EL 04-041

SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

APPLICATION

FOR

EAST SIDE PEAKING PROJECT

RECEIVED

DEC 2 2 2004

SOUTH DAKOTA PUBLIC
UTILITIES COMMISSION

Prepared by:

BASIN ELECTRIC POWER COOPERATIVE
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BISMARCK, NORTH DAKOTA 58501
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December 2004

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EXHIBITS

ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
Basin Electric	Basin Electric Power Cooperative
BOP	Balance of plant
Btu	British thermal unit
CEM	Continuous emission monitoring
CFR	Code of Federal Regulations
CO	Carbon monoxide
CPWC	Cumulative Present Worth Cost
CTG	Combustion turbine generator
CWA	Clean Water Act
dBA	A-weighted decibel
dB	Decibel
DOT	Department of Transportation
EMF	Electric and magnetic fields
EPA	U.S. Environmental Protection Agency
EPC	Engineer, procure, and construct
ERW	Electric resistance welding
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GE	General Electric
gpm	Gallons per minute
HMI	Human machine interface
HPC	High-pressure compressor
Hwy	Highway
kV	Kilovolt
Kwh	Kilowatt-hour
LPC	Low-pressure compressor
$\mu g/m^3$	Micrograms per cubic meter
MAOP	Maximum Allowable Operating Pressure
MAPP	Mid-Continent Area Power Pool
mmscfd	Million standard cubic feet per day
msl	Mean sea level
mva	Million volt-amperes
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NBPL	Northern Border Pipeline
NESC	National Electrical Safety Code
NO_2	Nitrogen Oxide
NOx	Nitrous Oxides
NRC	National Research Council

ACRONYMS AND ABBREVIATIONS (Continued)

O&M	Operating and maintenance
OPS	Office of Pipeline Safety
PLSS	Public Land Survey System
PM_{10}	Particulate matter less than 10 microns
PRS	Power requirements study
PSD	Prevention of significant deterioration
psig	Pounds per square inch gauge
PUC	Public Utilities Commission
ROW	Right-of-way
RUS	Rural Utilities Service
SD	South Dakota
SDAR	South Dakota Administrative Rule
SDCL	South Dakota Codified Law
SDGS	South Dakota Geological Survey
Section line	Public Land Survey System section line
SHPO	State Historic Preservation Office
SMYS	Specified minimum yield strength
T&E	Threatened and endangered
Tetra Tech	Tetra Tech EM Inc.
tpy	Tons per year
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Western	Western Area Power Administration

1.0 APPLICATION PREFACE

Basin Electric Power Cooperative (Basin Electric) is proposing construction of a peaking resource generator near Groton, South Dakota, to serve projected member load growth. An 80 to 100 megawatt (MW) simple cycle, natural gas-fired turbine was identified as the least-cost, self-build resource option to provide for future peaking requirements. This project is known as the East Side Peaking Project.

The proposed East Side Peaking Project will include a new 80 to 100 MW simple cycle combustion turbine generator (CTG) in eastern South Dakota that will use natural gas for fuel. Firm agreements for gas supply and transportation are in place and satisfy Mid-Continent Area Power Pool (MAPP) accreditation requirements. The East Side Peaking Project will include an 80 to 100 MW simple cycle gas turbine generator, approximately 11.5 miles of underground gas pipeline, and approximately 0.5 mile of transmission line.

This application meets the requirements set forth in South Dakota Codified Law (SDCL) 49-41B and South Dakota Administrative Rule (SDAR) 20:10:22. The balance of this document provides the application, supporting exhibits, and supporting documents. In accordance with SDCL 49-41B-22, Basin Electric affirms that:

1. The proposed facilities comply with all applicable laws and rules;
2. The facilities will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area;
3. The facilities will not substantially impair the health, safety, or welfare of the inhabitants; and
4. The facilities will not unduly interfere with the orderly development of the region with due consideration having been given to the views of governing bodies of affected local units of government.

Basin Electric requests that the Public Utilities Commission (PUC) of South Dakota make complete findings and render a decision to grant a permit to construct the generation facilities on such terms, conditions, or modification of construction and operation or maintenance as the PUC may deem appropriate.

Basin Electric Power Cooperative

By: ______________________ Date: 12-21-04

Name, Title

Env. Coordinator

2.0 APPLICATION

This Basin Electric application to the PUC was developed and organized to meet the requirements of the South Dakota PUC rules set forth in South Dakota Administrative Rule (SDAR) 20:10:22. This application is submitted to the South Dakota PUC and conforms to South Dakota statutes and rules that govern energy conversion and transmission facilities.

2.1 NAME OF PARTICIPANTS (SDAR 20:10:22:06)

The applicant's name, address, and telephone number are:

Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58501-0564
(701) 223-0441

The individuals authorized to receive communications about the application on behalf of Basin Electric are:

Jim Berg
Environmental Permitting Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58501-0564
(701) 223-0441

Myron Steckler
Project Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58501-0564
(701) 223-0441

2.2 NAME OF OWNER AND MANAGER (SDAR 20:10:22:07)

The proposed generation and transmission facilities are to be owned by Basin Electric. The project manager is:

Myron Steckler
Project Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58501-0564
(701) 223-0441

2.3 PURPOSE OF FACILITY (SDAR 20:10:22:08)

Basin Electric is a consumer-owned, regional cooperative headquartered in Bismarck, North Dakota. Basin Electric was formed in 1961 by 67 member cooperatives, after the U.S. Department of the Interior announced that the federal hydropower system would not be able to meet the additional energy requirements of the region's rural electric cooperatives and other preference customers of the U.S. Bureau of Reclamation beyond the winter of 1965. Basin Electric was formed as a wholesale power supplier to plan, design, construct, and operate generating facilities necessary to meet the growing electrical demands of its member systems. Basin Electric generates and transmits wholesale electricity to 125 member rural electric systems in nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming. These member systems, in turn, distribute electricity to more than 1.8 million customers.

Construction of the proposed East Side Peaking Project is required to meet the growing needs for power for Basin Electric's membership in its service territory. Basin Electric has identified the need to add a peaking resource to serve projected load growth for its members. This project was established on the basis of an ongoing need to address reliability and to supply low-cost power to Basin Electric's members (Basin Electric 2003, 2004b).

2.4 ESTIMATED COST OF FACILITY (SDAR 20:10:22:09)

The estimated total construction cost of the proposed facilities is $69 million. The major components of this estimate are as follows:

Simple cycle gas turbine	$47.7 million
Underground gas pipeline (about 11.5 miles)	$6.7 million
115 kV transmission line (less than 0.5 miles) and substation upgrades	$3.0 million
Engineering, overhead, interest during construction, contingency	$11.6 million

2.5 DEMAND FOR FACILITY (SDAR 20:10:22:10)

Construction of the East Side Peaking Project is required to meet the growing needs for power of Basin Electric's membership in its service territory. Basin Electric has established the need to add a peaking resource to serve projected load growth for its members. This project was established on the basis of an ongoing need to address reliability and to supply low-cost power to Basin Electric's members (Basin Electric 2003, 2004b).

Exhibit 1 presents the projected summer loads for Basin Electric's east side. Numbers enclosed in parenthesis indicate a deficit.

EXHIBIT 1
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
PROJECTED SUMMER LOADS, RESOURCES, AND DEFICITS FOR BASIN ELECTRIC'S EAST SIDE

Year	Summer Seasonal Demand	Net Generation Owned	Firm & Participation Purchases	Firm & Participation Sales	Net Reserve Capacity	Basin Electric Surplus/ Deficit
2004	1502	1759	121	229	223	(74)
2005	1507	1790	117	253	224	(77)
2006	1527	1790	117	186	227	(33)
2007	1570	1790	117	107	232	(2)
2008	1588	1790	117	103	234	(18)
2009	1610	1791	117	98	238	(38)
2010	1627	1790	116	105	240	(67)
2011	1661	1790	116	55	237	(47)
2012	1679	1790	116	61	239	(73)
2013	1696	1790	116	64	242	(96)
2014	1715	1790	116	67	245	(121)
2015	1739	1790	115	70	249	(152)
2016	1761	1790	115	73	252	(181)
2017	1781	1790	115	77	255	(208)
2018	1803	1790	115	82	259	(239)
2019	1826	1790	115	88	262	(271)
2020	1849	1790	115	91	266	(301)

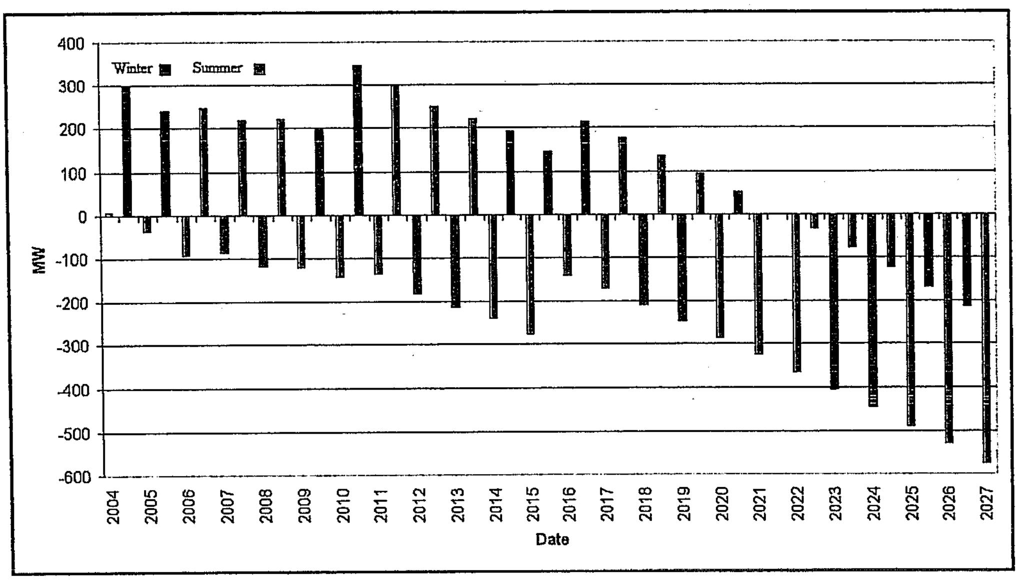
Note: Units are megawatts

Even though the most rural areas are experiencing a loss in population, many areas served by Basin Electric in the project region are experiencing population growth. As a result, Basin Electric is experiencing load growth throughout its system in every consumer class. A new peak demand delivery to members was reached in 2002.

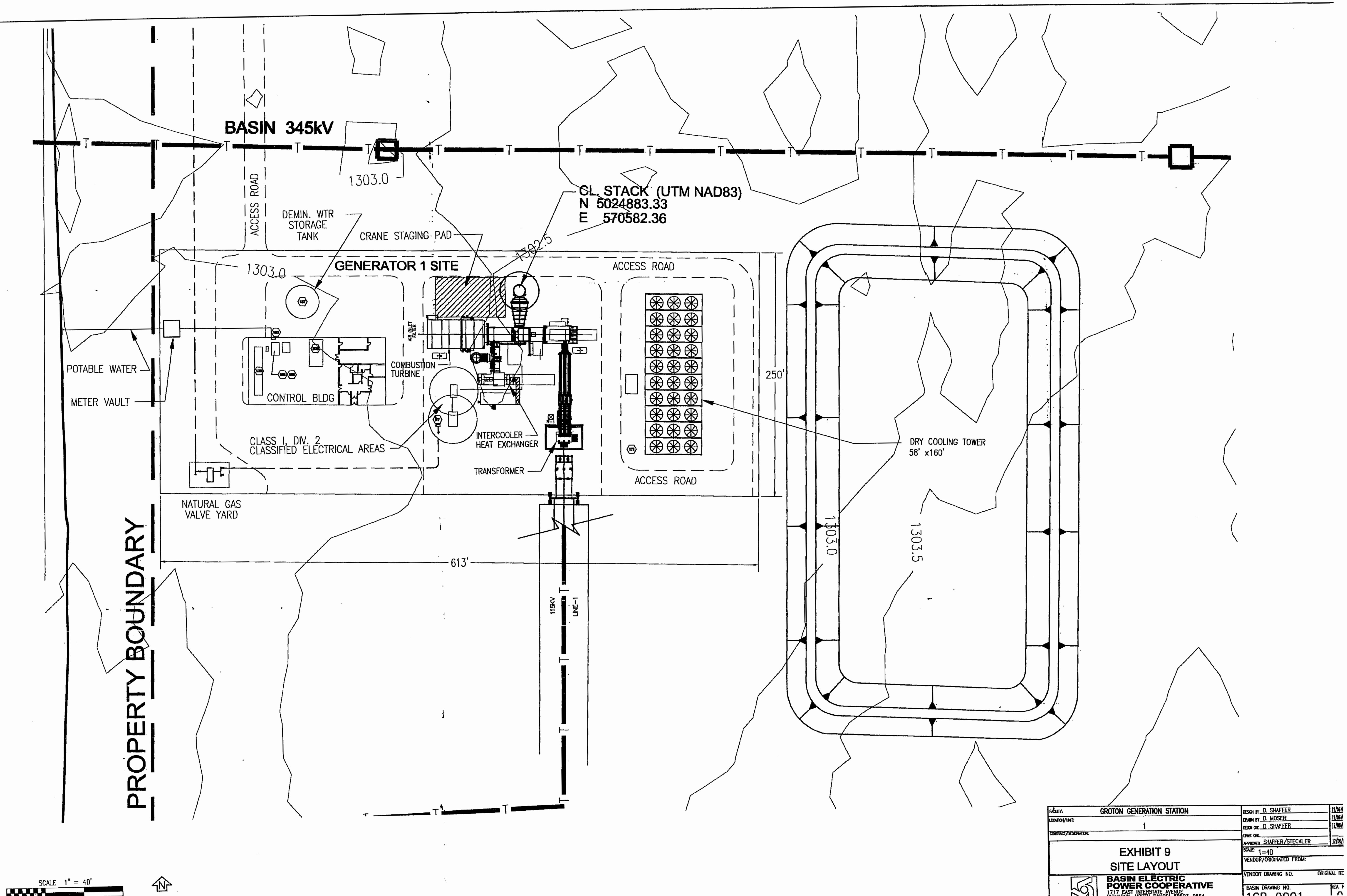
Basin Electric's forecasted system capacity requirements for the 2004 through 2027 planning horizon are contained in the 2003 Power Supply Analysis Study (Basin Electric 2003, 2004b). The study was prepared in accordance with Rural Utilities Service (RUS) regulations published at 7 Code of Federal Regulations (CFR) 1710 Subpart F. The study was conducted to identify the best capacity additions for Basin Electric's service area. The capacity alternative ultimately chosen must ensure a safe, adequate, and reliable supply of electricity for Basin Electric and its members at the lowest reasonable cost. The preferred self-build option identified by this study is the anticipated lowest-cost resource option and has been compared with other options available to Basin Electric, including proposals received through a capacity solicitation process.

The need for additional capacity is driven by general load growth among its members and anticipated growth in commercial load throughout the Basin Electric member service area. Exhibit 2 presents the load and capability surplus/deficit calculation for the total Basin Electric system. The calculation includes projects currently under construction, as well as projects Basin Electric committed to building.

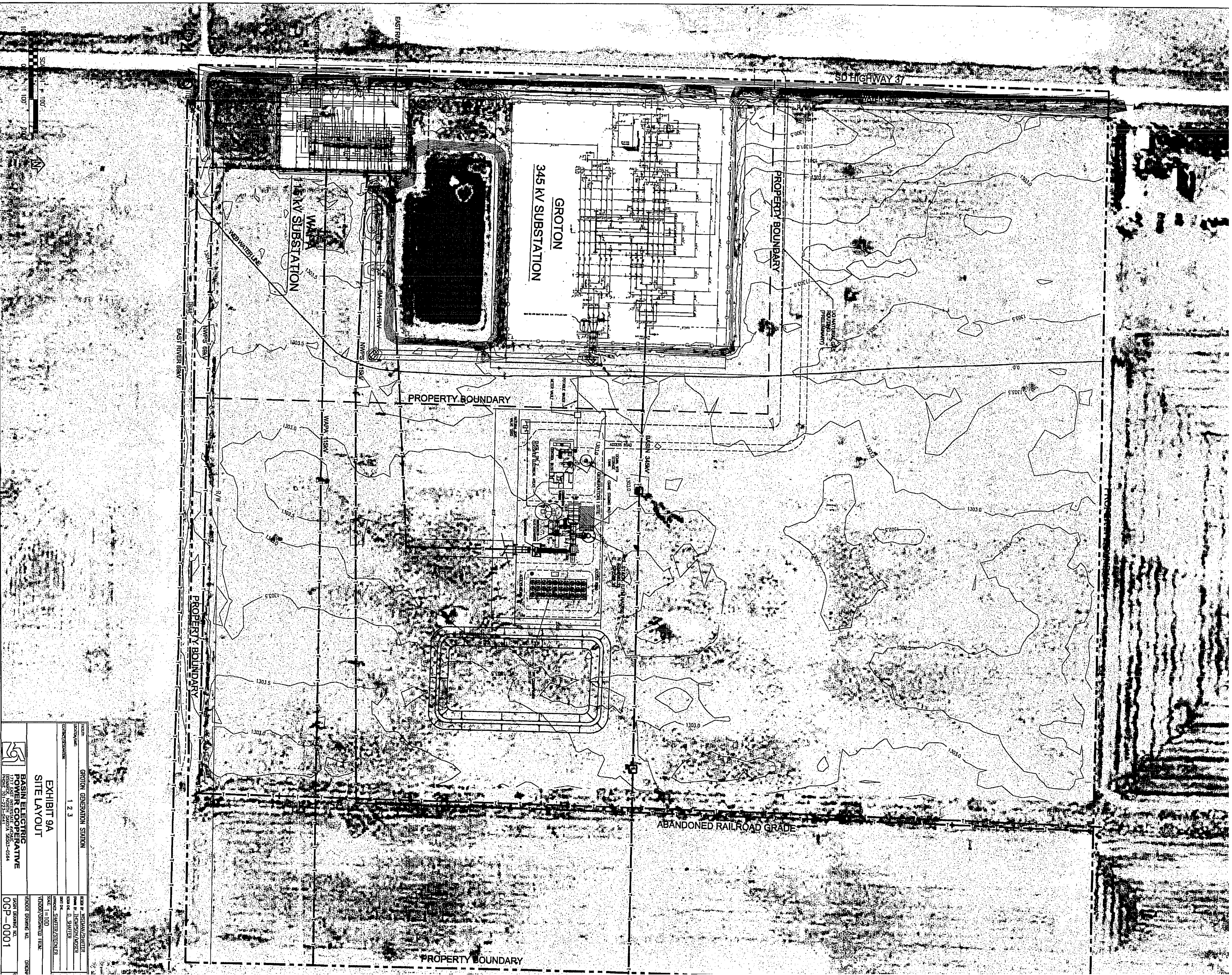
EXHIBIT 2
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
TOTAL BASIN ELECTRIC SYSTEM SURPLUS/DEFICIT CAPACITY ESTIMATE



The study evaluated candidate capacity options that will satisfy the currently forecasted Basin Electric system capacity requirements in the least-cost manner, defined as the expansion plan that offers the lowest Cumulative Present Worth Cost (CPWC) over the 2004 though 2027 planning horizon. Included in CPWC are all incremental capital and fixed operating and maintenance (O&M) costs, plus all system variable (fuel plus variable O&M) costs incurred to meet all capacity requirements. The system planning process requires development of capital cost and performance parameters for all candidate generating units to be evaluated. For this study, Basin Electric developed conceptual-level cost and performance information for a number of solid fuel- and gas-fired units.

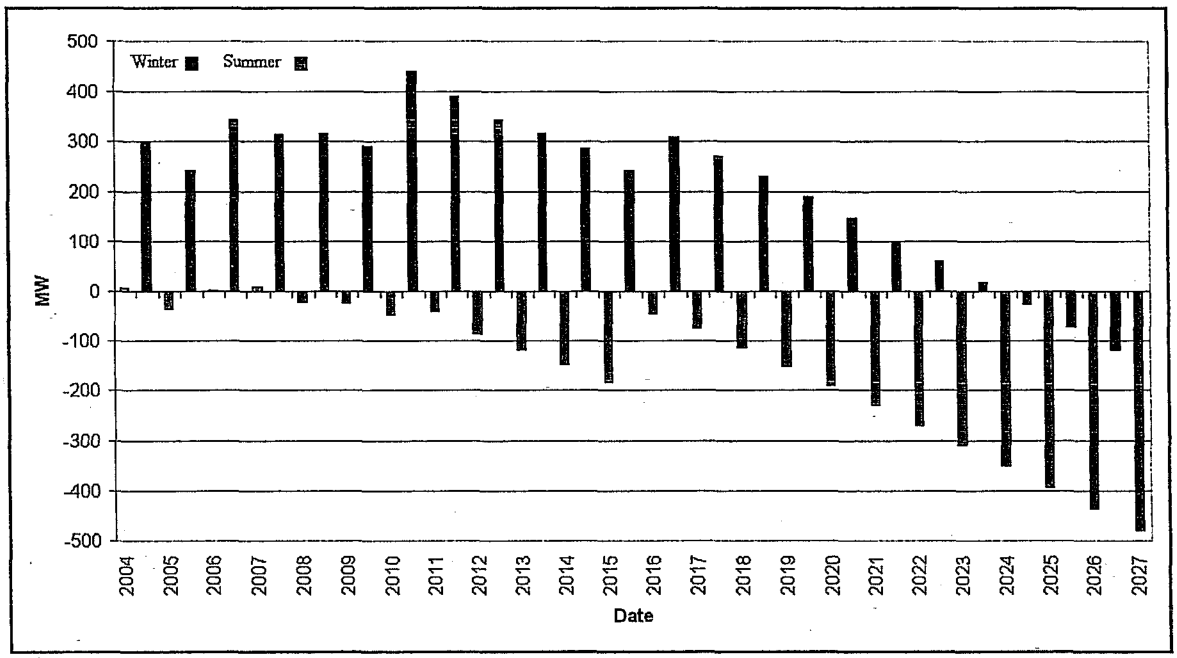


FACILITY: GROTON GENERATION STATION	DESIGN BY D. SHAFFER
LOCATION/UNIT: 1	DRAWN BY D. MOSER
CONTRACT/DESIGNATION:	DESIGN CHK D. SHAFFER
EXHIBIT 9 SITE LAYOUT	APPROVED SHAFFER/STECKLER
	SCALE 1=40
BASIN ELECTRIC POWER COOPERATIVE 1717 EAST INTERSTATE AVENUE BISMARCK, NORTH DAKOTA 58503-0564	VENDOR/ORIGINATED FROM:
	VENDOR DRAWING NO. ORIGINAL RE
	BASIN DRAWING NO. REV.


SD HIGHWAY 37
GROTON
345 kV SUBSTATION
WAPA
115 kV SUBSTATION
PROPERTY BOUNDARY
PROPERTY BOUNDARY
PROPERTY BOUNDARY
PROPERTY BOUNDARY
ABANDONED RAILROAD GRADE
EAST RIVER 69KV
WAPA 115KV
BASIN 345KV
GROTON GENERATION STATION
1 2 3
EXHIBIT 9A
SITE LAYOUT
BASIN ELECTRIC POWER COOPERATIVE
0GP-0001

Based on the analysis of loads and resources, Basin Electric will face a power deficit in 2004 and therefore requires a peaking-type resource. The capacity analysis shows that Basin Electric faces a power deficit in the summer season of 80 to 100 MW; the energy situation shows that peaking is the type of energy (resource) needed. Considering a variety of constructed and purchased options, the alternative that offered the lowest total system cost as the next resource for Basin Electric is an 80 to 100 MW simple cycle CTG located in South Dakota. Exhibit 3 presents the load and capability surplus/deficit calculation for the total Basin Electric system with the addition of an 80 to 100 MW turbine.

EXHIBIT 3
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
TOTAL BASIN ELECTRIC SYSTEM SURPLUS/DEFICIT CAPACITY ESTIMATE
WITH THE ADDITION OF AN 80 to 100 MW TURBINE



An estimated load pattern for Basin Electric's total system was developed for the projected peak demand in 2006 and 2012. The energy available from existing resources was also graphed with the load pattern. The estimated load pattern for 2006 is shown in Exhibit 4, and the estimated load pattern for 2012 is shown in Exhibit 5. These exhibits indicate that Basin Electric has sufficient coal to meet its base load energy needs for some time to come. However, there is a shortage of peaking energy resources to satisfy these needs. Furthermore, the load pattern is based on the 2002 load profile; however, the peak in this load profile is more diverse than is envisioned in Basin Electric's plans, so the peak in both 2006 and 2012 could be higher than is projected in the load pattern. The available energy is based on Basin Electric's existing resources, scheduled maintenance outages for existing resources, and contract purchases. The load pattern is the Basin Electric member load, diversity, contingency, losses, reserves, and contracted non-member sales.

2.6 GENERAL SITE DESCRIPTION (SDAR 20:10:22:11)

This section describes the site, including the CTG, the underground gas pipeline, and the general topographic features of the proposed site.

EXHIBIT 4
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2006 TOTAL SYSTEM ESTIMATED LOAD PATTERN AND AVAILABLE ENERGY

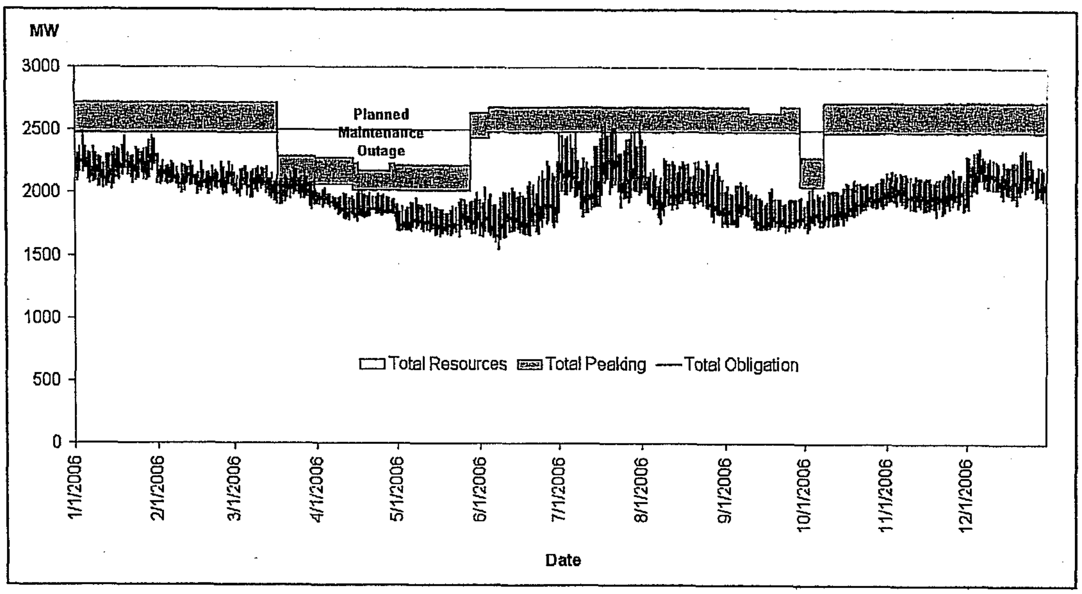
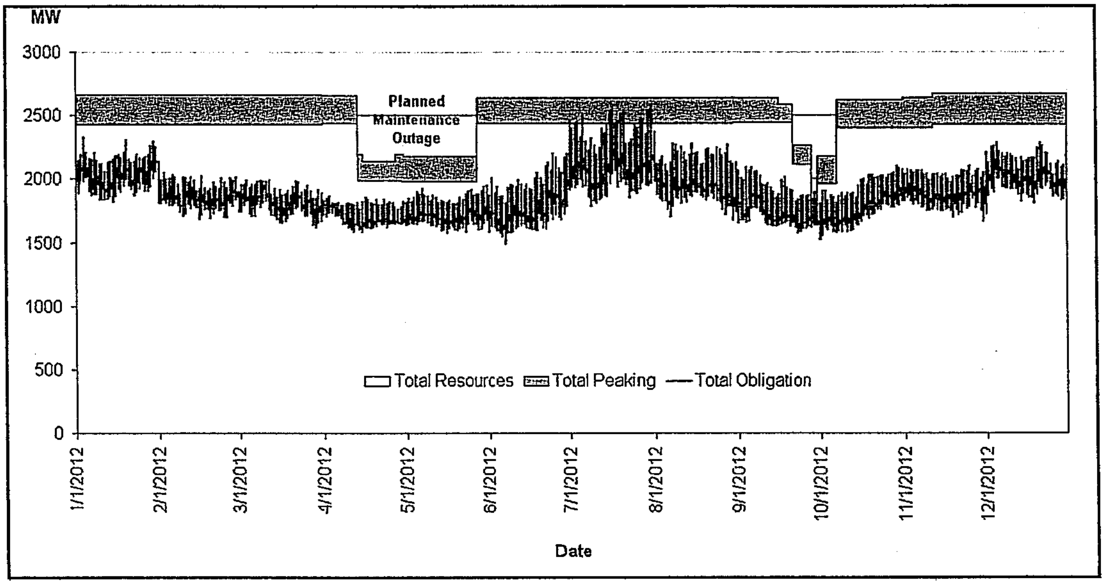


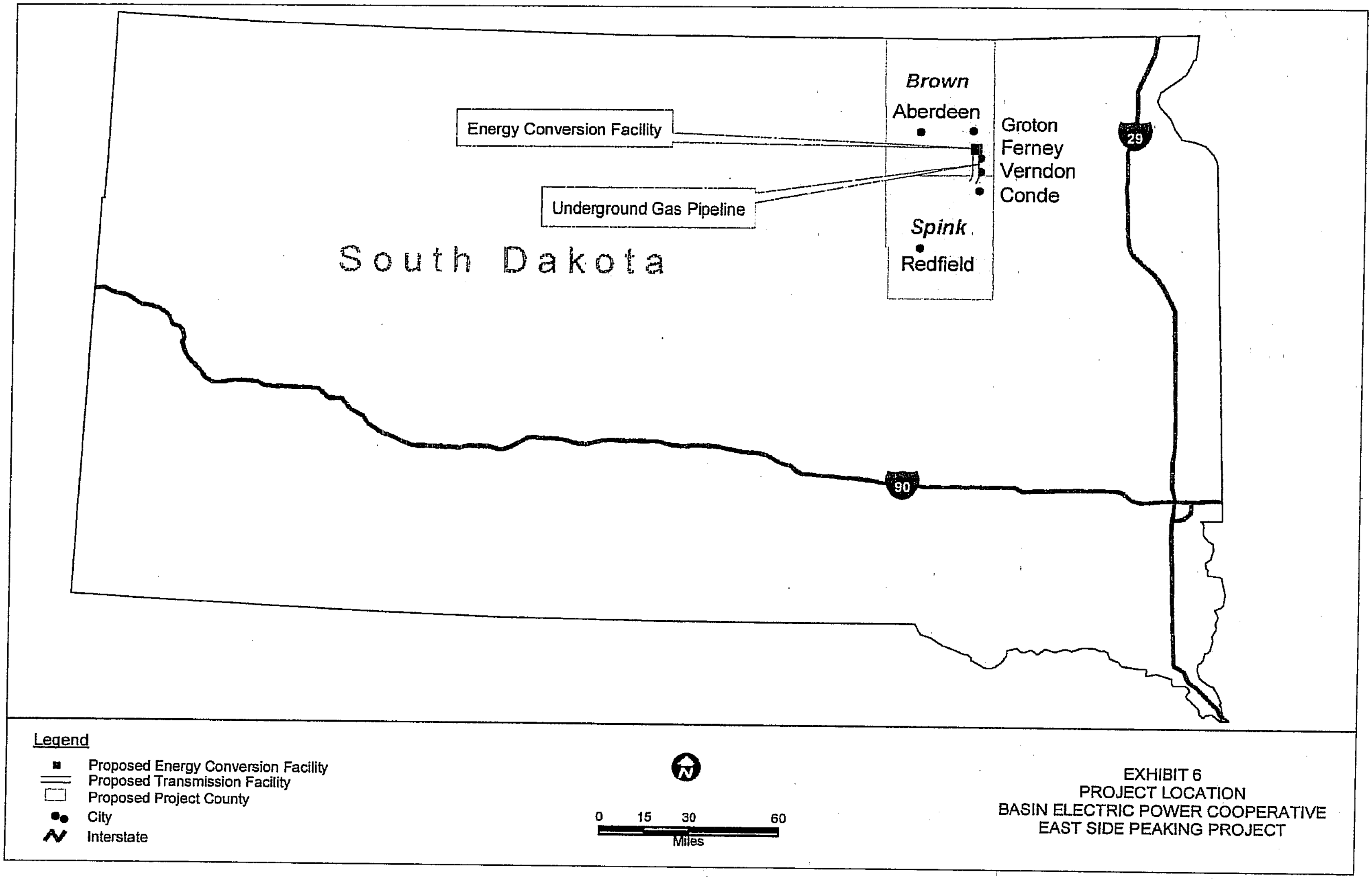
EXHIBIT 5

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2012 TOTAL SYSTEM ESTIMATED LOAD PATTERN AND AVAILABLE ENERGY



2.6.1 80 to 100 MW Natural Gas-Fired Combustion Turbine Generator Site

The site for the East Side Peaking Project is located in a predominantly agricultural area, compatible with the proposed project. The proposed CTG site will be located in Section 18, Township 122 North, Range 60 West, on property owned by Basin Electric. The site is located 5 miles south of Groton, in Brown County, South Dakota (Exhibit 6). A small town, Ferney, is located 3 miles south of the site. Aberdeen, South Dakota, is located 18 miles northwest of the site. Spink County is 9 miles south, Day County is 6 miles east, and Edmunds County is 30 miles west of the site. The North Dakota state line is 39 miles north of the site. A U.S. Geological Survey (USGS) topographic map, Exhibit 7, and an aerial photograph, Exhibit 8, show the project area.


Brown
Aberdeen
Groton
Ferney
Verndon
Conde
Spink
Redfield
Energy Conversion Facility
Underground Gas Pipeline
South Dakota
29
90
Legend
Proposed Energy Conversion Facility
Proposed Transmission Facility
Proposed Project County
City
Interstate
0 15 30 60
Miles
EXHIBIT 6
PROJECT LOCATION
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

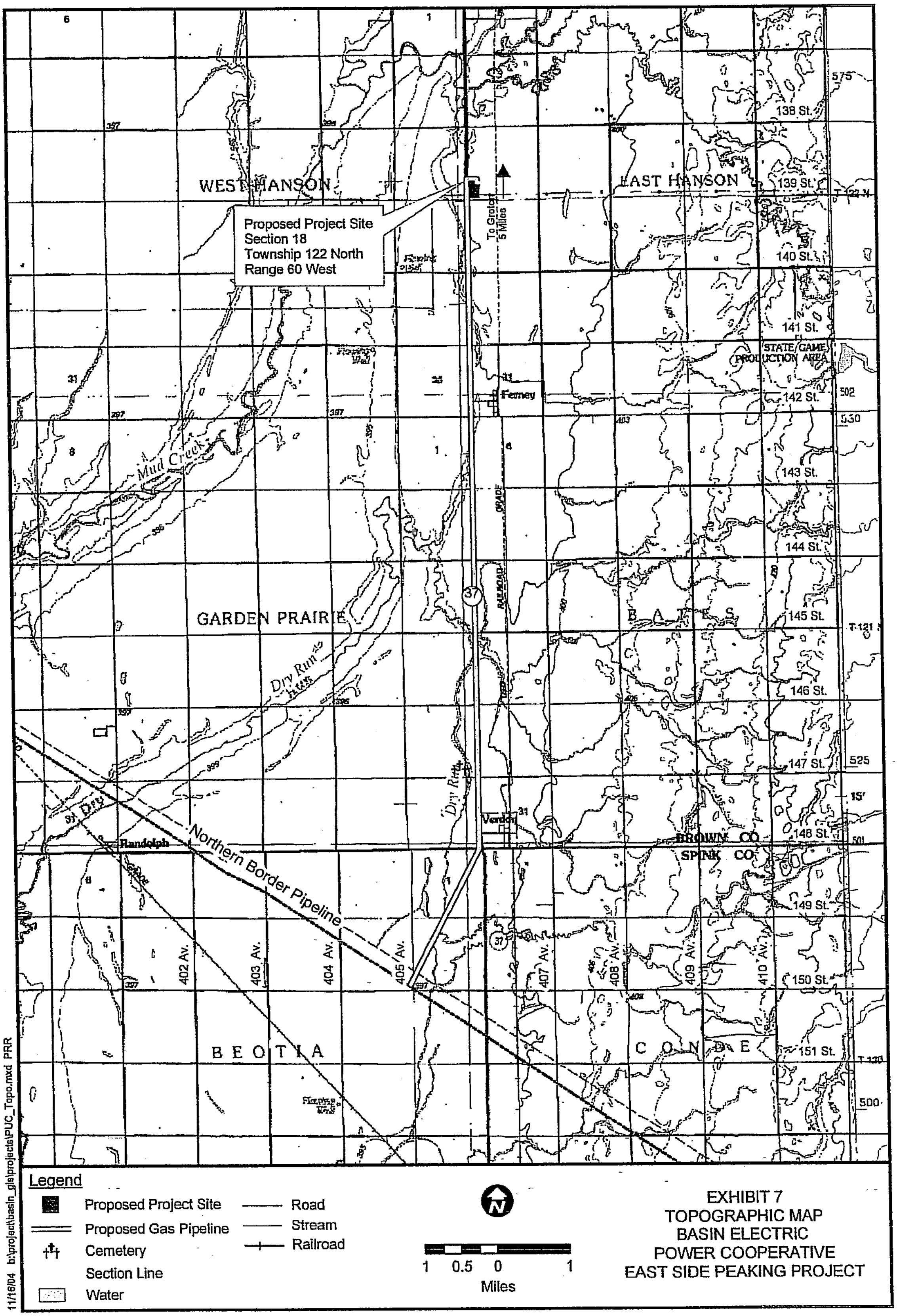


EXHIBIT 7
TOPOGRAPHIC MAP
BASIN ELECTRIC
POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

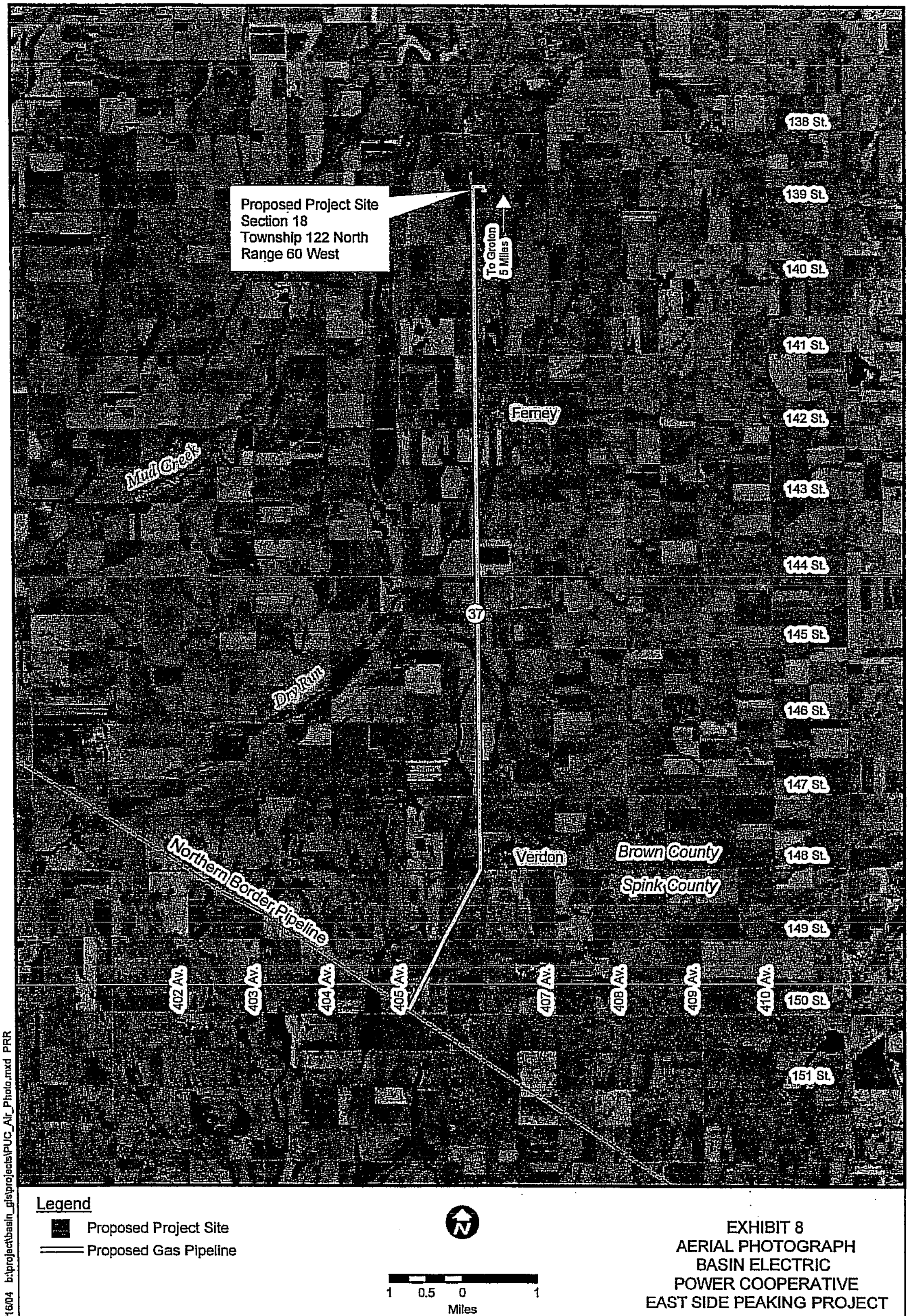


EXHIBIT 8
AERIAL PHOTOGRAPH
BASIN ELECTRIC
POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

The site is located in relatively level terrain adjacent to a Western Area Power Administration (Western) 115-kilovolt (kV) substation and the Groton 345 kV substation. The Groton 345 kV substation is owned by Basin Electric, Heartland Consumers Power District, and Northwestern Public Service Company through a joint project facility agreement. Basin Electric is responsible for the operation and maintenance of the Groton 345 kV substation.

An existing 345 kV transmission line owned by Basin Electric and a 115 kV line owned and operated by Western currently pass within 0.5 mile of the site. The proposed CTG will be constructed on land already owned by Basin Electric, and will be located just east of the Groton 345-kV substation. The proposed site will include a drainage pond to accommodate the proposed project. The only other feature present on the site (with the exception of the transmission lines) is an abandoned segment of railroad. All that remains of the railroad is the railroad bed.

2.6.2 Underground Gas Pipeline

In addition to the proposed CTG, this project includes construction of approximately 11.5 miles of 10.75-inch diameter underground natural gas pipeline to supply the gas turbine. The pipeline will originate in Section 13, Township 120 North, Range 61 West at a meter site at the existing 42–inch Northern Border Pipeline (NBPL). For approximately two miles the pipeline will diagonally cross privately-owned agricultural property until it reaches the existing utility and road right-of-way (ROW) on the west side of State Highway 37. The remaining pipeline segment will be located in the highway ROW until it reaches a point directly west of the CTG site. When the pipeline reaches the CTG site, the pipeline will cross beneath the highway and onto the CTG site. The pipeline will parallel an existing underground pipeline owned by Northern Natural Gas from the NBPL to the location across from the CTG site (Exhibit 8).

2.6.3 General Topographic Features of the Project

The elevation is approximately 1,300 feet (400 meters) above mean sea level (msl) at the turbine site and at the southern end of the underground gas pipeline where the pipeline will connect with the NBPL. The topography of the proposed CTG site and the corridor for the proposed pipeline is relatively flat. Some rolling hills are in the area. Topographic maps of the proposed project area are provided as Exhibit 7, Exhibit 9, and Exhibit 9A.

2.7 ALTERNATIVE SITES (SDAR 20:10:22:12)

This section presents the general criteria used to select the proposed project site and evaluates alternative sites considered and the advantages of the proposed generation facility.

2.7.1 Evaluation Criteria

Basin Electric systematically evaluated alternatives to the Proposed Project. There were several objectives in considering an alternative: access to high voltage transmission system, available gas and water supply, low cost, and minimal environmental and public impact. One objective was to minimize the need for construction of additional transmission capacity by identifying projects near existing transmission lines with available capacity. Another objective was to provide low-cost electrical energy to the members served by Basin Electric. A third objective was to identify projects that will minimize the potential impacts to the environment and public. Basin Electric's alternative evaluation included:

- Studying the entire proposed area of the project using aerial photographs, maps, and existing land use databases
- Screening the area of the project to identify restricted and potentially incompatible areas, including conflicting land uses, existing structures or developments, and potentially challenging environmental features such as ponds, lakes, or hills
- Identifying gas pipeline corridors that are predominantly along existing Public Land Survey System (PLSS) section lines or that follow existing ROW
- Identifying existing electric transmission lines and substations. (Existing substations were desirable but not a necessary attribute for potential sites.)
- Completing field surveys by a multidisciplinary team that included a project engineer, environmental compliance specialist, and land use planner
- Identifying potential costs associated with development of viable options
- Conducting a comparative assessment of viable alternatives using criteria on reliability/dependability for energy supply, distance from existing transmission line capacity, cost (capital and operating and maintenance), and environmental considerations

Water requirements for a simple-cycle combustion turbine, although important, would not be as critical as fuel supply and transmission capabilities.

An initial screening process followed by a field reconnaissance identified potential alternatives to the proposed project. The initial task involved identification of potential transmission interconnection points; delineation of the boundaries of the project area; and examination of photographs, maps of existing and future land uses, transportation and utility maps, and maps that show environmental features such as floodplains, wetlands, and soils. This initial review was completed to identify realistic projects and potential transmission interconnection points, and eliminate from further consideration projects that are obviously unsuitable. Based on the results of the screening evaluation, transmission interconnection points were identified and gas pipeline corridors were drawn on a map. The following considerations were included in the screening process:

- Minimizing the number of homes and buildings adjacent to the project area
- Minimizing the number of landowners who would be affected
- Minimizing potential impacts to known wetlands, threatened and endangered (T&E) species, sensitive habitats, waters of the U.S., and other environmental resources
- Minimizing costs associated with acquisition, construction, and maintenance
- Eliminating alignments that did not predominantly coincide with section lines, existing property boundaries, and utility rights-of-way to comply with agency requests that these areas be avoided, where possible.

2.7.2 Alternative Sites Evaluated

Initially, 12 potential CTG locations were identified in Basin Electric's East Side, which includes eastern South Dakota and northwestern Iowa (Exhibit 10) (Basin Electric 2004a). Basin Electric staff completed an initial field review of these 12 sites on June 2 through 4, 2003. This site screening field review verified the accuracy of databases used to locate existing natural gas pipelines, transmission lines and substations, and the spatial relationship of these resources to each other in the area surrounding the potential sites. Existing water supplies and transportation access were also documented.

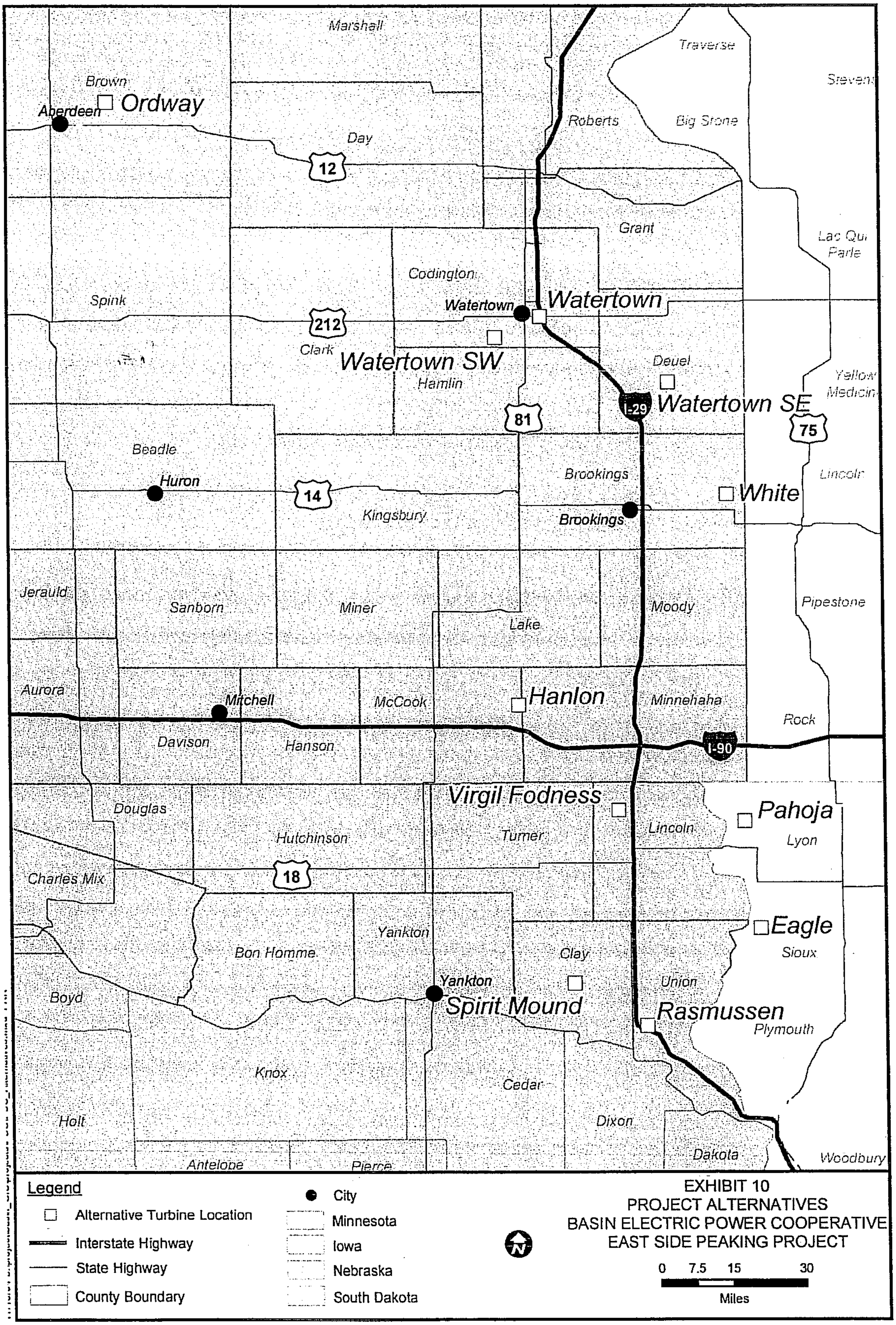


EXHIBIT 10
PROJECT ALTERNATIVES
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Potential environmental and human constraints in the area surrounding the potential sites were also noted. Regional air quality constraints, land use compatibility, geologic hazards, potential biological or cultural resource constraints, wetlands, and any potential for hazardous waste or spill sites in the general area were considered. Ten of these sites were eliminated from consideration for the reasons described in Section 3.0 of the environmental report located in Appendix A of this PUC application (Basin Electric 2003, 2004b).

An alternative site 27 miles southeast of the city of Watertown, in Deuel County, South Dakota, (Exhibit 10) was evaluated in detail. The site is located in relatively level terrain near the intersection of the NBPL 42-inch-diameter gas pipeline and a Western 345 kV transmission line. However, there is no substation at this location, and so a new 345 kV substation will need to be constructed as part of the project if this alternative were implemented.

2.7.3 Advantages of Proposed Generation Facility

The evaluation of alternatives revealed that the proposed project is the only alternative that addresses the needs of Basin Electric and its consumers while minimizing impacts to the environment. Several generation technologies and alternative gas turbine locations were considered. The proposed project was selected because its accessibility, location, and scoring relative to the selection criteria chosen were comparable or superior to the other alternatives evaluated. The proposed project is compatible with land uses in the region, minimizes impacts to environmentally sensitive or significant features, and meets the power supply needs of Basin Electric and its members. Furthermore, the proposed project avoids potentially unfavorable features (such as existing or future residential communities, commercial developments, and schools), and minimizes the need to environmentally affect sensitive or significant features, including prime farmland, potentially sensitive habitats, waterways, and vegetation communities. The proposed CTG will be located on land owned by Basin Electric. The majority of the pipeline will be constructed in existing ROW reducing potential reliance on eminent domain powers.

2.8 ENVIRONMENTAL INFORMATION (SDAR 20:10:22:13)

Basin Electric has completed an environmental report for the East Side Peaking Project that is located in Appendix A of this application. The existing environment is described in detail in Section 4.0 of the environmental report. Estimates of the changes and impacts to the existing environment from activities associated with construction and maintenance of the proposed generation facilities are discussed in detail in Section 5.0 of the environmental report.

The proposed CTG site will be located on property owned by Basin Electric just east of the existing Groton 345 kV substation (Exhibit 9). A Western 115 kV substation is also adjacent to the proposed site. The proposed alignment for the underground gas pipeline will minimize changes and impacts to the existing environment by using existing road and utility rights-of-way, following existing property boundaries, siting in areas with compatible land use, avoiding potentially unfavorable cultural features, and minimizing the need to cross environmentally sensitive or significant features. The environmental report (Appendix A) demonstrates that the proposed project will have no significant environmental impact on all factors evaluated. It is anticipated that this project would not create any significant direct, cumulative, or synergistic hazards to the health and welfare of human, plant, or animal communities. No other major industrial facilities under regulation will have an adverse affect of the environment as a result of their construction or operation in the proposed project's siting area.

2.9 EFFECT ON PHYSICAL ENVIRONMENT (SDAR 20:10:22:14)

This section provides information on the effect of the proposed generation facility on the physical environment.

2.9.1 Regional Land Forms

The proposed project will use the existing level to nearly level terrain for the gas turbine and associated facilities. The grading and earthmoving required is not significant because the sites are nearly level and not are located in areas susceptible to flooding (USDA 1994, 1997). As a result, no direct, indirect, or cumulative impacts to topography are anticipated from the proposed project. Regional land forms are discussed more specifically in conjunction with the topography in the project area in Section 2.9.2.

2.9.2 Topography

A topographic map of the project area is provided in Exhibit 7. Modifications to approximately 15 acres of cultivated farm fields will be associated with grading an area for the generator pad and establishing drainage of storm water across and around the site. A retention pond for site surface runoff water and non-contact cooling water would also be constructed.

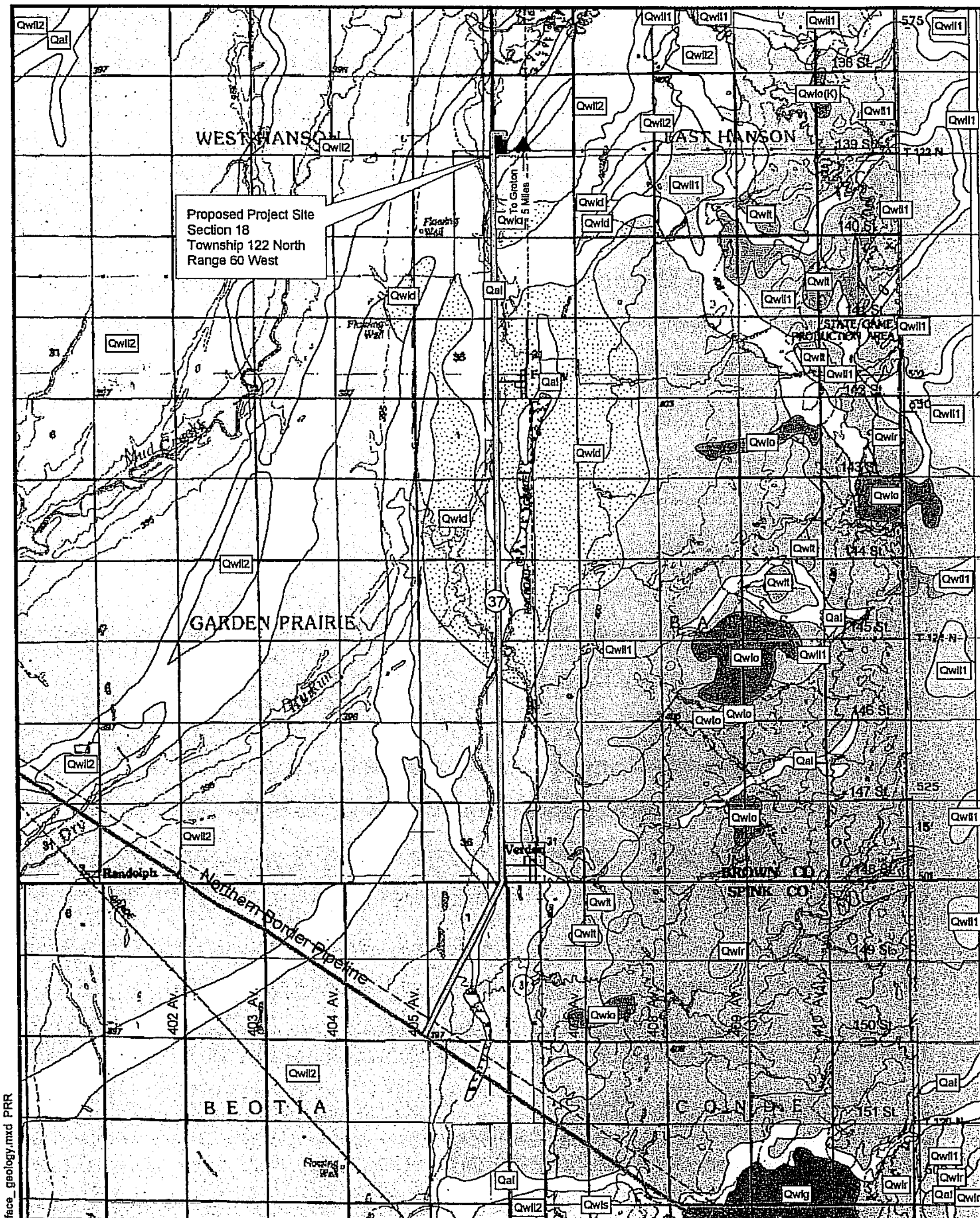
The proposed CTG site and the approximately 11.5-mile-long underground gas pipeline route are located on level to nearly level terrain associated with the broad James River valley (USDA 1994, 1997). Slopes range from 0 to 2 percent, and cultivation and increased erosion and deposition have caused additional filling of low areas. The general area slopes westward toward the James River, located 10 miles west of the proposed CTG project location. No significant grading or earthmoving will be required. No direct, indirect, or cumulative impacts to topography are anticipated by construction of the proposed project.

2.9.3 Geologic Features

The project site is located in the Lake Dakota Plain within the James Basin Physiographic Division of the Central Lowlands province (Leap 1986). The ancient Lake Dakota bed is composed of lacustrine silts and is generally flat, with relief under 10 feet. Till highlands are present east and west of the Lake Dakota Plain (Leap 1986).

Brown County, including the project area, is underlain by Precambrian basement rocks to the Cretaceous Pierre Shale. The entire county is covered by Pleistocene glacial drift. This drift includes till, outwash, lake silt, and sand. Surface sediments within the project area consist of the Pleistocene (Late Wisconsin)-age Delta Deposits. Typically, these deposits are gravel in the center, grading to finer sands and silts at the edges (Leap 1986) (Exhibit 11).

Several intermittent streams, Mud Creek, and Dry Run are near the project area. Alluvium is present along these stream beds. The alluvium is described as mostly silt, sand, clay, and gravel; poorly sorted; medium to dark gray where unweathered; present in most stream valleys; it may be up to 30 feet thick within the Lake Dakota Plain (Leap 1986).



Legend

- ■ Proposed Project Site
- Proposed Gas Pipeline
- Road
- Stream
- Railroad
- Section Line
- Water
- Marsh

- Qal - Alluvium
- Qwld - Outwash, Delta
- Qwlg - Till II, Ground Moraine
- Qwll1 - Lacustrine Deposits
- Qwll2 - Lacustrine Deposits Dakota and Byron
- Qwlo, o(K), o(DR), o(T) - Outwash
- Qwlr - Till II, Recessional Moraine
- Qwls - Till II, Stagnation Moraine
- Qwlt - Till I

EXHIBIT 11
SURFICIAL GEOLOGY
BASIN ELECTRIC
POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

1 0.5 0 1
Miles

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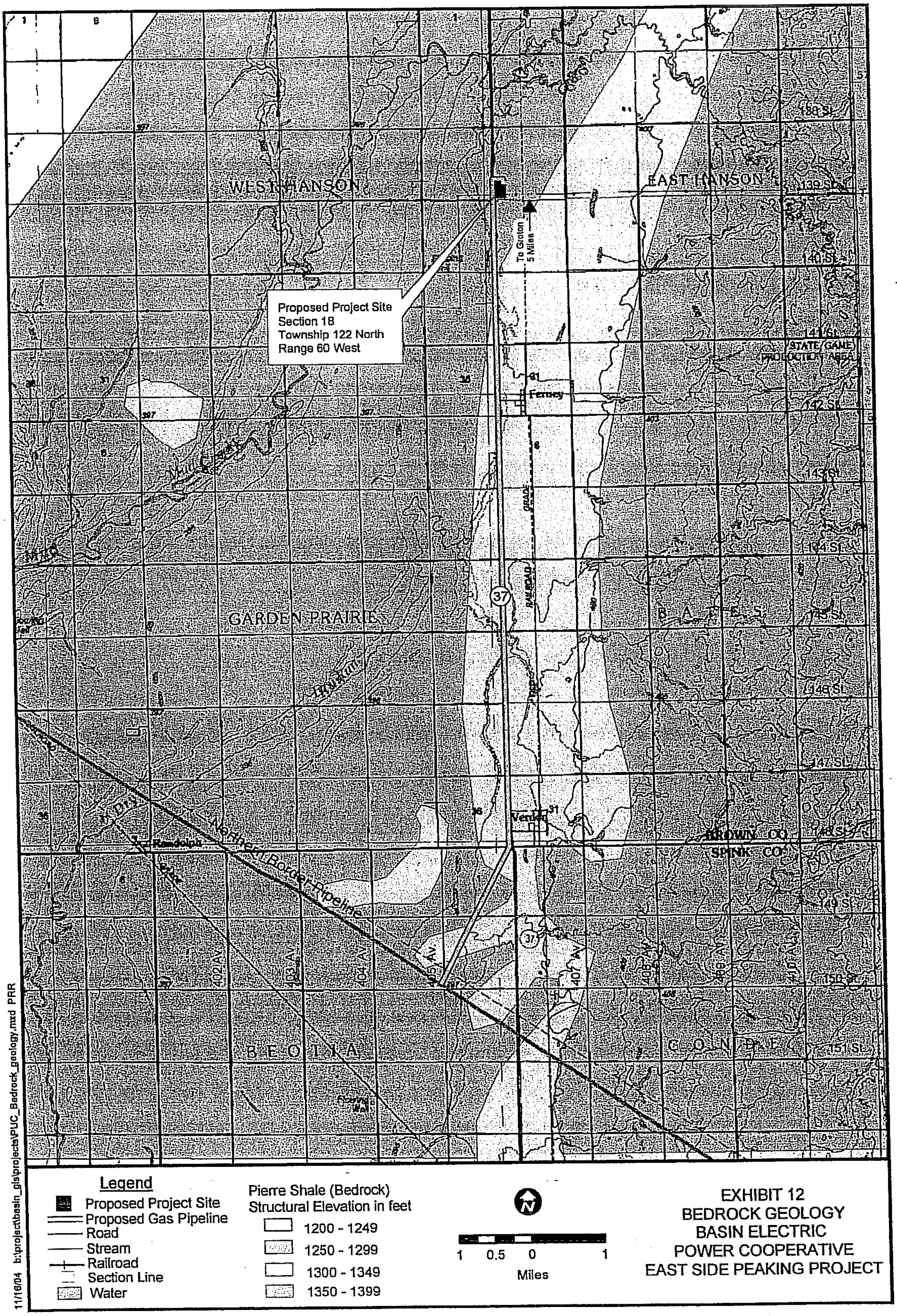
The Pierre Shale is the uppermost bedrock formation in Brown County and the project area. It is a medium to dark-gray shale that contains lenses of bentonite and ferruginous concretions. The Pierre underlies the glacial drift and is in conformable contact with the underlying Niobrara Formation. Depth to bedrock in the project area is approximately 100 feet below ground surface. The Pierre crops out in stream beds in the western part of Brown County (Leap 1986) (Exhibit 12).

Variations within the Pierre bedrock are the result of a wide valley that contained the channel system of the Ancient Grand-Moreau-Cheyenne River. The channel system is oriented generally northeast to southwest, with highlands on either side of the valley. This ancient channel system served as the major drainage before the late Wisconsin glaciation (Leap 1986).

The Precambrian basement of eastern South Dakota is part of the southern extension of the Canadian Shield. Before the Paleozoic Era, a large structural downwarping began to form in the areas of Montana, North Dakota, and South Dakota and created the Williston Basin, which is elongate to the north and south. Brown County is located on the eastern edge of this basin. The Williston Basin was undergoing deposition during the Paleozoic. The western part of Brown County was located within a deeper portion of the basin and therefore exhibits a more complete rock record of Paleozoic deposition. Erosion most likely removed the deposition that occurred on the eastern edge of the basin. After a period of uplift and erosion during the Mesozoic, downwarping of the crust began again over large areas of North America, including the Williston Basin, with deposition of the Mesozoic formations following. No significant Tertiary sediments were deposited in Brown County. The Pleistocene history of Brown County consists of one major glacial advance of Late Wisconsin age, termed the James Lobe (Leap 1986). Geologic cross-sections depicting the major subsurface variations in the siting area are presented in Appendix B.

2.9.4 Economic Deposits

No economic mineral deposits are identified in the project area, according to the Soil Survey of Brown and Spink Counties (USDA 1994, 1997). The proposed project is located in an area of poor probability of sand and gravel occurrence (Koch and Bradford 1977).



WEST HANSON
EAST HANSON
Proposed Project Site
Section 18
Township 122 North
Range 60 West
To Groton
5 Miles
Ferney
STATE GAME PRODUCTION AREA
GARDEN PRAIRIE
Mud Creek
BATES
Verdon
Randolph
Northern Border Pipeline
BROWN CO.
SPINK CO.
BEOTIA
CONDE
RAILROAD
GRADE
402 AV.
403 AV.
404 AV.
405 AV.
407 AV.
408 AV.
409 AV.
410 AV.
138 SL
139 SL
140 SL
141 SL
142 SL
143 SL
144 SL
145 SL
146 SL
147 SL
148 SL
149 SL
150 SL
151 SL
Legend
Proposed Project Site
Proposed Gas Pipeline
Road
Stream
Railroad
Section Line
Water
Pierre Shale (Bedrock)
Structural Elevation in feet
1200 - 1249
1250 - 1299
1300 - 1349
1350 - 1399
1 0.5 0 1
Miles
EXHIBIT 12
BEDROCK GEOLOGY
BASIN ELECTRIC
POWER COOPERATIVE
EAST SIDE PEAKING PROJECT
11/16/04 b:\project\basin_gis\projects\PUC_Bedrock_geology.mxd PRR

2.9.5 Soil Type

Soils at the gas turbine site are described as Aberdeen (silty clay loam), Nahon (silty clay loam), and Exline (silt loam) series. Aberdeen soils consist of deep, moderately well drained soils formed in clayey glaciolacustrine sediments. Nahon soils are similar to Aberdeen but can be somewhat poorly drained. The Exline soils also similar to the Aberdeen and Nahon soils in depth and drainage but the surface texture is a silt loam. Aberdeen soils are located on the upper foot slopes; Nahon soils are located on the lower foot slopes and in micro-low areas; and Exline soils are located on the toe slopes.

These silty clay and silt loam soils have moderate organic matter content, and their available water capacity is moderately high. The permeability in the upper soil horizons is moderately low (0.2 to 0.6 inches per hour) to low (0.06 to 0.2 inches per hour). These soils are easily eroded by wind- and water-related forces (USDA 1994).

The soil types in the project area are described in more detail in Section 4.0 of the environmental report located in Appendix A of this PUC application.

2.9.6 Potential for Erosion and Sedimentation

Impacts to soils from the proposed project would be insignificant. Direct impacts to soils within the CTG site and the proposed pipeline corridor could include localized short-term increases in the potential for erosion from wind and water runoff, compaction, and rutting.

Areas that are cleared or disturbed by construction of the gas turbine could be susceptible to erosion. The impacts from erosion are a function of the local soil type and the amount of clearing required. Some portions of the proposed pipeline corridor may be located in areas with steeper slopes and will require regrading and stabilization immediately after the pipeline crossing is complete, as required under the Nationwide 12 permit (U.S. Army Corp of Engineers 2001). The potential for soil erosion and resulting sedimentation of downgradient wetlands, drainages, and streams is higher in these steeper areas. Reduced absorption caused when heavy construction equipment compacts the soils can also aggravate erosion. Impacts from construction of the pipeline would be limited to the vegetation within the existing utility and road ROW. No significant impacts related to the increase in potential for erosion are expected as a result of construction of the pipeline. Areas that are disturbed by construction equipment are expected to recover naturally with vegetative reestablishment or will be reseeded with native vegetation after the construction equipment is permanently removed.

2.9.7 Seismic Risks, Subsidence Potential, and Slope Instability

Seismic hazards in the study areas are rated as very low. USGS defines seismic hazard by the level of horizontal shaking that has a 1 in 10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of the acceleration of gravity. For example, a shaking level of 0 to 2 percent indicates a 10 percent chance that a shaking force that exceeds 0 to 2 percent of the force of gravity would be exceeded in a 50-year period. Gravitational forces of 2 to 4 percent could be felt by some people but would not likely cause any structural damage (USGS 1996).

No potentially hazardous geological areas, such as slumps or landslides, would be affected by construction of the gas turbine or the 11.5-mile-long pipeline. As a result, no direct, indirect, or cumulative impacts to geological resources are anticipated by the proposed project.

Basin Electric's proposed energy conversion facility and associated pipeline will be designed and constructed in accordance with all applicable codes and will incorporate state-of-the-art standards to address potential structural difficulties associated with seismic, subsidence, or slope instability. In general, soils in the proposed project area are expected to provide adequate foundation for the gas turbine structure without concern of subsidence. In addition, the project area is flat, where slope instability will not be an issue

2.9.8 Geological Constraints

There do not appear to be any geological characteristics that present unusual constraints to the design, construction, or operation of the proposed generation facility or pipeline.

2.10 HYDROLOGY (SDAR 20:10:22:15)

This section provides information on the hydrology of the project area and the effect of the proposed gas turbine facility and associated pipeline on surface water and groundwater.

2.10.1 Hydrologic Information and Map

The proposed site is relatively flat with only 1 foot of relief across the approximately 15 acre area to be occupied. To facilitate drainage around the CTG and associated equipment, an area of approximately 5 acres will be built up and graded to drain storm water off the site to a shallow retention pond. The retention pond will be sized as required to accommodate a 25-year/24-hour rainfall event in addition to any non-contact water generated by operation of the unit. Pond waster will be dissipated through a combination of evaporation and percolation. Water will be routed to the pond by open drainage ditches, a collection of sump and pump or a combination of both. Exhibits 9 and 9A present surface water drainage patterns near the CTG site.

No mapped surface water bodies are within the proposed area of the gas turbine site (USDA 1994). However, several ephemeral drainage channels occur along the proposed path of the underground gas pipeline. The James River flows generally north and south and is located 10 miles west of the site at its closest point. Mud Creek, a tributary of the James River, is located 1 mile north of the proposed site. The area surrounding the site is well drained, although there is little topographic relief throughout the site.

Impacts to surface water from the proposed project would be insignificant. Surface water resources within the proposed project corridors may include impounded stock ponds in pastureland and ephemeral streams and drainages. Direct, temporary impacts to the quality of water in small, ephemeral or unmapped water that would result from construction of the underground gas pipeline are also anticipated to be insignificant. These impacts could result from movement of construction equipment and may include increased total suspended solids and sediment. Construction will be conducted in accordance with a plan prepared by Basin Electric for control of sediment and erosion. After construction, no direct, indirect, or cumulative impacts to surface water quality that will result from proposed project construction or operation are anticipated.

Flood damage prevention ordinances for Brown County require a description of any potential alteration in flood watercourses. Furthermore, if an alteration in a watercourse is anticipated, the ordinances require certification that the flood-carrying capacity of the watercourse will not be diminished. According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the proposed project, the Groton gas turbine site will not cross into, or be located within, a 100-year floodplain (FEMA 1998). No impacts to the flood-handling capability of the floodplain from a 100-year flood or the pattern and magnitude of the flood flow are anticipated because the Groton gas turbine site is not located within a 100-year floodplain.

The proposed Groton gas turbine site is located in a 500-year flood zone associated with a tributary off of Mud Creek. Potential impacts that could result from construction and operation of a gas turbine project in a floodplain include:

- Disrupting utility service for a considerable period of time during a 500-year flood event
- Creating barriers that could unnaturally divert flood waters or increase flood hazards in other areas;
- Altering the natural floodplains and protective barriers that help channel or accommodate flood waters; and
- Creating scour and other turbulence that could erode channel banks.

Direct, indirect, or, cumulative impacts will not likely occur as a result of this project's location in a 500-year flood zone because the Groton gas turbine is intended to supply electricity only during periods of peak demands. Furthermore, mitigation measures will be implemented to prevent impacts to the flood-handling capability of the floodplain or to the pattern or magnitude of the flood flow. Potential direct and indirect impacts to existing or potential floodplains near the project area are anticipated to be insignificant.

The proposed gas pipeline will cross the 100-year floodplain associated with the same tributary of Mud Creek, as well as tributaries associated with Dry Run, as shown in Appendix A, Figure 4-2. No impacts to floodplains that result from construction of a gas pipeline are anticipated because the pipeline will be buried and the ground surface will be returned to its original condition. Possible short-term impacts may result from construction of the underground gas pipeline. However, these short-term, construction-related impacts will be short and the ground surface will be returned to its original condition immediately after construction.

The principal sources of water for domestic use and for livestock in the study area are glacial deposit aquifers. The glacial deposit aquifers are in the glacial outwash valleys and alluvium, in sand and gravel lenses, and in subsurface gravel and silt. Aquifers in Brown County are divided into two classifications: aquifers above the bedrock surface, and bedrock aquifers. Brown

County aquifers above the bedrock surface consist of three main systems: the Deep James Aquifer, the Middle James Aquifer, and the Elm Aquifer. In addition to these three aquifers, the Lake Dakota Plain is a source of groundwater in eastern Brown County. The proposed project site is located within the Lake Dakota Plain, which consists primarily of silt, fine sand, and clay soils.

Groundwater levels within the Lake Dakota Plain fluctuate between 3 feet and 17 feet, depending on the specific location. The water levels in most location within the Lake Dakota Plain fluctuate less than 6 feet. The depth to ground water ranges from ground surface to 27 feet below land surface. Until the early 20th century, the Lake Dakota Plain consisted of wetlands located on soil with poor drainage and flat ground surfaces. However, wetland conditions no longer exist as a result of development of a vast network of manmade drainage ditches constructed over the first half of the 20th century (Koch 1986.)

The proposed approximately 11.5-mile-long underground pipeline will use the road and utility right-of-way through Brown County and diagonally cross agricultural land in Spink County for approximately 2 miles. The site is located within the Middle James aquifer in Spink County. The depth to groundwater for the Middle James aquifer is 10 to 100 feet. This aquifer is 30 feet thick, on average (Hamilton 1996).

No significant direct, indirect, or cumulative impacts to groundwater quality from the proposed project are anticipated. Subsurface activities will be required to install the gas connection lines to sufficient depth. However, placement of the proposed pipeline will penetrate only about 4 feet into the ground. No aquifers are known to be present at the shallow depths required to install the gas transmission lines. As a result, the proposed project is not considered likely to impair groundwater resources or quality. No significant direct, indirect, or cumulative impacts to groundwater quality are expected to occur from project construction or operation.

2.10.2 Effect on Current Planned Water Uses

WEB Water Development Association in Aberdeen, South Dakota, will provide all of the water for the facility from an existing 12-inch rural water distribution pipeline that is adjacent to the site. Implementing the project would have no impacts on planned water uses by communities, agriculture, recreation, fish, or wildlife.

2.10.3 Surface and Groundwater Use by Proposed Facility

WEB Water Development Association in Aberdeen, South Dakota, would provide the water for the CTG. The proposed facilities would not require consumptive use of or discharge to any surface water body or groundwater. All non-contact cooling water will be collected in an on-site storage pond, where it will evaporate into the atmosphere or percolate into the soil. The offsite pipeline or channels required for water supply is presented in Exhibit 9.

2.10.4 Aquifer Use by Proposed Facility

Groundwater will not be used for the proposed CTG. WEB Water Development Association in Aberdeen, South Dakota, will provide all of the water for the facility from an existing 12-inch rural water distribution pipeline that crosses the site.

2.10.5 Water Storage, Reprocessing, and Cooling by Proposed Facility

Turbine injection water for nitrogen oxide (NO_x) control will be demineralized in trailer-mounted vessels. Spent vessels will be removed from the site for regeneration at an authorized site. All non-contact cooling water will be collected in an on-site storage pond, where it will evaporate into the atmosphere or percolate into the soil. Contaminated industrial wastewater and sewage will be collected in underground storage vessels and then will be transferred to trucks and removed from the site for treatment at authorized disposal facilities.

2.10.6 Deep Well Injection Use by Proposed Facility

No deep well injection will be required for construction or operation of the proposed gas turbine facility and associated pipeline.

2.11 EFFECT ON TERRESTRIAL ECOSYSTEMS (SDAR 20:10:22:16)

This section contains information on the terrestrial ecosystem that could be affected by the proposed gas turbine facility and associated pipeline. More detailed information from biological field surveys conducted to identify and quantify the terrestrial fauna and flora that may be affected by the proposed gas turbine facility and associated pipeline are contained in Sections 4.5

through 4.7 of the environmental report in Appendix A of this PUC application. The impact of construction and operation of the proposed facility and pipeline on the terrestrial biotic environment is analyzed in Sections 5.5 through 5.7 of the environmental report in Appendix A of this PUC application.

2.11.1 Effect on Terrestrial Fauna

No threatened, endangered, or candidate animal or plant species were observed in or around any of the proposed project study areas. Although the seasonal weather conditions precluded comprehensive direct observation of wildlife, the existing habitats in the project areas are not suitable for T&E listed or other species of concern. Therefore, it is unlikely that additional surveys would be successful in verifying the presence of any listed species in the proposed project areas. Additionally, information provided through the South Dakota Natural Heritage Database does not indicate use of the proposed project areas by any state or federally listed species. Appendix C in the attached environmental report (Appendix A) presents a list of rare, threatened, endangered, and candidate species in the study area, and Appendix D in the attached environmental report (Appendix A) presents a list of species observed in the proposed project area.

Construction of a CTG and an associated pipeline would not have significant direct and indirect impacts on wildlife in the proposed areas. Short-term construction noise and activities could affect wildlife by temporarily frightening them from the area. Installation of an underground pipeline could temporarily displace wildlife through a short-term loss of habitat. However, habitat in the area is suitable to support any wildlife displaced by construction of the CTG. The increase in human activity in the project area might also temporarily disrupt wildlife use, resulting in an insignificant indirect impact (Appendix A).

2.11.2 Effect on Terrestrial Flora

Impacts to vegetation in all of the proposed project areas are expected to be insignificant since the majority of the acreage for the gas turbine and pipeline corridor is agricultural land or existing substation, existing constructed drainage pond, or existing right-of-way. Cultivated cropland and farming are the principal land use in all of the project areas and regions.

Short-term direct impacts (that affect vegetation for 1 year or less) could include disturbance, removal, and soil compaction caused by:

- Trenching and installing the approximately 11.5-mile-long pipeline
- Staging areas for equipment and material near the gas turbine site
- Performing geotechnical investigations

These short-term disturbances would be reclaimed soon after construction is completed. Most areas affected by short-term disturbances would be returned to cropland or seeded grass pasture within one growing season.

Long-term direct impacts could be caused by:

- Clearing, grubbing, grading, and constructing the buildings and associated facilities for the natural gas-fired CTG
- Installing additional culverts and fill materials to improve access to the sites
- Losing vegetated acreage at the gas turbine site

Disturbed soil creates a hospitable environment for invasion of weeds, and project-related traffic may provide a transport mechanism for seeds of noxious weeds to the area. Removal of vegetation may increase erosion and sedimentation. Increased runoff on bare and compacted soils could create gullies and change the overall landscape. The proposed CTG and pipeline sites are, however, located on level to nearly level terrain that is not subject to flooding.

Cumulative impacts to vegetation are anticipated to be insignificant and include the effects from existing farming and ranching. The primary land use in the project area consists of cultivated fields of corn, soybeans, small grains, and alfalfa, practices that have been changing the landscape for many years. Future agricultural use of the area may continue to cause significant changes to the landscape as well. Based on current land use regimes, this and future projects should have an insignificant impact on vegetation, as most areas already have been altered from their natural state.

2.12 EFFECT ON AQUATIC ECOSYSTEMS (SDAR 20:10:22:17)

This section contains information on the aquatic ecosystems potentially affected by the proposed gas turbine facility and associated pipeline. Existing information from biological surveys conducted to identify and quantify the aquatic fauna and flora that may be affected within the gas turbine site or pipeline area are discussed in more detail in Sections 4.2 and 4.3 of the environmental report in Appendix A of this PUC application. The impact of construction and operation of the proposed facilities on the aquatic biotic environment is analyzed in Sections 5.2 and 5.3 of the environmental report located in Appendix A of this PUC application.

The proposed CTG and the approximately 11.5-mile-long natural gas pipeline are not expected to cause significant, direct, indirect, or cumulative impacts on wetlands. Less than 10 acres of isolated herbaceous wetlands are located within the total quarter-section surrounding the site, and the 11.5-mile-long pipeline crosses only one small non-jurisdictional wetland. The small, isolated wetland area located within the borrow ditches for the road would be minimally affected by the trenching and backfilling associated with pipeline construction. The Nationwide 12 permit for construction of utility lines in waters of the United States requires that the top 6 inches to 12 inches of topsoil be salvaged separately and replaced after the pipeline and trench are backfilled. Furthermore, the pipeline trench cannot be constructed in such a manner as to drain waters of the United States (such as backfilling with extensive gravel layers, which would create a french drain effect). It will not be necessary to install clay blocks along the pipeline to ensure that the trench does not drain the waters of the United States where the pipeline line is installed because the native soils have silty clay loam and silt loam textures and low permeabilities. The slopes and stream banks will be re-graded and stabilized immediately after the pipeline crossing is complete where the crossing contacts the ephemeral stream tributary, as required under the Nationwide 12 permit (U.S. Army Corps of Engineers 2001).

Access to the pipeline route and CTG will primarily be from the existing roads, thus minimizing all impacts any nearby wetland areas. The proposed alignment of the project pipeline uses areas near or adjacent to existing county roads or highways. In addition, maintenance will be carried out from these same rights-of-way.

Temporary indirect impacts to the wetlands would be less than 1 day in duration. Based on the temporary nature of potential impacts, the effects of the proposed project would be insignificant. Although construction and maintenance of the proposed pipeline will be from the existing roadway, there is the potential for construction and maintenance to be carried out off the roadway but within the designated right-of-way.

The single most significant contributor to cumulative impacts to wetlands in the study area is the conversion of mixed grass prairie grasslands to cultivated fields of corn, soybeans, small grains, and alfalfa (Appendix A). This conclusion is based on existing land uses and projects within and near the proposed natural gas turbine the proposed approximately 11.5-mile-long natural gas pipeline corridor.

2.13 LAND USE (SDAR 20:10:22:18)

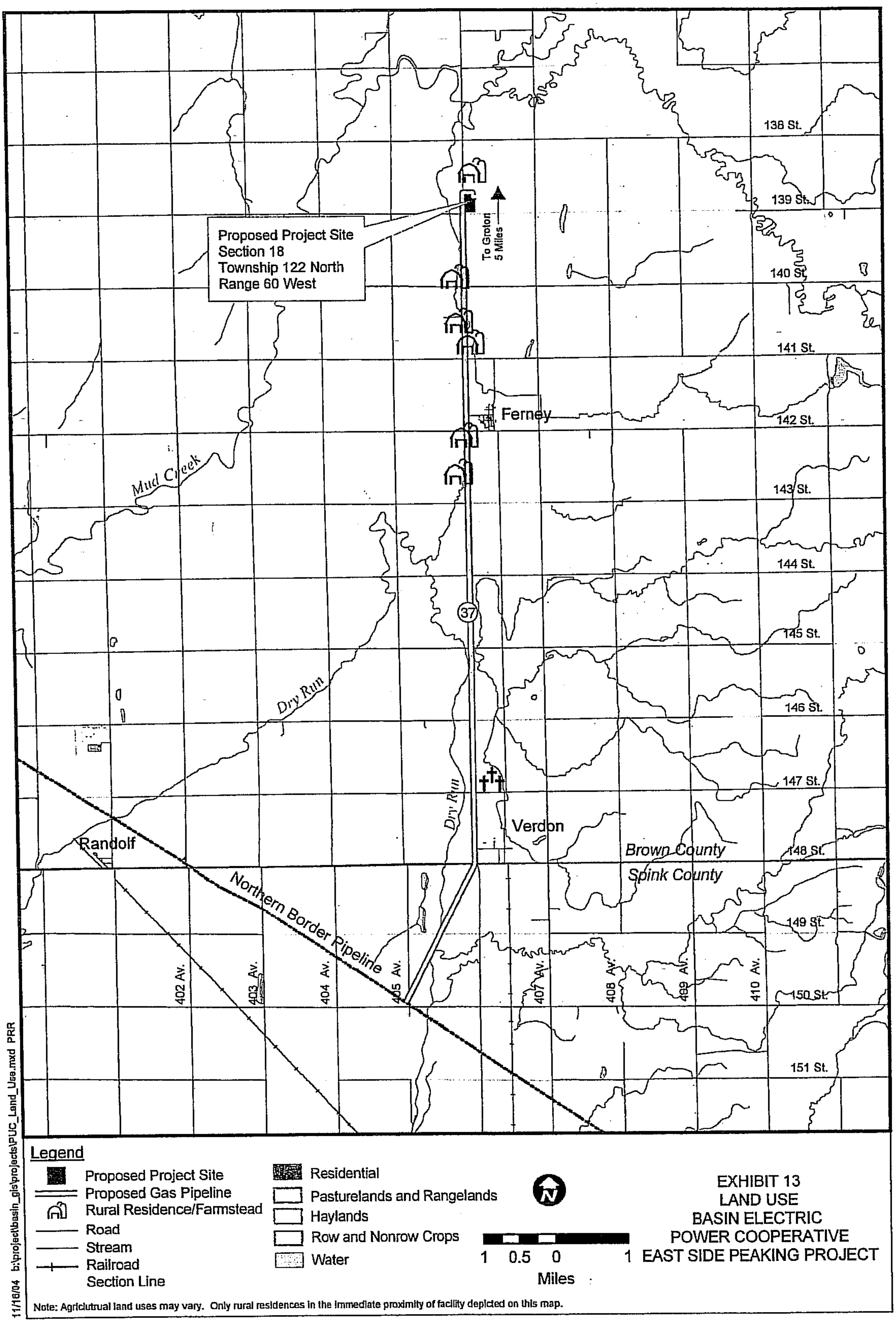
This section provides information on the present and anticipated use or condition of the land.

2.13.1 Land Use Map

This section describes the land use in the affected environment and includes general and agricultural land use and formally classified lands. The land use study area is defined as the proposed site for the Groton gas turbine facility in Brown County, as well as the proposed pipeline that will extend from the proposed turbine facility approximately 11.5 miles south into Spink County. Exhibit 13 shows current land use in and around the proposed CTG and pipeline.

The CTG will encompass approximately 15 acres of land. This acreage includes the entire combustion turbine facility with on-site natural gas supply and the associated equipment including the non-contact water retention pond. A 200-foot corridor (100 feet on either side of the centerline) is associated with the proposed approximately 11.5-mile-long pipeline that will connect the CTG to the existing NBPL. The pipeline will parallel and existing pipeline and primarily be constructed in previously disturbed areas and existing utility and road right-of-way.

The proposed CTG and pipeline will occupy a landscape with a mixture of land uses, including right-of-way, a small amount of commercial, industrial, or transportation-related land uses, some row crops, and some hay or pasture land. The proposed gas turbine facility will occupy 100 percent private land that is regulated by Brown County land use plans and ordinances. The proposed CTG facility would not alter any transportation corridors and will be located east of State Highway 37. The majority of the proposed gas pipeline will be constructed in the State Highway 37 right-of-way.



Proposed Project Site
Section 18
Township 122 North
Range 60 West
To Groton
5 Miles
138 St.
139 St.
140 St.
141 St.
142 St.
143 St.
144 St.
145 St.
146 St.
147 St.
148 St.
149 St.
150 St.
151 St.
Ferney
Mud Creek
Dry Run
Dry Run
37
Verdon
Randolf
Brown County
Spink County
Northern Border Pipeline
402 Av.
403 Av.
404 Av.
405 Av.
407 Av.
408 Av.
409 Av.
410 Av.
Legend
Proposed Project Site
Proposed Gas Pipeline
Rural Residence/Farmstead
Road
Stream
Railroad
Section Line
Residential
Pasturelands and Rangelands
Haylands
Row and Nonrow Crops
Water
1 0.5 0 1
Miles
EXHIBIT 13
LAND USE
BASIN ELECTRIC
POWER COOPERATIVE
EAST SIDE PEAKING PROJECT
Note: Agriclutrual land uses may vary. Only rural residences in the immediate proximity of facility depicted on this map.
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Farming is the principal enterprise in Brown and Spink Counties, South Dakota near the proposed Groton gas turbine facility and pipeline. Approximately 40 percent of farm income is derived from the sale of livestock and livestock products, with the remaining 60 percent derived mainly from the sale of corn, soybeans, and small grain (USDA 2003). Some of the crops are used as feed for livestock. About 87 percent of the acreage is used for cultivated crops (such as corn, soybeans, wheat, oats, and barley) and approximately 13 percent is used for tame pasture or hay. In 2001, farmers made more money selling crops than from sales of livestock, livestock products, and poultry (USDA 2003).

The project area of the proposed combustion turbine facility does not contain any land that is formally classified or administered by federal or state governments. The pipeline will be subject to classifications administered by the state because it will be constructed in an existing right-of-way. Prime farmland has been designated in Brown and Spink Counties. However, no prime farmland exists in the project area (USDA 1994).

2.13.2 Homes and Persons Displaced

No homes or persons will be displaced as a result of construction, operation, or maintenance of the proposed facilities.

2.13.3 Land Use Compatibility

The proposed CTG and associated pipeline are compatible with the present land uses of the surrounding area. The proposed gas turbine will be constructed on land currently owned by Basin Electric and will be adjacent to an existing substation site. The addition of the gas turbine facility and the associated pipeline to the area would have minimal direct or indirect impacts on the already linear features of the landscape, as existing roads, fencing, and power lines transect the area. Construction would temporarily alter the area. Development of land in the region would continue to have cumulative impacts by changing the landscape from cropland and rangeland to rural and possibly future urban developments. There would be no impact to prime farmland as a result of construction of the facilities. Prime farmland is not located at the CTG site, and the gas pipeline will be located in the existing utility and road right-of way, and in agricultural areas that are not considered prime farmland.

2.13.4 Effect on Land Use

The proposed CTG and pipeline would have a minimal impact on land use. The majority of the proposed facility occupies private land that is regulated by Brown and Spink County land use plans and ordinances.

Surface disturbance caused by construction of the proposed energy conversion facility and transmission would be minimal. The anticipated soil disturbance and removal of land from agriculture-related activities to energy-related activities is expected to be approximately 15 acres.

The short-term impacts to land use would include disturbance to vegetation and farming caused by:

- Preparing equipment yards and sites for construction trailers
- Clearing, grubbing, and grading for construction of the proposed CTG

The short-term disturbances to vegetation that would result for construction of the pipeline in the right-of-way would be reclaimed soon after construction is completed. Any disturbances to farming near the CTG site that could result from construction would be expected to be infrequent and would last only 1 day per disruption. The long-term impacts would include disruption of vegetation and farming caused by loss of crops, hay, or livestock forage as a result of construction of the combustion turbine facility and any additional area for facility expansion.

On a county-wide basis, conversion of agricultural land to the proposed CTG would have a relatively small (approximately 15 acre) impact on potential crop production or livestock grazing. In general, the cumulative impact of the proposed CTG on land use will be minimal. The pipeline is authorized by the South Dakota Department of Transportation (DOT) to use existing right-of-way. The remainder of the pipeline will parallel an existing natural gas pipeline.

2.14 LOCAL LAND USE CONTROLS (SDAR 20:10:22:19)

The proposed CTG occupies existing right-of-way and mainly private land and is regulated under local land use plans and ordinances. Following are specific measures that will be adopted to protect land use in the area of the proposed project and the alternative project site:

- A commitment to follow the recommendations of the district conservationist to minimize soil erosion and prevent invasion by noxious weeds.

- Periodic closure of access to livestock and farm irrigation, tilling, and harvesting operations, scheduled to minimize local occupational disruption.

- The routing of the underground gas pipeline will share existing road and utility rights-of-way

- Design and installation of the gas turbine will meet the project objectives for cost and reliability and provide for minimal disruption of land use.

Brown or Spink Counties were contacted about zoning or land use approvals (Tetra Tech 2004a, 2004b). The proposed project complies with local land use zoning and building rules, regulations, and ordinances. Basin Electric applied for a variance from the Brown County Zoning Ordinance to allow construction of the CTG. The Application for Variance was approved Brown County Planning and Zoning Commission and is presented in Appendix C.

2.15 WATER QUALITY (SDAR 20:10:22:20)

Construction of the gas turbine site and underground gas pipeline will comply with all applicable federal, state, and local permits required for alteration of wetlands, streams, or rivers from the project. The following are specific measures that will be adopted to protect water quality in the proposed project area:

- Best management practices will be implemented to minimize erosion and sedimentation, runoff, and surface instability during construction.

- Construction will be conducted to minimize disturbances around surface water bodies to the extent possible.

- Current drainage patterns in areas affected by construction will be maintained to the extent possible.

- Staging areas for project-related construction equipment will be located in areas that are not environmentally sensitive.

- Any work in existing streams will be conducted, to the extent possible, during periods of low flow or when the streams are dry.

- If stream crossings are required, temporary bridges will be constructed at as close to a right angle with the stream as is possible. After construction, all temporary crossings will be removed and the area will be restored as nearly as possible to its original condition.

- Staging and laydown yards for project-related construction will be established at least 50 feet from waterways or wetlands, if permitted by topography.

- Construction equipment will not be serviced within 25 feet of waterways or wetlands. Equipment will not be fueled within 100 feet of waterways or wetlands.

- Any spills of fuels or other hazardous materials during construction or system maintenance will be promptly contained and cleaned up to the extent possible.

- Any herbicides used in ROW maintenance will be approved by the U.S. Environmental Protection Agency (EPA) and applied by licensed professionals. Application of herbicides will be limited to the extent necessary for regular maintenance of the site.

Any contaminated industrial wastewater from operation of the facility as well as sewage will be collected in underground storage vessels and will be transferred to trucks and removed from the site for treatment at authorized disposal facilities.

2.16 AIR QUALITY (SDAR 20:10:22:21)

Construction of the gas turbine site and underground gas pipeline will comply with all applicable federal, state, and local permits required to protect air quality. Dispersion modeling was used to estimate the air quality impact of potential emissions of NO_X and carbon monoxide (CO) from the CTG. The dispersion modeling followed the guidance and protocols outlined in the *New Source Review Workshop Manual* (EPA 1990), and EPA's *Guideline on Air Quality Models (Revised)* (EPA 2001). Modeling was conducted to demonstrate that potential air pollution impacts from the generator emissions are below National Ambient Air Quality Standards (NAAQS) and South Dakota Ambient Air Quality Standards, in accordance with South Dakota Air Regulation §74:36:05:06, *Standard for Issuance of Operating Permit.* Proposed emissions for the combustion turbine are below the major source threshold of 250 tons per year (tpy) with respect to prevention of significant deterioration (PSD) standards, but above the South Dakota Title V Operating Permit major source threshold of 100 tpy for CO and for NO_2. The proposed turbine site is located in an area that is designated as in attainment for all criteria pollutants.

The predicted maximum impacts from the proposed combustion turbine demonstrate that operation of the generator will not cause or contribute to violations of applicable air quality standards. Predicted maximum-modeled concentrations of NO_X and CO are well below the applicable PSD significance levels, as well as the South Dakota ambient air quality standards and

NAAQS. Maximum impacts were predicted largely northwest of the site. Exhibit 14 compares the PSD significance levels and NAAQS with maximum-modeled concentrations.

Particulate emissions associated with construction of the generation station and transmission line will be mitigated using dust-suppression techniques. Examples of measures for control of particulates are, if necessary:

- Applying water or dust palliatives, such as magnesium chloride, to disturbed areas, as necessary, to reduce dust when vehicle traffic is present.
- Covering open haul trucks with tarps both on site and off site.
- Limiting vehicle speeds on unpaved roads and in the construction ROW, as required, to control dust.
- Removing any soil or mud deposited by construction equipment on paved roads near the egress from unpaved areas, when required.
- Stabilizing disturbed areas in compliance with the revegetation plan after construction is complete.

PM_{10} emissions from construction will be substantially reduced with implementation of these mitigation measures. Accordingly, particulate emissions from construction of the project, as mitigated, are considered less than significant. No significant emissions are expected from operation of the gas turbine facility. Additional information on air quality and emissions is presented in the air quality operating permit application prepared for the South Dakota Department of Environment and Natural Resources (Appendix D).

2.17 TIME SCHEDULE (SDAR 20:10:22:22)

Initial plant site construction is planned for June 23, 2005, with the gas pipeline and transmission interconnection planned later that fall with an estimated duration of 2 months. Commercial operation is planned for June 2006.

These dates are based on receiving all construction and environmental permits by June 23, 2005. If start of construction is delayed, so that the foundations cannot be installed before freeze-up, start of construction may need to be postponed until spring 2006. This postponement would delay commercial operation until spring of 2007. Appendix E presents the proposed project schedule.

EXHIBIT 14
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
DISPERSION MODELING RESULTS

Scenario #	Maximum Modeled Concentration ($\mu g/m^3$)		
	Annual NO_X	**1-Hour CO**	**8-Hour CO**
Scenario 1	0.060	3.4	0.84
Scenario 2	0.062	3.0	0.88
Scenario 3	0.062	3.6	0.87
Scenario 4	0.059	3.4	0.84
Scenario 5	0.445	2.9	0.83
Scenario 6	0.061	3.6	0.85
Scenario 7	0.056	3.1	0.81
Scenario 8	0.059	2.9	0.79
Scenario 9	0.059	2.4	0.83
Scenario 10	0.054	3.0	0.79
Scenario 11	0.058	2.9	0.78
Scenario 12	0.052	2.3	0.82
Scenario 13	0.054	3.1	0.76
Scenario 14	0.057	2.7	0.78
Scenario 15	0.057	3.4	0.80
Scenario 16	0.375	2.9	0.73
Prevention of Significant Deterioration Significance Level	1	2,000	500
National Ambient Air Quality Standard	100	40,000	10,000

Notes:

$\mu g/m^3$ Micrograms per cubic meter

General Electric Engineer, Procure and Construct (EPC) Contract

The major contract for this project is the engineer, procure, and construct (EPC) contract with General Electric (GE). This contract is to supply the CTG and for the balance of plant equipment and installation, including testing and startup. This contract was issued in June 2004.

Pipeline Engineering Contract

The pipeline engineering contract is for the detailed design and routing of the interconnecting pipeline. This pipeline will bring the gas supply from Northern Border's 42-inch main supply line to the Groton Generation Site, an approximate distance of approximately 11.5 miles. This contract was formally bid and has been issued to Natural Gas Consulting.

Pipeline Installation Contract

The pipeline installation contract will be bid after the engineering has been complete.

Transmission Engineering and Construction Contract

The transmission engineering and construction contract will be for the transmission interconnection from CTG to the Western 115 kV substation, including modifications required to the substation. This contract will be bid later.

Construction contracts for the transmission interconnection and the gas pipeline installation are scheduled to be bid the first quarter of 2005.

2.18 COMMUNITY IMPACT (SDAR 20:10:22:23)

This section identifies and analyzes the effects of construction, operation, and maintenance of the proposed facilities on socioeconomic, taxation, agricultural production, population and community, transportation, and cultural resources. A detailed discussion of community impacts within the project area is provided in Sections 5.1, 5.4, and 5.12 through 5.16 of the environmental report in Appendix A of this PUC application.

2.18.1 Forecast of Socioeconomic Impact

No significant adverse socioeconomic impacts to the local communities and governmental facilities or services are anticipated as a result of construction and maintenance of the proposed gas turbine facility and associated pipeline. It is expected that the project will provide socioeconomic benefit by creating employment opportunities, increased demand for locally supplied construction equipment, increased reliability of available electrical power, and additional power for a rapidly expanding area of the region.

The proposed project may have a positive direct impact on economic conditions for the area. Labor expenditures would be spread over time and would include salaries, benefits, and overtime for contract supervisors, skilled and unskilled labor, and equipment rental. It is expected that construction and operation of the gas turbine would result in increased sales tax receipts, both locally and statewide.

In addition to local expenditures by construction workers, other income generated by construction of the gas combustion sites and underground gas pipeline would include local purchases of material. It is likely that Basin Electric would acquire a variety of construction materials, supplies, and fuel in the project area. Construction materials could include fencing, concrete, tools, fuels, and a variety of other construction-related materials. Local suppliers of these materials could expect increases in sales during the construction period. The impact on housing would be negligible because some of the work force would be local.

2.18.2 Forecast of Taxation Impacts

No significant immediate or long-term impact on property and other taxes of the affected taxing jurisdictions are anticipated as a result of construction and maintenance of the proposed facilities.

2.18.3 Forecast of Agricultural Impacts

Short-term impacts to agriculture are expected to last no more than a day per disruption and would primarily affect access to livestock and farm irrigation, tilling, and harvesting. The small conversion of agricultural land to the gas turbine site area is expected to have minimal impact on overall crop production within the proposed project area.

2.18.4 Forecast of Population and Community Impacts

The proposed project is not expected to substantially affect the population, income, occupational distribution, or the integration and cohesion of the adjacent communities. The population of Brown and Spink Counties in 2000 was estimated at 35,460 and 7,454, respectively (Census 2003) and is not expected to change on a short-term basis as a result of this project. It is not anticipated that the population of the area would be affected by this project. It is expected that a portion of the construction work force will be native to each specific county. Additional construction personnel from outside of the project area would usually include specialists and supervisory personnel who would temporarily relocate to the project area. This temporary workforce would be accommodated within existing temporary housing in the project area such as motels and hotels.

The project area is predominantly rural, and existing ambient noise levels in the vicinity of the proposed project are generally low because the land is used for agriculture. The study area consists of large tracts of pasture, crops, rangeland, and undeveloped grassland, with unpaved and infrequently traveled roads, typically constructed along section lines. Sources of noise in the study area include wind, livestock, wildlife, farm equipment, farm truck traffic, and adjacent substations. Elevated levels of noise occur in the portion of the project area near transportation corridors and are generally associated with automobile and truck traffic and farm equipment. One residence is located approximately 1,700 feet north of the proposed facility, adjacent to State Highway 37. Evergreen and deciduous trees are planted along the southern side of the residence (Exhibit 9A). Other residences in the region are approximately 4,400 northwest and approximately 5,700 feet southeast.

Background noise levels obtained at the CTG site demonstrate that the location is relatively unaffected by any activity other than traffic. Data from the noise survey show that the late-night sound levels are as low as 33 A-weighted decibels (dBA) and that daytime values are typically between 45 and 90 dBA as 1-minute averages. The higher values were spikes, indications that the likely causes were events such as wind gusts or passage of a loud vehicle or an airplane. The hourly average daytime results peaked at about 62 dBA, but were typically in the 45- to 55-dBA range during the day. High winds appear to have caused elevated noise levels at times overnight on September 29, 2004, and early on the morning of October 1, 2004. The spatial distribution of the data for background noise indicates that the existing equipment at the substation is causing virtually no impact approximately 160 feet in any direction beyond the boundary of the substation.

Sound pressure falls inversely with distance. Therefore, doubling the distance from a point source produces a reduction of sound of 6 dBA. The equation to calculate the noise levels some distance away from a point or industrial source is:

SPL2 = SPL1 – 20log(R2/R1)

Where SPL2 = sound pressure level in dB at distance R2
SPL1 = sound pressure level in dB at distance R1

The equations above, the distance to sensitive receptors, and the manufacturer-supplied data were used to estimate noise levels at nearby sensitive receptors. Noise guarantees for the CTG and balance of plant (BOP) equipment is 85 dB near field and 65 dB far field (400 feet). The nearest residence north of the existing substation is 1,700 feet from the planned location of the power generation system, and GE guarantees a noise level of 65 dB from the proposed turbine at 400 feet. Using the equation to calculate the level of sound, the reduction in noise level at the residence should be 12.57 dB from the guaranteed level at 400 feet.

SPL2 = 65 – 20log(1700/400)
SPL2 = 65 – 12.57
SPL2 = 52.43

Where: 65 = SPL1 *or* guaranteed sound level
1700 = R2 *or* distance from turbine to nearest residence
400 = R1 *or* distance to guaranteed sound level

Predicted noise levels from the operating turbine are expected to be 65 dBA at 400 feet and drop off to about 54 dBA at the nearest residence, some 1,700 feet away. A row of trees lies between the proposed generator site and the residence, so the sound level from the generator that would affect the nearby home would probably be below 54dBA, close to the daytime level observed in noise monitoring. Additional information on potential noise impacts is presented in the noise study prepared for this project (Appendix F).

Impacts related to ambient noise and television interference are expected to be negligible based on calculations presented in an electric effects analysis (Burns & McDonnell 2001). Basin Electric's policy is to investigate and correct problems with television and radio interference associated with its facilities. In addition, construction will be scheduled and conducted to minimize annoyances to nearby residences.

Construction of the East Side Peaking Project will comply with all National Electrical Safety Code (NESC) standards to ensure minimal safety and electrical hazards. Following are specific measures that will be taken to protect human health and safety in the proposed project area:

- Standard grounding policies will be implemented to minimize the possibility of nuisance shocks caused by induced currents from stationary objects.
- A fence and posted warning signs will be constructed to minimize the possible hazard of the gas turbine.

The underground gas pipeline will be identified with warning signs to comply with local, state, and federal requirements.

The flow of electricity produces electric and magnetic fields (commonly referred to as EMF). Magnetic and electric fields are strongest at the source of electrical power and decrease markedly as the distance from the source increases. In many cases, people are exposed to higher levels of EMF from household appliances than from transmission lines because the source is closer.

Numerous sources of EMF exist in nature and in the occupational and residential environments. These fields pose no obvious threat to human health or safety in nearly all instances. However, public awareness of the ubiquitous nature of these fields, and the historical controversy over their potential effects on living systems, have stimulated the research community to define more precisely the physical properties of these fields and to delineate the thresholds for their possible effects on human health and the environment.

Certain epidemiological investigations have indicated potential risk factors in a number of residential and occupational studies from exposure to EMF. However, many studies report no statistically significant correlation. A recent Danish residential study reported that, although consumption of electricity in Denmark has increased by 30 times since 1945, the incident rate of cancer had changed little (Guenel and others 1993). In 1996, the National Research Council (NRC) completed a study of research on EMF that had been under way since 1979. The study concluded that the evidence so far "does not show that exposure to these fields (such as EMF) presents a human health hazard" (NRC 1996).

2.18.5 Forecast of Transportation Impacts

No significant direct, indirect, or cumulative impacts are expected to the transportation systems of cities, counties, and the state. Right-of-way surveying and staking, vegetation clearing, construction, and operation and maintenance of the proposed facilities will comply with all applicable state and local regulations and permit requirements. No airports are located in the immediate vicinity of the proposed project, and no mitigation to aircraft or airfields is necessary. Basin Electric and its contractors will implement the following mitigation measures to avoid or minimize any potential impacts to transportation routes within the study area:

- Construction vehicles will not exceed the posted weight limit of bridges.
- Construction along or across roads and highways will incorporate an appropriate traffic control plan in accordance with the Manual of Uniform Traffic Control Devices.
- Permits will be obtained from the South Dakota Department of Transportation for encroachment across highways.
- No permanent access roads will be installed without securing an agreement from the landowner.

All access will be from the nearest existing public roadway and will avoid or minimize intrusion into off-site areas.

2.18.6 Forecast of Cultural Resource Impacts

Basin Electric has conducted a records search and an on-site cultural resources inventory of the project area. The results of the cultural resources study are discussed in Section 5.4 of the environmental report located in Appendix A of this PUC application, and the specific reports are included. The proposed project is expected to have no significant direct, indirect, or cumulative impacts on cultural resources. However, work would cease immediately should cultural resources be uncovered during excavation at any of these sites. The South Dakota State Historic Preservation Office (SHPO) should then be contacted to assess the find and potential mitigation measures before construction resumes.

2.19 EMPLOYMENT ESTIMATES (SDAR 20:10:22:24)

Table 4-9 in the environmental report (Appendix A) lists employment by industry for each county (Census 2003). Once the facility is operational, existing local employees will maintain and operate the gas turbine facility. No additional permanent employment is expected.

Plant Site Construction Employment Estimates (General Electric)

The estimated number of jobs for the construction phase of the project follows:

- Civil discipline — with carpenters, apprentices and laborers, about 35 to 45 employees for a duration of 3 to 5 months
- Structural discipline — with iron workers, welders, apprentices and laborers, about 15 to 20 employees for a duration of 3 to 4 months
- Mechanical discipline — with millwrights, mechanics, apprentices and laborers, about15 to 25 employees for a duration of 3 to 5 months
- Pipe discipline — with pipe fitters, welders, instrument fitters apprentices and laborers, about 15 to 20 employees for a duration of 3 to 5 months
- Electrical discipline — with electricians, apprentices and laborers, about 25 to 35 employees for a duration of 6 to 8 months
- The general contractor will also require 15 to 20 indirect support for the company's work, along with local support for clerical and material management with approximately 4 to 5 personnel. Local hires for all disciplines are estimated at 40 to 60 percent of total employment.
- Subcontractors from local firms will vary form civil testing, quality assurance/quality control for pipe and, painters, sheet rockers, and steel erection for building services, along will communications and data.

Pipeline Construction Employment Estimates

- Estimated number of employees employed during construction: 75
- Estimated residents: 60
- Estimated non-residents: 15

Transmission Interconnection and Substation Modifications Employment Estimate

- Civil discipline: 6 employees for 1 month
- Iron workers: 6 employees for 1 month
- Pipe discipline with pipe fitters, welders: 6 employees for 1month
- Electrical discipline with electricians, apprentices, and laborers: 10 employees for 2 months

The anticipated workforce needed from Brown and Spink Counties is not large, and a portion of the work force proposed for construction of the project would be local; therefore, there should be little additional demand on local services such as police, medical facilities, fire, or educational services, and there should be no detrimental impact to the community. No significant cumulative impacts on the existing infrastructure are expected to occur as a result of the proposed project.

2.20 FUTURE ADDITIONS AND MODIFICATIONS (SDAR 20:10:22:25)

Basin Electric does not request approval of any future additions or modifications under this permit application.

2.21 NATURE OF PROPOSED ENERGY CONVERSION FACILITY (SDAR 20:10:22:26)

The project consists of one simple cycle gas-fired CTG, BOP equipment, and materials required to render a fully functional facility. The site is considered a greenfield installation that requires all production inputs, waste handling, and transmission interconnection. Natural gas will be supplied from the NBPL main gas transmission pipeline, requiring installation of approximately 11.5 miles of new branch pipeline. Basin Electric will own and operate this pipeline. Transmission interconnection will be with the Western 115 kV substation adjacent to the site, thus requiring minimal (less than ½ mile) of 115 kV transmission line. An existing 12-inch rural water distribution pipeline adjacent to the site will supply water. These interconnections are all part of the scope of the project.

2.21.1 Proposed On-line Life and Projected Operating Capacity

The life of this facility is estimated at 33 or more years. Its intended use is as a peaking facility with running plant factors between 5 and 15 percent.

2.21.2 General Description

The CTG is a GE Aero LMS100 dual fuel-capable gas turbine designed for outdoor installation. The LMS100 is a new GE design currently in development, which will be the most efficient simple cycle turbine in the world in its size range. The unit will be capable of generating a nominal 95 MW with a heat rate of approximately 9,300 British thermal units (Btu)/net kilowatt-hour (Kwh)-High Heating Value. The LMS100 is a combination of the best of GE's aero (jet engine) technology and its heavy frame technology. The increased efficiency is mainly a result of the addition of an intercooler. The compressed air from the low-pressure compressor (LPC) is cooled in an air-to-air heat exchanger and is ducted to the high-pressure compressor (HPC). The cooled flow means less work for the HPC, with resulting increased overall efficiency and power output. Furthermore, the cooler low-pressure compressor air used for turbine cooling allows higher firing temperatures, resulting in increased power output and overall efficiency. The intercooler includes a secondary cooling system. This secondary cooling system will be a dry air-cooled system and will be approximately 60 feet by 160 feet.

The exhaust stack will be approximately 86 feet tall and will provide for future installation of a continuous emissions monitoring (CEM) system. The gas turbine site equipment includes the turbine, generator, generator breaker, site station service transformer, motor control centers equipment, battery systems, and other gas turbine site equipment and systems.

The unit will be suitable for dual-fuel (natural gas and low-sulfur #2 fuel oil) operation. However, only the on-skid equipment required for firing the #2 fuel will be included as part of this project. The design of the site will provide for the addition of the off-skid equipment if desired later. The dual-fuel provision allows Basin Electric the option to add the secondary fuel if required later to maintain MAPP accreditation.

Unique with this project is installation of a clutch between the gas turbine and the generator. This clutch allows the generator to be used as a synchronous condenser when generation is not needed. The turbine is used to bring the generator up to synchronous speed, then is uncoupled, running the generator as a motor to provide reactive power support to the transmission system during upset conditions. The turbine can be started, brought up to synchronous speed, and coupled to the generator without ever stopping the generator if generation is required while in synchronous operation.

The facility will operate as a peaking plant designed for minimum plant staff, with capability for on-site and remote-site start-up, operation, and shutdown. The facility will be designed and provided with remote operating capability, including three fully functional remote human machine interfaces (HMIs); the ability to move a subset of data to several other remote locations; and interface to existing utility facilities needed for protective relaying and transfer trips as required. One remote HMI will be in a control building on site, and the other two will be at existing power stations located in southern South Dakota and central North Dakota

Basin Electric will provide the design and equipment for the gas turbine, plant equipment, generator breaker, site station service transformer, and associated ancillary equipment and systems. Basin Electric will also provide the design and equipment needed for connections to the existing transmission system, including system equipment such as the buss structure, breaker, dead-end structure, line protection relaying, motor operated sectionalizing switches, and associated power and control cabling.

Because of the potential severe winters, the CTG and BOP equipment will be located inside the conditioned building or in conditioned walk-in enclosures. In addition to the space required for the equipment, the building will include an area for the control room and offices, a shop, and a warehouse. A foundation for the gas turbine, associated control building, and associated equipment will be built on site. The site will include a chain-link fence with locking gate.

Natural gas conditioning equipment will include an emergency shutdown valve, gas cleaning, pressure control, gas dew-point heating, performance gas heating (if required), and other equipment required for both start up and continuous safe operation. Gas heating will include heating required to meet minimum temperature requirements specified by the turbine design and for performance. The site layout drawings presented as Exhibits 9 and 9A present a general description of the proposed facility.

2.21.3 Materials Flowing Into the Facility

The materials flowing into this facility will be natural gas, water and air. Appendix G presents performance information at various conditions that identifies fuel flows and exhaust parameters. The gas turbine will have fast-start capability and will be fueled by locally available natural gas. The natural gas delivery capacity at the CTG will be 26 million standard cubic feet per day (mmscfd). Basin Electric currently has in place firm contracts for gas supply and transportation required for MAPP accreditation. The facility will consume a maximum of 100 gallons per minute (GPM) of water. The water will be provided by WEB Water Development Association, located in Aberdeen, South Dakota. The gas turbine will include an inlet air filter system capable of removing air born dust and a short exhaust gas stack.

2.21.4 Materials Flowing Out of the Facility

Water treatment will be by semi-trailer-mounted demineralizing vessels. The vessels will be regenerated off site. The control building will include a truck bay for the trailer. The site will include a 200,000-gallon insulated and heated stainless steel storage tank to handle surge demands.

Non-contact wastewater from the evaporative cooler will be handled in on-site ponds. Storm water will be routed to an on-site pond. All waste generated during construction of the facility will be disposed of at an approved landfill on a daily basis.

2.21.5 Procedures Proposed to Avoid Discharges and Emissions

Operation of the proposed CTG will not constitute a public nuisance. Air emissions will adhere to the terms and conditions of the operating permit issued by the South Dakota Department of Environment and Natural Resources. Solid wastes will be disposed of by using a licensed disposal firm. Contaminated wastewater will be collected in vessels and removed from the site by a licensed disposal firm. No recreational facilities are located near the CTG facility, and none would be endangered by operation of the facility.

The CTG facility will be lighted, fenced, and locked to prevent any harm to human or animal life.

2.22 PRODUCTS TO BE PRODUCED (SDAR 20:10:22:27)

The combustion turbine will use natural gas as fuel to generate electricity. The electricity will be provided to the Western 115kV transmission system for transmission and distribution.

2.23 FUEL TYPES USED (SDAR 20:10:22:28)

2.23.1 Primary Proposed Fuel Types

The primary proposed fuel type is natural gas. Firm contracts for gas supply and transportation are in place and satisfy MAPP accreditation requirements. The CTG is capable of being modified later to use fuel oil.

2.23.2 Anticipated Yield and Range

The anticipated yield is anticipated to be 1,000 Btu per cubic foot for natural gas.

2.23.3 Approximate Chemical Analysis of the Proposed Design Fuel

Exhibit 15 presents the chemical analysis of the proposed fuel for the CTG.

EXHIBIT 15
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
NBPL AVERAGE MONTHLY GAS QUALITY

	NBPL Average Monthly Gas Quality									
				Normal	Iso	Normal	Iso	Hexane		Heating
	Methane	Ethane	Propane	Butane	Butane	Pentane	Pentane	plus	Hydrogen	Value
	C1	C2	C3	NC4	IC4	NC5	IC5	C6	H2	BTU
	mole %	mole %	mole %	mole %	mole %	mole %	mole %	mole %	mole %	
Nov-02	95.496	1.842	0.078	0.004	0.004	0.000	0.001	0.001	0.179	1004.307
Dec-02	95.623	1.782	0.067	0.003	0.003	0.000	0.000	0.000	0.178	1004.098
Jan-03	95.685	1.769	0.062	0.003	0.003	0.000	0.000	0.000	0.170	1004.342
Feb-03	95.629	1.819	0.072	0.004	0.004	0.000	0.001	0.000	0.201	1005.114
Mar-03	95.453	1.954	0.095	0.006	0.005	0.001	0.001	0.000	0.209	1006.487
Apr-03	95.561	1.921	0.099	0.008	0.007	0.001	0.002	0.001	0.157	1007.142
May-03	95.584	1.839	0.167	0.023	0.018	0.004	0.006	0.003	0.105	1008.727
Jun-03	95.566	1.887	0.128	0.012	0.010	0.002	0.003	0.002	0.155	1007.675
Jul-03	95.841	1.601	0.075	0.002	0.002	0.000	0.000	0.000	0.192	1003.231
Aug-03	95.577	1.833	0.114	0.008	0.006	0.001	0.002	0.001	0.205	1006.260
Sep-03	95.562	1.847	0.152	0.017	0.014	0.003	0.004	0.002	0.172	1007.970
Oct-03	95.520	1.769	0.165	0.022	0.017	0.004	0.005	0.003	0.144	1006.769
Average =	95.591	1.822	0.106	0.009	0.008	0.001	0.002	0.001	0.172	1006.010

2.24 PROPOSED PRIMARY AND SECONDARY FUEL SOURCES AND TRANSPORTATION (SDAR 20:10:22:29)

In addition to the proposed CTG, this project will include the construction of natural gas pipeline. The proposed pipeline will be constructed in accordance with the guidelines set forth jointly by the U.S. Departments of Interior, Transportation, and Agriculture, and in the National Safety Code. The pipeline will supply the gas turbine with natural gas from the existing NBPL. The gas pipeline will be constructed underground, and surface reclamation will occur concurrently with construction and site development.

The route for the proposed gas pipeline to supply the proposed CTG will begin at the Northern Border Pipeline NBPL Section 13, Township 120 North, Range 61 West, in Spink County, South Dakota. The proposed gas pipeline will terminate at the proposed gas turbine location in Section 18, Township 122 North, Range 60 West, in Brown County, South Dakota (Exhibits 7 and 8).

The unit will be suitable for dual-fuel (natural gas and low-sulfur #2 fuel oil) operation. However, only the on-skid equipment required for firing the #2 fuel will be included as part of this project. The design of the site will provide for the addition of the off-skid equipment to accommodate secondary fuel sources if desired later.

Water treatment will be by semi-trailer-mounted dematerializing vessels. The vessels will be regenerated off site. The control building will include a truck bay for the trailer. The site will include a 200,000-gallon insulated and heated stainless-steel storage tank to handle surge demands. No additional transportation facilities are needed to deliver raw materials and to remove wastes.

2.25 ALTERNATIVE ENERGY RESOURCES (SDAR 20:10:22:30)

Alternatives for generation were considered and addressed. The following alternative renewable energy technologies were identified and evaluated:

- Solar Electric
- Wind
- Geothermal
- Small Hydroelectric

Solar electric energy was eliminated because of the nature of the generation, which is not consistent to meet load demand, and is available only when the sun shines. Thus, this potential alternative does not reliably meet the peaking power supply needs of the members.

Wind energy was similarly eliminated from further consideration because this resource has an availability of less than 50 percent, which does not meet the reliable power supply needs of the members.

Geothermal energy was eliminated from further consideration because there are no significant geothermal resources available in the service area.

Similarly, small hydroelectric resources depend on stream flows and are an unreliable resource within the service territory of Basin Electric.

Construction of the East Side Peaking Project is required to meet the growing needs for power of Basin Electric's membership in its service territory. The East Side Peaking Project is being proposed because it is the alternative that best meets the needs of Basin Electric's members

2.26 SOLID OR RADIOACTIVE WASTE (SDAR 20:10:22:31)

The environmental factors in the process design, in addition to air quality, include waste management. Operations associated with simple-cycle gas turbines do not involve off-site water discharge. Water-quality-related design considerations are associated with site run-off both during construction and post-construction and will be controlled and managed by a water treatment system under the terms and conditions of the Storm Water Management and Control Permit for the facility.

Waste management associated with the gas turbine will be minimal. No hazardous wastes will be generated by process operations. Industrial wastes will consist of waste fluids and detergents from turbine maintenance and miscellaneous other materials. All industrial wastes will be removed from the site and held for disposal in a licensed and permitted commercial waste disposal facility.

2.27 ESTIMATE OF EXPECTED EFFICIENCY (SDAR 20:10:22:32)

Expected efficiency is based on and in agreement with the manufacturer's specifications for the proposed CTG. Data used to calculate efficiency included, the lower heating value (LHV) for the natural gas supply that will be used to fuel the CTG, the power output capability of the generator set, and the fuel feed rate. In addition, an efficiency calculation of percent (%) heat recovery using the guaranteed heat consumption rate for the combination system. Based on these calculations, the proposed CTG would meet the efficiencies presented in Exhibit 16:

EXHIBIT 16
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
CTG EFFICIENCY

	Calculated Maximum	Vendor Guarantee
% Heat Recovery (Power output / Heat input)	43.49 %	42.18 %
Heat Consumption (Btu/hr per KW-hr)	7,841	8,084

The slight differences in these results arise from conservative assumptions made by the vendor related to mechanical and thermal losses during the energy conversion process. The efficiency in either case is higher than that for similar power generating facilities of current design. The equations used for calculating these results are provided in Appendix H.

2.28 DECOMISSIONING (SDAR 20:10:22:33)

All equipment and buildings will be removed from site and disposed of appropriately. Concrete will be buried on site as appropriate, and the ground surface will be returned to its original contour quality and usage. This facility will not produce any hazardous material that will be stored or deposed of on site, requiring no hazardous removal at decommissioning. The underground gas and water pipelines will be capped below grade and abandoned in place. The estimated cost of decommissioning is $1.7 million.

2.29 ADDITIONAL INFORMATION IN APPLICATION (SDAR 20:10:22:36)

This application contains all information necessary for the local review committees to assess the effects of the proposed facilities pursuant to SDCL 49-41B-7 and 49-41B-11. This application also contains all information necessary to meet the burden of proof specified in SDCL 49-41B-22.

2.30 STATEMENT DESCRIBING GAS PIPELINE STANDARDS (SDAR 20:10:22:37)

The U.S. Department of Transportation Safety Regulations, Title 49 CFR Part 192 prescribes minimum federal safety standards for construction, operation, and maintenance of natural gas pipelines. Basin Electric will comply with 49 CFR Part 192 in constructing, operating, and maintaining the proposed line. Pipeline safety matters for this facility are under the jurisdiction of the South Dakota Office of Pipeline Safety (OPS).

2.31 DESCRIPTION OF GAS TRANSMISSION LINE (SDAR 20:10:22:38)

The underground pipeline will follow existing ROW and parallel an existing pipeline in agricultural areas, as such, no extensive tree clearing or removal will be needed during construction of the pipeline. Vegetation will be cleared as needed in a few areas of the ROW for construction and maintenance of the underground pipeline.

Construction will be sequenced to limit disruption to any area at one time to reduce the impact of construction on vegetation. Any trenches will be backfilled according to regulations, and the area will be reseeded with native grasses and forbs after construction is complete. Any trees removed during construction will be replaced. Impacts from construction of the pipeline will be limited to the vegetation within the existing utility and road ROW. No significant impacts related to the increase in the potential for erosion are expected as a result of construction of the pipeline. Areas that are disturbed by construction equipment are expected to recover naturally with vegetative reestablishment or will be reseeded with native vegetation after the construction equipment is permanently removed.

2.31.1 Design Capacity of the Proposed Transmission Facility

The transmission facility will consist of a new pipeline from the existing 42-inch Northern Border interstate pipeline. Pipeline parameters are summarized in Exhibit 17. The inlet flow capacity will be 52 mmscfd. The pipeline will have a 10.75-inch outside diameter and a design pressure of 1475 per square inch gauge (psig). Delivery pressure to the gas turbine will be approximately

1,100 psig. The minimum line pressure for the system will be 700 psig to keep the product in a uniform state.

The pipeline will traverse approximately 11.5 miles. All pipeline will be conducted of welded steel. No new compressor stations or storage facilities will be required.

EXHIBIT 17
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT
SUMMARY OF PIPELINE DESIGN PARAMETERS

Parameter		Measurement
Flow Rates		
NBPL inlet capacity		52 mmscfd
Turbine delivery capacity		26 mmscfd
Future capacity		26 mmscfd
Pressure		
Inlet pressure (MAOP at NBPL tap)		1435 psig
Turbine delivery pressure		1100 psig (average)
Maximum operating pressure		882 psig
Minimum operating pressure		700 psig
Temperature		
Minimum		-30°F
Maximum		110°F

2.31.2 Changes in Flow

The proposed pipeline would be connected to the NBPL transmission facilities. Flow characteristics of the NBPL system are dynamic and cannot be generally determined with respect to a pipeline interconnection intended to operate on a demand basis. The proposed pipeline is a normal use associated with the NBPL system so no adverse affect on the flow should occur.

2.31.3 Technical Specifications

The American Petroleum Institute (API) provides a published specification for high-test line pipe. This specification covers various grades of seamless and welded steel line pipe. Process of manufacture, chemical and physical requirements, methods of test, dimensions and other parameters are specified. Grade designates pipe manufactured according to API specifications according to API specification 5L with specified minimum yield strength (SMYS) designated in pounds per square inch. ERW has one longitudinal seam, which is formed by electric resistance welding during the manufacturing process.

EXHIBIT 18
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT
PIPELINE TECHNICAL SPECIFCATIONS

Technical Specification		Measurement
Outside diameter		10.75 inches
Nominal wall thickness		0.260 inches
Pipe type		API 5L, PSL-2, ERW
Pipe design factor		0.50
Longitudinal or seam joint factor		1.0
Specified minimum yield strength		60,000 pounds per square inch
Tensile strength		75,000 pounds per square inch

Operating Pressure (psig)

The maximum actual operating pressure of the propose pipeline will be approximately 1,300 psig at the start of the line and is dependent on the NBPL and the volume throughput of the pipeline. The maximum allowable operating pressure design point will be 1,451 psig. The design pressure for steel pipe is determined in accordance with the following formula.

$$P = (2St/D) * E * F * T$$

Where P = design pressure in pounds per square inch gauge
S = yield strength in pounds per square inch
D = nominal outside diameter of pipe in inches
t = nominal wall thickness of the pipe in inches
F = design factor
E = longitudinal joint factor
T = temperature derating factor

2.31.4 Compressor Stations

No compressor stations will be constructed for this project.

2.31.5 Storage Facilities

No storage facilities associated with the proposed facility are anticipated.

2.32 TESTIMONY AND EXHIBITS (SDAR 20:10:22:39)

This document includes all data, exhibits, and related testimony necessary to support the content of the application. Exhibit 19 presents the list of preparers in support of the information contained in this application.

EXHIBIT 19
EAST SIDE PEAKING PROJECT
SOUTH DAKOTA PUC APPLICATION
BASIN ELECTRIC POWER COOPERATIVE
LIST OF PREPARERS FOR PUBLIC UTILITIES COMMISSION APPLICATION

Name	Education and Experience	Responsibility
Tetra Tech		
Robert Hammer	M.S, B.S., Meteorology 19 Years Experience	Program Manager
Bob Farnes	B.A. Geography 16 Years Experience	Project Manager, Field Investigation, Aesthetics, Human Health and Safety
J. Edward Surbrugg, PhD	Ph.D. Soil Science M.S. Land Rehabilitation B.S. Range Ecology 21 Years Experience	Field Investigation Lead, Soils, Geology, Wetlands, Vegetation
Chris Mammoliti	M.S. Environmental Studies B.S. Fisheries & Wildlife Biology 25 Years Experience	Field Investigation, T&E Fish and Wildlife
Heather Paskevic	B.A. Geography 5 Years Experience	Maps, Figures, Spatial Analysis
Miriam Hacker	M.S. Civil and Environmental Engineering B.S. Mathematics 10 Years Experience	Air Quality, Climatology
Jessica Beck	B.S. Biology 3 Years Experience	Land Use, Floodplains
Keith Reamer	B.S. Geology 14 Years Experience	Geology, Water Resources
Jim Knight	M.S. Marketing and Business Administration B.S. Forestry and Wildlife Management 17 Years Experience	Noise, Radio, and Television Interference, Socioeconomic Conditions and Community
Jim Bowlby	B.S. Hydrology/Watershed Management 27 Years Experience	Technical Review
ACR Consultants Inc.		
Donna Stubbs	M.S. Interdisciplinary Archaeological Studies and Museum Studies 7 Years Experience	Cultural Resources
Basin Electric Power Cooperative		
Jim Berg	Certified Professional Geologist B.S. Geology 22 Years Experience	Oversight, Project Description, Need for Project
Myron Steckler	Registered P.E. B.S. Mechanical Engineering 14 Years Experience	Project Coordinator

3.0 REFERENCES

Basin Electric Power Cooperative (Basin Electric). 2003. 2003 Power Supply Analysis Study. Basin Electric Power Cooperative, Bismarck, North Dakota. November.

Basin Electric. 2004a. East Side Peaking Combustion Turbine Generator Site Selection Study. Basin Electric Power Cooperative, Bismarck, North Dakota. March.

Basin Electric. 2004b. Power Supply Analysis Study – Supplemental 2004. Basin Electric Power Cooperative, Bismarck, North Dakota. September

Burns & McDonnel. 2001. Rapid City 230 kV Transmission Project, Electrical Effects Analysis. Completed for Basin Electric Power Cooperative. Bismarck, North Dakota. May.

Federal Emergency Management Agency (FEMA). 1998. Flood Insurance Rate Maps (FIRMS). Q3 Data for Brown, Deuel, and Spink Counties, South Dakota.

Guenel, P., P. Raskmark, X. Andersen, and E. Lynge. 1993. Incidence of Cancer in Persons with Occupational Exposure to Electromagnetic Fields in Denmark. British Medical Journal 50:758-764.

Hamilton, L., L. Howells. 1996. Water Resources of Spink County, South Dakota. Water-Resources Investigations Report 96-4056. Rapid City, South Dakota. U.S. Geological Survey

Koch, N., W. Bradford, , and D. Leap. 1977. Major Aquifers and Sand and Gravel Resources in Brown County, South Dakota. Information Pamphlet No. 4. South Dakota Geological Survey.

Leap, Darrell. 1986. Geology and Water Resources of Brown County, South Dakota. Bulletin 25, Part 1. Department of Water and Natural Resources, South Dakota Geological Survey.

National Resource Council (NRC). 1996. Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. Committee on the Possible Effects of Electromagnetic Fields on Biological Systems. National Academy Press.

South Dakota Geological Survey (SDGS). 2004. Internet resources. Accessed October 2004. On-line Address: http://www.sdgs.usd.edu/.

Tetra Tech EM Inc. (Tetra Tech). 2004a. Record of Telephone Conversation Regarding Local Land Use Controls and Permitting. Between Bob Farnes, Project Manager, and Butch Burns, Foreman, Brown County Highway Department. November 2.

Tetra Tech EM Inc. (Tetra Tech). 2004b. Record of Telephone Conversation Regarding Local Land Use Controls and Permitting. Between Bob Farnes, Project Manager, and Kim Markalee, Planner, Spink County Planning and Zoning. November 2.

U.S. Army Corps of Engineers. 2001. Fact Sheet – Nationwide 12 Permit. Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Census Bureau (Census). 2003. Population and other demographics for various years. Accessed on October 2003. On-Line Address: http://www.census.gov/.

U.S. Department of Agriculture (USDA). 1994. Soil Conservation Service. Soil Survey of Brown County, South Dakota. National Cooperative Soil Survey, U.S. Department of Agriculture. June.

USDA. 1997. Natural Resources Conservation Service. Soil Survey of Deuel County, South Dakota. National Cooperative Soil Survey, U.S. Department of Agriculture. November.

USDA. 2003. South Dakota Agricultural Statistics Service (SDASS). Accessed on June 26, 2003. On-line Address: http://www.nass.usda.gov/sd

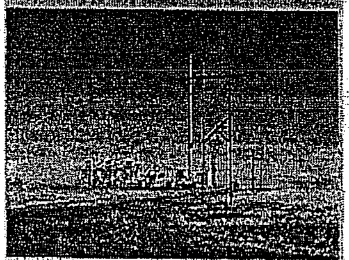
U.S. Environmental Protection Agency (EPA). 1990. "New Source Review Workshop Manual - Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft)." Office of Air Quality Planning and Standards. Research Triangle Park, NC.

EPA. 2001. "Guideline on Air Quality Models (Revised)." 40 Code of Federal Regulations, Part 51, Appendix W. Office of Air Quality Planning and Standards. Research Triangle Park, NC.

U.S. Geological Survey (USGS). 1996. National Seismic Shaking Hazard [online]. Accessed on April 11, 2001. On-line Address: http://geohazards.cr.usgs.gov/eq/index.html.

APPENDIX A

ENVIRONMENTAL REPORT



East Side Peaking Project Environmental Report

September 2004

Prepared for:

U.S. Department of Agriculture
Rural Utilities Service
Engineering and Environmental Section
1400 Independence Avenue, SW
Washington, DC 20250-1571

Prepared by:

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Bismarck, ND 58503

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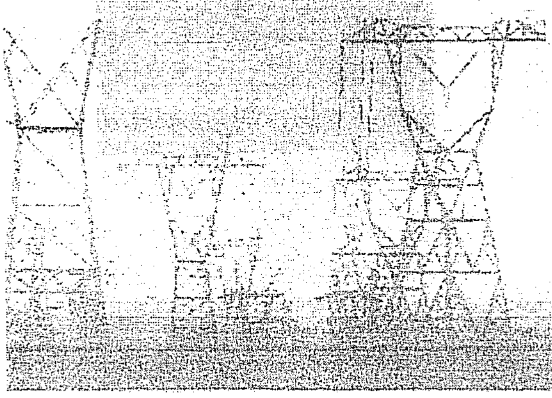
4940 Pearl East Circle
Boulder, CO 80301



Basin Electric Power Cooperative
East Side Peaking Project
Manager's Statement

I have reviewed this ER for the proposed East Side Peaking Project and, to the best of my knowledge; it accurately describes the proposed project, associated environmental impacts, and reasonable alternatives. Basin Electric Power Cooperative intends to carry out the environmental commitments, mitigation measures, and monitoring efforts presented in this ER. Our personnel and those of any involved independent contractor will be made aware of such environmental commitments before the initiation of construction. If any information relevant to the environmental effects of the proposed project comes to our attention subsequent to the submission of this ER, such material will be provided promptly to RUS.

Ron R. Harper
Basin Electric CEO and General Manager

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Appendix

FIGURES

Figure

TABLES

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EXHIBITS

ACRONYMS AND ABBREVIATIONS

°C	degrees Celcius
°F	degrees Fahrenheit
$\mu g/m^3$	Micrograms per cubic meter
ACR	ACR Consultants Inc.
Basin Electric	Basin Electric Power Cooperative
BEA	Bureau of Economic Analysis
BMP	Best Management Practice
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CO	Carbon monoxide
CPWC	Cumulative Present Worth Cost
CRP	Conservation Reserve Program
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibels
DC	Direct current
EHV	Extra high voltage
EMF	Electric and magnetic fields
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
GE	General Electric
HVAC	Heating, Ventilation, and Air Conditioning
HPRCC	High Plains Regional Climate Center
Hz	Hertz
kV	Kilovolt
kV/m	Kilovolts per meter
kW	Kilowatt
MAPP	Mid-Continent Area Power Pool
MG	Milligauss
mph	miles per hour
MW	Megawatt
MWh	Megawatts per hour
N	North
NA	Not applicable
NAAQS	National Ambient Air Quality Standards
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act

ACRONYMS AND ABBREVIATIONS (Continued)

NBPL	Northern Border Pipeline
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPWRC	Northern Prairie Wildlife Research Center
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSA	Noise sensitive area
NWI	National Wetland Inventory
O&M	Operating and Maintenance
O_x	Oxygen
PCPI	Per capita personal income
PLSS	Public Land Survey System
PM_{10}	Particulate matter with a diameter of 10 micrometers or less
Ppm	Parts per million
ROW	Right-of-way
rpm	Revolutions per minute
RUS	Rural Utilities Service
SCADA	Supervisory Central and Data Acquisition
SD	South Dakota
SDDENR	South Dakota Department of Environment and Natural Resources
SDDGFP	South Dakota Department of Game, Fish and Parks
SDNH	South Dakota Natural Heritage
SDNHD	South Dakota Natural Heritage Database
SDGOED	South Dakota Governor's Office of Economic Development
SDSU	South Dakota State University
SE	Southeast
SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
STATSGO	State Soil Geographic Database
T&E	Threatened and endangered
Tetra Tech	Tetra Tech EM Inc.
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile organic compound
W	West
Western	Western Area Power Administration

EXECUTIVE SUMMARY

Basin Electric Power Cooperative (Basin Electric) is a consumer-owned, regional cooperative, headquartered in Bismarck, North Dakota. Basin Electric generates and transmits wholesale electricity to 125 member rural electric systems in nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming. These member systems, in turn, distribute electricity to more than 1.8 million customers.

Basin Electric has established the need to add a peaking resource to serve projected member load growth. An 80 - 100 Megawatt (MW) simple-cycle, natural gas-fired turbine was determined to be the least-cost, self-build resource option to provide for future peaking requirements. Load growth is expected to be greatest in Basin Electric's membership areas in eastern South Dakota and northwestern Iowa (East Side). A new Basin Electric peaking resource located in this region is needed to serve member loads

Basin Electric is proposing to construct a new 80 - 100 MW simple cycle gas turbine in eastern South Dakota. The East Side Peaking Project would include a gas-fired combustion turbine normally using natural gas for a fuel. Fuel oil is not planned as a "back-up" fuel at this time. A firm gas supply and firm transportation agreements are in place and satisfy Mid-Continent Area Power Pool (MAPP) accreditation requirements. If required, the gas-fired turbine is capable of being modified to use fuel oil at a later date.

The evaluated plant design was based on a General Electric (GE) LMS100 gas turbine. The LMS100 gas turbine is the newest machine offered by GE in this size range, and offers the advantage of high efficiency. The high efficiency design of this turbine results in exhaust temperatures below 800°F (427°C).

The preferred site for the location of the turbine is near Groton, South Dakota (Groton). An alternate site has been identified southeast of Watertown, South Dakota (Watertown SE Alternative). Depending on which proposed gas turbine might be constructed, either a modification to an existing substation at the Groton site, or a new substation at the Watertown SE Alternative, would be required. In addition, approximately 0.5 mile of new transmission lines will be constructed, and a new gas supply pipeline will be constructed to supply the natural gas to the gas turbine.

The evaluation of alternatives revealed that the Proposed Project, followed by Watertown SE Alternative, best address the needs of Basin Electric and its consumers while minimizing impacts to the environment, existing land uses, concerns of land owners, and regulatory requirements.

Construction of the East Side Peaking Project is required to meet the growing needs for power of Basin Electric's membership in its service territory. The need for additional capacity is driven by general member load growth and anticipated commercial load growth throughout the Basin Electric member service area. Based on the analysis of loads and resources, Basin Electric will be deficit in 2004 and is in need of a peaking type resource. The capacity situation shows that Basin Electric is deficit (80 to 100 MW) in the summer season, while the energy situation shows that peaking is the type of energy (resource) needed. With consideration of a variety of constructed and purchased options, the lowest total system cost evaluated alternative for the next resource for Basin Electric is the development of an 80 - 100 MW simple cycle gas turbine located in South Dakota.

This Environmental Report (ER) was developed to assess the potential environmental consequences of the Proposed Project and reasonable alternatives. The Rural Utilities Service Bulletin 1794A-601 was used as guide in preparation of this ER.

The following conclusions are based on an assessment of direct, indirect, and cumulative environmental impacts of the Proposed Project and the reasonable alternatives. This assessment indicates that a determination of no significant environmental impacts is anticipated as a result of the East Side Peaking Project. In addition, any minor anticipated impacts would be easily mitigated.

Land Use: The primary land use in this project area is agriculture consisting of ranching and farming. No prime farmland would be affected by the proposed project. The proposed project should have minimal environmental impacts on land use.

Floodplains: The proposed project is expected to have no significant impact on floodplains.

Wetlands: The proposed project is expected to have no significant impact on jurisdictional wetlands.

Cultural Resources: The proposed project is expected to have minimal impact on cultural resources.

Threatened and Endangered Species: The proposed project is expected to have no significant impact on federal and state protected species.

Fish and Wildlife Resources: The proposed project would have minor direct, indirect, or cumulative impacts on wildlife. Short-term construction noise and activities could affect wildlife by temporarily displacing them from the area. Only small areas in the project area would be affected and only minimal portions would be disturbed by construction of the combustion turbine and installation of the associated gas pipeline. The increase in human activity in the proposed project area during construction might also temporarily disturb wildlife.

Vegetation: Direct, indirect, or cumulative environmental impacts to vegetation are anticipated to be minor and include the effects from farming and ranching, the primary land uses in the project area. Topsoil removed during construction will be stored and replaced after the project is complete. A re-vegetation plan would be developed, in compliance with applicable federal, state, and local regulations and ordinances. This and future projects should have an insignificant impact on vegetation, as most areas have been altered from their natural state.

Geology, Topography, and Soils: No potentially hazardous geological areas, such as slumps or landslides, would be affected by construction of the combustion turbine and installation of the gas pipeline. As a result, no direct, indirect, or cumulative impacts to geological resources are anticipated by the proposed project.

Air Quality and Climatology: Construction would have no significant long-term direct, indirect, or cumulative impacts on air quality from the proposed project. Because construction activities and the combustion turbine would not measurably increase background values, the direct, indirect, and cumulative impacts on air quality from the proposed project would be negligible. The gas turbine facility would be operated in accordance with conditions outlined in an air quality permit issued by the South Dakota Department of Environment and Natural Resources.

Water Quality: Impacts to surface water from the proposed project would be insignificant. No significant water resources are associated with the gas turbine or the gas pipeline proposed project area; as a result, no mitigation measures are proposed for these sites for protection of water resources. Best Management Practices (BMP) will be used to prevent erosion and sedimentation of nearby ephemeral drainages.

Aesthetics: The proposed project would have an insignificant impact on aesthetic resources. The project area is characterized by rolling hills of agricultural lands. No scenic viewpoints or scenic roads are in the proposed project area. The gas turbine generation station will be located near existing electrical transmission lines to minimize the need for additional power poles and lines. The addition of the combustion turbine facilities would have minimal direct or indirect impacts on the already linear features of the landscape, as existing roads, fencing, pipelines, substations, and transmission lines transect the area.

Transportation: No significant direct, indirect, or cumulative impacts are expected to the transportation systems of cities, counties, and the state. Short-term impacts may include minor traffic delays caused by construction activities. Any such short-term roadway closings would be scheduled with appropriate authorities, marked clearly, and detour routes would be provided as necessary. Construction of the proposed project would be expected to cause only insignificant adverse transportation effects to public access as a result of minor roadway congestion from workers vehicles.

Noise and Radio and Television Interference: Noise associated with construction of the proposed project would be intermittent and of relatively short duration. The proposed project is located in rural, unpopulated areas. Noise impacts from construction are expected to be short term. Components would be assembled off site and construction will be limited to daytime hours to mitigate any noise generated. The gas turbine will be located near existing roadways and away from existing dwellings to minimize noise impacts to the area. In addition, the proposed project is not expected to contribute significantly to cumulative noise impacts within the project area. Interference with radio and television signals is not anticipated.

Human Health and Safety: The East Side Peaking Project has been designed with attention to the reduction of hazards associated with its operation and meets or exceeds state and federal safety standards in all its components.

Socioeconomic Conditions and Community Resources: No specific mitigation measures are applicable to socioeconomic and community resources, because the proposed project does not pose disproportionate environmental effects to minority and low-income populations. In addition, no measurable impacts to the local communities are anticipated; therefore, no mitigation measures are required

1.0 PROJECT DESCRIPTION

Basin Electric Power Cooperative (Basin Electric) is a consumer-owned, regional cooperative headquartered in Bismarck, North Dakota. Basin Electric operates a total of 3,407 Megawatts (MW) of electric generating capacity of which 953 MW is for participants in the Missouri Basin Power Project, a group of six consumer-owned utilities, including the Missouri River Energy Services and Heartland Consumers Power District. Basin Electric also has 73 MW of ownership rights in two projects which it does not operate, and has 85 MW of wind energy. Basin Electric also manages and maintains 2,424 miles of high-voltage transmission lines; 40 switchyards and substations, and 58 microwave installations used for communications and system protection.

Basin Electric has established the need to add a peaking resource to serve projected member load growth (Basin Electric 2003, 2004b). An 80 - 100 MW simple-cycle, natural gas-fired turbine was determined to be the least-cost, self-build resource option to provide for future peaking requirements. Load growth is expected to be greatest in Basin Electric's membership areas in eastern South Dakota and northwestern Iowa (East Side). A new Basin Electric peaking resource in this region is needed to serve member loads.

Basin Electric is proposing to construct a new 80 - 100 MW simple cycle gas turbine in eastern South Dakota. The project would include a gas-fired combustion turbine using natural gas for fuel. A firm gas supply and firm transportation agreements are in place and satisfy Mid-Continent Area Power Pool (MAPP) accreditation requirements. If required, the gas-fired turbine is capable of being modified to use fuel oil at a later date.

The evaluated plant design was based on a General Electric (GE) LMS100 gas turbine. The LMS100 gas turbine is the newest machine offered by GE in this size range, and offers the advantages of an aero-derivative gas turbine in achieving higher efficiency. The high efficiency design of this turbine results in exhaust temperatures below 800°F (427°C).

The proposed project consists of constructing one 80 - 100 MW simple-cycle, natural gas-fired turbine. The Northern Border Pipeline (NBPL) would supply the natural gas. The NBPL is a 1,249-mile United States interstate pipeline system that transports natural gas from the Montana-Saskatchewan border near Port of Morgan, Montana to interconnecting pipelines in the upper Midwest of the United States. For 2001, it was estimated that NBPL transported approximately 20% of the total amount of natural gas imported from Canada to the United States.

The preferred site for the proposed gas turbine is near Groton, in Brown County South Dakota (Groton) (Figures 1-1 and 1-2). An alternate site has been identified southeast of Watertown, in Deuel County South Dakota (Watertown SE) (Figures 1-1, 1-2A) (Basin Electric 2004a). Either a modification to an existing substation at the Groton site, or a new substation at the Watertown SE site will be required. In addition, approximately 0.5 mile of new transmission lines will be constructed, and a new gas supply pipeline will be constructed to supply the natural gas.

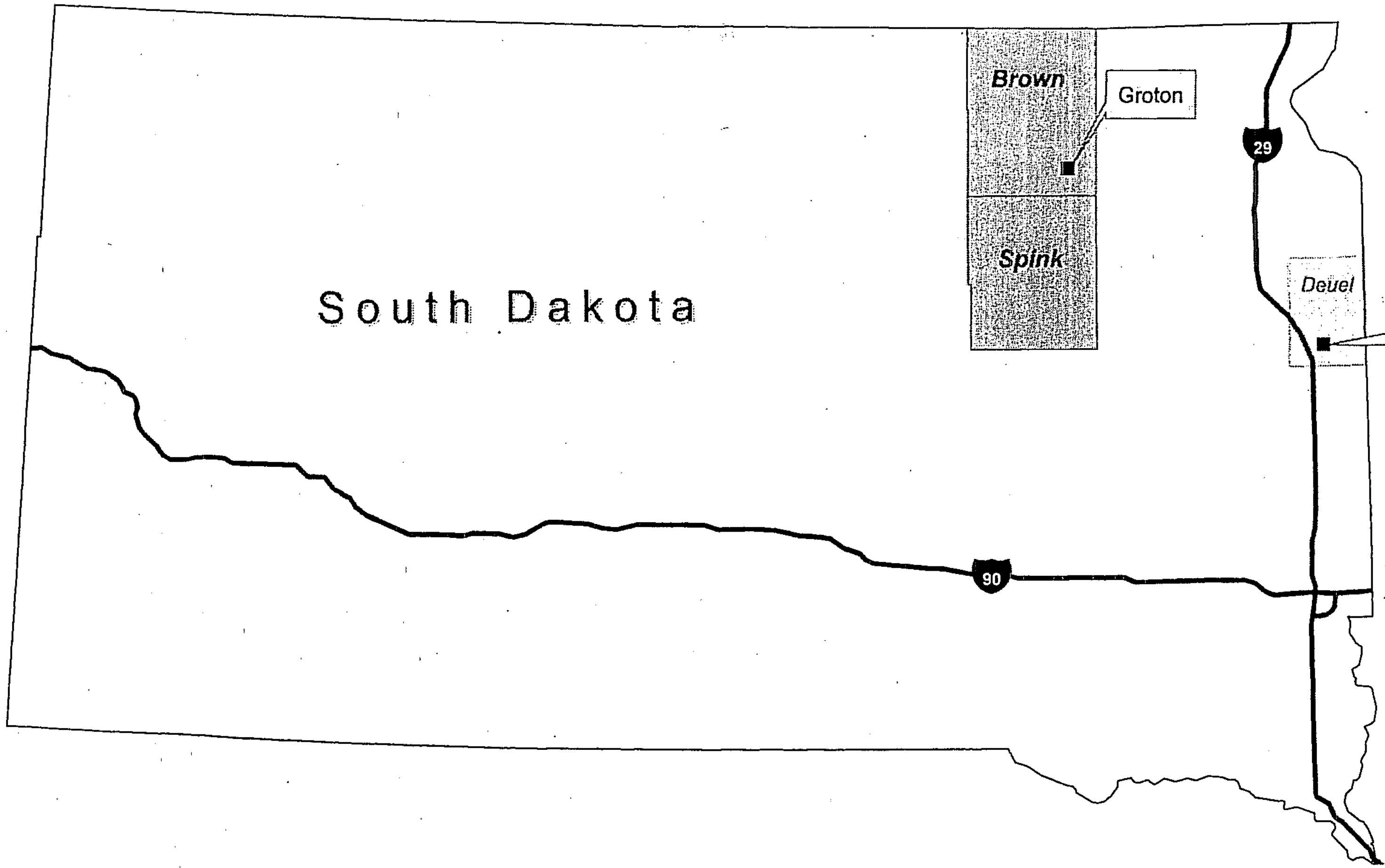
One gas turbine site is planned, with 80 - 100 MW of peaking generation capacity. The total area of the proposed project site would be less than 15 acres in size. The gas turbine would be sized to best match project loads, environmental requirements, and overall economics.

The proposed project site would include one gas turbine, factory assembled to the greatest extent possible, with a summer peaking capacity of approximately 80-100 MW. The gas turbine is capable of operating at all loads from 3 percent to 100 percent of rated capacity, but would normally operate between 50 percent and 100 percent of rated capacity.

An enclosure would be constructed protect the gas turbine from ambient conditions, which include temperatures between -30° and 105°F and winds up to 100 miles per hour (mph). The gas turbine would include an inlet air filter system, capable of removing air born dust, and a short exhaust gas stack (approximately 85 feet high) (Figure 1-3). The gas turbine will have fast-start capability and would be fueled by locally available natural gas.

A foundation for the gas turbine, associated control building, and associated equipment would be built on site. The site would include a chain-link fence with locking gate. A building to house the control systems to support the gas turbine would be constructed. This building will house metal enclosed switchgear, control systems, communication systems, battery systems, and other control equipment. This building would require a heating, ventilation, and air conditioning (HVAC) system.

Basin Electric will provide the design and equipment for the gas turbine, plant equipment, generator breaker, site station service transformer, and associated ancillary equipment and systems. Basin Electric will also provide the design and equipment needed for connections to the existing transmission system. This will include system equipment such as the buss structure, breaker, dead-end structure, line protection relaying, motor operated sectionalizing switches, and associated power and control cabling.



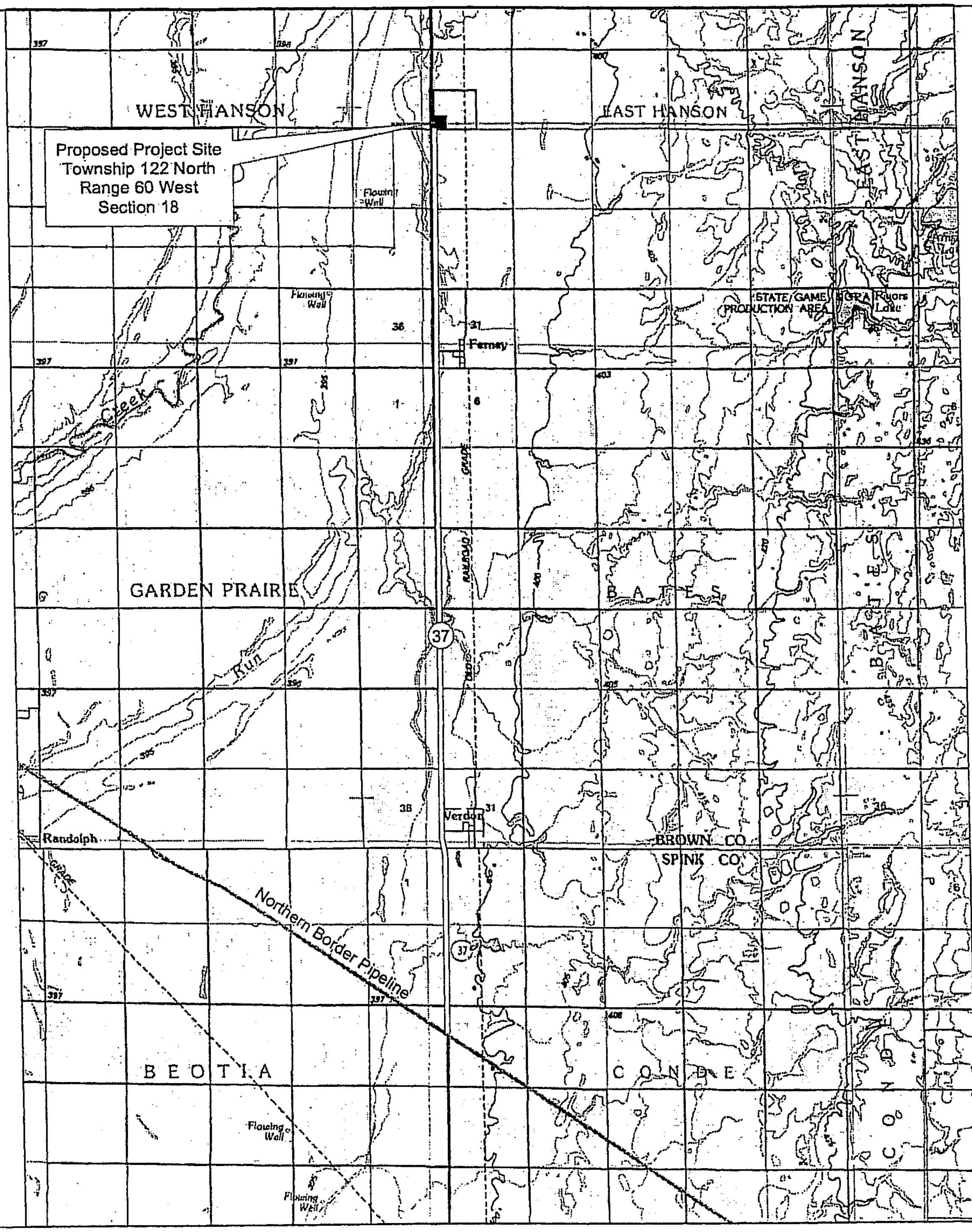
Legend

- Proposed Gas Turbine Location
- Alternative Gas Turbine Location
- Interstate Highway
- Proposed Project County
- Alternative Project County

FIGURE 1-1
PROJECT REGION
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

0 15 30 60
Miles

b:\project\basin_gis\projects\SDPeaking_project location.mxd hp



Legend

Proposed Gas Pipeline

Proposed Project Area

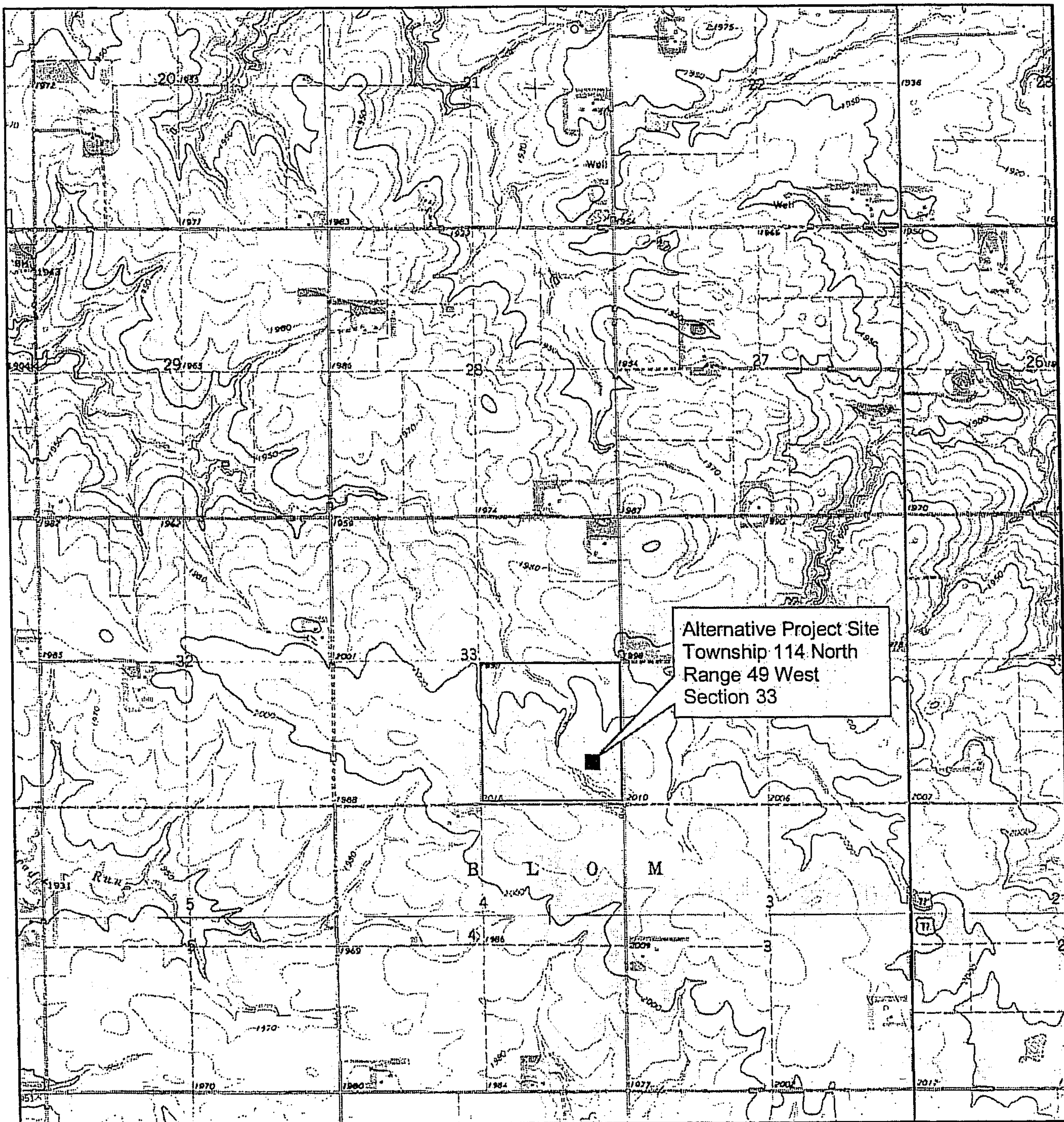
Proposed Gas Turbine Site

U.S. Geological Survey (USGS).
South Dakota Seamless USGS Topographic Maps on CD-ROM. 2000.

FIGURE 1-2
PROJECT SITE LOCTION
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Miles
0 0.5 1 2 3

07/21/04 b:\project\basin_gis\projects\SDPeaking_GrotonLine_Topo.mxd HP



Alternative Project Area

Alternative Project Site

0 0.5 1 mile

approximate scale

FIGURE 1-2A
ALTERNATIVE SITE LOCATION
WATERTOWN SE ALTERNATIVE SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

U.S. Geological Survey (USGS).
South Dakota Seamless USGS Topographic Maps on CD-ROM. 2000.

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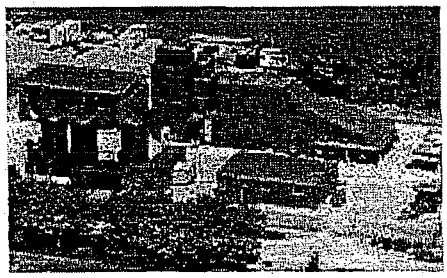

Example Gas Turbine Site

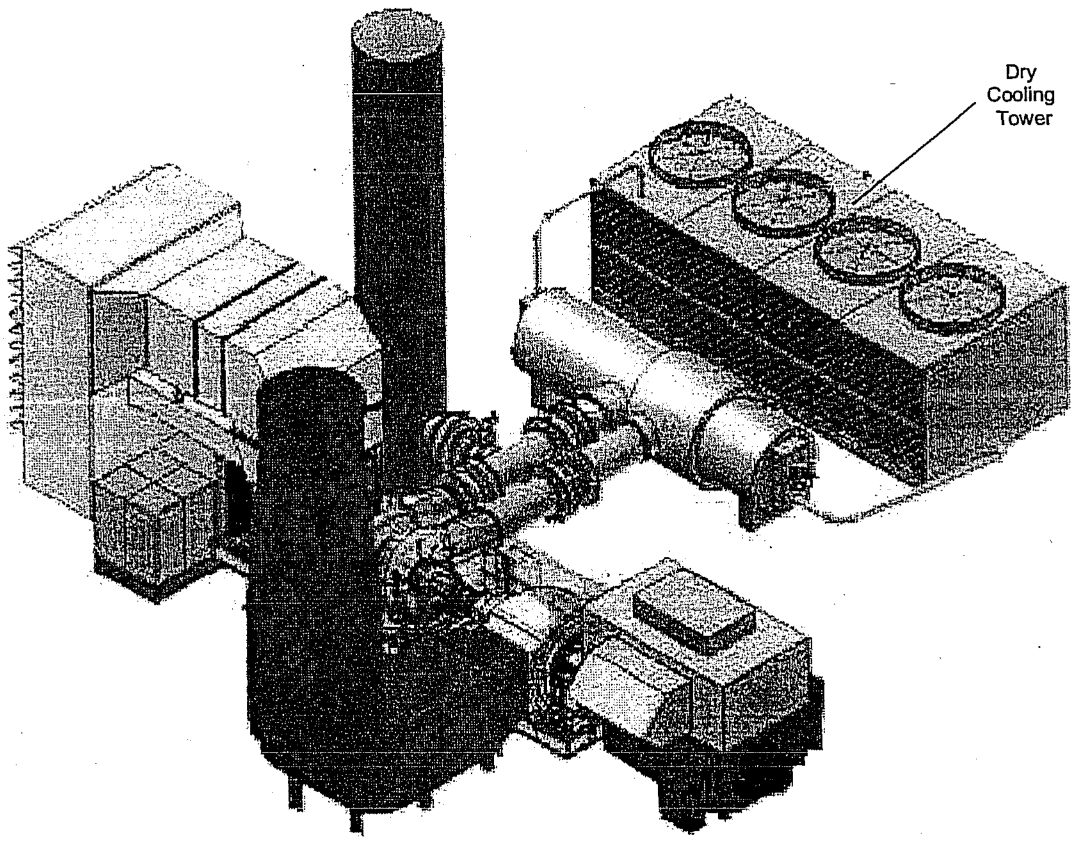

FIGURE 1-3
GENERAL ELECTRIC LMS100
CONCEPTUAL CONFIGURATION
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Source: General Electric

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A Supervisory Central and Data Acquisition (SCADA) system will be used to monitor and control gas turbine site equipment. The gas turbine site equipment includes the turbine, generator, generator breaker, site station service transformer, motor control centers equipment, battery systems, and other gas turbine site equipment and systems.

The gas turbine unit would include a dilutent combustion system and a 95 % reduction CO catalyst system, subject to the terms and conditions of the project's South Dakota Department of Environment and Natural Resources (SDDENR) Air Quality Permit to Construct. The air quality permit will be obtained prior to facility construction. Other criteria pollutants identified by the State of South Dakota, along with fugitive particulate emissions from both construction and operations, would be addressed to the satisfaction of the regulatory agency.

The process design environmental factors, in addition to air quality, include water quality and waste management. Operations associated with simple-cycle gas turbines do not involve off-site water discharge. Water-quality related design considerations are associated with site run-off both during construction and post-construction and would be controlled and managed by a water treatment system under the terms and conditions of the Storm Water Management and Control Permit for the facility.

Waste management associated with the gas turbine would be minimal. No hazardous wastes would be generated by process operations. Industrial wastes would consist of waste fluids and detergents from turbine maintenance and miscellaneous other materials. All industrial wastes would be removed from the site and held for disposal in a licensed and permitted commercial waste disposal facility.

Construction of Underground Gas Pipeline

In addition to the proposed gas turbine generation, this project will include the construction of natural gas pipeline. The proposed pipeline will be constructed in accordance with the guidelines set forth jointly by the U.S. Department of Interior, Transportation, and Agriculture and the National Safety Code. The pipeline would supply the gas turbine with natural gas from the existing NBPL. The underground gas pipeline would be constructed underground and surface reclamation would occur concurrently with construction and site development.

Groton Gas Pipeline – The route for the proposed gas pipeline to supply the proposed Groton gas turbine would begin at the NBPL Section 13, Township 120 North, Range 61 West, in Spink County, South Dakota. The proposed gas pipeline would continue north approximately 11.5 miles on the west side of State Highway 37, primarily using the existing utility and road right of way. The proposed gas pipeline would terminate at the proposed gas turbine and existing substation location in Section 18, Township 122 North, Range 60 West, in Brown County, South Dakota (Figure 1-2).

Watertown SE Alternative Gas Pipeline – The proposed location of the Watertown SE Alternative is very near the intersection of the NBPL and an existing 345 kV transmission line. Less than ¼ mile of new gas pipeline would be required for this alternative. (Figure 1-2A).

2.0 NEED FOR THE PROJECT

Basin Electric was formed in 1961 by 67 member cooperatives after the U.S. Department of the Interior announced that the federal hydropower system would not be able to meet the additional energy requirements of the region's rural electric cooperatives and other preference consumers of the U.S. Bureau of Reclamation beyond the winter of 1965. Basin Electric was formed as a wholesale power supplier to plan, design, construct, and operate generating facilities necessary to meet the growing electrical demands of its member systems.

Construction of the East Side Peaking Project is required to meet the growing needs for power of Basin Electric's membership in its service territory. Basin Electric has established the need to add a peaking resource to serve projected member load growth. A new Basin Electric peaking resource located in this region is needed to serve member loads. This project was established on the basis of an ongoing need to address reliability and to supply low cost power to Basin Electric members. (Basin Electric 2003, 2004b

Table 2-1 presents the summer surplus for Basin Electric's east side. Numbers enclosed in parenthesis indicate a deficit.

TABLE 2-1

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
SUMMER LOADS, RESOURCES, AND DEFICITS FOR BASIN ELECTRIC'S EAST SIDE

Year	Summer Seasonal Demand	Net Generation Owned	Firm & Participation Purchases	Firm & Participation Sales	Net Reserve Capacity	Basin Electric Surplus/ Deficit
2004	1502	1759	121	229	223	(74)
2005	1507	1790	117	253	224	(77)
2006	1527	1790	117	186	227	(33)
2007	1570	1790	117	107	232	(2)
2008	1588	1790	117	103	234	(18)
2009	1610	1791	117	98	238	(38)
2010	1627	1790	116	105	240	(67)
2011	1661	1790	116	55	237	(47)
2012	1679	1790	116	61	239	(73)
2013	1696	1790	116	64	242	(96)
2014	1715	1790	116	67	245	(121)
2015	1739	1790	115	70	249	(152)
2016	1761	1790	115	73	252	(181)
2017	1781	1790	115	77	255	(208)
2018	1803	1790	115	82	259	(239)
2019	1826	1790	115	88	262	(271)
2020	1849	1790	115	91	266	(301)

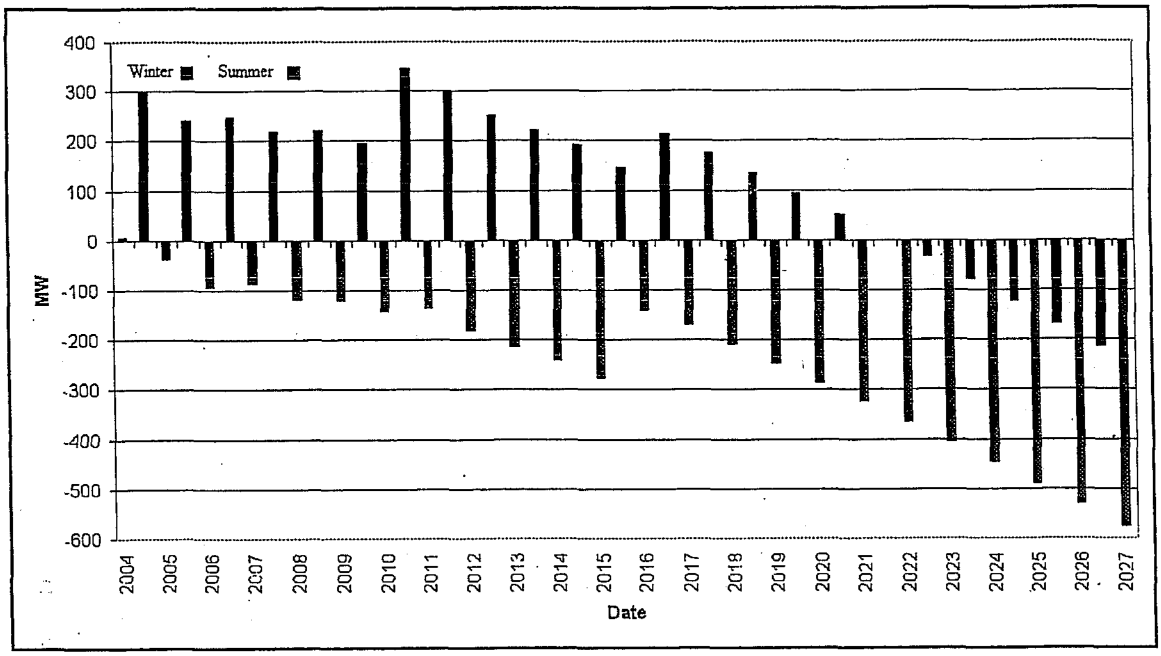
Even though the most rural areas are experiencing population loss, many areas served by Basin Electric in the project region are experiencing population growth. Basin Electric is experiencing load growth throughout their system in every consumer class. A new peak demand delivery to members was reached in 2002.

Forecasted Basin Electric system capacity requirements for the 2004 through 2027 planning horizon are contained in the 2003 Power Supply Analysis Study (Basin Electric 2003, 2004b). The study was prepared in accordance with Rural Utilities Service (RUS) regulations published in 7 Code of Federal Regulations (CFR) 1710 Subpart F. The purpose of the study was to determine the best capacity additions for Basin Electric's service area. The capacity alternative ultimately chosen must be one which will ensure a safe, adequate, and reliable supply of electricity for Basin Electric and its members at the lowest reasonable cost. The preferred self-build option identified by this study is the anticipated lowest cost resource option and has been compared to other Basin Electric options including proposals received through a Basin Electric capacity solicitation process.

The need for additional capacity is driven by general member load growth and anticipated commercial load growth throughout the Basin Electric member service area. Exhibit 2-1 presents the load & capability surplus/deficit calculation for the total Basin Electric system. The calculation includes projects currently under construction, as well as projects committed to or under consideration (the Waste Heat Cogen Project).

Exhibit 2-1

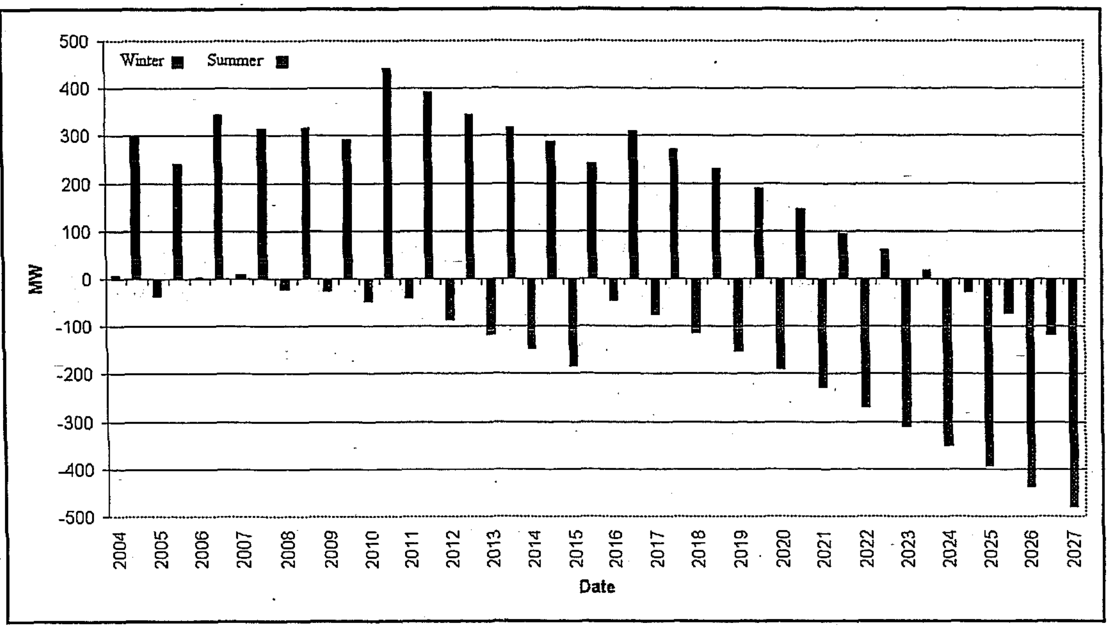
East Side Peaking Project
Basin Electric Power Cooperative
Total Basin Electric System Surplus/Deficit Capacity Estimate



The study evaluated which candidate capacity options will satisfy the currently forecasted Basin Electric System capacity requirements in the least-cost manner, defined as the expansion plan having the lowest Cumulative Present Worth Cost (CPWC) over the 2004 though 2027 planning horizon. Included in CPWC are all incremental capital and fixed Operating and Maintenance (O&M) costs, plus all system variable (fuel plus variable O&M) costs incurred to meet all system capacity requirements. The system planning process requires the development of capital cost and performance parameters for all candidate-generating units to be evaluated. For this study, Basin Electric developed conceptual level cost and performance information for a number of solid fuel and gas-fired units.

Based on the analysis of loads and resources, Basin Electric will be deficit in 2004 and is in need of a peaking type resource. The capacity situation shows that Basin Electric is deficit in the summer season 80 - 100 MW, while the energy situation shows that peaking is the type of energy (resource) needed. With consideration of a variety of constructed and purchased options, the lowest total system cost evaluated alternative for the next resource for Basin Electric is the development of an 80 - 100 MW simple cycle gas turbine located in South Dakota. Exhibit 2-3 presents the load & capability surplus/deficit calculation for the total Basin Electric system with the addition of an 80 - 100 MW turbine.

Exhibit 2-2
East Side Peaking Project
Basin Electric Power Cooperative
Total Basin Electric System Surplus/Deficit Capacity Estimate
with the Addition of an 80 – 100 MW Turbine



An estimated load pattern for the Basin Electric total system was developed for the projected peak demand in 2006 and 2012. The energy available from existing resources was also graphed with the load pattern. The 2006 estimated load pattern is shown in Exhibit 2-3 and the 2012 estimated load pattern is shown in Exhibit 2-4. These exhibits indicate that Basin Electric has sufficient coal to meet its base load energy needs for some time to come. However, there is a shortage of peaking energy resources to satisfy these needs. Also note, the load pattern is based on 2002 load profile which has more diversity in the peak than is planned for, so the peak in both 2006 and 2012 could be higher than is projected in the load pattern. The available energy is based on Basin Electric's existing resources, scheduled maintenance outages for existing resources, and contract purchases. The load pattern is the Basin Electric member load, diversity, contingency, losses, reserves, and contracted non-member sales.

Exhibit 2-3

East Side Peaking Project
Basin Electric Power Cooperative
2006 Total System Estimated Load Pattern and Available Energy

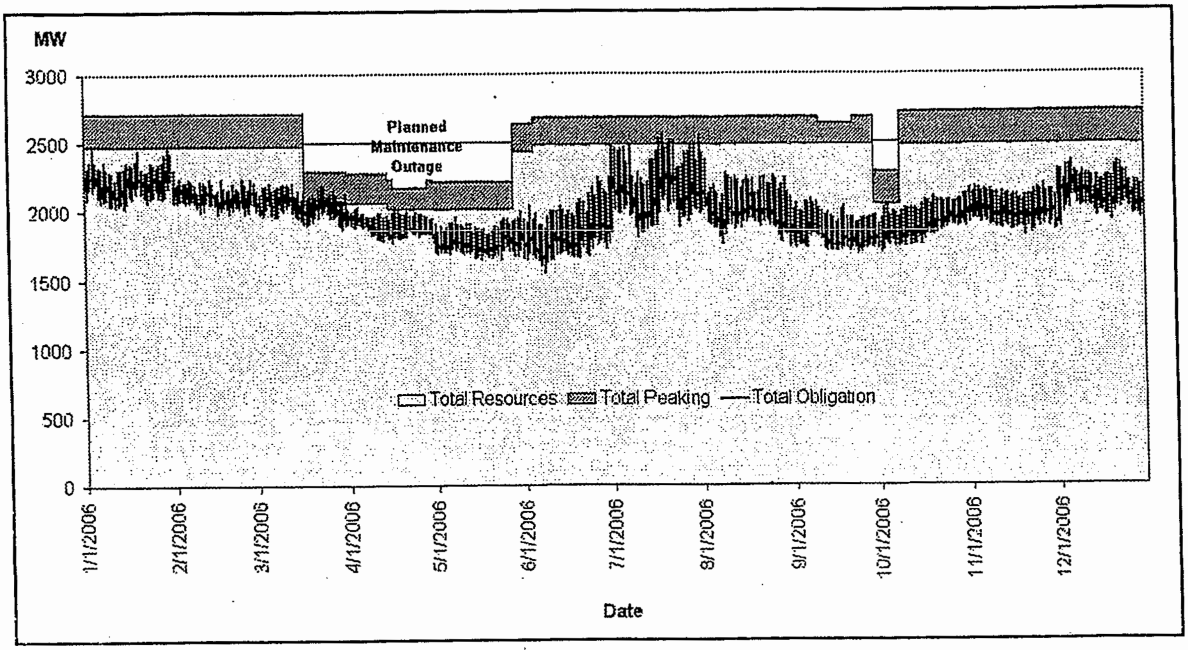
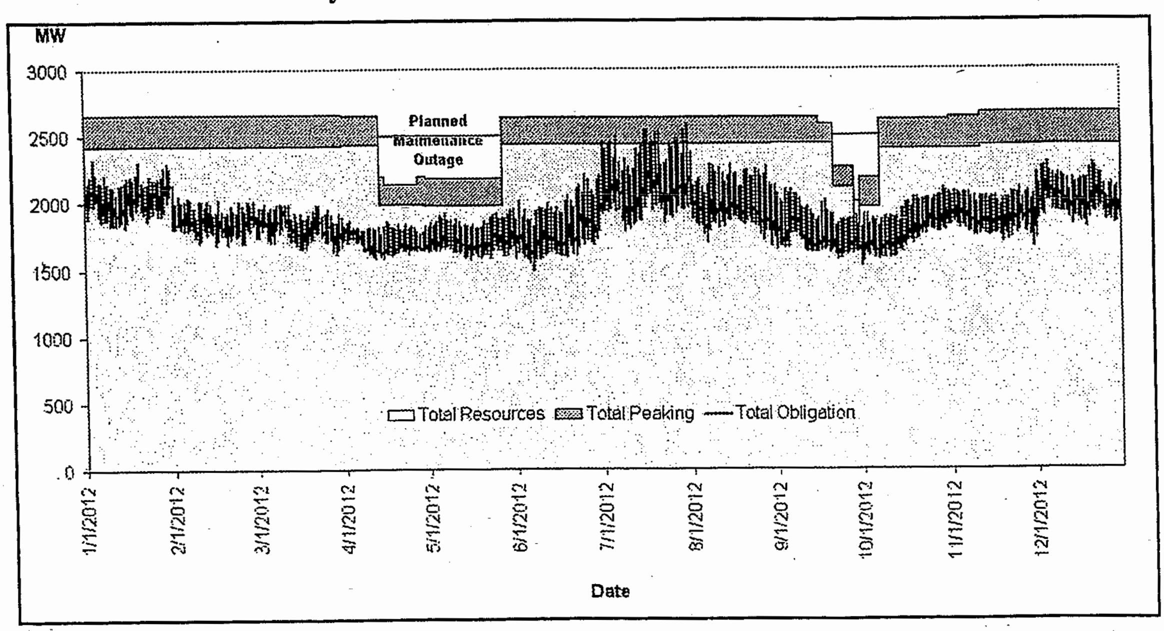


Exhibit 2-4

East Side Peaking Project
Basin Electric Power Cooperative
2012 Total System Estimated Load Pattern and Available Energy



Looking at the short-term proposals (under 5 years), Basin Electric could postpone the construction of the self-build for a couple of years and purchase in the market. With this approach, Basin Electric would be exposed to market fluctuation. Also, the cost of gas turbines is very uncertain in the future and the ability of transmission would be significantly more difficult to obtain if Basin Electric waited a couple of years. Based on these risks, Basin Electric should move forward with the construction of a simple cycle gas turbine at this time.

3.0 ALTERNATIVES TO THE PROPOSED PROJECT

This section describes all reasonable alternatives to the Proposed Project that were considered for further evaluation, and explains the reasons alternatives were rejected. It also describes the No Action Alternative.

3.1 DEVELOPMENT OF ALTERNATIVES

Basin Electric conducted a systematic evaluation of alternatives to the Proposed Project. There were several objectives in considering an alternative: minimal extra high voltage (EHV) transmission, available gas and water supply, low cost, and minimal environmental and public impact. One objective was to minimize the need for additional transmission capacity by identifying projects near existing transmission lines with available capacity. Another objective was to provide low cost electrical energy to the members served by Basin Electric. The third objective was to identify projects that would minimize the potential impact to the environment. Basin Electric's alternative evaluation included:

- Studying the entire proposed area of the project using aerial photographs, maps, and existing land use databases
- Screening the area of the project to identify restricted and potentially incompatible areas, including conflicting land uses, existing structures or developments, and potentially challenging environmental features such as ponds, lakes, or hills
- Identifying gas pipeline corridors that are predominately along existing Public Land Survey System (PLSS) section lines or follow existing right-of-way
- Identifying existing electric transmission lines, and substations (Existing substations were desirable but not a necessary attribute for potential sites)
- Water requirements for a simple-cycle combustion turbine although important would not be as critical as fuel supply and transmission capabilities
- Completing field surveys by a multidisciplinary team including a project engineer, environmental compliance specialist, and land use planner
- Identifying potential costs associated with development of viable options
- Conducting a comparative assessment of viable alternatives using criteria on reliability/dependability for energy supply, distance from existing transmission line capacity, cost (capital and operating and maintenance), and environmental considerations

3.1.1 Selection Criteria

An initial screening process followed by a field reconnaissance identified potential alternatives to the proposed project. The initial task involved: (1) identification of potential transmission interconnection points, (2) delineation of the boundaries of the project area, and (3) examination of photographs, maps of existing and future land uses, transportation and utility maps, and maps that show environmental features including floodplains, wetlands, and soils. This initial review was completed to identify the realistic projects, identify potential transmission interconnection points, and eliminate from further consideration projects that are obviously unsuitable. Based on the results of the screening evaluation, transmission interconnection points were identified, and gas pipeline corridors were drawn on a map. The following considerations were included in the screening process included:

- Minimization of the number of homes and buildings adjacent to the project area
- Minimization of the number of landowners' impacted
- Minimization of potential impacts to known wetlands, threatened and endangered (T&E) species, sensitive habitats, waters of the U.S., and other environmental resources
- Minimization of costs associated with acquisition, construction, and maintenance
- Elimination of alignments that did not predominately coincide with section lines, existing property boundaries, and utility rights-of-way to comply with "agency" requests that these areas be avoided, where possible.

3.1.2 Generation Technologies Considered But Eliminated From Further Study

Alternatives for generation were considered and addressed. The following alternative renewable energy technologies were identified and evaluated:

- Solar Electric
- Wind
- Geothermal
- Small Hydroelectric

Solar electric energy was eliminated because of the nature of the generation, which is not available consistently to meet load demand, and is only available when the sun shines. Thus, this potential alternative does not reliably meet the peaking power supply needs of the members.

Wind energy was similarly eliminated from further consideration because this resource has an availability of less than 50%, which does not meet the reliable power supply needs of the members.

Geothermal energy was eliminated from further consideration because there are no significant geothermal resources available in the service area.

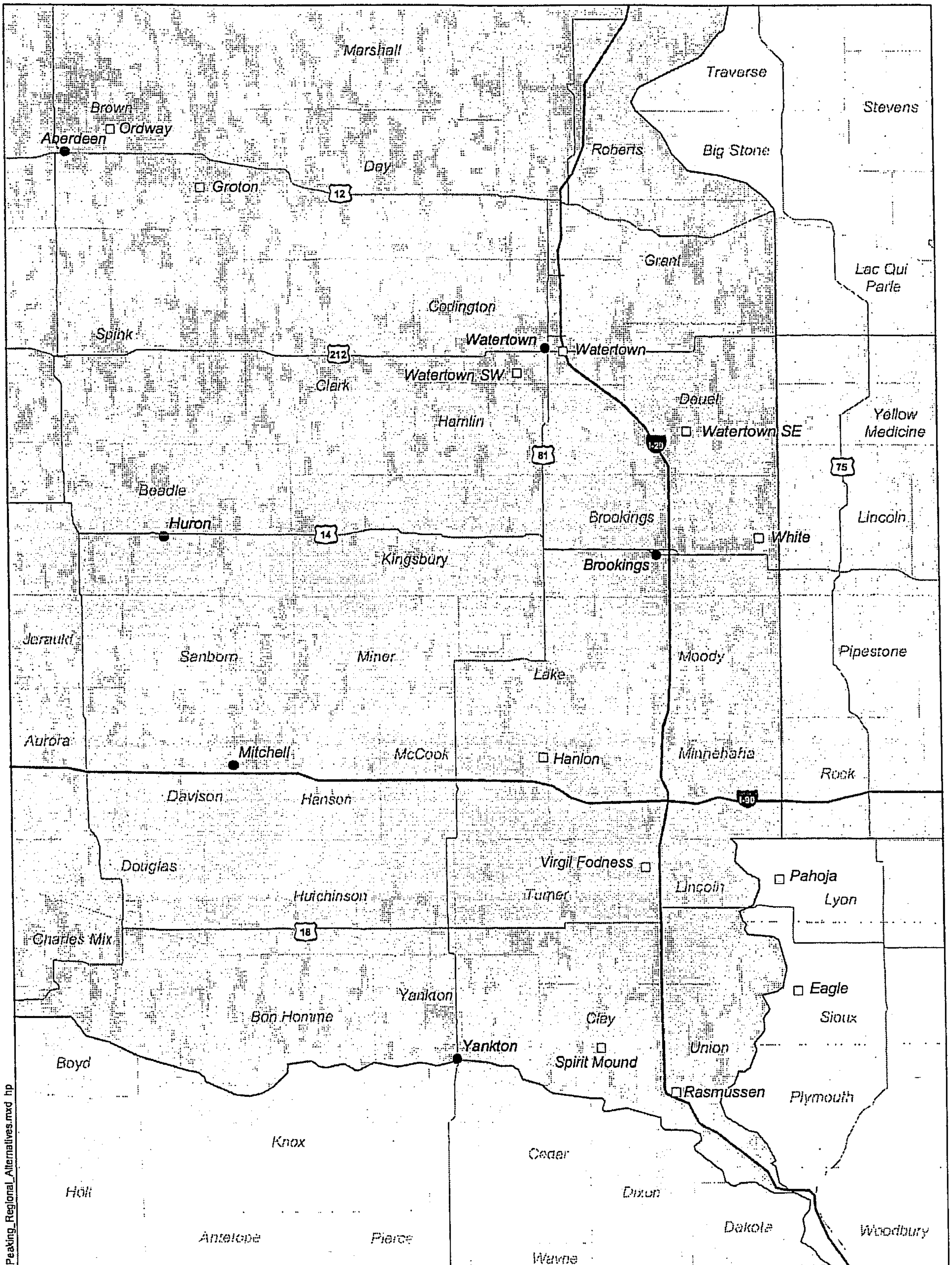
Similarly, small hydroelectric resources are dependent on stream flows and are an unreliable resource within the service territory of Basin Electric.

3.1.3 Turbine Site Alternatives Considered But Eliminated From Further Consideration

Initially, 12 potential gas turbine locations were identified in eastern South Dakota and northwestern Iowa (Figure 3-1)). The Groton and Ordway sites are located in proximity to Aberdeen, SD. The Watertown SW, Watertown SE, and Watertown sites are located in proximity to Watertown, SD. The White site is located in proximity to Brookings, SD. The Hanlon and Virgil Fodness sites are in proximity to Sioux Falls, SD. The Spirit Mound and Rasmussen sites are in proximity to Vermillion, SD. The Pahoja and Eagle sites are in northwestern Iowa, also in proximity to Sioux Falls, SD. (Figure 3-1) (Basin Electric 2004a).

Basin Electric staff completed an initial field review of these 12 sites on June 2-4, 2003. The purpose of this site screening field review was to verify the accuracy of databases used to locate existing natural gas pipelines, transmission lines and substations, and the spatial relationship of these resources to each other in the area surrounding the potential sites. Existing water supplies and transportation access were also documented. Potential environmental and human constraints in the area surrounding the potential sites were also noted. Regional air quality constraints, land use compatibility, geologic hazards, potential biological or cultural resource constraints, wetlands, and any potential for hazardous waste or spill sites in the general area were considered.

The Rasmussen, Ordway, Eagle, and Spirit Mound sites were eliminated from further consideration due to an inadequate gas supply or long distances to existing gas pipelines that would increase site



Legend

- City
- Potential Alternative Combustion Turbine Location
- Interstate Highway
- State Highway
- County Boundary

States

- Minnesota
- Iowa
- Nebraska
- South Dakota

FIGURE 3-1
POTENTIAL GAS TURBINE LOCATIONS
CONSIDERED BUT ELIMINATED
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

0 9 18 36
Miles

7.22.04 b:\projects\basin_GIS\projects\SDPeaking_Regional_Alternatives.mxd hp development costs significantly. The Virgil Fodness site was eliminated from further consideration during the initial site investigation due to conflicting land use resulting from expanding residential development in the immediate vicinity of the site. The Pahoja site was eliminated from further consideration due to the existence of a nearby recreation area. The Watertown site was rejected due to its urban location and existing facility congestion. The Hanlon site was eliminated from further consideration because firm or non-interruptible gas supplies would be uneconomical. Further if a second unit were ever added in gas supplies may not be adequate. The White site was eliminated from further consideration because of high third party mitigation costs. The Watertown SW site was eliminated from further consideration for two primary reasons. First, the site location is within 5 miles of the city limits of Watertown, SD, within 2 miles of developed recreation areas, and urban development is occurring nearby within 1 mile of the site. Second, preliminary discussions with the SDDENR regarding initial air quality screening have resulted in indications from that agency that the Watertown SW site is the least desirable site from an air quality and permitting standpoint

3.2 ALTERNATIVES TO THE PROPOSED PROJECT

Based on the preliminary screening process, the remaining practical alternative to the Proposed Project, other than the No Action Alternative, is the Watertown SE Alternative.

3.3 NO ACTION ALTERNATIVE

The No Action Alternative would forego permitting and construction of the gas turbine and associated facilities. No change would be made to resources in the study area and no environmental effects would be expected. However, energy demands would not be met and Basin Electric will be deficit in overall system resources.

3.4 WATERTOWN SE ALTERNATIVE

The GE LMS100 gas turbine configured in a manner similar to the Proposed Project would power the Watertown SE Alternative. The Watertown SE Alternative site is located approximately 27 miles southeast of Watertown, in Deuel County, South Dakota (Figure 1-3). The site is located in relatively level terrain essentially near the intersection of the NBPL 42-inch diameter gas pipeline, and the Western Area Power Administration (Western) 345-kV transmission line. There is no substation at this location and a new 345-kV substation would be constructed as part of the project for this site. Natural gas would be provided to the site through approximately ¼ mile of new gas pipeline that would interconnect with the existing NBPL. This is the same interstate gas transmission line anticipated to supply the fuel to the Proposed Project and has adequate capacity for this project. If implemented, the Watertown SE Alternative site would be enclosed in a secure fenced area. The gas turbine will be situated on a concrete pad and enclosed in a structure.

3.5 SUMMARY OF ALTERNATIVES

The evaluation of alternatives revealed that the Watertown SE Alternative is the only alternative that addresses the needs of Basin Electric and its consumers while minimizing impacts to the environment. Several generation technologies and alternative gas turbine locations were considered. The Watertown SE Alternative is the only alternative to the proposed project that is compatible with land uses in the region, minimizes impacts to environmentally sensitive or significant features, and meets the power supply needs of Basin Electric and its members

3.6 PROPOSED PROJECT

The proposed project involves the construction of a gas turbine for the purpose of generating electricity. In addition to the proposed generation, this project will include the construction 11.5 miles of buried underground pipeline as a fuel source for the gas fired turbine and transmission interconnection with the Western 115 kV substation adjacent to the proposed site(Figure 1-2).

Gas Turbine

The proposed Groton gas turbine is a natural gas-fired, turbine-powered electricity generation station, located approximately 5 miles south of the town of Groton, in Brown County, South Dakota. The elevation of the site is approximately 1,300 feet above mean sea level (msl). The terrain in the region is relatively flat with some rolling hills. The area surrounding the Groton site is well-drained although there is little topographic relief throughout the site.

The Groton gas turbine will be powered by one GE LMS100 gas turbine, fired by natural gas. The site will be enclosed in a secure fenced area. The turbine will be situated on a concrete pad and enclosed in a structure (Figure 1-3). The proposed site would be located on property owned by Basin Electric. A Basin Electric substation, and a constructed drainage pond exist at the proposed site (Appendix A). A Western substation is adjacent to the proposed site.

Gas Pipeline

In addition to the proposed generation, this project will involve the construction of approximately 11.5 miles of buried underground pipeline to carry natural gas from the NBPL to the gas turbine. The majority of the gas pipeline would be constructed on the west side of State Highway 37 in the existing utility and road right-of-way. Approximately 2 miles of the pipeline would be constructed in agricultural land.

Transmission Interconnection

The Groton site is located adjacent to a Basin Electric owned, 345 kV substation, and a Western 115 kV substation. Interconnection to the Western substation is planned. Modifications to the substation and less than 0.5 mile of new transmission line will be required. The new transmission will be constructed on Basin Electric property.

The Proposed Project, best addresses the needs of Basin Electric and its consumers while minimizing impacts to the environment, existing land uses, concerns of land owners, and regulatory requirements. Furthermore, the Proposed Project is compatible with land uses in the region; avoids potentially unfavorable features such as existing or future residential communities, commercial developments, transportation corridors, and schools; and minimizes impacts to environmentally sensitive or significant features including wetlands, potentially sensitive habitats, waterways, and vegetation communities.

4.0 AFFECTED ENVIRONMENT

This section describes the affected environment of the East Side Peaking Project. The baseline information provided in this section supports the evaluation of potential direct, indirect, and cumulative, environmental impacts that could result from the Proposed Project and the Watertown SE Alternative. For most environmental resources, the affected environment for the Proposed Project and the Watertown SE alternative is very similar. The Proposed Project and the Watertown SE Alternative are both located in rural, agricultural areas of eastern South Dakota. On-the-ground environmental resource surveys were conducted at the Proposed Project site and the Watertown SE Alternative site in October 2003. For the environmental resources where the affected environment of the Proposed Project differs from the Watertown SE alternative, a more detailed discussion of the Watertown SE affected environment is provided.

The project consists of the construction of an 80 – 100 MW gas turbine and construction of a underground gas pipeline to meet load demands. According to RUS rules 7 CFR 1794.24(b)(2), the construction of the 80-100 MW gas turbine is a proposal requiring a Environmental Assessment (EA) with scoping.

Each potentially affected environmental resource is addressed in terms of a study area for the Proposed Project. Appendix A presents photographs of the study area. Generally the proposed project area for all resources is defined as the area surrounding the gas turbine and gas pipeline and access to these sites. However, the study area is defined for each resource by the physical extent that could be affected by the Proposed Project or the Watertown SE Alternative. The study areas for certain resources vary based on the prevalence or scarcity of the resource in the region, its size and dispersion, its sensitivity to local disturbance, and the nature and amount of information available on the resource. The study areas for each resource and the reasoning used in the selection process are presented in Table 4-1.

TABLE 4-1

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
STUDY AREA BY ENVIRONMENTAL RESOURCE

Environmental Resource	Study Area
Land Use	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Floodplains	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Wetlands	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Cultural Resources	Brown County, South Dakota Proposed Groton combustion turbine facility (160 acres) Brown and Spink Counties, South Dakota Proposed Groton pipeline (11.5 miles, approximately 350 acres) Deuel County, South Dakota - Watertown SE Alternative combustion turbine facility (160 acres)
Threatened and Endangered Species	Brown County, South Dakota Spink County, South Dakota Deuel County South Dakota - Watertown SE Alternative
Fish and Wildlife Resources	Brown County, South Dakota Spink County, South Dakota Deuel County South Dakota - Watertown SE Alternative
Vegetation	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)

TABLE 4-1 (Continued)	
Environmental Resource	**Study Area**
Geology, Topography, and Soils	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Coastal Areas	Not applicable to this project
Air Quality and Climatology	Brown and Spink Counties, South Dakota Deuel County, South Dakota - Watertown SE Alternative
Water Resources	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Aesthetics	Area within which the proposed facilities may be visible
Transportation	Brown and Spink Counties, South Dakota Nearby streets, railroads, and airports Deuel County, South Dakota - Watertown SE Alternative Nearby streets, railroads, and airports
Noise and Radio and Television Interference	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Human Health and Safety	Proposed Groton combustion turbine facility (160 acres) Proposed Groton pipeline (11.5-mile long 200-foot wide corridor, approximately 280 acres) Watertown SE Alternative combustion turbine facility (160 acres)
Socioeconomic Conditions and Community Resources	Brown County, South Dakota Spink County, South Dakota Deuel County, South Dakota - Watertown SE Alternative

Specific environmental resources in the proposed study area are described in the following sections.

4.1 LAND USE

This section describes the land use in the affected environment and includes general and agricultural land use and formally classified lands. The land use study area is defined as the proposed site for the Groton gas turbine facility, within Brown County, as well as the proposed pipeline, extending from the proposed turbine facility, approximately 11.5 miles south into Spink County. Figure 4-1 shows current land use in and around the proposed Groton gas turbine facility and pipeline.

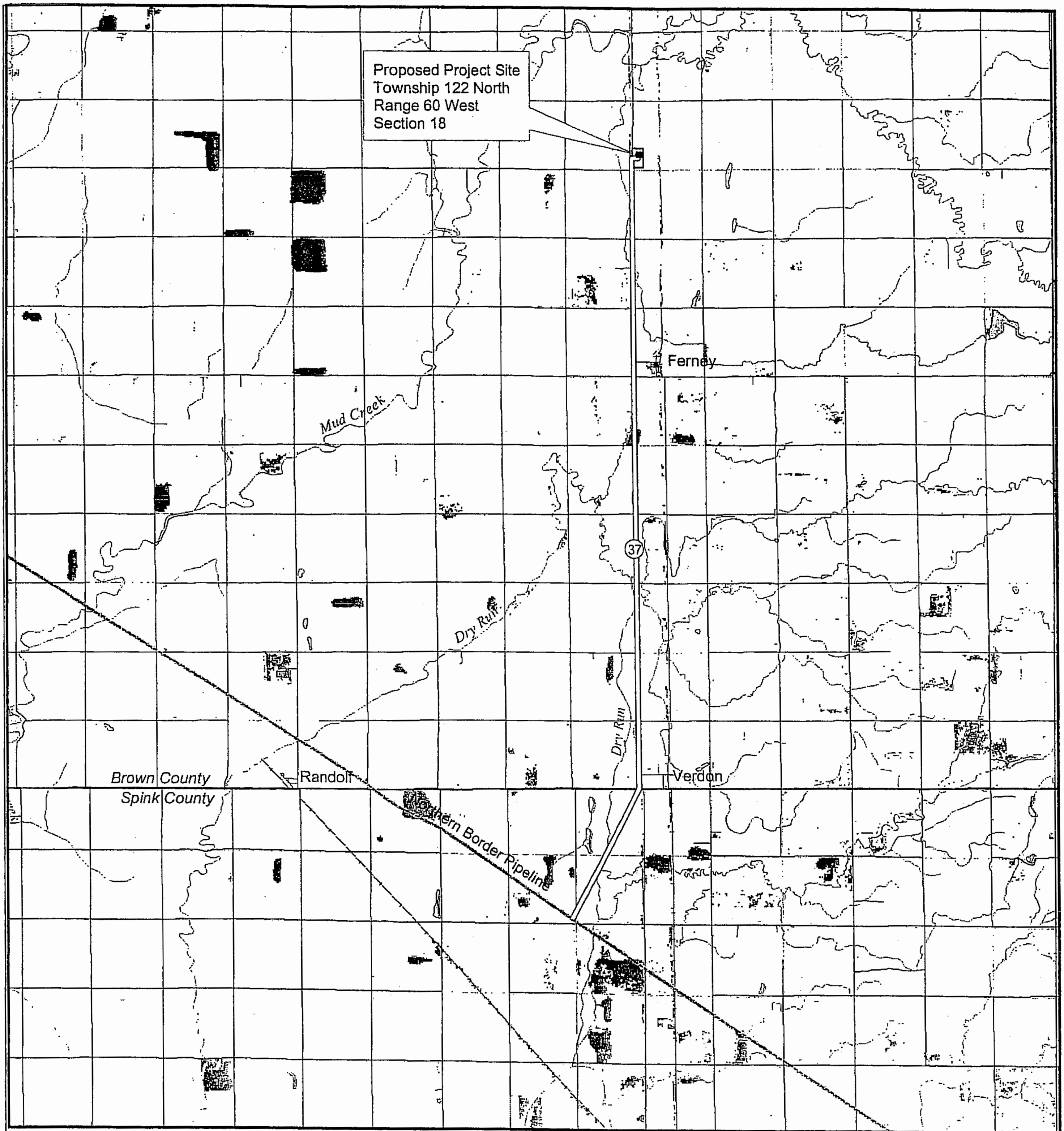
The Groton gas turbine facility would encompass less than 15 acres of land. This acreage includes the entire combustion turbine facility with on-site natural gas supply and the associated equipment. A 200 foot corridor (100 feet on either side of the centerline) is associated with the proposed 11.5 mile long pipeline connecting the Groton site to the existing NBPL. The pipeline would be constructed in previously disturbed, existing utility and road right-of-way.

4.1.1 General Land Use

The proposed Groton gas turbine facility and pipeline would occupy a landscape with a mixture of land uses including; row crops, some hay or pasture land, and a small amount of commercial/industrial/transportation land. The proposed gas turbine facility would occupy 100 percent private land that is zoned agricultural and is regulated by Brown County land use plans and ordinances. The proposed Groton gas turbine facility would not impact any transportation corridors, and would be located west of State Highway 37. The proposed gas pipeline would be constructed in the State Highway 37 right-of-way.

4.1.2 Agriculture

Farming is the principal enterprise in Brown and Spink Counties, South Dakota near the proposed Groton gas turbine facility and pipeline. Approximately 40% of farm income is derived from the sale of livestock and livestock products, with the remaining 60% derived mainly from the sale of corn, soybeans, and small grain (USDA 2003b). Some of the crops are used as feed for livestock. About 87% of the acreage is used



Legend

- Proposed Project Area
- Proposed Project Site
- Proposed Gas Pipeline
- Road
- Stream
- Railroad
- Section Line
- Water
- Wetlands
- Commercial/Industrial/Transportation
- Shrubland
- Grasslands/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Fallow
- Urban/Recreational Grasses

FIGURE 4-1
LAND USE
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Miles
0 0.5 1 2 3

for cultivated crops (such as corn, soybeans, wheat, oats, and barley) and approximately 13% is used for tame pasture or hay. In 2001, farmers made more money selling crops than sales of livestock, livestock products, and poultry (USDA 2003b).

Table 4-2 provides agricultural statistics for Brown and Spink Counties. This table shows that the number of farms decreased in Brown County between 1987 and 1997. During the same years, the number of acres of farmland, as well as the average size per farm in Brown County increased (USDA 2003a, b). In Spink County, the number of farms, as well as the number of acres of farmland decreased between 1987 and 1997, while farm size increased (USDA 2003a, b). However, no prime farmland exists in the study area (USDA 1994).

TABLE 4-2

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
1987, 1992, AND 1997 AGRICULTURAL STATISTICS

Brown County Statistic [a,b]	1987	1992	1997
Number of Farms	1183	1089	1006
Land in Farms (acres)	992,938	1,026,353	1,069,597
Average Farm Size (acres)	839	942	1,063
Spink County Statistic [a,b]	**1987**	**1992**	**1997**
Number of Farms	813	743	647
Land in Farms (acres)	905,592	890,711	849,345
Average Farm Size (acres)	1,114	1,199	1,313

Source:

[a] USDA 2003a
[b] USDA 2003b

4.1.3 Formally Classified Lands

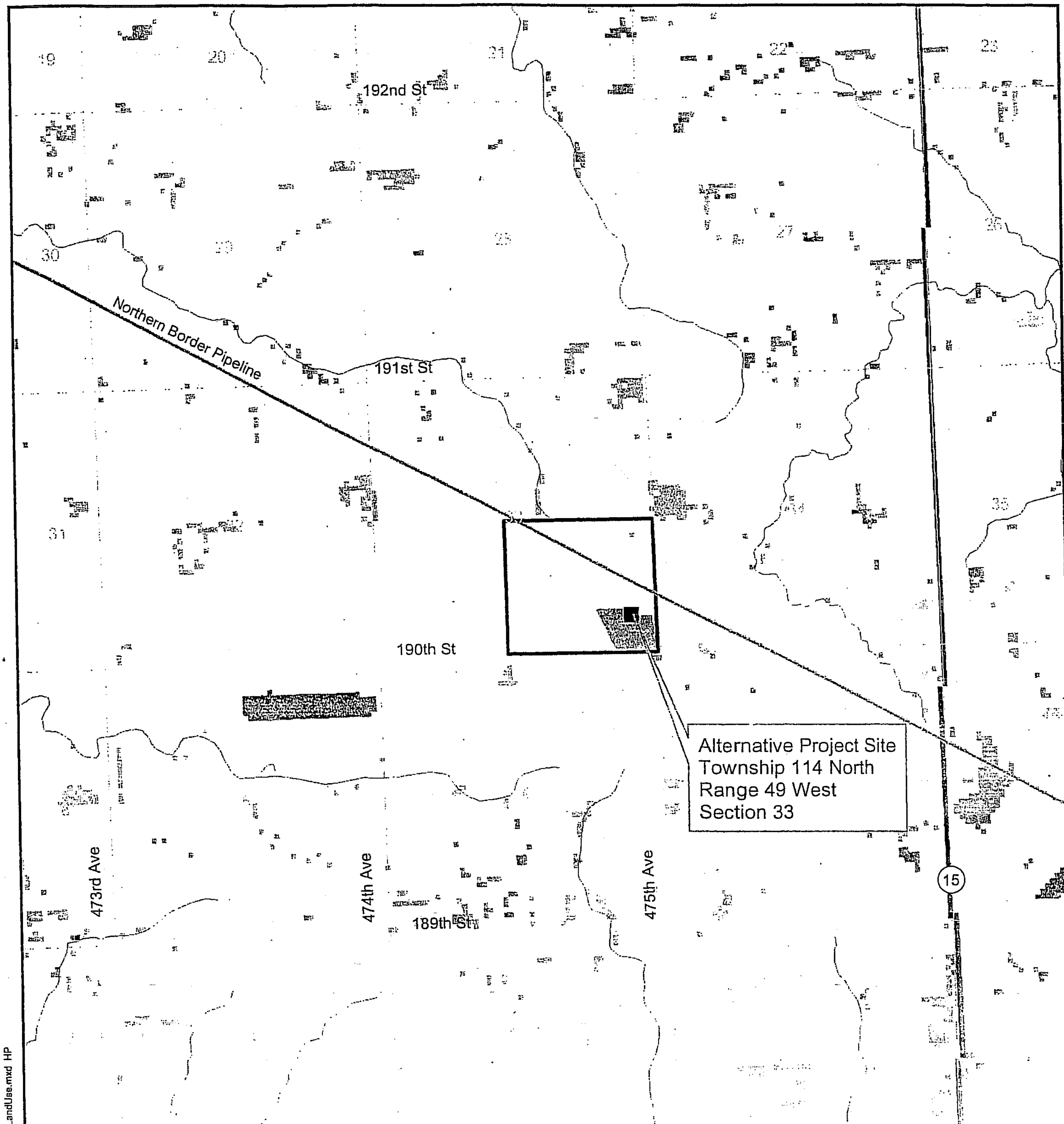
The project area of the proposed combustion turbine facility does not contain any land that is formally classified, or administered by federal or state governments. Because the gas pipeline will be constructed in a existing right-of-way, it will be subject to classifications administered by the state. Prime farmland exists in Brown and Spink Counties. However, no prime farmland exists in the project area (USDA 1994).

4.1.4 Watertown SE Alternative

The Watertown SE Alternative gas turbine facility would occupy a landscape with hay or pasture land and row crops. The Watertown SE Alternative would occupy 100% private land that is zoned agricultural and is regulated by local land use plans and ordinances. The Alternative Watertown SE gas would be located in the Southeast ¼ of Section 33, Township 114 North, Range 69 West (Figure 4-1A).

Farming is the principal enterprise in Deuel County, South Dakota near the Watertown SE Alternative gas turbine facility. Approximately 67% of farm income is derived from the sale of livestock and livestock products, with the remaining 33% derived mainly from the sale of corn, soybeans, and small grain. Some of the crops are used as feed for livestock. About 65% of the acreage is used for cultivated crops (such as corn, soybeans, wheat, oats, and barley) and 10% is used for tame pasture or hay (USDA 1997). In 1997, farmers made more money selling livestock, livestock products, and poultry than sales of crops (USDA 2003b).

The number of farms also decreased in Deuel County between 1987 and 1997. During the same years, the number of acres of farmland in Deuel County decreased, however, the average size per farm increased (USDA 2003b,c). The project area of the Watertown SE Alternative does not contain any land that is formally classified, or administered by federal or state governments. The Watertown SE Alternative would be located in areas considered prime farmland (USDA 1997).



Legend

- Alternative Project Area
- Alternative Project Site
- Road
- Stream
- Railroad
- Section Line
- Commercial/Industrial/Transportation
- Deciduous Forest
- Pasture/Hay
- Row Crops
- Small Grains
- Emergent Herbaceous Wetlands

FIGURE 4-1A
LAND USE
WATERTOWN SE ALTERNATIVE SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Miles
0 0.25 0.5 1

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4.2 FLOODPLAINS

Floodplains are flat tracts of land bordering a river, mainly in its lower reaches, consisting of alluvium deposited by the river.

4.2.1 Proposed Project

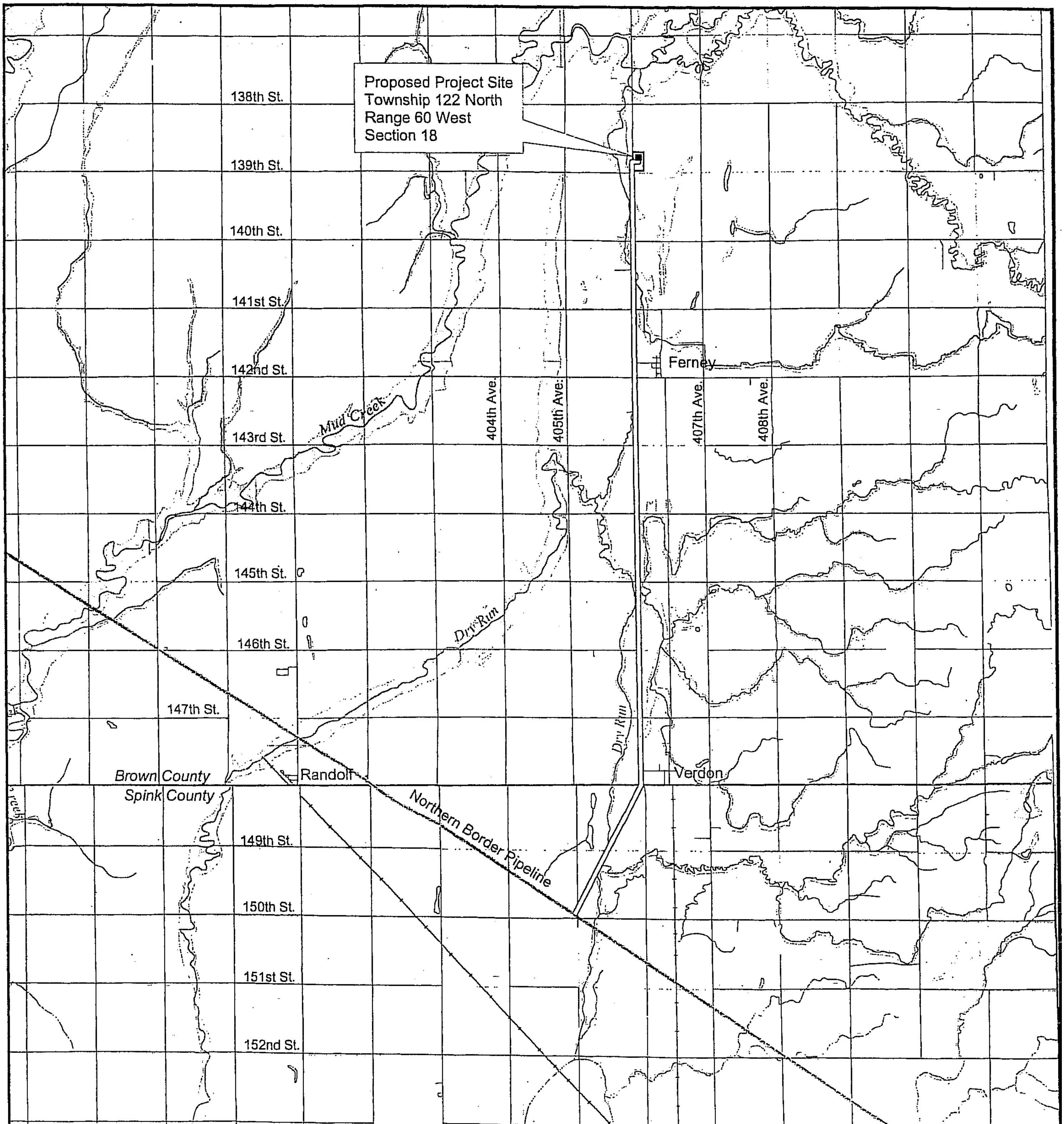
The James River flows generally north and south, and is located approximately 10 miles west of the site at the closest point. Mud Creek, a tributary of the James River, is located 1 mile north of the proposed site. The area surrounding the site is well-drained although there is little topographic relief throughout the site.

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the proposed project, the proposed Groton gas turbine site will not cross into, or be located within, a 100-year floodplain (FEMA 1998). However, the site is within a 500-year floodplain, associated with a tributary off of Mud Creek. The proposed gas pipeline will cross the 100-year floodplain associated with the same tributary of Mud Creek, as well as tributaries associated with Dry Run, as shown in Figure 4-2.

Flood damage prevention ordinances for Brown County require a description of any potential alteration in flood watercourses and, if an alteration in a watercourse is anticipated, certification that the flood-carrying capacity of the watercourse will not be diminished.

4.2.2 Watertown SE Alternative

According to FEMA FIRMs, the Watertown SE Alternative would not be located within, a 100- or 500-year floodplain. Hidenwood Creek (located 5.5 miles northwest of the site) and Bullhead Run (located 1 mile southwest of the site) are the nearest named streams. Both streams are tributaries of the Big Sioux River. The site elevation is approximately 2000 feet ASL, while the nearest streams are at least 20 feet lower in elevation, which supports the assertion that flooding of the site is unlikely. Flood damage prevention ordinances for Deuel County require a description of any potential alteration in flood watercourses and, if an alteration in a water course is anticipated, certification that the flood-carrying capacity of the watercourse will not be diminished.



Legend

- Proposed Project Area
- Proposed Project Site
- Gas Pipeline
- Road
- Stream
- Railroad
- Section Line
- 100-yr Floodplain

FIGURE 4-2
FLOODPLAINS
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

0 0.5 1 2 3 Miles

9/9/04 O:\Basin_Electric\Projects\SDPeaking_GrotonLine_flood.mxd HP

4.3 WETLANDS

Section 404 of the Clean Water Act (CWA; 33 United States Code [U.S.C] 1344) provides a statutory definition of wetlands and assigns jurisdiction over protection of wetlands to the U.S. Army Corps of Engineers (USACE). Section 404 of the CWA defines jurisdictional wetlands as "…those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (WTI 1995).

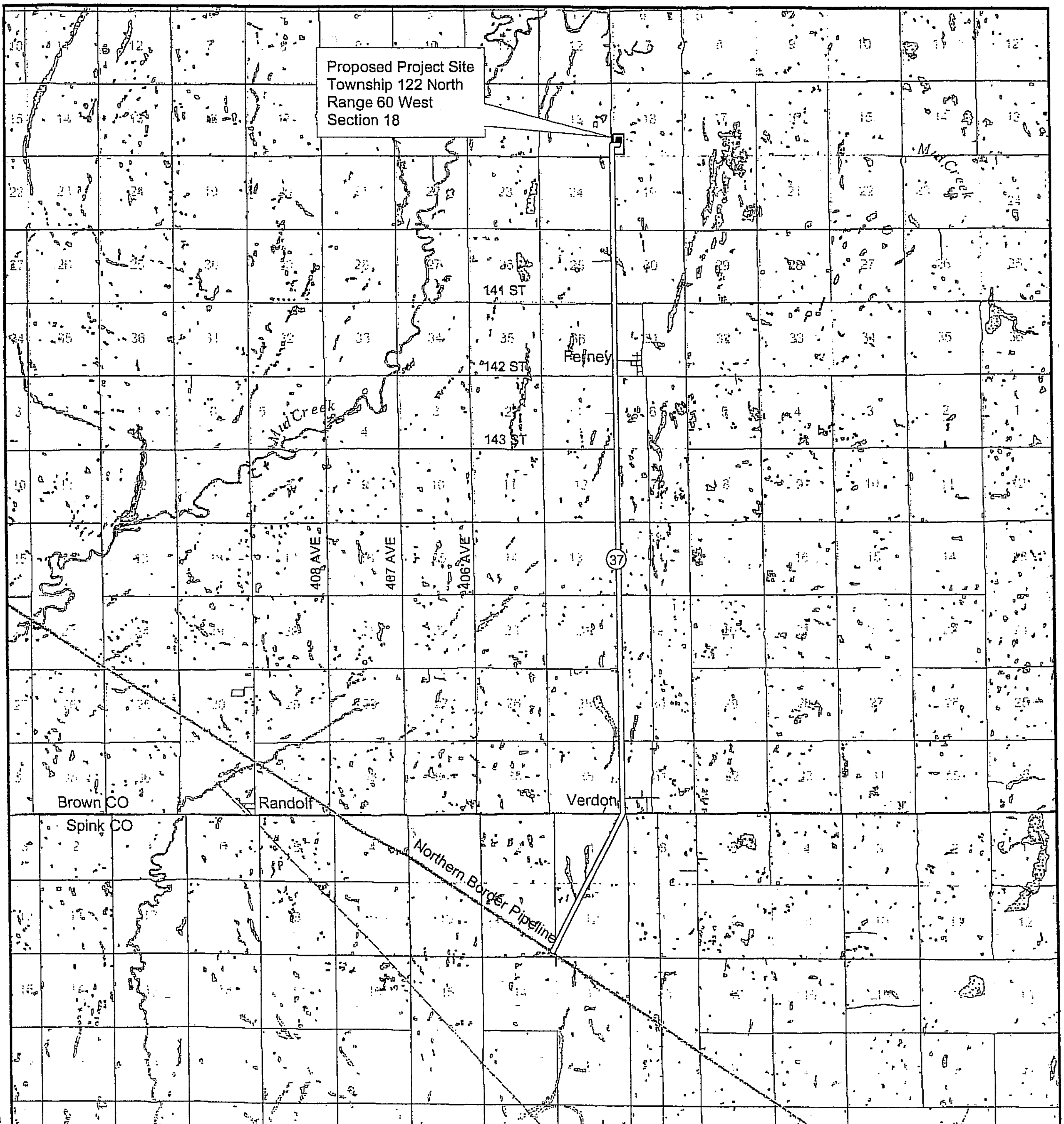
Wetlands are important regional ecological resources within the project area, providing the following critical functions, among others:

- Filtration of sediments and pollutants that run off from surface water
- Retention of flood water
- Erosion control
- Resting, foraging, and nesting habitat for waterfowl and mammals
- Spawning areas for fish
- Amphibian habitat
- Habitat for hydrophytic vegetation

An area is considered a jurisdictional wetland only if it is hydraulically connected to waters of the U.S. and exhibits the following three characteristics: evidence of hydric soils; dominance of hydrophytic vegetation; and wetland hydrology. Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR 230.3 and 33 CFR 328.3).

Figure 4-3 identifies wetlands located in and around the proposed project area. The wetlands in the proposed project area are palustrine wetlands and not jurisdictional wetlands (USFWS 2003c)

The study area for wetlands resources is defined as the 160 acre site (quarter section) that is proposed for the Groton gas turbine site. In addition, a 200 foot corridor (100 feet on either side of the centerline) was evaluated for a proposed 11.5 mile long pipeline connecting the Groton site to an existing natural gas pipeline.



Legend

Proposed Project Area

Proposed Project Site

Proposed Gas Pipeline

Section Line

Palustrine Wetland

Road

Railroad

*Source: National Wetlands Inventory

FIGURE 4-3
WETLANDS
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

0 0.5 1 2 3 Miles

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4.3.1 Proposed Project Wetlands Occurrence

Wetlands in the regional area are predominantly associated with glaciated prairie potholes, man-made impoundments, and, to a lesser extent, river or creek systems. Wetlands often occur in transition zones between open water and upland systems that are inundated or saturated for prolonged periods during the growing season, considered April through September for South Dakota. Hydrology in wetlands in the study area is generally governed by precipitation, stream flooding, fluctuations in the water table, surface saturation, and seepage associated with distribution of irrigation water.

The majority of wetlands in the region are emergent and are associated with irrigation diversions, stock ponds, and road right-of-way borrow pits. Most of the emergent wetlands in the area are of the palustrine class, are seasonally or temporarily flooded, and are formed by dikes or impoundments. These wetlands are a resource to wildlife, but are not afforded protection under Section 404 of the CWA. These wetlands are predominantly mixed emergent marsh and cattail marsh. The mixed emergent marsh wetlands support a mixture of rushes (*Juncus* spp.), reed canary grass (*Phalaris arundinacea*), inland saltgrass (*Distichlis spicata* var. *stricta*), bluejoint reedgrass (*Calamagrostis canadensis*), barnyardgrass (*Echinochloa crusgalli*), reed canarygrass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), brome (*Bromus* spp.), and American sloughgrass (*Beckmannia syzigachne*). Species in the herbal layer of these emergent marshes include smartweed (*Polygonium coccineum*). Emergent wetlands in the cattail marsh category are dominated by cattails (*Typha latifolia*) and often include sedges (*Carex* spp.). Cattail marshes generally develop a peaty mat over time that allows roots to grow without contacting the bottom of the mat.

4.3.2 Study Area Wetlands Resources

Wetland Inventory (NWI) maps were obtained for the Groton, South Dakota site. Small isolated inland herbaceous wetland areas are shown in the area near the proposed project site. Wetlands identified on NWI maps are typically located based on aerial photography without field checking; potential wetlands identified on the NWI maps were not found to be jurisdictional wetlands based on a field reconnaissance conducted by wetland scientists between October 27, 2003 and October 29, 2003 (Tetra Tech 2003c).

The Groton site has small isolated inland herbaceous wetland areas indicated on the NWI maps. Because the area near the Gorton site is currently under cultivation, most of these wetland areas no longer support hydrophytic vegetation. A small, 2 to 3 acre, entirely bermed pond has been constructed between two existing electric substations located on this site. This pond was dry during the field reconnaissance . The Groton site also has a proposed 11.5-mile pipeline route associated with the gas turbine. The pipeline route will intersect several small non-jurisdictional wetland areas associated with prairie potholes and ephemeral streams and drainages. Wetland fringe areas and unconsolidated bottoms or shores are associated with the small stream tributaries. No jurisdictional wetlands exist in the corridor surrounding proposed underground pipeline.

4.3.3 Watertown SE Alternative

No wetland areas were identified on NWI maps in the proximity of the Watertown SE Alternative. In addition, field reconnaissance did not identify any wetlands.

4.4 CULTURAL RESOURCES

This section presents the results of the cultural resources records search and field inspection of the East Side Peaking Project. ACR Consultants, Inc. (ACR) conducted the Class I cultural resources surveys during October 2003 and September 2004. A draft cultural resources report is included in Appendix B. A final report documenting the results of the 2004 survey is currently being prepared and will be provided to the South Dakota State Historic Preservation Officer (SHPO) at a later date.

4.4.1 Proposed Project

ACR requested and received a file search on October 16, 2003 for Section 18, Township 122 North, Range 60 West, from the South Dakota State Historical Society's Archaeological Research Center, Rapid City, South Dakota for previously conducted projects and previously recorded sites in the project area. An additional file search was requested and received on October 23, 2003 for the entire length of the proposed underground gas pipeline corridor.

The 2003 fieldwork consisted of a Class I block survey of the southwest quarter of Section 18, Township 122 North, Range 60 West and a Class I linear survey of 11.5 miles of the east side of the State Highway

37 right-of-way from Section 19, Township 122 North, Range 60 West to Section 18, Township 120 North, R60West in Brown and Spink Counties, South Dakota. The 2004 fieldwork consisted of a Class I linear survey of 11.5 miles of the west side of the State Highway 37 right-of-way from Section 13, Township 122 North, Range 61West to Section 12, Township 120 North, Range 61Wes,t plus 1.9 miles across Sections 1 and 12, T120 North, Range 61 West to the NBPL in Section 11, Township 120 North, Range 61West in Brown and Spink Counties, South Dakota. The right-of-way surveys used a 100-foot corridor. The 1.9 mile survey used a 300-foot corridor (150 feet each side of an existing pipeline.)

No previous cultural resource surveys have been conducted within the project area. However, three surveys have been conducted within a one-mile radius of the project area.

- South Dakota State University (SDSU) completed a survey for the Northern Border Pipeline Project in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel, and Brookings Counties in 1982.
- Dakota Research Services completed a survey of portions of a rural water distribution system in Brown, Edmunds, and Spink Counties in 1987.
- The Archaeology Laboratory, Augustana College completed a survey of three proposed pipeline projects in eastern South Dakota in 1990.

The file search listed one site within the block survey project area and approximately 0.3 miles east of the linear project area. Site **39BN2003/39SP2003 E** is the abandoned Chicago & North Western Railroad grade. The railroad grade passes north-south from Section 18, Township 122 North, Range 60 West to Sections 18, Township 120 North, Range 60 West. The SHPO has determined that all railroads are eligible for the National Register of Historic Places (NRHP).

Background research was conducted at the Brown County Courthouse, Aberdeen, South Dakota on October 28, 2003 for information on the two newly identified sites. Additional research was conducted at the Aberdeen Library in Aberdeen, on October 29, 2003. Plat maps for multiple years were consulted and information on construction dates of the farm buildings was requested.

Based on the file search information for this project and professional experience, ACR anticipated finding few cultural resource sites within the current project area.

4.4.2 Watertown SE Alternative

The 160-acre block survey was in a recently harvested soybean field with chaff remaining. Several modern impacts are present in the project area. An existing overhead transmission line crosses the alternative project area from northwest to southeast The NBPL crosses the project area from northwest to southeast.

ACR requested and received a file search on October 16, 2003 for Sections 33 and 34, T114N, R49W from the South Dakota State Historical Society's Archaeological Research Center (SARC), Rapid City, South Dakota for previously conducted projects and previously recorded sites within the project area.

Two previous cultural resource surveys have been conducted within the project area.

- SDSU completed a survey for the Northern Border Pipeline Project in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel, and Brookings Counties in 1982.
- The University of South Dakota completed a survey for a proposed transmission line from Watertown, South Dakota to Moville, Iowa in 1973.

The file search indicated there are no sites located within the project area. However, there is one site within a one-mile radius of the project area.

- **Site 39DE0035** is a prehistoric artifact scatter located in the northeast quarter of Section 32, Township 114 North, Range 49 West. The site was identified by SCSU and recorded in 1980. The site consists of a wide surface scatter of lithic flakes and a broken biface in a cultivated field. It is over 0.5 miles northwest of the current project area.

Only two surveys have been completed within the project area and adjacent surroundings. Two prehistoric sites and no historic sites have been identified. The study area is in a plowed field. Based on the file search information, field reconnaissance, and professional experience, few cultural resource sites were expected to be encountered in the project area.

During the survey, ACR personnel walked parallel transects, spaced no more than 10 meters apart, across the project area. The transects were oriented east-west (Appendix B).

4.5 THREATENED AND ENDANGERED SPECIES

This section presents a general description of threatened and endangered (T&E) species that could potentially be found at the proposed project site or the alternative site.

Information from the U.S. Fish and Wildlife Service (USFWS) (USFWS 2003a,b), the South Dakota Department of Game, Fish, and Parks (SDDGFP) (SDDGFP 2003a,b), and SDSU (SDSU 2003) was evaluated to identify potential habitat for federally and state listed T&E, candidate, and species of special concern within the proposed project areas. In addition, database records from the South Dakota Natural Heritage Database (SDNHD) (SDNHD 2003) were reviewed and field investigations were conducted to identify the physical habitat characteristics and biological community of the proposed project areas.

While several federally and state listed species of concern are known to occur in the project area, agency resources and the field reconnaissance indicate that little habitat is available for T&E species within the proposed project area. However, limited surveys have been conducted to verify their presence. Appendix C presents a list of all rare, threatened, endangered, and candidate species for Brown and Spink counties.

4.5.1 Federal Threatened and Endangered Species by County

USFWS has identified five federally listed T&E wildlife and plant species that could inhabit at least one of the two counties (USFWS 2003a). These species include: the bald eagle (*Haliaeetus leucocephalus*, threatened), Topeka shiner (*Notropis topeka*, endangered), Western prairie fringed orchid (*Platanthera praeclara*, threatened), whooping crane (*Grus americana*, endangered), and the Eskimo curlew (*Numenius borealis,* endangered). One additional species, the Dakota skipper (*Hesperia dacotae*), has been identified as a candidate for eventual listing and is known to occur in Brown County (USFWS 2003b).

The six federally listed species that could occur in the project areas include: one plant, one insect, three birds, and one fish. Records of rare and T&E species tracked through the SDNHD (2003) were reviewed for Brown and Spink counties to further refine the potential for occurrence of federally protected species in the project area. Only three – bald eagle, Topeka shiner, Dakota skipper – of the six identified above have been documented within a 10-mile radius of the proposed project site. None of the three have been documented to occur at the proposed project locations or within a five-mile radius of these locations. More detail on these three species is provided below:

- Bald Eagle – Bald eagles have historically wintered throughout North and South Dakota (Grondahl and Martin 2003). The decline in bald eagle numbers is primarily due to loss of habitat, shooting, trapping, and the use of pesticides such as DDT. The bald eagle has been identified as a threatened (federal) or endangered (state) species in both counties of concern (USFWS 2003a). The SDNHD (2003) documents eight occurrences within Brown and Spink counties. Nearby records are a 1998 occurrence of the species approximately 10 miles west of the proposed Groton generation station project location and a 2002 occurrence approximately eight miles west and six miles north of the proposed project area.

- Topeka Shiner – The Topeka shiner is a stout-bodied minnow that occurs primarily in small prairie streams or pools containing clean gravel, rock or sand bottoms. In South Dakota, the Topeka shiner is found in scattered tributaries of the James, Vermillion, and Big Sioux Rivers (Shearer 2003). While considered federally endangered, recent studies in South Dakota have documented the Topeka shiner in 80% of historically known streams, along with many streams where the species was not previously reported (Shearer 2003). The species was recently documented in Elm Creek in Brown County (Shearer 2003). No occurrence is within a five-mile radius of the proposed project areas.

- Dakota Skipper – The Dakota skipper is a small butterfly that feeds on the nectar of a variety of flowers associated with native tallgrass prairie habitat as typified by the rolling hills and prairies in South Dakota. Conversion of tallgrass prairie to agricultural use has eliminated most of the habitat of the Dakota skipper (NPWRC 2003). In particular, the Dakota skipper is known to occur in native prairies of Brown County (USFWS 2003b). The SDNHD (2003) documents one occurrence in Brown County. The only record in Brown County is a 1969 occurrence approximately 39 miles north and six miles east of the Groton generation station project location.

Additional detail for the other three species having potential occurrence is provided below:

- Western Prairie Fringed Orchid – The Western prairie fringed orchid was historically found throughout the tallgrass regions of North America. The major cause of the species decline has been the conversion of prairie habitat to cropland. While potential habitat for the species may exist in Brown County, there are no known populations of this species in South Dakota (SDNHD 2003; USFWS 2003a).

- Whooping Crane – The whooping crane population currently totals 260 and exists in three wild populations and four captive locations. The migration route of the whooping crane passes through western North Dakota and South Dakota in the Missouri River basin (Grondahl and Martin 2003). The whooping crane is known to occur as an occasional migrant through Spink County, however, there are no definable occurrences for conservation purposes (SDDGFP 2003b; USFWS 2003a).

- Eskimo curlew – The Eskimo curlew was formerly abundant but is now thought to be nearly extinct or perhaps extinct with no reliable North American sightings since 1987 (NatureServe 2003a). The USFWS (2003a) considers the species to be an extremely rare migrant through Spink County.

4.5.2 Additional Threatened and Endangered Species

In addition to the federally listed species, inventories or listings provided by other organizations or agencies were evaluated to ensure that no additional species of concern were identified for the two counties surrounding the proposed project location. As noted, the SDDGFP through their Natural Heritage Program provided a database of all known occurrences of federal and state listed T&E species, candidates, and species of special concern in Brown and Spink counties (SDNHD 2003). State listed rare and T&E species identified by the SDDGFP are also included in Appendix C. There were no records of any rare, threatened, or endangered species within the proposed project boundaries however; there were four records within a 10-mile radius of the proposed project locations. These four records include three birds and one freshwater mussel. Additional detail on each of these species is provided below:

- Great blue heron (*Ardea herodias*) – The great blue heron is a large, gray-blue wading bird that hunts fish and other animals in shallow, quiet water (Sibley 2000). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1992 occurrence of the species approximately 10 miles west of the proposed Groton gas turbine location.

- Great egret (*Casmerodius albus*) – The great egret is a tall, slender, white bird that feeds primarily on fish captured in open water (Sibley 2000). It is found in permanently flooded lakes surrounded by cottonwoods, sugar maples, and green ash (SDSU 2003). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1992 occurrence of the species approximately 10 miles west of the proposed Groton gas turbine location.

- Yellow-crowned night heron (*Nyctanassa violacea*) – The yellow-crowned night heron is a stocky, nocturnal bird which forages in shallow ponds and marshes (Sibley 2000). The species is considered globally secure but of uncertain status in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1992 occurrence of the species approximately 10 miles west of the proposed Groton generation station project location.

- Yellow sandshell (*Lampsilis teres*) – The yellow sandshell is a freshwater mussel that occurs primarily in medium-sized sand or mud/sand bottomed streams and rivers. Globally, it is considered to be one of the most wide ranging, common, and successful *Lampsilis* species in the Mississippi River drainage (NatureServe 2003b). Although not listed as state T&E, the species is considered to be critically imperiled in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1985 occurrence of the species approximately 9 miles west and one mile north of the proposed Groton gas turbine location.

4.5.3 Site Surveys

Field surveys were completed at the proposed gas turbine site and the Groton pipeline corridor between October 27, 2003 and October 29, 2003. The proposed gas turbine study area was delineated as the Southeast 1/4 of Section 18, Township 122 North, Range 60 West, Brown County. The proposed Groton pipeline study corridor was delineated as the 11.5 mile length of the proposed pipeline along the west right-of-way of South Dakota State Highway 37. The pipeline survey began at the proposed gas turbine location and continued south through Section 18, Township 120 North, Range 60 West, Spink County. Wildlife surveys included a walk-through of the site with visual observation of individual species or evidence of their existence such as tracks, stems, or habitat characteristics. The time of year and weather conditions during the surveys inhibited direct visual observations of most individual wildlife species. However, evidence of animal use (burrows, tracks, scat) and the current physical habitat conditions at each project location were noted for consideration of potential T&E presence. Based upon information provided through the SDNHD and the current habitat conditions, it is unlikely that additional surveys would be successful in verifying any listed species within the proposed project areas (Tetra Tech 2003b). Appendix C presents a list of rare, threatened, endangered, and candidate species within each study area.

4.5.4 Watertown SE Alternative

While several federally and state listed species of concern are known to occur in the Deuel County, agency resources and the field reconnaissance indicate that little habitat is available for these species within the Watertown SE project area. However, limited surveys have been conducted to verify their presence. Appendix C presents a list of all rare, threatened, endangered, and candidate species for Deuel County.

USFWS has identified three federally listed T&E wildlife and plant species that could inhabit at Deuel County (USFWS 2003a). These species include: the bald eagle (*Haliaeetus leucocephalus*, threatened), Topeka shiner (*Notropis topeka*, endangered), and Western prairie fringed orchid (*Platanthera praeclara*, threatened). One additional species, the Dakota skipper (*Hesperia dacotae*), has been identified as a candidate for eventual listing and is known to occur in Deuel County (USFWS 2003b).

The four federally listed species that could occur in the Watertown SE Alternative project area include: one plant, one insect, one bird, and one fish. Records of rare and T&E species tracked through the SDNHD (2003) were reviewed for Deuel County to further refine the potential for occurrence of federally protected species in the project area. Only two, the Topeka shiner and Dakota skipper, of the four identified above have been documented within a 10-mile radius of the proposed project site. Neither of the two federally protected species has been documented to occur at the Watertown SE Alternative location or within a five-mile radius of this location. More detail on these three species is provided below:

- Bald Eagle – Bald eagles have historically wintered throughout North and South Dakota (Grondahl and Martin 2003). The decline in bald eagle numbers is primarily due to loss of habitat, shooting, trapping, and the use of pesticides such as DDT. The bald eagle has been identified as a threatened (federal) or endangered (state) species in the county of concern (USFWS 2003a). The SDNHD (2003) review did not document any bald eagle occurrences in Deuel County.

- Topeka Shiner – The Topeka shiner is a stout-bodied minnow that occurs primarily in small prairie streams or pools containing clean gravel, rock or sand bottoms. In South Dakota, the Topeka shiner is found in scattered tributaries of the James, Vermillion, and Big Sioux Rivers (Shearer 2003). While considered federally endangered, recent studies in South Dakota have documented the Topeka shiner in 80% of historically known streams, along with many streams where the species was not previously reported (Shearer 2003). The species was recently documented in Peg Munky Run and Hidewood Creek in Deuel County (Shearer 2003). No occurrence is within a five-mile radius of the proposed project area.

- Dakota Skipper – The Dakota skipper is a small butterfly that feeds on the nectar of a variety of flowers associated with native tallgrass prairie habitat as typified by the rolling hills and prairies in South Dakota. Conversion of tallgrass prairie to agricultural use has eliminated most of the habitat of the Dakota skipper (NPWRC 2003). In particular, the Dakota skipper is known to occur in native prairies of Deuel County (USFWS 2003b). The SDNHD (2003) documents five occurrences in Deuel County. The most recent Deuel County record is a 1996 occurrence of the species approximately 11 miles north and six miles east of the proposed project location.

Additional detail for the other species having potential occurrence is provided below:

- Western Prairie Fringed Orchid – The Western prairie fringed orchid was historically found throughout the tallgrass regions of North America. The major cause of the species decline has been the conversion of prairie habitat to cropland. While potential habitat for the species may exist in Deuel County, there are no known populations of this species in South Dakota (SDNHD 2003; USFWS 2003a).

In addition to the federally listed species, inventories or listings provided by other organizations or agencies were evaluated to ensure that no additional species of concern were identified for Deuel County. As noted, the SDDGFP through their Natural Heritage Program, provided a database of all known occurrences of federal and state listed T&E species, candidates, and species of special concern in Deuel County (SDNHD 2003). State listed rare and T&E species identified by the SDDGFP are also included in Appendix C. There were no records of any rare, threatened, or endangered species within the Watertown SE Alternative boundary; however, there were five records within a five-to-ten-mile radius of the Watertown SE Alternative location. These five records include one bird, three plants, and one fish. Additional detail on each of these species is provided below:

- Burrowing owl (*Athene cunicularia*) – The burrowing owl is found on dry, open, treeless shortgrass prairies and overgrazed pastures near mammal burrows (SDSU 2003). Preferred sites are grazed, level pastures with a high density of burrows (SDSU 2003). The species is apparently secure on a global scale but considered somewhat rare or restricted in its South Dakota range (SDDGFP 2003b). The SDNHD (2003) documents a 1994 occurrence of the species approximately 5 miles east and 7 miles north of the Watertown SE Alternative gas turbine project location.

- Hornyhead chub (*Nocomis biguttatus*) – The hornyhead chub is a minnow found in small- to medium-sized streams (SDSU 2003). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1993 occurrence of the species approximately 7 miles east and 5 miles north of the proposed Watertown SE Alternative gas turbine project location.

- Small-fringed gentian (*Gentianopsis procera*) – The small-fringed gentian is a plant species found in native tallgrass prairie and wet meadow areas (Tetra Tech 2003a). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1982 occurrence of the species approximately 4 miles east and 2 miles south of the Watertown SE Alternative gas turbine project location.

- Large-leaf pondweed (*Potamogeton amplifolius*) – The large-leaf pondweed is a rooted aquatic plant occurring in wetlands, lakes, or ponds (Larson 1993). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1983 occurrence of the species approximately 4 miles south and 3 miles west of the Watertown SE Alternative gas turbine project location.

- Beckwith clover (*Trifolium beckwithii*) – The Beckwith clover is a plant found in native tallgrass prairie (Tetra Tech 2003a). While globally secure, populations of this species are considered rare or of restricted range in South Dakota (SDDGFP 2003b). The SDNHD (2003) documents a 1984 occurrence of the species approximately 4 miles east and 2 miles south of the Watertown SE Alternative gas turbine project location.

Field surveys were completed at the proposed gas turbine site between October 27, 2003 and October 29, 2003. The Watertown SE Alternative study area was delineated as the Southeast 1/4 of Section 33, Township 114 North, Range 49 West, Deuel County. Wildlife surveys included a walk-through of the site with visual observation of individual species or evidence of their existence such as tracks, stems, or habitat characteristics. The time of year and weather conditions during the surveys inhibited direct visual observations of most individual wildlife species. However, evidence of animal use (burrows, tracks, scat) and the current physical habitat conditions the proposed project location were noted for consideration of potential T&E presence. Based upon information provided through the SDNHD and the current habitat conditions, it is unlikely that additional surveys would be successful in verifying any listed species within the proposed project areas (Tetra Tech 2003b). Appendix C presents a list of rare, threatened, endangered, and candidate species within each study area.

4.6 FISH AND WILDLIFE RESOURCES

This section describes fish and wildlife resources in the general vicinity of the proposed project area. Appendix D presents a list of observed mammals, birds, and other animals for each study area.

4.6.1 Proposed Project

Land use in the proposed project area is row crop agriculture crossed by 69 kV, 115 KV, and 345 kV transmission lines. The area also includes an electric power substation, a constructed pond (dry at the time of field survey), and small, scattered patches of mixed-grass prairie around the substation and tower bases. While there are no streams at the proposed gas turbine site, the pond may provide seasonal aquatic habitat. Wildlife in these habitats consists of species adapted to agricultural and grassland areas.

Seven common bird species were observed in the proposed project area – ring-necked pheasant, dark-eyed junco, song sparrow, American tree sparrow (*Spizella arborea*), mourning dove (*Zenaida macroura*), Brewer's blackbird (*Euphagus cyanocephalus*), and snow goose (*Chen caerulescens*). The last three species were not present on the site but observed migrating through the general area. No nests were observed, although it is likely that several bird species use the undisturbed grassland as nesting sites. Two mammal species, white-tailed deer and Eastern cottontail rabbit (*Sylvilagus floridanus*), were observed directly while two others were identified indirectly, American badger and common raccoon

(*Procyon lotor*). A variety of mammal burrows indicate the presence of an unidentified species of ground squirrel and pocket gopher. Due to the weather conditions, no reptile, amphibian, or insect species were observed.

Land use along the majority of the proposed pipeline corridor is maintained brome grass road right-of-way. Adjacent areas include cropland, rangeland, and mixed-grass prairie, intermittent stream drainages, and sporadic stands of trees providing additional habitat. Wildlife in these habitats consists of species adapted to agricultural, grassland, and riparian areas.

Four common bird species were observed along and adjacent the proposed underground gas pipeline corridor – ring-necked pheasant, Western meadowlark (*Sturnella neglecta*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and red-tailed hawk (*Buteo jamaicensis*). One large nest was observed outside the pipeline corridor within a small woodlot adjacent the road right-of-way (Southwest 1/4 Section 18, Township 121North , Range 60West). Based upon the nest size, it is likely not the nest of a T&E species, but that of an unidentified raptor species. Several smaller nests were observed in shrubs located within the boundaries of a cemetery but outside the pipeline corridor (Southwest 1/4 Section 30, Township 121 North –Ranger 60 West, Brown Co.). It is likely that several bird species also use the adjacent grassland and tree habitats in the area as nesting sites. No wild mammal species were observed, however a variety of mammal burrows indicate the presence of various rodent species within the pipeline corridor. Although stream drainages are present, they were dry and unsuitable for T&E fish species known to inhabit Brown County. There were no reptile, amphibian, or insect species observed in the study area (Tetra Tech 2003b).

4.6.2 Watertown SE Alternative

Land use in the Watertown SE area is row crop agriculture crossed by 345 KV transmission lines. Unmaintained fence rows, road right-of-way, and 345 kV transmission line tower bases provide fragmented grassland habitat. There are no wetlands, ponds, or streams providing aquatic habitat. Wildlife in these habitats consists of species adapted to agricultural and disturbed grassland areas.

Four common bird species were observed within or adjacent the proposed project area – ring-necked pheasant (*Phasianus colchicus*), horned lark (*Eremophila alpestris*), dark-eyed junco (*Junco hyemalis*), and song sparrow (*Melospiza melodia*). It is likely that other bird species use nearby mixed-grass prairie and tree habitats in the area as nesting sites. While a variety of mammal burrows and other signs were observed in the road right-of-way and fence rows, only one direct mammal observation was made –

prairie vole (*Microtus ochrogaster*). Three other mammal species were identified indirectly – American badger (*Taxidea taxus*), coyote (*Canis latrans*), and white-tailed deer (*Odocoileus virginianus*). The mammal burrows indicate the presence of an unidentified species of ground squirrel along with other small rodent species. No reptile, amphibian, or insect species were observed (Tetra Tech 2003b).

4.7 VEGETATION

This section describes vegetation and vegetation likely to be present within the study area. The principal natural vegetation communities in the regions of South Dakota that were surveyed represent mixed-grass prairie habitat. Forbs and shrubs occur as small, patchy communities with trees occurring sporadically throughout the prairie community in small hardwood stands along drainages, around homesteads, and in windrows in agricultural areas. Other communities include flora adapted to riparian and emergent wetlands and floodplains in the Midwest. Section 4.3 discusses specific wetland areas. Appendix E presents a list of plant species occurrence in the study area.

4.7.1 Proposed Project

Approximately 75% of the land in the study area and pipeline corridor is cropland, primarily corn, soybeans, small grains, and alfalfa. The remaining land is comprised of existing electrical substations, road side borrow ditches, mixed-grass prairie, and occasional isolated windrows and other sparse stands of trees (Tetra Tech 2003c).

4.7.2 Watertown SE Alternative

Approximately 90% of the land in the Watertown SE Alternative study area is cropland, primarily corn and soybean. The remaining land is comprised of road side borrow ditches, old farmstead windbreaks, and uncultivated islands under the existing 345 kV transmission line towers (Tetra Tech 2003c).

4.8 GEOLOGY, TOPOGRAPHY, AND SOILS

The following sections describe geology, topography, and soils in the proposed project area.

4.8.1 Geology

This section addresses geological formation and seismic hazards for the proposed gas turbine and pipeline. The geology of the Groton site is a level to nearly level glacial lake plain associated with the James River lowland physiographic unit.

Seismic hazards in the study areas are rated as very low. USGS defines seismic hazard by the level of horizontal shaking that has a 1 in 10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of the acceleration of gravity. For example, a shaking level of 0 to 2% indicates a 10% chance that a shaking force that exceeds 0 to 2% of the force of gravity would be exceeded in a 50-year period. Gravitational forces of 2 to 4% could be felt by some people, but would not likely cause any structural damage (USGS 1996).

4.8.2 Topography

Modifications to the existing cultivated farm field topography would be associated with leveling an area for the generator pad site, establishing drainage of storm water across and around the site, and improving the access from the adjacent county roads.

The Groton site and the 11.5 mile-long pipeline route are located on level to nearly level terrain associated with the broad James River valley (USDA 1994). Slopes range from 0 to 2 percent and cultivation and increased erosion and deposition have caused additional filling of low areas. The general area slopes westward toward the James River that is located approximately 10 miles west of the proposed Groton gas turbine project location.

4.8.3 Soils

Soils at the Groton gas turbine site are described as Aberdeen (silty clay loam), Nahon (silty clay loam), and Exline (silt loam) series. Aberdeen soils consist of deep, moderately well drained soils formed in clayey glaciolacustrine sediments. Nahon soils are similar to Aberdeen but can be somewhat poorly drained. The Exline soils also similar to the Aberdeen and Nahon soils in depth and drainage but have a silt loam surface texture. Aberdeen soils are located on the upper foot slopes; Nahon soils are located on the lower foot slopes and in micro-low areas; and Exline soils are located on the toe slopes.

These silty clay and silt loam soils have moderate organic matter content and their available water capacity is moderately high. The permeability in the upper soil horizons is moderately low (0.2 to 0.6 inches per hour) to low (0.06 to 0.2 inches per hour). These soils are easily eroded by wind and water forces (USDA 1994).

4.8.4 Watertown SE Alternative

The Watertown SE site exhibits nearly flat to very gently sloping terrain that drains to the northwest. The landform is characterized as till plains with only small changes in slopes from 0 to 2 percent. Cultivation and increased erosion and deposition have caused additional filling of lower areas. The general area slopes towards the northwest. (USDA 1997).

Soils at the Watertown SE site consist of Kranzberg (silty clay loam) and McIntosh (calcareous silty clay loam) soil series (USDA 1997). The Kranzberg is a well drained soil on summits and back slopes while the McIntosh is a somewhat poorly drained, calcareous soil on foot slopes. The depth to the water table is greater than 6 feet for the Kranzberg soils and 1.5 to 2.5 for the McIntosh soils. These silty soils have moderate organic matter content and are formed in glacial till. Available water capacity is moderate and permeability in the upper 3 feet is rated as moderately high (0.6 to 2 inches per hour). These soils are easily eroded by wind and water forces (USDA 1997).

4.9 COASTAL AREAS

A discussion of coastal areas is not applicable to this project because the area is located well beyond any coastal areas.

4.10 AIR QUALITY AND CLIMATOLOGY

The climatology and air quality for the study area are described in the following sections.

4.10.1 Proposed Project

Climatology

The semiarid climate of the project region is characterized by cold, dry winters and moderately hot, moister summers. Annually, temperatures in nearby Aberdeen, South Dakota range from –45° to 115°F. The average annual temperature for the study area is 43.5°F. According to the High Plains Regional

Climate Center (HPRCC) the highest mean monthly temperature occurs in July and is 72.7°F, while the lowest occurs in January and is 10.4°F HPRCC, 2004. The study area is subject to these large variations in annual temperature because it is in the center of the North American land mass. Arctic air moves into the region from the north and northwest during the winter causing periods of extreme cold that alternate with milder temperatures. Summer temperatures are usually warm, but some hot spells and occasional cool days can be expected. Table 4-3 lists the average monthly and annual temperatures for the study area.

Table 4-3 also provides the average monthly and annual precipitation for the study area. The table shows that the annual average total precipitation is 19.49 inches, with the highest levels of precipitation occurring from May through July (HPRCC, 2004). The driest months are December, January and February.

TABLE 4-3

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
ABERDEEN SOUTH DAKOTA MEAN MONTHLY TEMPERATURE AND PRECIPITATION

Month	Temperature (°F)	Precipitation (inches)
January	10.4	0.54
February	16.3	0.56
March	28.9	1.14
April	44.8	1.99
May	57.1	2.55
June	66.5	3.53
July	72.7	2.76
August	70.7	2.19
September	59.8	1.67
October	47.4	1.38
November	29.9	0.71
December	16.9	0.46
Annual	43.5	19.5

Data Source: High Plains Regional Climate Center, Aberdeen meteorological monitoring station online at www.hprcc.unl.edu.

Air Quality

Construction of the proposed gas turbine would occur in Brown County, with underground gas pipeline being constructed in Brown and Spink Counties. Both of these counties are classified as attainment areas for all regulated pollutants by the U.S. Environmental Protection Agency (EPA). The title "attainment area" indicates that all National Ambient Air Quality Standards (NAAQS) are being met. Table 4-4 lists the applicable NAAQS that must be maintained throughout construction of the project (Title 40 CFR Part 50).

TABLE 4-4

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	NAAQS ($\mu g/m^3$)
PM_{10}	24-hour[1]	150
	Annual[2]	50
NO_2	Annual[2]	100
SO_2	3-hour[1]	1300
	24-hour[1]	365
	Annual[2]	80
CO	1-hour[1]	40,000
	8-hour[1]	10,000
Ozone	1-hour[3]	235
	8-hour[4]	157
Lead	Quarterly	1.5

Notes:

$\mu g/m^3$ Micrograms per cubic meter
PM_{10} Particulate matter with an aerodynamic diameter of 10 microns or less
NO_2 Oxide of nitrogen
SO_2 Sulfur dioxide
CO Carbon monoxide
1 – This standard is not to be exceeded more than once per year
2 – Arithmetic mean
3 - The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 157 □g/m^3 (0.12 part per million) is <= 1. (b) The 1-hour standard is applicable to all areas notwithstanding the promulgation of 8-hour ozone standards under Sec. 50.10. On June 2, 2003, (68 FR 32802) EPA proposed several options for when the 1-hour standard would no longer apply to an area.
4 - The 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 235 □g/m^3 (0.08 parts per million).

Published concentrations for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), or lead near the study area are not available because there are no nearby monitoring stations for these criteria pollutants. Data for particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) are available from a monitoring station at 111 2nd Avenue SE in Aberdeen, South Dakota for 2000 and 2001 (Table 4-5). PM_{10} data from another station, located at 500 South Phillips in Sioux Falls, SD was available from 1998 through 2001. The data are presented in Table 4-6. The Sioux Falls site is not as representative of local conditions at the proposed Groton site, since it is located in a more populated area, and is farther away. Data from both stations were used to approximate concentrations that may be found in the area of the proposed generation site since no other monitoring stations are nearby.

TABLE 4-5

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
PM_{10} MONITORED VALUES
ABERDEEN MONITORING STATION

Year	Number of Data Collection Days per Year	1st Max 24-hour Value ($\mu g/m^3$)	2nd Max 24-hour Value ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
2000	100	56	50	19.7
2001	61	56	53	20.4

Notes:

$\mu g/m^3$ Micrograms per cubic meter

TABLE 4-6

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
PM_{10} MONITORED VALUES
SIOUX FALLS MONITORING STATION

Year	Number of Data Collection Days per Year	1st Max 24-hour Value ($\mu g/m^3$)	2nd Max 24-hour Value ($\mu g/m^3$)	Annual Mean ($\mu g/m^3$)
1998	98	54	52	21.9
1999	112	74	43	22
2000	110	50	50	19.6
2001	60	60	54	22.6

Notes:

$\mu g/m^3$ Micrograms per cubic meter

4.10.2 Watertown SE Alternative

Climatology

The semiarid climate of the project region is characterized by cold, dry winters and moderately hot, moister summers. Annually, temperatures in nearby Watertown, SD range from –35° to 108°F. The average annual temperature for the study area is 42.6°F. The highest mean monthly temperature occurs in July and is 71.32°F, while the lowest occurs in January and is 10.0°F (HPRCC, 2004). Summer temperatures are usually warm, but some hot spells and occasional cool days can be expected. Table 4-7 lists the average monthly and annual temperatures for the study area.

Table 4-7 also provides the average monthly and annual precipitation for the study area. The table shows that the annual average total precipitation is 21.72 inches, with the highest levels of precipitation occurring from May through July (HPRCC, 2004). The driest months are December and January.

TABLE 4-7

EASE SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
MEAN MONTHLY TEMPERATURE AND PRECIPITATION
WATERTOWN METEOROLOGICAL MONITORING STATION

Month	Temperature (°F)	Precipitation (inches)
January	10.0	0.51
February	16.0	0.58
March	27.7	1.11
April	43.4	2.14
May	56.0	2.83
June	65.8	3.90
July	71.3	3.14
August	69.4	2.73
September	58.7	1.86
October	46.5	1.58
November	29.9	0.85
December	16.4	0.48
Annual	42.6	21.7

Data Source: High Plains Regional Climate Center, Watertown meteorological monitoring station online at www.hcrcc.unl.edu.

Air Quality

Construction of the Watertown SE Alternative would occur in Deuel County. This county is classified as an attainment area for all regulated pollutants by the U.S. Environmental Protection Agency (EPA). The title "attainment area" indicates that all National Ambient Air Quality Standards (NAAQS) are being met. Table 4-4 lists the applicable NAAQS that must be maintained throughout construction of the project (Title 40 CFR Part 50).

Published concentrations for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), or lead near the study area are not available because there are no nearby monitoring stations for these criteria pollutants. PM_{10} data from a station, located at 500 South Phillips in Sioux Falls, SD was available from 1998 through 2001. This data is presented in Table 4-8.

TABLE 4-8

WATERTOWN GENERATION PROJECT
BASIN ELECTRIC POWER COOPERATIVE
PM_{10} MONITORED VALUES
SIOUX FALLS MONITORING STATION

Year	Number of Data Collection Days per Year	1st Max 24-hour Value (µg/m³)	2nd Max 24-hour Value (µg/m³)	Annual Mean (µg/m³)
1998	98	54	52	21.9
1999	112	74	43	22
2000	110	50	50	19.6
2001	60	60	54	22.6

Notes:

µg/m³ Micrograms per cubic meter

4.11 WATER QUALITY

This section addresses affected environment in and around the area of the proposed project.

4.11.1 Surface water Resources

There are no mapped surface water bodies within the proposed area of the gas turbine site (USGS 2000). However, several ephemeral drainage channels occur along the proposed path of the underground gas pipeline.

4.11.2 Groundwater Resources

The principle sources of water for domestic use and for livestock in the study area are glacial deposit aquifers. The glacial deposit aquifers are in the glacial outwash valleys and alluvium, in sand and gravel lenses, and in subsurface gravel and silt. Aquifers in Brown County, South Dakota are divided into two classifications: aquifers above the bedrock surface and bedrock aquifers. Brown County aquifers above the bedrock surface consist of three main aquifer systems: the Deep James Aquifer, the Middle James Aquifer, and the Elm Aquifer. In addition to these three aquifers, the Lake Dakota plain is a source of groundwater in eastern Brown County. The proposed project site is located within the Lake Dakota plain, which consists primarily of silt, fine sand, and clay soils. The groundwater levels within the Lake Dakota plain fluctuate between 3 feet and 17 feet, depending on the specific location. The water levels in most location within the Lake Dakota plain fluctuate less than 6 feet. The depth to ground water ranges from ground surface to 27 feet below land surface. Prior to the early 20th century, the Lake Dakota plain consisted of wetlands located on soil with poor drainage and flat ground surfaces. Due to the development of a vast network of man-made drainage ditches constructed over the first half of the 20th century, wetland conditions no longer exist (Koch, 1986.)

The proposed underground pipeline extends in the road and utility right-of-way through Brown County and into Spink County for approximately 2.0 miles. Within Spink County, the site is located within the Middle James aquifer. The depth to groundwater for the Middle James aquifer is 10 to 100 feet. This aquifer is 30 feet thick on average (Hamilton 1996).

4.11.3 Watertown SE Alternative

Three main aquifers feed the water resource needs of Deuel County: the Big Sioux aquifer, the Prairie Coteau aquifer, and the Altamont aquifer. Several minor outwash aquifers are scattered around the county as well. The average depth from land surface to ground water for the minor aquifers in Deuel County is 0 to 39 feet. The average depth to ground water is 6 feet (Kume 1985).

There are no mapped surface water bodies within the Watertown SE study area. However, several ephemeral drainage channels downslope from the site carry surface water runoff generally northward to Hidewood Creek. Dams and dugouts in the drainage ways provide water for livestock and wildlife.

4.12 AESTHETICS

The region that comprises the gas turbine generation station and underground gas pipeline is primarily used as agricultural land.

4.12.1 Proposed Project

The Groton site is located approximately 5 miles south of the town of Groton, in Brown County, South Dakota. The site is located in relatively level terrain between a Western 115-kV substation and a Basin Electric 345-kV substation. An existing 345-kV transmission line owned by Basin Electric, and a 115-kV line owned and operated by Western currently pass within 1/4 mile of the site. Photographs of the study area are presented in Appendix A.

The original prairie landscape exists in an altered agricultural state. Linear features of highways, paved roads, gravel roads, two-track roads, electric transmission lines, and fencing transect each project area. Evidence of a buried gas pipeline also transects the project area in a general northwest to southeast direction. Vegetation in these areas consists of primarily of mixed grass pasture land and planted corn, oats and soybeans. The land is primarily used agriculturally for agrarian purposes and livestock grazing.

4.12.2 Watertown SE Alternative

The region that comprises area for the proposed Watertown SE alternative is used as agricultural land. The site is located in relatively level terrain essentially at the intersection of an existing 345-kV transmission line and the NBPL. Photographs of the study area are presented in Appendix A.

The original prairie landscape exists in an altered agricultural state. Linear features of highways, paved roads, gravel roads, two-track roads, electric transmission lines, and fencing transect the alternative project area. Evidence of a buried gas pipeline transects the Watertown SE Alternative site location in a general northwest to southeast direction.

4.13 TRANSPORTATION

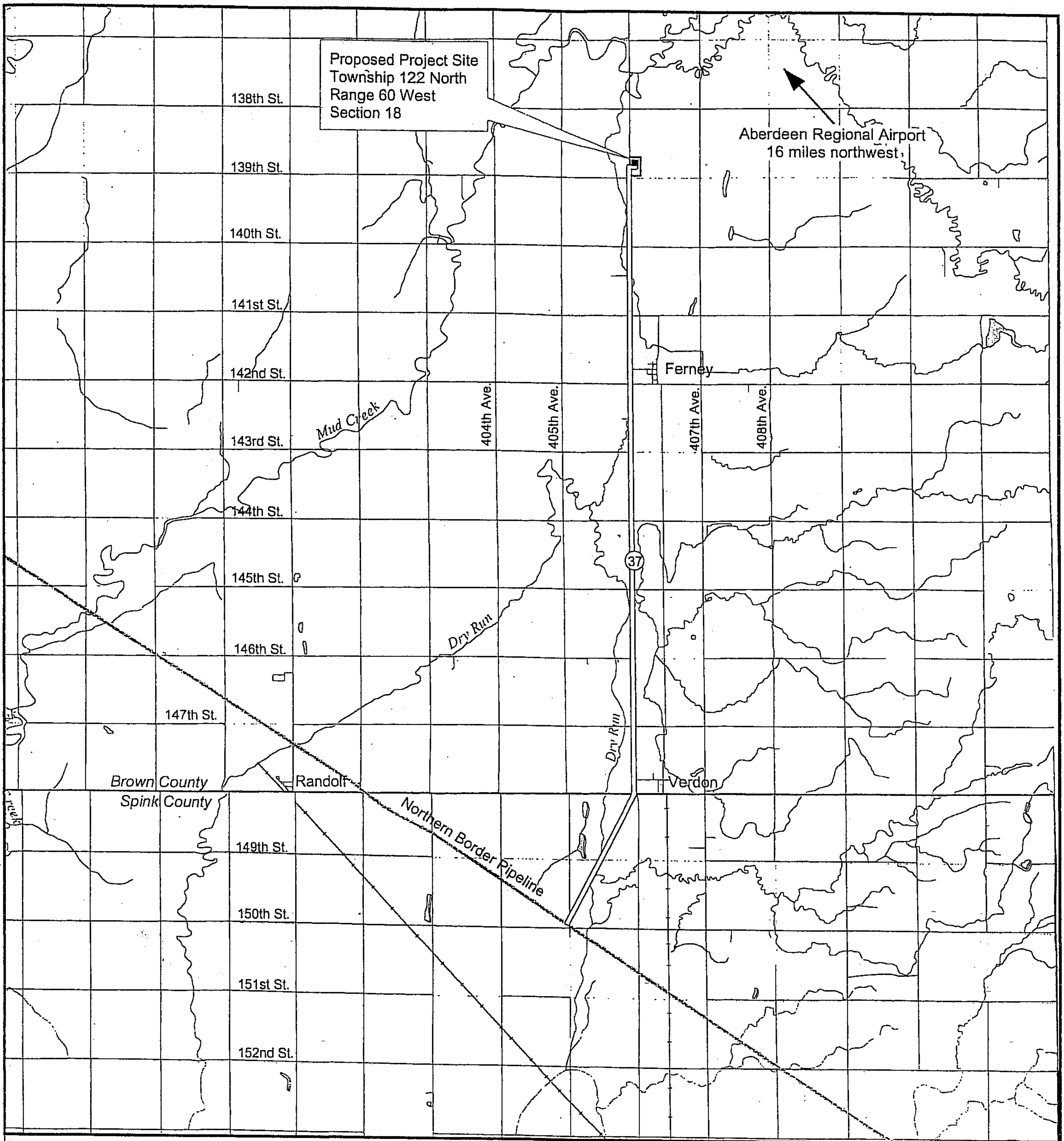
This section presents the transportation resources in the vicinity of the proposed Groton gas turbine facility and pipeline.

4.13.1 Proposed Project

The study area for transportation resources is defined as approximately a 15 mile radius around the proposed Groton combustion turbine site, as well as a 200 foot corridor surrounding the pipeline. As shown in Figure 4-4, there are no active railroad lines within 5 miles or major international or regional airports within 15 miles of the proposed gas turbine site or pipeline (Delorme 2001 and Census Bureau 2000). The following sections describe the various transportation features in the vicinity of the proposed Groton combustion turbine site. Figure 4-4 presents the names and locations of transportation routes within the vicinity of the proposed Groton combustion turbine facility and pipeline (Delorme 2001 and Census Bureau 2000).

Highways

As shown in Figure 4-4, the Groton site is immediately adjacent to South Dakota State Highway 37 and access to the site would be directly from this highway. The proposed pipeline would be located west of State Highway 37 in the exiting utility and road right-of-way. State Route 37 interconnects with US Route 12, located 5 miles north of the site at Groton, SD.



Legend

Proposed Project Area

Proposed Gas Pipeline

Road

Stream

Railroad

Section Line

Water

FIGURE 4-4
TRANSPORTATION
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING

0 0.5 1 2 3 Miles

9/9/04 O:\Basin_Electric\Projects\SDPeaking_GrotonLine_Transp.mxd HP

Topography within the study corridor is mostly open, gently rolling agricultural land with scattered woodlands. This terrain is unlikely to have any noticeable effect on the propagation of noise from sources within the corridor.

Radio and Television Interference

The proposed project area is located in an agricultural area with a very low population density. The only issues within the proposed project areas where television or radio interference would be of concern are area along roadways, nearby residences, or facilities that receive radio or television signals via antennas, where radio or television signals may be temporarily influenced or disrupted. A few existing power transmission lines are the primary sources of electric and magnetic fields (EMF) in the project areas, although other electrical equipment produces low levels of EMF.

4.14.1 Watertown SE Alternative

Ambient Noise

The project study area runs adjacent to two track and unpaved roads, as shown in the photographs in Appendix A. Besides traffic noise, the proposed Watertown SE Alternative is subject to noise associated with winds, farm equipment, livestock, and wildlife

Radio and Television Interference

The Watertown SE Alternative is located in an agricultural area with a very low population density. The only issues within the proposed project areas where television or radio interference would be of concern are area along roadways, nearby residences, or facilities that receive radio or television signals via antennas, where radio or television signals may be temporarily influenced or disrupted. A few existing power transmission lines are the primary sources of electric and magnetic fields (EMF) in the project areas, although other electrical equipment produces low levels of EMF.

4.15 HUMAN HEALTH AND SAFETY

This section summarizes the present human health and safety conditions that exist within the study area for the East Side Peaking project. The human health and safety study area is defined in Table 4-1. Topics reviewed in this section include electrical effects, schools, and health facilities.

4.15.1 Proposed Project

The affected environment for the proposed project is discussed in the following sections.

Electrical Effects

Gas turbines would be connected to transmission lines in the study area. Direct contact with electric conductors from transmission lines and generating facilities, is commonly referred to as shock hazard. Direct contact, as with household electrical wiring, can inflict serious electric shocks if precautions are not taken to minimize shock hazard. Avoidance of objects, such as antennas and irrigation equipment, near transmission line or gas tie-in to the transmission line is a proper precaution that should be observed. All of Basin Electric's lines are designed and constructed in accordance with National Electrical Safety Code (NESC) standards to minimize shock hazard.

The flow of electricity produces electric and magnetic fields (commonly referred to as EMF). Magnetic fields and electric fields are strongest at the source of the flow of electrical power and drop off markedly as the distance from the source of the current increases. In many cases, people are exposed to higher EMF levels from household appliances than from transmission lines as a result of the proximity of the source.

Numerous sources of EMF exist in nature and in the occupational and residential environments. In nearly all instances, these fields pose no obvious threat to human health or safety. However, public awareness of the ubiquitous nature of these fields, and the historical controversy over their potential effects on living systems, have stimulated the research community to define more precisely the physical properties of these fields and to delineate the thresholds for their possible effects on human health and the environment.

Certain epidemiological investigations have indicated potential risk factors in a number of residential and occupational studies for exposure to EMF. However, many studies report no statistically significant correlation. A recent Danish residential study reported that while consumption of electricity in Denmark has increased by 30 times since 1945, incidence rates of cancer had changed little (Guenel and others 1993). In 1996, the National Research Council (NRC) completed a study of research on EMF that had been ongoing since 1979 and concluded that the evidence so far "does not show that exposure to these fields presents a human health hazard" (NRC 1996).

Although a substantial amount of research on EMFs has been completed and is continuing, the body of research on health effects is still preliminary and inconclusive. The emerging evidence no longer allows the assertion that there are no risks; still, there is no basis for arguing that there is a significant risk.

<u>**Schools and Health Facilities**</u>

A records review of the state database did not identify any potentially affected schools and health facilities. Sites within a 0.5-mile range of the site locations for the gas turbine considered to be in the study area. Under current conditions, the proposed gas turbine and alternatives do not pass within 0.5 mile of a school or health care facility where exposures to EMF from the project might occur.

4.15.2 Watertown SE Alternative

Under current conditions, the Watertown SE Alternative does not pass within 0.5 mile of a school or health care facility where exposures to EMF from the project might occur. In addition, the Watertown SE Alternative is not adjacent to existing residences.

4.16 SOCIOECONOMIC CONDITIONS AND COMMUNITY RESOURCES

This section summarizes the socioeconomic conditions and community resources in two counties in South Dakota. The East Side Peaking project study areas include a combustion turbine and approximately 9 miles of gas connection line in Brown County and approximately 2.5 miles of gas connection line in Spink County. Specifically, this section addresses population, economic conditions, income, employment, housing, local government facilities and services, and utilities.

4.16.1 Population

The proposed gas turbine is located in Brown County, South Dakota, which has a population of 35,460 (Census 2003). The town nearest the gas turbine site is Groton, which is approximately 5 miles north. The proposed gas connection line will pass near the towns of Ferney and Verdon in Brown County. The nearest urban area is Aberdeen, South Dakota. Table 4-8 lists the associated population of Brown County in 1990 and 2000 that could be affected by construction of gas turbine site and gas connection line.

Brown County experienced a decrease in population between 1990 and 2000 (Census 2003). Because There are no major towns in the vicinity of the gas turbine.

A portion of the proposed gas connection line is located in Spink County, South Dakota, which has a population of 7,454 (Census 2003). The town nearest the underground gas pipeline is Verdon, which is approximately 3 miles north of the point at which the underground gas pipeline connects to NBPL. The nearest urban area is Aberdeen, South Dakota. Table 4-8 lists the associated population of Spink County in 1990 and 2000 that could be affected by construction of the gas connection line. Spink County also experienced a decrease in population between 1990 and 2000 (Census 2003).

TABLE 4-8

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
POTENTIALLY AFFECTED POPULATIONS BY COUNTY

Area	1990	2000
State of South Dakota	696,004	754,844
Brown County	35,580	35,460
Spink County	7,981	7,454

Source: Census 2003

4.16.2 Economic Conditions

In Brown County, South Dakota, the manufacturing, trade, and service industry are the three primary employers. Table 4-9 lists employment by industry for the county in 2000. In 2001, the per capita personal income (PCPI) in Brown County was $29,923, or 98% of the national average. In comparison, PCPI for the state of South Dakota was $26,566, or 87% of the national average. Between 1969 and 2001, the average annual rate of growth in the PCPI was 7.1% for Brown County. During the same period, the average annual growth rate in the PCPI for the state was 7.5% (BEA 2003). The percentage of unemployed workers in Brown County was 2.4% in 2000 (Census 2003). This contrasts with the statewide average of 3% for all of South Dakota.

In Spink County, South Dakota, the service and trade industries and agriculture are the three primary employers. Table 4-7 lists employment by industry for the county in 2000. In 2001, the PCPI in Spink County was $26,816, or 88% of the national average. In comparison, PCPI for the state of South Dakota was $26,566, or 87% of the national average. Between 1969 and 2001, the average annual rate of growth in the PCPI was 5.8% for Spink County. During the same period, the average annual growth rate in the PCPI for the state was 7.5% (BEA 2003). The percentage of unemployed workers in Spink County was 1.9% in 2000 (Census 2003). This contrasts with the statewide average of 3% for all of South Dakota

4.16.3 Environmental Justice

In accordance with Executive Order 12898, an evaluation of the Proposed Project must include an assessment of effects on minority and low-income populations, and an alternative location or action must be considered if the Proposed Project discriminates against a minority or low-income population. Table 4-9 presents employment by industry or employer.

The race and sex of the rural population in the two counties where the combustion turbines and associated underground gas pipeline line are located is presented in Table 4-10.

TABLE 4-9

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2000 COUNTY EMPLOYMENT BY INDUSTRY OR EMPLOYER

	Services (education, health etc.)	Trade (wholesale and retail)	Government (including military)	Manufacturing	Construction	Financial and Insurance	Transportation	Information (radio, TV, newspapers)	Agriculture, mining and forestry
Combustion Turbine Site: Brown County, South Dakota									
Number of Employees	8,333	3,233	989	2,137	1,136	1,016	625	370	1,078
Percentage of Employees	44%	17.1%	5.2%	11.3%	6.0%	5.4%	3.3%	2.0%	5.7%
Gas Connection Line: Spink County, South Dakota									
Number of Employees	1,202	424	258	138	177	145	149	32	659
Percentage of Employees	37.7%	13.3%	8.1%	4.3%	5.6%	4.6%	4.7%	1.0%	20.7%

Sources: Census 2003, South Dakota Governor's Office of Economic Development (SDGOED)2003, Discover North Dakota 2003.

TABLE 4-10

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2000 COUNTY POPULATION DATA BY RACE AND SEX

	Total Population	Caucasian	African-American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Other (single race)	Other (two or more races)	Total Minority
STATE OF SOUTH DAKOTA									
Total Population	754,844 (100%)	669,404 (88.7%)	4,685 (0.62%)	62,283 (8.3%)	4,378 (0.6%)	261 (0.03%)	3,677 (0.49%)	10,156 (1.3%)	90,259 (11.9%)
Female Population	380,286 (50.3%)	335,697 (50.1%)	1,649 (35.2%)	31,569 (50.7%)	2,329 (53.2%)	122 (46.7%)	1,561 (42.5%)	5,054 (49.8%)	44,589 (49.4%)
Male Population	374,558 (49.7%)	328,888 (49.9%)	3,036 (64.8%)	30,714 (49.3%)	2,049 (46.8%)	139 (53.3%)	2,116 (57.5%)	5,102 (50.2%)	45,670 (50.6%)
Combustion Turbine Site and Gas Connection Line: Brown County, South Dakota									
Total Population	35,460 (100%)	33,715 (95%)	100 (0.3%)	964 (2.7%)	142 (0.4%)	31 (.09%)	63 (0.2%)	306 (0.9%)	1745 (4.9%)
Female Population	18,343 (51.7%)	17,439 (51.7%)	33 (33%)	507 (52.6%)	83 (58.5%)	12 (38.7%)	32 (50.8%)	165 (53.9%)	904 (51.8%)
Male Population	17,117 (48.3%)	16,276 (48.3%)	67 (67%)	457 (47.4%)	59 (41.5%)	19 (61.3%)	31 (49.2%)	141 (46.1%)	841 (48.2%)
Gas Connection Line: Spink County, South Dakota									
Total Population	7,454 (100%)	7,254 (98.8%)	16 (0%)	110 (0.5%)	7 (0.1%)	1 (0%)	9 (0.1%)	39 (0.5%)	200 (1.2%)
Female Population	3,597 (48.3%)	3,528 (48.6%)	4 (25%)	37 (33.6%)	3 (42.9%)	0 (0%)	4 (44.4%)	16 (41%)	69 (34.5%)
Male Population	3,857 (51.7%)	3,726 (51.4%)	12 (75%)	73 (66.4%)	4 (57.1%)	1 (100%)	5 (55.6%)	23 (59%)	131 (65.5%)

Source: Census 2000

The percentage of all minorities in Brown County, South Dakota, was 4.9% in the census taken in the year 2000 (Census 2003). By contrast, the percentage of all minorities in the State of South Dakota was 11.9%, with over 69% comprised of Native Americans. The population of this minority group is 55.2% of the total minorities and 2.7% of the total population in Brown County.

Approximately 9.9% of the population of Brown County was below the poverty level. This compares to 13.2% of the total population of South Dakota that is below the poverty level (Census 2003).

The percentage of all minorities in Spink County, South Dakota, was 1.2% in the census taken in the year 2000 (Census 2003). By contrast, the percentage of all minorities in the State of South Dakota was 11.9%, with over 69% comprised of Native Americans. The population of this minority group is 55% of the total minorities and 1.5% of the total population in Spink County.

Approximately 12.8% of the population of Spink County was below the poverty level. This compares to 13.2% of the total population of South Dakota that is below the poverty level (Census 2003).

4.16.4 Local Facilities, Services, and Utilities

Areas that are relatively close to towns may offer full-service law enforcement and fire districts, schools, hospitals, emergency response services, water and sewer services, road and bridge departments, solid waste disposal, recreation programs, library systems, zoning ordinances, land use planning, and social services. However, it is unlikely that any of the specific project areas near the gas site and gas connection lines would have services associated with towns or larger urban areas. Instead, rural communities typically offer fewer services and facilities due to the more dispersed and limited populations, and limited revenues for these services.

The electric, natural gas, water, and telecommunication utilities and services of the two counties that are potentially affected by the proposed project area are described in more detail as follows:

South Dakota has some of the lowest costs of energy in the nation. Groton Municipal Electric supplies electricity for the Groton community in Brown County South Dakota Governor's Office of Economic Development (SDGOED) (SDGOED 2003). Northwestern Public Service provides natural gas (SDGOED 2003). WEB Water is the water provider in the Groton area. James Valley

Telecommunications provides all of the telecommunication needs for the Groton community (SDGOED 2003).

Northwestern Public Service provides electricity for the Conde area in Spink County (SDGOED 2003). Northwestern Public Service also provides natural gas in the Conde area of Spink County (SDGOED 2003). WEB Rural Water System is the water provider in the Conde area. James Valley Telecommunications provides all of the telecommunication needs for most towns and rural areas located in Spink County (SDGOED 2003).

4.16.5 Watertown SE Alternative

The Watertown SE Alternative is located in Deuel County, South Dakota, which has a population of 4,498 (Census 2003). In Deuel County, the town nearest the site is Brandt, which is approximately 5 miles northeast. The nearest urban area is Watertown, South Dakota. Table 4-11 lists the associated population of Deuel County in 1990 and 2000 that could be affected by construction of the gas turbine facility. Deuel County experienced a decrease in population between 1990 and 2000 (Census 2003). Because there are no major towns in the vicinity of the Watertown SE Alternative, no information on specific towns is included in this evaluation.

TABLE 4-11

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
POTENTIALLY AFFECTED POPULATIONS

Area	1990	2000
State of South Dakota	696,004	754,844
Deuel County	4,522	4,498

Source: Census 2003

In Deuel County, South Dakota, the service and manufacturing industries and agriculture are the three primary employers. Table 4-12 lists employment by industry for the county in 2000. In 2001, the PCPI in Deuel County was $24,888, or 82% of the national average. In comparison, PCPI for the state of South Dakota was $26,566, or 87% of the national average. Between 1969 and 2001, the average annual rate of growth in the PCPI was 6.7% for Deuel County. During the same period, the average annual growth rate in the PCPI for the state was 7.5% (BEA 2003). The percentage of unemployed workers in Deuel County was 0.9% in 2000 (Census 2003). This contrasts with the statewide average of 3% for all of South Dakota.

The race and sex of the rural population in Deuel County is presented in Table 4-13. The percentage of minorities in Deuel County, South Dakota, was 2% in the total census taken in the year 2000 (Census 2003). By contrast, the percentage of minorities in the State of South Dakota was 11.9%. Over 69% of the total minority population in South Dakota is comprised of Native Americans. The population of this minority group is 20.3% of the total minorities and 0.4% of the total population in Deuel County.

Approximately 10.3% of the population of Deuel County was below the poverty level. This compares to 13.2% of the total population of South Dakota that is below the poverty level (Census 2003)

TABLE 4-12

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2000 EMPLOYMENT BY INDUSTRY OR EMPLOYER

	Services (education, health etc.)	Trade (wholesale and retail)	Government (including military)	Manufacturing	Construction	Financial and Insurance	Transportation	Information (radio, TV, newspapers)	Agriculture, mining and forestry
Combustion Turbine Site: Deuel County, South Dakota									
Number of Employees	703	223	71	437	134	89	138	47	381
Percentage of Employees	31.5%	10%	3.2%	19.7%	6%	4%	6.2%	2.1%	17.1%

Sources: Census 2003, SDGOED 2003, Discover North Dakota 2003.

TABLE 4-13

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2000 POPULATION DATA BY RACE AND SEX

	Total Population	Caucasian	African-American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Other (single race)	Other (two or more races)	Total Minority
STATE OF SOUTH DAKOTA									
Total Population	754,844 (100%)	669,404 (88.7%)	4,685 (0.62%)	62,283 (8.3%)	4,378 (0.6%)	261 (0.03%)	3,677 (0.49%)	10,156 (1.3%)	90,259 (11.9%)
Female Population	380,286 (50.3%)	335,697 (50.1%)	1,649 (35.2%)	31,569 (50.7%)	2,329 (53.2%)	122 (46.7%)	1,561 (42.5%)	5,054 (49.8%)	44,589 (49.4%)
Male Population	374,558 (49.7%)	328,888 (49.9%)	3,036 (64.8%)	30,714 (49.3%)	2,049 (46.8%)	139 (53.3%)	2,116 (57.5%)	5,102 (50.2%)	45,670 (50.6%)
Combustion Turbine Site: Deuel County, South Dakota									
Total Population	4,498 (100%)	4,409 (98%)	5 (0.1%)	16 (0.4%)	3 (0%)	0 (0%)	21 (0.5%)	44 (1.0%)	79 (2%)
Female Population	2,223 (49.4%)	2,196 (49.8%)	1 (20%)	7 (43.8%)	3 (100%)	0 (0%)	7 (33%)	19 (43.2%)	27 (34.2%)
Male Population	2,265 (50.6%)	2,213 (50.2%)	4 (80%)	9 (56.2%)	0 (0%)	0 (0%)	14 (67%)	25 (56.8%)	52 (65.8%)

Source: Census 2003

South Dakota has some of the lowest costs of energy in the nation. Otter Tail Power Company provides electricity for Deuel County (SDGOED 2003). Northwestern Public Service provides natural gas (SDGOED 2003) and Brookings-Deuel Rural Water supplies water to users in the Toronto area. The Interstate Telecommunications Coop provides all of the telecommunication needs for both towns and rural areas located in Deuel County (SDGOED 2003).

5.0 ENVIRONMENTAL IMPACTS

This section describes potential environmental impacts from the East Side Peaking Project. Direct, indirect, and cumulative impacts are addressed considering the short- and long-term consequences. Potential impacts are based on the information developed in Section 4.0, and mitigation of potential impacts is discussed in Section 6.0. For most environmental resources, the environmental impacts of the Proposed Project and the Watertown SE alternative are very similar.

5.1 LAND USE

This section discusses the direct, indirect, and cumulative environmental impacts associated with land uses as a result of the proposed project.

5.1.1 Proposed Project

The proposed Groton gas turbine facility and pipeline would have a minimal impact on land use. The majority of the proposed gas turbine facility occupies private land that is zoned agricultural and is regulated by Brown and Spink County land use plans and ordinances. It is likely the Groton site would be located, at lease partially, on land owned and operated by Basin Electric for existing electrical facilities

Surface disturbance caused by construction of the proposed Groton gas turbine facility and pipeline would be minimal. The anticipated soil disturbance and removal of land from agriculture-related activities to energy–related activities is expected to be less than 15 acres.

There would be no impact to prime farmland resulting from construction of the Groton gas turbine. Prime farmland is not located at the Groton site and the gas pipeline would be located in the existing utility and road right-of way which is not considered prime farmland.

The short-term impacts to land use would include disturbance vegetation and farming caused by:

- Preparing equipment yards and sites for construction trailers
- Clearing, grubbing, and grading for construction of the proposed gas turbine facility

The short-term disturbances to vegetation resulting for construction of the pipeline in the right of way would be reclaimed soon after construction is completed. Any disturbances to farming near the Groton site resulting from construction would be expected to be infrequent and would last only 1 day per disruption.

The long-term impacts would include disruption of vegetation and farming caused by:

- Loss of crops, hay, or livestock forage due to combustion turbine facility construction and any additional area for facility expansion.

There would be no significant direct, indirect, or cumulative impacts to individual farming operations because the proposed gas turbine would be located on built up areas; existing substations or existing constructed drainage ponds. On a county-wide basis, the conversion of agricultural land to the proposed combustion turbine facility would have a relatively small (less than 15 acres) impact on potential crop production or livestock grazing. In general, the cumulative impact of the proposed Groton combustion turbine facility on land use will be minimal.

5.1.2 Watertown SE Alternative

The proposed location for the Watertown SE Alternative is located in an area where the soils are considered prime farmland. Table 5-1 indicates the percentage of prime farmland in Deuel County that would be impacted from implementing the Watertown SE Alternative. There would be direct impacts to prime farmland resulting from construction of the Watertown SE Alternative.

TABLE 5-1

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
POTENIALLY AFFECTED PRIME FARMLAND IN DEUEL COUNTY

	Maximum Acreage Affected by Project Area[a]	Acreage of County Prime Farmland[b]	Percentage of Prime Farmland Affected by Project Area[c]
Watertown SE Alternative	15	205,024	.0073

Notes:

[a] Total acreage was calculated as the area of the proposed combustion turbine facility.

[b] Total acreage of prime farmland was taken from USDA 1997.

[c] Percentage of total prime farmland in the county that is affected by the project area.

The estimated 15-acre disturbance area is an exaggerated estimate based on a larger than anticipated gas turbine facility and an assumption that the turbine is situated entirely on soils considered prime farmland.

The short-term impacts to land use would include disturbance vegetation and farming caused by:

- Preparing equipment yards and sites for construction trailers
- Clearing, grubbing, and grading for construction of the alternative gas turbine facility

Any disturbances to farming near the Watertown SE Alternative site resulting from construction would be expected to be infrequent and would last only 1 day per disruption.

The long-term impacts would include disruption of vegetation and farming caused by:

- Loss of crops, hay, or livestock forage due to combustion turbine facility construction and any additional area for facility expansion.

There would be no significant direct, indirect, or cumulative impacts to individual farming operations because the conversion of agricultural land to combustion turbine facility would have a relatively small (less than 15 acres) impact on potential crop production or livestock grazing.

5.2 FLOODPLAINS

This section discusses the potential environmental impacts associated with floodplains.

5.2.1 Proposed Project

According to FEMA Flood Insurance Rate Maps (FIRMs) for the Proposed Project, the Groton gas turbine site will not cross into, or be located within, a 100-year floodplain. Because Groton gas turbine site is not located within a 100-year floodplain and no impacts from a 100–year flood to the facility or impacts to the flood handling capability of the floodplain, or the pattern or magnitude of the flood flow are anticipated.

No impacts to floodplains resulting from the construction of a gas pipeline are anticipated because the pipeline would be buried and the ground surface would be returned to its original condition. Possible short-term impacts may result from construction of the underground gas pipeline. However, these short-term construction-related impacts would be short in duration and the ground surface would be returned to original condition.

The proposed Groton gas turbine site is located in a 500-year flood zone. Potential impacts that could result form construction and operation of a gas turbine project in a floodplain include:

- Disruption of utility service for a considerable period of time during a 500-year flood event
- Creating barriers that could unnaturally divert flood waters or increase flood hazards in other areas;
- Altering the natural floodplains and protective barriers that help channel or accommodate flood waters; and
- Creating scour and other turbulence that could erode channel banks.

Direct, indirect, or, cumulative impacts will not likely occur as a result of this project being located in a 500-year flood zone because the Groton gas turbine is intended to supply electricity only during periods of peak demands and mitigation measures will be implemented to prevent impacts to flood handling capability of the floodplain, or the pattern or magnitude of the flood flow. Because mitigation activities would be implemented, potential direct and indirect impacts to existing or potential floodplains near the project area are anticipated to be insignificant.

5.2.2 Watertown SE Alternative

The Watertown SE Alternative is not located in a 100-year or 500-year flood zone. No significant direct, indirect, or cumulative impacts from a 100– or 500-year flood to the facility or impacts to the flood handling capability of the floodplain, or the pattern or magnitude of the flood flow are anticipated as a result of implementing the Watertown SE Alternative.

5.3 WETLANDS

This section discusses the environmental impacts on wetlands resulting from construction and operation of the proposed project.

5.3.1 Proposed Project

The proposed gas turbine and one 11.5-mile natural gas pipeline are not expected to have significant, direct, indirect, or cumulative impacts on wetlands. Less than 10 acres of isolated herbaceous wetlands are located within the total 160 acres (1 quarter section) and the 11.5-mile pipeline crosses only one small non-jurisdictional wetland. The small isolated wetland area located within the road borrow ditches would be minimally impacted by the trenching and backfilling activities associated with the pipeline construction work. The Nationwide 12 permit for construction of utility lines in waters of the United States requires that the top 6" to 12" of topsoil be salvaged separately and replaced after the pipeline and trench are backfilled. Furthermore, the pipeline trench cannot be constructed in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Because the native soils have silty clay loam and silt loam textures and low permeabilities, it will not be necessary to install clay blocks along the pipeline to ensure that the trench does not drain the waters of the United States through which the pipeline line is installed. At crossing contacts with the ephemeral stream tributary, the slopes and stream banks will be regraded and stabilized immediately upon completion of the pipeline crossing, as required under the Nationwide 12 permit (U.S. Army Corp of Engineers 2001).

Access to the pipeline route and generator station would primarily be from the existing roads, thus minimizing all impacts any nearby wetland areas. The proposed project pipeline alignment makes use of areas near or adjacent to existing county roads or highways. In addition, maintenance activities would be carried out from these same rights-of-way (ROW).

Temporary indirect impacts to the wetlands would be less than 1 day in duration. Based on the temporary nature of potential impacts, the effects of the proposed project would be insignificant. Although construction and maintenance of the proposed pipeline would be from the existing roadway, there is the potential for construction and maintenance activities to be performed off the roadway but within the designated ROW.

The potential direct impacts to wetlands from construction and maintenance of the proposed gas turbine and pipeline could include the following:

- Wetland vegetation may be crushed by heavy machinery during construction.
- Wetland soils may be compacted during construction by vehicles or equipment. When soils are compacted, runoff increases and water-holding capacity is reduced, leading to impaired function of the wetland.
- If access roads are constructed in wetlands, the amount and direction of water flow can be changed, permanently damaging wetland soils and vegetation.
- Sediments can be re-suspended by equipment, foot traffic, and vehicles, endangering fish and other wildlife.

Potential indirect impacts to wetlands in and near the proposed gas turbine and pipeline alignment are also anticipated to be minor, but may include:

- Destruction of native wetland plants, as could occur when vehicles or crews cross wetlands, can in turn promote invasion by weedy vegetation that does not provide food and nesting habitat for wildlife.

- Compaction of wetland soils by vehicles or crews could impede germination of perennial seeds, root growth, and establishment of plants, thereby displacing native plants. Bare areas could develop that are more susceptible to erosion by water and wind in areas where plants are not established. Erosion could impair water quality by compromising the capacity for pollution filtration and sequestering the wetland.

- Construction equipment can carry seeds or parts of invasive plant species into wetlands that can crowd out native vegetation and destroy wildlife habitat.

Based on existing land uses and projects within and near the proposed natural gas turbine and one 11.5 mile natural gas pipeline corridor, the single most significant contributor to cumulative impacts to wetlands in the study area is the conversion of mixed grass prairie grasslands to cultivated fields of corn, soybeans, small grains, and alfalfa.

5.3.2 Watertown SE Alternative

No wetlands are located in the immediate vicinity of the Watertown SE Alternative. No impacts to wetlands are anticipated from implementing the Watertown SE Alternative.

5.4 CULTURAL RESOURCES

The proposed project is expected to have no significant direct, indirect, or cumulative impacts on cultural resources. The cultural resources reports are included as Appendix B. Cultural clearance is recommended for the project. The potential impacts for each site identified or observed in project area discussed below.

5.4.1 Proposed Project

<u>Site 39BN2003/39SP2003</u>

This site, the Chicago and North Western Railroad, is located within survey area but is located more than700 feet east of the proposed gas turbine location. The site has previously been impacted by a power line and is recommended not eligible for the NRHP. The proposed project will avoid the railroad grade and will have no effect on the Chicago and North Western Railroad grade.

<u>Site BN-000-01226</u>

This site, the Verdon Cemetery, is located adjacent to the State Highway 37 right-of-way. The site is recommended eligible for the NRHP. This site is located within the right-of-way on the east side of State Highway 37; however, the underground gas pipeline will be installed on the west side of the highway. The proposed project will not adversely affect the site

<u>Site BN-005-00001/00002</u>

This site, the Finnegan/Heiser Farm, is located within the survey area but is located approximately 1,500 feet east of the proposed disturbance. Therefore, this project will have no effect on the Finnegan/Heiser farm.

<u>Site ACR SD04-01</u>

This site, the Bloedell/Hoops Farmstead, is located within the survey area on the west side of State Highway 37; however, the proposed project will have not adversely effect the site. Therefore, this project will have no effect on the Bloedell/Hoops farmstead.

5.4.2 Watertown SE Alternative

No cultural resources were encountered during the survey of the Watertown SE area. No direct, indirect, or cumulative impacts to cultural resources are anticipated as a result of implementing the Watertown SE Alternative.

5.5 THREATENED AND ENDANGERED SPECIES

This section discusses the environmental impacts of the proposed project to T&E species.

5.5.1 Proposed Project

There were no threatened, endangered, or candidate animal or plant species observed within or around any of the proposed project study areas. While the seasonal weather conditions precluded comprehensive direct wildlife observation, the existing habitats within the project areas are not suitable for T&E listed or other species of concern. Therefore, it is unlikely that additional surveys would be successful in verifying the presence of any listed species within the proposed project areas. Additionally, information provided through the SDNHD does not indicate use of the proposed project areas by any state or federally listed species. Appendix C presents a list of rare, threatened, endangered, and candidate species within the study area and Appendix D presents a list of species observed within the proposed project area.

5.5.2 Watertown SE Alternative

There were no threatened, endangered, or candidate animal or plant species observed within or around the Watertown SE Alternative. The existing habitats within the project area are not suitable for T&E listed or other species of concern and no impacts to T& E species are anticipated.

5.6 FISH AND WILDLIFE RESOURCES

Construction of the project is not expected to significantly disrupt wildlife in the proposed areas. The area in and around the proposed locations is dominated by cropland, pasture, and grassland habitats. Wildlife in these habitats is made up of species adapted to farmland and grassland areas.

5.6.1 Proposed Project

The construction of a gas turbine and an associated pipeline would not have significant direct and indirect impacts on wildlife within the proposed areas. Short-term construction noise and activities could affect wildlife by temporarily frightening them from the area. Installation of a underground pipeline could cause a temporary displacement of wildlife through a short-term loss of habitat. Construction of a gas turbine at Groton would permanently displace certain wildlife species due to the removal of habitat. However, there is suitable habitat in the area to support any wildlife displaced by construction of the Proposed Project. The increase in human activity in the project area might also temporarily disrupt wildlife use resulting in an insignificant indirect impact.

5.6.2 Watertown SE Alternative

Construction of the Watertown SE Alternative is not expected to have and direct, indirect or cumulative impacts wildlife in the proposed area. The area in and around the proposed location is dominated by cropland, pasture, and grassland habitats and construction of the Watertown SE Alternative would remove only 15 acres of potential habitat from the area.

5.7 VEGETATION

No significant direct, indirect, or cumulative impacts to vegetation in the proposed project areas are expected, because the predominant vegetation type impacted by the project is row crops.

5.7.1 Proposed Project

Impacts to vegetation in all of the proposed project areas are expected to be insignificant since the majority of the acreage for the gas turbine and pipeline corridor is agricultural land or existing substation, existing constructed drainage pond or existing right-of-way. Cultivated cropland and farming is the principal land use in all of the project areas and regions.

Short-term direct impacts (that affect vegetation for 1 year or less) could include disturbance, removal, and soil compaction caused by:

- Trenching and installation of the 11.5 mile pipeline
- Equipment and material staging areas near the gas turbine site
- Performing geotechnical investigations

These short-term disturbances would be recalimed soon after construction is completed. Most areas affected by short-term disturbances would be returned to cropland or seeded grass pasture within one growing season.

Long-term direct impacts could be caused by:

- Clearing, grubbing, grading, and constructing the buildings and associated facilities for the natural gas-fired generator
- Installing additional culverts and fill materials to improve access to the sites
- Loss of vegetated acreage at the gas turbine site

In the event it is necessary, removal of the vegetation could temporarily reduce the diversity of plant species. Shrubs and trees are slower to establish; therefore, a diverse vegetative cover would be reestablished within a decade.

Disturbed soil creates a hospitable environment for invasion of weeds, and project-related traffic may provide a transport mechanism for seeds of noxious weeds to the area. Removal of vegetation may increase erosion and sedimentation. Increased runoff on bare and compacted soils could create gullies and change the overall landscape. It should be noted that soil disturbance would be insignificant as nearly all of the proposed sites are located on level to nearly level terrain that are not subject to flooding. Cumulative impacts to vegetation are anticipated to be insignificant and include the effects from existing farming and ranching. The primary land use in the project area consists of cultivated fields of corn, soybeans, small grains, and alfalfa; practices that have been changing the landscape for many years, future agricultural use of the area may continue to cause significant changes to the landscape as well. Based on current land use regimes, this and future projects should have an insignificant impact on vegetation, as most areas have been altered from their natural state.

5.7.2 Watertown SE Alternative

Direct, indirect, and cumulative impacts to vegetation are expected to be insignificant since the majority of the acreage for the gas turbine is cultivated cropland and a maximum of 15 acres of cropland would be converted from its current state to gas turbine facility. Short-term direct impacts (that affect vegetation for 1 year or less) could include disturbance, removal, and soil compaction caused by: equipment and material staging areas near the gas turbine site; and performing geotechnical investigations.

Cumulative impacts to vegetation are anticipated to be insignificant and include the effects from farming and ranching. The primary land use in the project area consists of cultivated fields of corn, soybeans, small grains, and alfalfa; practices that have been changing the landscape for many years. Future agricultural use of the area may continue to cause significant changes to the landscape as well. Based on current land use practices, this and future projects should have an insignificant impact on vegetation, as most areas have been altered from their natural state.

5.8 GEOLOGICAL RESOURCES

This section presents the impacts of the proposed project to the geological resources in the proposed project area.

5.8.1 Geology

No potentially hazardous geological areas, such as slumps or landslides, would be affected by construction of the gas turbine or 11.5-mile pipeline. As a result, no direct, indirect, or cumulative impacts to geological resources are anticipated by the proposed project.

5.8.2 Topography

The proposed project would make use of existing level to nearly level terrain for construction of the gas turbine and associated facilities (access road, storage building, and substation). The grading and earthmoving required is not significant because the sites are nearly level and not located in areas susceptible to flooding. As a result, no direct, indirect, or cumulative impacts to topography are anticipated by the proposed project.

5.8.3 Soils

Impacts to soils from the proposed project would be insignificant. Direct impacts to soils within the gas turbine site and proposed pipeline corridor could include localized short-term increases in potential for erosion from wind and water runoff, compaction, and rutting.

Areas that are cleared or disturbed by gas turbine construction activities could be susceptible to erosion. The impacts from erosion are a function of the local soil type and the amount of clearing required. Some portions of the proposed pipeline corridor may be located in areas with steeper slopes and will require regrading and stabilization immediately upon completion of the pipeline crossing, as required under the Nationwide 12 permit (U.S. Army Corp of Engineers 2001). The potential for soil erosion and resulting sedimentation of downgradient wetlands, drainages, and streams is higher in these steeper areas. Reduced absorption caused by heavy construction equipment compacting the soils can also aggravate erosion. Impacts from construction of the pipeline would be limited to the vegetation within the existing utility and road right of way. No significant impacts related to the increase in potential for erosion are expected as a result of construction of the pipeline. Areas that are disturbed by construction equipment are expected to recover naturally with vegetative reestablishment or will be reseeded with native vegetation after the construction equipment is permanently removed.

5.8.4 Watertown SE Alternative

No potentially hazardous geological areas, such as slumps or landslides, would be affected by construction of the combustion turbine sites or gas connection lines. As a result, no direct, indirect, or cumulative impacts to geological resources are anticipated by the proposed project.

No significant grading or earthmoving would be required. As a result, no direct, indirect, or cumulative impacts to topography are anticipated by the proposed project.

Impacts to soils from the proposed project would be insignificant. Direct impacts to geological resources and soils within the proposed project areas could include localized increases in potential for erosion from wind and water runoff, compaction, and rutting.

Areas that are cleared or disturbed by construction could be susceptible to erosion. The impacts from erosion are a function of the local soil type and land slope and the amount of clearing required. The potential for soil erosion and resulting sedimentation of downgradient drainages and streams is higher in steeper areas. Reduced absorption caused by soil compaction from heavy construction equipment can also aggravate erosion. Because of the relatively flat topography, the potential for increased erosion as a result of construction of the Watertown SE Alternative is insignificant.

5.9 COASTAL AREAS

A discussion of direct, indirect, or cumulative impacts to coastal areas is not applicable to this project because the area is not located near coastal areas.

5.10 AIR QUALITY

The proposed project would have an impact on air quality from:

- The operation of the natural gas turbine and associated equipment
- Construction of the generation station and gas pipeline line

5.10.1 Proposed Project

Table 5-2 presents emission rates expected from the facility-wide operation of the proposed combustion turbine generation station.

The proposed Groton site would be composed of one 80-100 MW natural gas-fired electric turbine generator. Emission rates provided in Table 5-2 were based on turbine specifications and emission factors from the proposed Groton gas turbine and are based on criteria established by EPA (EPA 2001). Worst-case emission estimations were determined based on an evaluation of various load and temperature screening scenarios provided by the manufacturer for the LMS100 turbine, without the CO reactor, which will be installed with the proposed turbine. A ratio of worst case emissions to "Guarantee" condition emissions (100% load and 78 °F) was determined for CO and NO_X, and subsequently applied to the emissions calculated for the "Guarantee" emissions for the LMS100 with the CO reactor.

TABLE 5-2
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
GE LMS100 TURBINE EMISSIONS SUMMARY FOR CRITERIA POLLUTANTS

Emission Unit:	**GE LMS100 Natural Gas Combustion Turbine Generator**
Fuel Flow:	**793.5**
Control Equipment:	**Dry Low NOx**

Criteria Pollutants	Emission Factor[A] (lb/MMBtu)[C]	Emission Rate[B] (lb/hr)[D]	Emission Rate (tons/yr)[E]
TSP	6.60E-03	5.24	15.2
PM_{10}	6.60E-03	5.24	15.2
SO_2	3.40E-03	2.70	7.82
NOx	NA	84.6	245
CO	NA	79.0	229
VOC	NA	15.5	44.9
Lead	4.90E-07	3.89E-04	1.13E-03

Notes:

NA Not applicable

A The emisison factors for TSP, PM_{10}, and SO_2 were obtained from AP-42, Table 3.1-2a (dated 4/00). An emission factor for lead was not available from AP-42, 3.1-2a, and was obtained from AP-42, Table 1.4-2 (dated 7/98). (The emission factor for lead was calculated by dividing 0.0005 lb/10^6scf by 1,020 MMBtu/10^6scf).

B The NO_X, CO and VOC emisison rates were provided by the manufacturer in units of lb/MMBtu and converted to pounds per hour or tons per ear based on fuel flow data at 78°F under 100 percent load conditions. A safety factor was applied to the NO_X and CO emission rates to account for variable temperature conditions, creating maximum emissions.

C lb/MMBtu => pounds per million British thermal units

D lb/hr => pounds per hour

E tons/yr => tons per year; assuming operation of 4,000 hours per year

Basin Electric will present these emission rates to the SDDENR as part of the state air permit application for the gas turbine. Because the turbine would be operated according to permit conditions, and it would be located in a remote area, no direct, indirect, or cumulative impacts from operation are anticipated.

Construction of the combustion turbine generation station site would result in short-term emissions from operation of vehicles (tailpipe emissions) and generating of fugitive dust. These construction-related emissions would have minor short-term direct and indirect impacts on air quality. These impacts would be restricted to short periods of construction along the proposed pipeline corridor and would diminish after construction ceases. Air quality permits from SDDENR would not be required for construction.

Emissions of NO_x, VOCs, CO, and SO_2 during construction would occur from the tailpipe of internal-combustion engines in a small dozer, tractor, backhoe, maintainer, fuel and maintenance trucks, four drilling rigs, a hydraulic lift truck, and from construction worker vehicles and supply trucks traveling to and from the work site.

Potential fugitive dust emissions (PM_{10} emissions) involve both land disturbance emissions from construction of the pipeline and gas turbine site, and tailpipe emissions from construction vehicles. During construction, fugitive dust could be generated from soil disturbed during clearing, grading, trenching, backfilling, and movement of construction vehicles. Fugitive dust would also be generated by wind erosion of disturbed areas before the area is re-vegetated.

Construction would have no significant long-term direct, indirect, or cumulative impacts on air quality at the combustion turbine generation stations. Monitored background values for PM_{10} concentrations near the construction areas do not currently exceed NAAQS, and short-term construction would not cause these background values to exceed NAAQS in the future. Because construction would not measurably increase background values, the cumulative effect on air quality from construction would be insignificant.

5.10.2 Watertown SE Alternative

Similar to the Proposed Project, construction of the combustion turbine generation station site would result in short-term emissions from operation of vehicles (tailpipe emissions) and generating of fugitive dust. These construction-related emissions would have minor short-term direct and indirect impacts on air quality

The proposed Watertown SE Alternative would be composed of one 80-100 MW natural gas-fired turbine. The turbine would have the same emissions as the emissions described in table 5-2 and have no significant direct, indirect, or cumulative impacts on air quality.

5.11 WATER QUALITY/RESOURCES

This section addresses the impacts of the proposed project on surface water and groundwater resources. The indirect, direct, and cumulative impacts of construction and operation of the proposed project are discussed in the following sections.

5.11.1 Proposed Project

Impacts to surface water from the proposed project would be insignificant. Surface water resources present within the proposed project corridors may include impounded stock ponds in pastureland, and ephemeral streams and drainages.

Direct, temporary impacts to the quality of water in small, ephemeral or unmapped water resulting from construction of the underground gas pipeline are anticipated to be minor. These impacts could result from movement of construction equipment and may include increased total suspended solids and sediment.

Construction would be conducted in accordance with a plan prepared by Basin Electric for control of sediment and erosion. The plan would be included with a water quality protection permit application to be submitted under Section 401 of the CWA. After construction, no direct, indirect, or cumulative impacts to surface water quality that would result from proposed project construction activities are anticipated.

No significant direct, indirect, or cumulative impacts to groundwater quality from the proposed project are anticipated. Subsurface activities would be required to install the gas connection lines to sufficient depth. However, placement of the proposed pipeline would penetrate approximately 6 feet into the ground. No aquifers are known to be present at the shallow depths required for installation of gas connection lines. As a result, the proposed project is not considered likely to impact groundwater resources or quality. Some shallow aquifers and perched groundwater may be present along the alignment of the gas connection line. No significant direct, indirect, or cumulative impacts to groundwater quality are expected to occur from project construction or operation.

5.11.1 Watertown SE Alternative

Direct, indirect, or cumulative impacts to surface water from the proposed project would be insignificant. No surface water resources are present in the area of the Watertown SE Alternative.

Direct, temporary impacts to the quality of water in small, ephemeral or unmapped water resulting from construction of the underground gas pipeline are anticipated to be insignificant. Construction would be conducted in accordance with a plan prepared by Basin Electric for control of sediment and erosion. The plan would be included with a water quality protection permit application to be submitted under Section 401 of the CWA. After construction, no direct, indirect, or cumulative impacts to surface water quality that would result from proposed project construction activities or operation are anticipated.

No significant direct, indirect, or cumulative impacts to groundwater quality from the Watertown SE Alternative are anticipated. Subsurface activities would be required to install the gas connection lines to sufficient depth. No aquifers are known to be present at the shallow depths required for installation of gas connection lines. As a result, the Watertown SE Alternative is not considered likely to impact groundwater resources or quality.

5.12 AESTHETICS

The addition of a gas turbine to the area would have no significant direct, indirect, or cumulative impacts on the already linear features of the landscape, as existing roads, fencing, subsurface gas lines, and existing power lines that transect the area.

5.12.1 Proposed Project

The addition of a gas turbine to the area would not cause significant direct, indirect, or cumulative impacts on the already linear features of the landscape, as existing roads, fencing, subsurface gas lines, and existing power lines that transect the area. Roads, transmission lines, fencing, and railroads transect the study area, and scattered farmsteads and agricultural areas are scattered throughout the region (Appendix A). The existing landscape has been modified by human activity in the past, and conversion of native grassland to rangeland and cropland and removal of shrubs along drainages have altered the viewscape. No scenic drives, trails, or viewpoints exist in the study area.

The Gas turbine facility would be constructed on a approximately 15-acre plot of land at the turbine site. An underground gas pipeline would be used to fuel the turbine. Security fencing and gates will be constructed to limit access to the site. Short-term construction activities would be visible during the project from highways and minor roads in the area. Equipment, traffic, signs, and raw earth would also be visible and would create a temporary effect during construction.

This project would have an insignificant impact on the visual aesthetics of the area, as existing transmission lines, substations, and roadways exist in the area. The incremental increase for this project will have an insignificant cumulative impact on aesthetics in the area. The project area is dominated by rolling farmland and rangeland. The addition of a gas turbine to the area would have no significant direct or indirect impacts on general aesthetics in the rural area.

Other development of land in the region would contribute to cumulative impacts by changing the viewscape. Recent developments such as highway construction, roads, substations, and transmission lines add to the permanent linear change in the landscape.

5.12.2 Watertown SE Alternative

The addition of a gas turbine to the area would have no significant direct, indirect, or cumulative impacts on the already linear features of the landscape, as existing roads, fencing, subsurface gas lines, and existing power lines that transect the area. No scenic drives, trails, or viewpoints exist in the study area.

Short-term construction would be visible during the project the minor roads in the area. Equipment, traffic, signs, and raw earth would be visible and would create a temporary effect during construction.

This project would have an insignificant impact on the visual aesthetics of the area, as existing transmission lines. The incremental increase for this project will have an insignificant impact on aesthetics in the area. The addition of a gas turbine to the area would have minimal direct or indirect impacts on general aesthetics.

5.13 TRANSPORTATION

No significant direct, indirect, or cumulative impacts to the transportation systems in the project area are expected as a result of the construction or operation of the proposed project.

5.13.1 Proposed Project

No significant direct, indirect, or cumulative impacts to the transportation systems in the project area are expected as a result of the construction or operation of the proposed project. Short-term impacts may include an additional amount of localized traffic associated with construction activities and minor traffic delays during construction of the proposed Groton gas turbine facility and pipeline. Any such short-term roadway closings would be scheduled with appropriate authorities and clearly marked, and detour routes would be provided as necessary.

No major or small airports are located within 15 miles of the proposed Groton gas turbine facility. The height of all facilities associated with the proposed project will be well below any height restrictions from the FAA and will not penetrate any protected air space in the vicinity of these airfields.

5.13.2 Watertown SE Alternative

No significant direct, indirect, or cumulative impacts to the transportation systems in the project area are expected as a result of the construction or operation of the Watertown SE Alternative. The only roads impacted by short–term construction activities would be seldom-used gravel roads.

The height of all facilities associated with the proposed project will be well below any height restrictions from the FAA and will not penetrate any protected air space in the vicinity of these airfields.

5.14 NOISE AND RADIO AND TELEVISION INTERFERENCE

5.14.1 Proposed Project

The following sections discuss potential impacts from noise and radio and television interference.

<u>**Audible Noise**</u>

Noise associated with this proposed project would originate from the: (1) operation of gas turbine and (2) construction of the turbine and underground gas pipeline.

Noise impacts associated with gas turbine would be limited to the vicinity of the gas turbine facility.

Impacts caused by construction of the gas turbines are expected to be minimal and to have only a temporary impact. Short-term noise associated with vehicular traffic for deliveries of equipment and equipment off-loading would be created during the normal workday. The approximate noise level for existing vehicular traffic is 78 decibels (dBA). Noise from vehicular traffic involved in construction of the sites would not differ significantly from existing traffic-related noise. A significant portion of existing traffic on major regional thoroughfares is heavy trucks associated with agricultural operations. Other construction noises including drilling, pounding, and air compressors would contribute noise to the areas over a relatively short period, stopping when construction is complete. Because most equipment will be installed during daylight hours, nighttime disturbance should not be significant. Noise levels are expected to reach 85 to 105 dBA during construction of gas turbine facility. Construction would have little cumulative effect on the area.

Operation Related Noise

Operation of the combustion turbine will result in slightly increased noise levels near the gas turbine. Data provided by GE guarantee that the noise level caused by the turbine will be 65 dBA at a distance of 400 feet from the source. This guaranteed noise level may be used to calculate the expected sound level at the nearest residential dwelling. Sound pressure falls inversely with distance. Doubling the distance from a point source produces a reduction of sound of 6 dBA. To calculate the noise levels some distance away from a point or industrial source, the equation is:

$$\mathbf{SPL2 = SPL1 - 20\log(R2/R1)}$$

Where SPL2 = sound pressure level in dB at distance R2
SPL1 = sound pressure level in dB at distance R1

The residence to the north of the existing substation is located approximately 1,700 feet from the planned location of the power generation system and GE guarantees 65 dB at 400 feet. Using the sound calculation equation above; the reduction in noise level should be approximately 12.57 dB from the guaranteed level at 400 feet.

$$\mathbf{SPL2 = 65 - 20\log(1700/400)}$$
$$SPL2 = 65 - 12.57$$
$$SPL2 = 52.43$$

Where 65 = SPL1 *or* guaranteed sound level
1700 = R2 *or* distance from turbine to nearest residence
400 = R1 *or* distance to guaranteed sound level

Therefore, the estimated noise level at the nearest residential location resulting from turbine operation would be approximately 52-54 dBA depending on the exact configuration of the equipment, weather, air absorption, ground attenuation effects, and barriers and reflections. The residence is protected by rows of trees so the actual sound level at the residence would probably be less. This noise level at the residence is within the range typically considered acceptable by most regulatory agencies and is comparable to a normal conversation at 3 feet.

Radio and Television Interference

Interference with radio and television signals could occur in vehicles driving in the vicinity of, or homes located near, the transmission lines. However, interference is expected to be limited, since radio and television interference generally occurs in older transmission lines with loose or dirty insulators and spark gaps and transmission lines currently exist in the project area. In addition, the gas turbine and associated transmission lines will be constructed in accordance with the standards and guidelines published by the NESC. The underground gas pipeline operation is expected to have no significant impacts to radio and television signals.

5.14.2 Watertown SE Alternative

The following sections discuss potential impacts from noise and radio and television interference.

Audible Noise

Noise associated with this proposed project would originate from the: (1) operation of gas turbine and (2) construction of the turbine and underground gas pipeline. Noise impacts associated with gas turbine would be limited to the vicinity of the gas turbine facility.

The noise levels related to operation of the generation station are expected to increase above noise levels in the area; however, impacts will be minimal because of the remoteness of the Watertown SE Alternative.

Other construction noises including drilling, pounding, and air compressors would contribute noise to the areas over a relatively short period, stopping when construction is complete. Because most equipment will be installed during daylight hours, nighttime disturbance should not be significant.

Operation Related Noise

Operation of the combustion turbines will result in slightly increased noise levels near the gas turbine in the long term. The local terrain at each proposed site is open, rolling agricultural land, which would not aid in reducing noise from the turbines. Gas turbines, based on manufactured specifications, are expected to generate noise levels of 85 dBA at three feet. These were purposely set back from dwellings to minimized noise disturbances.

Radio and Television Interference

Interference with radio and television signals could occur in vehicles driving in the vicinity of, or homes located near, the transmission lines. However, interference is expected to be limited, since radio and television interference generally occurs in older transmission lines with loose or dirty insulators and spark gaps and transmission lines currently exist in the project area.

In addition, the gas turbine and associated transmission lines will be constructed in accordance with the standards and guidelines published by the NESC. The underground gas pipeline operation is expected to have no significant impacts to radio and television signals.

5.15 HUMAN HEALTH AND SAFETY

This section discusses the potential impacts of the proposed project on human health and safety.

5.15.1 Proposed Project

The proposed project would not present significant direct, indirect, or cumulative impacts posed by safety or electrical hazard to the general public. The proposed project would be constructed to NESC standards. General operation of gas turbine would not present a safety or electric hazard to the general public since Basin Electric's standard grounding policies effectively mitigate the possibility of nuisance shocks caused by induced currents from stationary objects. The facility would be fenced to prevent unauthorized access to the gas turbine and related equipment.

The operation of the gas turbine and associated electrical facilities may cause an increase in EMF. Numerous sources of EMF exist in nature and in the occupational and residential environments and, in nearly all instances, pose no obvious threat to human health or safety. Certain epidemiological investigations have suggested potential risks to residential and occupational populations from exposure to EMF. However, many studies report no statistically significant correlation. A recent Danish residential study reported that while consumption of electricity in Denmark has increased by 30 times since 1945, incidence rates of cancer had changed little (Guenel and others 1993). In October 1996, NRC completed a study of research on EMF that had been ongoing since 1979 and concluded that the evidence so far "does not show that exposure to these fields presents a human health hazard" (NRC 1996). Laboratory studies have also been predominantly inconclusive. Because the majority of the proposed alignment would be located in rural, undeveloped areas, the potential for effects is further diminished and direct, indirect, and cumulative impacts are not anticipated to be significant.

The gas pipeline would be buried, clearly marked in accordance with local and federal regulations, and pose no significant impacts to human health and safety. In addition, no impacts should occur to existing schools, health facilities, or hazardous materials sites during operation of the project.

5.15.2 Watertown SE Alternative

The Watertown SE Alternative would not present significant direct, indirect, or cumulative impacts posed by safety or electrical hazard to the general public. The proposed project would be constructed to NESC standards. The facility would be fenced to prevent unauthorized access to the gas turbine and related equipment.

The operation of the gas turbine and associated electrical facilities may cause and increase in EMF. Because the Watertown SE Alternative would be located in rural, undeveloped areas, the potential for effects is further diminished and direct, indirect, and cumulative impacts are not anticipated to be significant.

5.16 SOCIOECONOMIC AND COMMUNITY RESOURCES

This section evaluates the potential impacts of the proposed project in the context of social and economic changes in the counties of concern. Overall impacts to socioeconomic and community resources from the proposed project would be insignificant.

5.16.1 Proposed Project

Socioeconomic impacts from installation of the gas and gas connection lines would be insignificant. Construction and operation of the gas turbine would have a positive socioeconomic impact on local communities. The increased taxable value of the turbine site property following construction of the turbine would provide additional tax revenue to the. Increased tax revenue would be realized without significant increase in the demand for county services.

Population.

The proposed project would have an insignificant impact on population resources. This is primarily because of the relatively short construction period and the relatively rapid rate at which construction crews would pass through the area. It is not anticipated that the population of the area would be affected, as the number of workers required for construction of the gas turbine and underground gas pipeline would be relatively small. It is expected that a portion of the construction work force will be native to each specific county. Additional construction personnel from outside of the project area would usually include construction specialists and supervisory personnel who would temporarily relocate to the project area.

This temporary workforce would be accommodated within existing temporary housing in the project area such as motels and hotels.

Economic Conditions

The proposed project may have a positive direct impact on economic conditions for the area. Labor expenditures would be spread over time and would include salaries, benefits, and overtime for contract supervisors, skilled and unskilled labor, and equipment rental. It is expected that construction and operation of the gas turbine and would result in increased sales tax receipts both locally and on a statewide basis.

In addition to local expenditures by construction workers, other income generated by the construction of the gas combustion sites and underground gas pipeline would include local purchases of material. It is likely that Basin Electric would acquire a variety of construction materials, supplies, and fuel in the project area. Construction materials could include fencing, concrete, tools, fuels, and a variety of other construction-related materials. Local suppliers of these materials could expect increases in sales during the construction period. Because some of the work force would be local, the impact on housing would be negligible.

Environmental Justice

The proposed project would not have a significant impact on environmental justice. Pursuant to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, the Proposed Project has been evaluated to assess whether it would result in any disproportionately high and adverse human health or environmental effects on minority and low-income populations. The percentage of minorities in the two counties is low, as Table 4-8 illustrates (see Section 4.16.3). In addition, the percentage of the population below poverty level in the project area was comparable to the identified percentages on a statewide basis. Construction of the project would not present a disproportionate impact to human health or the environment on minorities or low-income populations. No additional burdens would be imposed on local minority or low-income services as a result of the proposed construction.

Local Facilities, Services, and Utilities

The anticipated workforce is not large and a portion of the work force proposed for construction of the project would be local; therefore, there should be little additional demand on local services such as police, medical facilities, fire, or educational services, and there should be no detrimental impact to the community. No significant cumulative impacts on the existing infrastructure are expected to occur as a result of the proposed project.

5.16.2 Watertown SE Alternative

Population

The Watertown SE Alternative would have an insignificant impact on population resources. This is primarily because of the relatively short construction period and the relatively rapid rate at which construction crews would pass through the area. It is not anticipated that the population of the area would be affected, as the number of workers required for construction of the gas turbine and underground gas pipeline would be relatively small. It is expected that a portion of the construction work force will be native to each specific county. Additional construction personnel from outside of the project area would usually include construction specialists and supervisory personnel who would temporarily relocate to the project area. This temporary workforce would be accommodated within existing temporary housing in the project area such as motels and hotels.

Economic Conditions

The Watertown SE Alternative may have a positive direct impact on economic conditions for the area. It is expected construction and operation of the gas turbine and would result in increased sales tax receipts both locally and on a statewide basis. It is likely that Basin Electric would acquire a variety of construction materials, supplies, and fuel in the project area. Construction materials could include fencing, concrete, tools, fuels, and a variety of other construction-related materials. Local suppliers of these materials could expect increases in sales during the construction period. Because some of the work force would be local, the impact on housing would be negligible.

Environmental Justice

The Watertown SE Alternative would not have an impact on environmental justice. The percentage of minorities in the project area is low. In addition, the percentage of the population below poverty level in the project area was comparable to the identified percentages on a statewide basis. Construction of the project would not present a disproportionate impact to human health or the environment on minorities or low-income populations. No additional burdens would be imposed on local minority or low-income services as a result of the proposed construction.

Local Facilities, Services, and Utilities

The anticipated workforce is not large and a portion of the work force proposed for construction of the project would be local; therefore, there should be little additional demand on local services such as police, medical facilities, fire, or educational services, and there should be no detrimental impact to the community. No significant cumulative impacts on the existing infrastructure are expected to occur as a result of the Watertown SE Alternative.

6.0 MITIGATION AND MONITORING

This section describes, where possible and when appropriate, specific mitigation measures and monitoring commitments that would be implemented to avoid or minimize the impacts of the proposed project or that are required by federal, state, or local permits or approvals. Where appropriate, the following mitigation and monitoring commitments apply to the Proposed Project and the Watertown SE Alternative.

6.1 LAND USE

The proposed Groton gas turbine and the Watertown SE Alternative occupy existing right-of-way and mainly private land that is zoned agricultural and is regulated local land use plans and ordinances; or as described in Section 4.1. Following are specific measures that would be adopted to protect land use in the proposed project and the alternative project site:

- A commitment to follow the recommendations of the district conservationist to minimize soil erosion, and prevent noxious weeds.
- Periodic closure of access to livestock and farm irrigation, tilling, and harvesting operations, scheduled to minimize local occupational disruption.
- Routing of the underground gas pipeline would share existing road and utility rights-of-way
- Design and installation of gas turbine would meet the project objectives for cost and reliability and provide for minimal disruption of land use activities.

6.2 FLOODPLAINS

The proposed project or the Watertown SE Alternative will be designed and constructed in accordance with all federal, state, and local requirements, including any ordinances. Information will be submitted to local permitting agencies, as required by applicable flood damage prevention ordinances, to demonstrate that the proposed facility will meet the criteria specified in the ordinance, requiring a description of any potential alteration in flood watercourses and, if an alteration in a water course is anticipated, certification that the flood-carrying capacity of the watercourse would not be diminished. Floodplain development permits and any other required state, local, or federal permits will be obtained before construction begins.

Concerns related to erosion or other physical impacts to floodplains in the event of a 500-year flood would be addressed through engineered controls. Hydraulic analysis of affected areas would be conducted to verify that the gas turbine site is constructed properly, and design drawings and specifications for gas pipeline construction would be reviewed by a registered professional engineer and would be certified as adequate to withstand forces associated with a 500-year flood.

6.3 WETLANDS

The proposed gas turbine site and 11.5-mile natural gas pipeline corridor either cross or are near wetland areas as described in Section 4.3. In the unlikely event that work would need to be performed off the roadway but within the right-of-way, these crossings would be designed to minimize direct and indirect impacts to wetland functions, as described below.

- Designs would include stabilization and regrading immediately upon completion of the pipeline crossing, as required under the Nationwide 12 permit.
- Salvage and replacement of 6 to 12 inches of soil on the regraded wetland areas to help reestablish the hydrophytic vegetation.
- All adjacent upland areas disturbed by construction or maintenance would be surrounded by silt fences and staked hay bales, as appropriate, to minimize indirect impacts to wetlands caused by siltation or sedimentation.
- Staging and laydown yards for project-related construction would be established at least 50 feet from waterways or wetlands, if permitted by topography. No vegetation would be cleared between the yard and the waterway or wetland.
- Construction equipment would not be serviced within 25 feet of waterways or wetlands. Equipment would not be fueled within 100 feet of the waterways or wetlands.
- Any spills of fuels or other hazardous materials during construction or system maintenance would be promptly contained and cleaned up to the extent possible.
- Any herbicides used in ROW maintenance would be approved by EPA and applied by licensed professionals. Application of herbicides would be limited to the extent necessary for regular maintenance of the transmission system.
- Best management practices would be implemented to minimize erosion and sedimentation, runoff, and surface instability during construction.

6.4 CULTURAL RESOURCES

The proposed gas turbine facility and ancillary underground gas pipeline will not affect any known significant cultural resources. However, should cultural resources be uncovered during excavation at any of these sites, work should cease immediately. The South Dakota SHPO should then be contacted to assess the find and potential mitigation before construction resumes.

6.5 THREATENED AND ENDANGERED SPECIES

No specific mitigation measures are applicable, because the proposed project would not pose negative ecological impacts to rare, threatened, endangered, or candidate species. If a T&E issue were to arise during construction or operation, Basin Electric would cooperate with the USFWS and the SDDGFP to comply with applicable federal and state regulations.

6.6 FISH AND WILDLIFE

Construction activities would be located within existing cropland and maintained road right-of-way to avoid primary areas of wildlife habitat.

Vegetation would be replanted in all areas disturbed by construction to limit displacement of wildlife and their food sources, and to mitigate the cumulative impacts of regional habitat loss. Trees removed during construction would be replaced by planting nearby where practicable. Native grasses would be reseeded, and shrubs should be replaced with container-grown plants to decrease time for establishment.

6.7 VEGETATION

After construction is complete, any compacted soil would be tilled and the area would be reseeded with native grasses and forbs. Because of their slower growth and establishment, shrubs would be replaced with container-grown plants to decrease time for establishment. Trees removed during construction of the natural gas pipeline would be replaced within the vicinity where practicable. Any off-road activity would be avoided when the soil is saturated to avoid excessive disturbance and soil compaction. Routing of the underground gas pipeline would share existing road and utility rights-of-way to minimize new clearing and would be re-vegetated if necessary.

6.8 GEOLOGY, TOPOGRAPHY AND SOILS

Erosion of soil at the gas turbine plant site or along the 11.5 mile underground gas pipeline corridor would be managed through implementation of a county- or state-approved soil erosion and sediment control plan until vegetation is re-established naturally or through seeding.

The following practices would be adopted for construction practices to minimize impacts to geological and soil resources.

- The amount of land cleared at any time would be limited to the amount required to complete the next phase of the generator or pipeline construction activity.
- Natural ground cover would be retained to the extent possible.
- Any topsoil removed during construction would be stockpiled for use during reclamation.
- Six to twelve inches of soil will be salvaged separately and replace on the pipeline trench after backfilling.
- Disturbed areas would be reclaimed as soon as practicable after construction ends in those areas.
- Areas where cover is removed would be seeded with native plant species.
- Reasonable steps would be taken to ensure that any fill material used during construction is free of contaminants.

6.9 COASTAL AREAS

No coastal areas are located in the project area. Coastal zone management or monitoring is not applicable to this project.

6.10 AIR QUALITY

A discussion of air quality mitigation measures are divided into the following categories:

- Operation of the turbine
- Construction of the gas turbine and underground gas pipeline

6.10.1 Air Quality Operation Mitigation

Particulate Matter

Particulate emissions from the GE LMS100 result from the incomplete combustion of noncombustible trace constituents in the fuel. Because the GE LMS100 will be fired exclusively on natural gas, which contains only trace quantities of non-combustible material, the particulate emissions are expected to be negligible. In addition, combustion turbines typically operate at 99 percent or greater combustion efficiency at full load. The NSPS for combustions turbines (40 CFR 60 Subpart GG) does not establish a limit for particulate emissions because the EPA recognized that particulate emissions from stationary gas turbines are extremely low. Therefore, firing of natural gas in the GE LMS100 is considered the most stringent level of control for particulate matter.

Sulfur Dioxide

Sulfur dioxide (SO_2) is formed in the gas turbine combustion process and is completely dependent on the sulfur content of the fuel since virtually all fuel sulfur is converted to SO_2. Pipeline quality natural gas is a relatively clean fuel with negligible amount of sulfur. The firing of only pipeline quality natural gas in simple-cycle combustion turbines is the most stringent method demonstrated for controlling SO_2 emissions. Since the GE LMS100 will be fired exclusively on pipeline quality natural gas, this is considered the most stringent level of control for SO_2 emissions.

Carbon Monoxide

CO emissions from turbines are a function of oxygen availability or excess air, flame temperature, residence time at flame temperature, combustion zone design, and turbulence. Combustion turbines are designed for maximum conversion of fuel to energy at full load conditions, resulting in comparatively low levels of incomplete combustion, and consequently low CO emissions when firing at full load. At lower loads, however, the fuel-to-energy conversion can be less efficient resulting in incomplete combustion and the formation of CO.

Catalytic oxidation removes CO from the turbine exhaust gas rather than limiting pollutant formation at its source. The oxidation of CO to CO_2 and water uses the excess air present in the turbine exhaust and the catalyst serves to lower the activation energy for the oxidation reaction to proceed. The turbine manufacturer has provided a guarantee that the operation of the GE LMS100 with the supplied catalyst, under specified conditions, will limit CO emissions to 28 ppmvd.

Volatile Organic Compounds

VOCs are formed during the combustion process due to incomplete oxidation of the carbon contained in the fuel. Commonly classified VOC pollutants can encompass a wide spectrum and may include some hazardous air pollutants. With natural gas combustion, some of the VOCs are unreacted trace constituents of the gas, while others are formed in the combustion of the heavier hydrocarbons. VOC formation is limited by ensuring complete and efficient combustion of the fuel in the combustion turbine. Maximized operating loads, high combustion temperatures, adequate excess air, and sufficient air/fuel mixing during combustion will minimize VOC emissions.

Catalytic oxidation is the post-combustion method for controlling VOC emissions in the GE LMS100. The oxidation catalyst promotes the oxidation of VOC to CO_2 and water. No reagent injection is necessary for the reaction to occur. The temperature of the flue gas as it passes through the catalyst and the VOC species present in the flue gas are the two factors affecting VOC oxidation. Higher temperatures promote more efficient oxidation of VOCs because long chain hydrocarbons are easier to oxidize than short chain hydrocarbons.

Nitrogen Oxide

NO_x is the number one pollutant in terms of quantity of emissions resulting from the combustion of natural gas in the simple-cycle turbine. Nitrogen oxides are formed in the gas turbine combustion process by the dissociation of nitrogen (N_2) and oxygen (O_2). Reactions following this dissociation result in seven known oxides of nitrogen. Of these, nitric oxide (NO) and nitrogen dioxide (NO_2) are the pollutants of interest that are referred to as NO_x. Nitrogen oxides are formed in turbine combustors by two mechanisms: (1) from the burning of fuel containing nitrogen, and (2) through the thermal oxidation of atmospheric nitrogen found in the combustion air. The GE LMS100 will be fueled by natural gas that contains little or no fuel burning nitrogen. Therefore, the majority of NO_x emissions will be a result of thermal oxidation. The primary factors influencing the amount of NO_x generated are the turbine combustor design, the type of fuel burned, ambient conditions, operating cycles, and the power output level as a percentage of the rated full power output of the turbine (USEPA 1993).

NO_x emissions from the turbine will be controlled by wet injection. The wet injection control reduces the formation of thermal NO_x with the injection of water or steam directly into the primary combustion zone with the fuel. The injected water or steam creates a heat sink that lowers the flame temperature and reduces the thermal NO_x formation. The water-to-fuel ratio is the most important factor affecting the performance of wet controls. In general, NO_x emissions decrease with higher water-to-fuel ratios (USEPA 1993).

Operation of the gas turbine requires a permit from South Dakota. The turbine will operate under permitted conditions and not exceed the emissions thresholds outlined in the operating permit.

6.10.2 Air Quality Construction Mitigation

Particulate emissions associated with construction of the generation station and associated transmission line would be mitigated using dust-suppression techniques. Examples of measures for control of particulates are, if necessary:

- Applying water or dust palliatives, such as magnesium chloride, to disturbed areas, as necessary, to reduce dust when vehicle traffic is present.
- Covering open haul trucks with tarps both on site and off site.
- Limiting vehicle speeds on unpaved roads and in the construction right of way (ROW), as required, to control dust.
- Removing any soil or mud deposited by construction equipment on paved roads near the egress from unpaved areas, when required.
- Stabilizing disturbed areas in compliance with the revegetation plan after construction is complete.

With implementation of these mitigation measures, PM_{10} emissions from construction would be substantially reduced.

6.11 WATER RESOURCES

Construction of the gas turbine site and underground gas pipeline would comply with all applicable federal, state, and local permits required for alteration of wetlands, streams, or rivers from the project. The following are specific measures that would be adopted to protect water quality in the proposed project corridors:

- Best management practices would be implemented to minimize erosion and sedimentation, runoff, and surface instability during construction.
- Construction would be conducted to minimize disturbances around surface water bodies to the extent possible.
- Current drainage patterns in areas affected by construction would be maintained to the extent possible.

- Staging areas for project-related construction equipment would be located in areas that are not environmentally sensitive.

- Any work in existing streams would be conducted, to the extent possible, during low flow periods or when the streams are dry.

- If stream crossings are required, temporary bridges would be constructed at as close to a right angle with the stream as possible. After construction, all temporary construction crossings would be removed and the area would be restored as nearly as possible to its original condition.

- Staging and laydown yards for project-related construction would be established at least 50 feet from waterways or wetlands, if permitted by topography. No vegetation would be cleared between the yard and the waterway or wetland.

- Construction equipment would not be serviced within 25 feet of waterways or wetlands. Equipment would not be fueled within 100 feet of the waterways or wetlands.

- Any spills of fuels or other hazardous materials during construction or system maintenance would be promptly contained and cleaned up to the extent possible.

Any herbicides used in ROW maintenance would be approved by EPA and applied by licensed professionals. Application of herbicides would be limited to the extent necessary for regular maintenance of the site.

6.12 AESTHETICS

The gas turbine would be located in a rural agricultural area. The addition of a gas turbine facility would have minimal impact on the area as existing power lines, fencing, and roads create a linear appearance in the area. Trees and shrubs planted near the gas turbine can conceal it from nearby roads. Construction debris and equipment would be removed from the view of residences and highways to minimize any temporary aesthetic impacts. Construction trash would be removed daily, and revegetation of the area would occur shortly after construction.

6.13 TRANSPORTATION

Right-of-way surveying and staking, vegetation clearing, construction, operation and maintenance of the proposed transmission line path would comply with all applicable state and local regulations and permit requirements. No airports are located in the immediate vicinity of the Proposed Project and no mitigation to aircraft or airfields are necessary. Basin Electric and its contractors would implement the following mitigation measures to avoid or minimize any potential impacts to transportation routes within the study area:

- Construction vehicles would not exceed the posted weight limit of bridges.
- Construction along or across roads and highways would incorporate an appropriate traffic control plan in accordance with the Manual of Uniform Traffic Control Devices.
- Permits would be obtained from the South Dakota Department of Transportation for encroachment across highways.
- No permanent access roads would be installed without securing an agreement from the landowner.

All access would be from the nearest existing public roadway and would avoid or minimize intrusion into off-site areas.

6.14 NOISE AND RADIO AND TELEVISION INTERFERNCE

Impacts related to radio and television interference are expected to be negligible based on calculations presented in the electrical effects analysis (Burns & McDonnell 2001). Basin Electric's policy is to investigate and correct problems with television and radio interference associated with its facilities. Construction activities would be scheduled and conducted to minimize annoyances to nearby residences. Construction and operation of the proposed project will probably cause an increase in the perceived noise levels at the nearby residence. The magnitude of that increase would be managed to adhere to noise abatement criteria values using relatively simple and inexpensive noise control techniques.

6.15 HUMAN HEALTH AND SAFETY

Construction of the East Side Peaking Project would comply with all NESC standards to ensure minimal safety and electrical hazards. Following are specific measures that would be taken to protect human health and safety in the proposed project area:

- Standard grounding policies would be implemented to minimize the possibility of nuisance shocks caused by induced currents from stationary objects.
- A fence and posted warning signs would be constructed to minimize the possible hazard of the gas turbine.
- The underground gas pipeline would by identified with warning signs to comply with local, state, and Federal requirements.

7.0 CORRESPONDENCE, PUBLIC NOTICE, AND OTHER PROJECT COORDINATION

As outlined in the Rural Utilities Service (RUS) guidelines for preparation of environmental reports (ERs), applicable federal state, and local government agencies and other potentially concerned parties received notification letters describing Basin Electric's Proposed Project and requesting information regarding potential concerns (RUS 2001). Appendix F contains copies of letters and other correspondence between Basin Electric and applicable agencies and parties. Appendix F also contains a copy of the newspaper advertisement and legal notice for the East Side Peaking Project.

8.0 DOCUMENT PREPARATION AND CONSULTATION

Tetra Tech EM Inc. (Tetra Tech) prepared this ER under contract to Basin Electric. The specialists who prepared this document are listed in Table 8-1. Other contributors involved in the production of this report include ACR Consultants, Inc, and Basin Electric.

TABLE 8-1

EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
LIST OF PREPARERS FOR ENVIRONMENTAL REPORT

Name	Education and Experience	Responsibility
Tetra Tech		
Robert Hammer	M.S, BS,. Meteorology 19 Years Experience	Program Manager
Bob Farnes	B.A. Geography 16 Years Experience	Project Manager, Field Investigation, Aesthetics Human Health and Safety
J. Edward Surbrugg, PhD	Ph.D. Soil Science M.S. Land Rehabilitation B.S. Range Ecology 21 Years Experience	Field Investigation Lead, Soils, Geology, Wetlands, Vegetation
Chris Mammoliti	M.S. Environmental Studies B.S. Fisheries & Wildlife Biology 25 Years Experience	Field Investigation, T&E Fish and Wildlife
Heather Paskevic	B.A. Geography 5 Years Experience	Maps, Figures, Spatial Analysis
Miriam Hacker	M.S. Civil and Environmental Engineering B.S. Mathematics 10 Years Experience	Air Quality, Climatology
Jessica Beck	B.S. Biology 3 Years Experience	Land Use, Floodplains
Keith Reamer	B.S. Geology 14 Years Experience	Geology, Water Resources
Jim Knight	M.S. Marketing and Business Administration B.S. Forestry and Wildlife Management 17 Years Experience	Noise, Radio, and Television Interference, Socioeconomic Conditions and Community
Jim Bowlby	B.S. Hydrology/Watershed Management 27 Years Experience	Technical Review

Name	Education and Experience	Responsibility
ACR Consultants Inc.		
Donna Stubbs	M.S. Interdisciplinary Archaeological Studies and Museum Studies 7 Years Experience	Cultural Resources
Basin Electric Power Cooperative		
Jim Berg	Certified Professional Geologist B.S. Geology 22 Years Experience	Oversight, Project Description, Need for Project
Myron Steckler	Registered P.E. B.S. Mechanical Engineering 14 Years Experience	Project Coordinator

9.0 REFERENCES

Basin Electric Power Cooperative (Basin Electric). 2003. 2003 Power Supply Analysis Study. Basin Electric Power Cooperative, Bismarck, North Dakota. November.

Basin Electric. 2004a. East Side Peaking Combustion Turbine Generator Site Selection Study. Basin Electric Power Cooperative, Bismarck, North Dakota. March.

Basin Electric. 2004b. Power Supply Analysis Study – Supplemental 2004. Basin Electric Power Cooperative, Bismarck, North Dakota. September

Burns & McDonnel. 2001. Rapid City 230 kV Transmission Project, Electrical Effects Analysis. Completed for Basin Electric Power Cooperative. Bismarck, North Dakota. May.

Bureau of Economic Analysis (BEA), U.S. Department of Commerce. 2003. "Per Capita Personal Income." Accessed November, 2003. Online at: http://www.bea.doc.gov

Delorme. 2001. *South Dakota Atlas & Gazetteer*. Second Edition.

Federal Emergency Management Agency (FEMA). 1998. Flood Insurance Rate Maps (FIRMS). Q3 Data for Brown, Deuel, and Spink Counties, South Dakota.

Grondahl, C. and K. Martin. 2003. North Dakota's Endangered and Threatened Species. North Dakota State Game and Fish Department's Nongame Program, Bismarck, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. Accessed on 10/30/2003. On-line Address: http://www.npsc.nbs.gov/resource/distr/others/endanger/endanger.htm

Guenel, P., P. Raskmark, X. Andersen, and E. Lynge. 1993. Incidence of Cancer in Persons with Occupational Exposure to Electromagnetic Fields in Denmark. *British Medical Journal* 50:758-764.

Hamilton, L., L. Howells. 1996. Water Resources of Spink County, South Dakota. Water-Resources Investigations Report 96-4056. Rapid City, South Dakota. U.S. Geological Survey

High Plains Regional Climate Center (HPRCC), Climate Data. Accessed May 2004. On-line Address: http://www.hprcc.unl.edu.

Kume, J. 1985. Water Resources of Deuel and Hamlin Counties, South Dakota. Water-Resources Investigations Report 84-4069. Huron, South Dakota. U.S. Geological Survey

Koch, N., W. Bradford. 1976. Geology and Water Resources of Brown County, South Dakota. Bulletin 25. Vermillion, South Dakota. U.S. Geological Survey

Larson, G.E. 1993. Aquatic and Wetland Vascular Plants of the Northern Great Plains. Gen. Tech. Rep. RM-238. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experimental Station. 681 pp.

National Resource Council (NRC). 1996. Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. Committee on the Possible Effects of Electromagnetic Fields on Biological Systems. National Academy Press.

NatureServe. 2003a. Comprehensive Species Report – NUMENIUS BOREALIS. Accessed on 10/31/2003. On-line Address: http://natureserve.org/explorer.htm.

NatureServe. 2003b. Comprehensive Species Report – LAMPSILIS TERES. Accessed on 10/31/2003. On-line Address: http://natureserve.org/explorer.htm.

Northern Prairie Wildlife Research Center (NPWRC). 2003. Butterflies of South Dakota. Accessed on 11/3/2003. On-line Address: http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/sd/485.htm.

Shearer, J.S. 2003. Topeka shiner (*Notropis topeka*) management plan for the state of South Dakota. South Dakota Department of Game, Fish and Parks, Pierre, Wildlife Division Report No. 2003-10, 82 pp.

Sibley, D.A. 2000. National Audubon Society: The Sibley Guide to Birds. Chanticleer Press, New York. 545 pp.

South Dakota Department of Game, Fish and Parks (SDDGFP). 2003a. Threatened, Endangered, and Candidate Species of South Dakota. Updated 3/8/20002. Accessed on 10/22/2003. On-line Address: http://www.state.sd.us/gfp/DivisionWildlife/Diversity/TES.htm.

SDDGFP. 2003b. Rare, Threatened or Endangered Animals Tracked by the South Dakota Natural Heritage Program. Updated March 15, 2002. Accessed on 10/22/2003. On-line Address: http://www.state.sd.us/gfp/DivisionWildlife/Diversity/TES.htm.

South Dakota Governor's Office of Economic Development (SDGOED). 2003. Community profiles. Accessed in November, 2003. On-line Address: http://www.sdgreatprofits.com/

South Dakota Natural Heritage Database. 2003. Rare, threatened or endangered animal locational records for Brown, Spink, and Deuel Counties. Database provided by Doug Backlund (SDDGFP) on 10/31/2003.

South Dakota State University. 2003. South Dakota GAP Analysis. Accessed on 10/31/2003. On-line Address: http://wfs.sdstate.edu/sdgap.htm

Tetra Tech EM Inc. (Tetra Tech). 2003a. Record of conversation regarding habitat affinities for two rare plant species and potential for their occurrence at proposed Watertown SE location. Between Doug Backlund, Wildlife Biologist, SDDGFP Wildlife Diversity Section and Chris Mammoliti, Biologist, Tetra Tech EM Inc. 11/4/2003.

Tetra Tech. 2003b. Field Notes Taken During Site Reconnaissance at Proposed Gas Turbine Locations. Prepared by Chris Mammoliti, Senior Biologist. October 27-29

Tetra Tech. 2003c. Field Notes Taken During Site Reconnaissance at Proposed Gas Turbine Locations. Prepared by Ed Surbrugg, Soil Scientist. October 27-29

U.S. Army Corps of Engineers. 2001. Fact Sheet – Nationwide 12 Permit. Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Bureau of the Census (Census Bureau). 2000. ARC Data Download Census 2000 TIGER/Line Data. Accessed June 30, 2003. On-Line Address: http://arcdata.esri.com/data/tiger2000/tiger_download.cfm

U.S. Department of Agriculture (USDA). 1994. Soil Conservation Service. Soil Survey of Brown County, South Dakota. National Cooperative Soil Survey, U.S. Department of Agriculture. June.

USDA. 1997. Natural Resources Conservation Service. Soil Survey of Deuel County, South Dakota. National Cooperative Soil Survey, U.S. Department of Agriculture. November.

USDA. 2003a. ArcExplorer 2.0 program on Compact Disk, and facsimile of Table 1 - Soil Interpretive Groups, from the South Dakota Technical Guide for Spink County, South Dakota. Transmitted by Jim Miller from the State Soil Conservationist's office in South Dakota. October 27.

USDA. 2003b. South Dakota Agricultural Statistics Service (SDASS). Accessed on June 26, 2003. On-line Address: http://www.nass.usda.gov/sd

USDA. 2003c. National Agricultural Statistics Service (NASS). 1992 Census of Agriculture. June 26, 2003. On-line Address: http://www.nass.usda.gov/census/census92/agrimenu.htm

USFWS. 2003a. Endangered Species by County List for South Dakota. Updated 6/5/2003. Accessed on 10/22/2003. On-line Address: http://southdakotafieldoffice.fws.gov/endsppbycounty.htm

USFWS. 2003b. Candidate Species By County List for South Dakota. Updated 10/7/2003. Accessed on 10/22/2003. On-line Address: http://southdakotafieldoffice.fws.gov/cty_cand.htm

USFWS, 2003c National Wetlands Inventory (NWI). 2003. "Wetland Data" Accessed October 2003. On-line Address: http:// wetlands.fws.gov/downloads.htm.

USGS. 2000. South Dakota Seamless USGS Topographic Maps on CD-ROM.

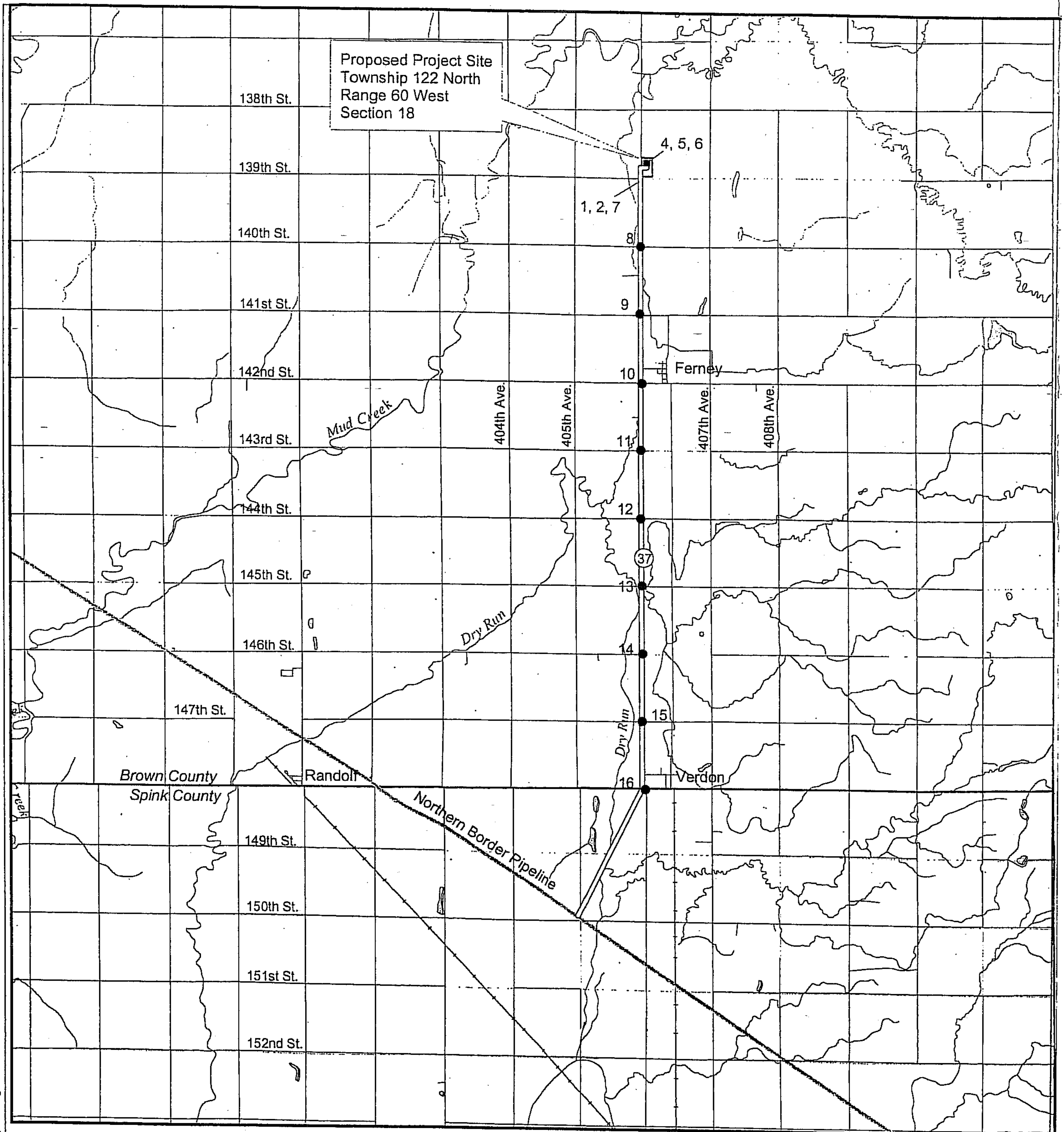
USGS. 1995. Quaternary Geologic Map of the Dakotas, 4° X 6° Quadrangle, United States.

USGS. 1996. National Seismic Shaking Hazard [online]. Accessed in November, 2003. On-line Address: http://geohazards.cr.usgs.gov/eq/index.html.

Wetland Training Institute, Inc. (WTI), 1995 Field Guide for Wetland Delineation: 1987 Corps of Engineers Manual. Poolesville, Maryland. WTI 95-3.

APPENDIX A

PROJECT PHOTOGRAPHIC LOG



Legend

- Proposed Project Area
- Proposed Gas Pipeline
- Photograph Location
- Road
- Stream
- Railroad
- Section Line
- Water

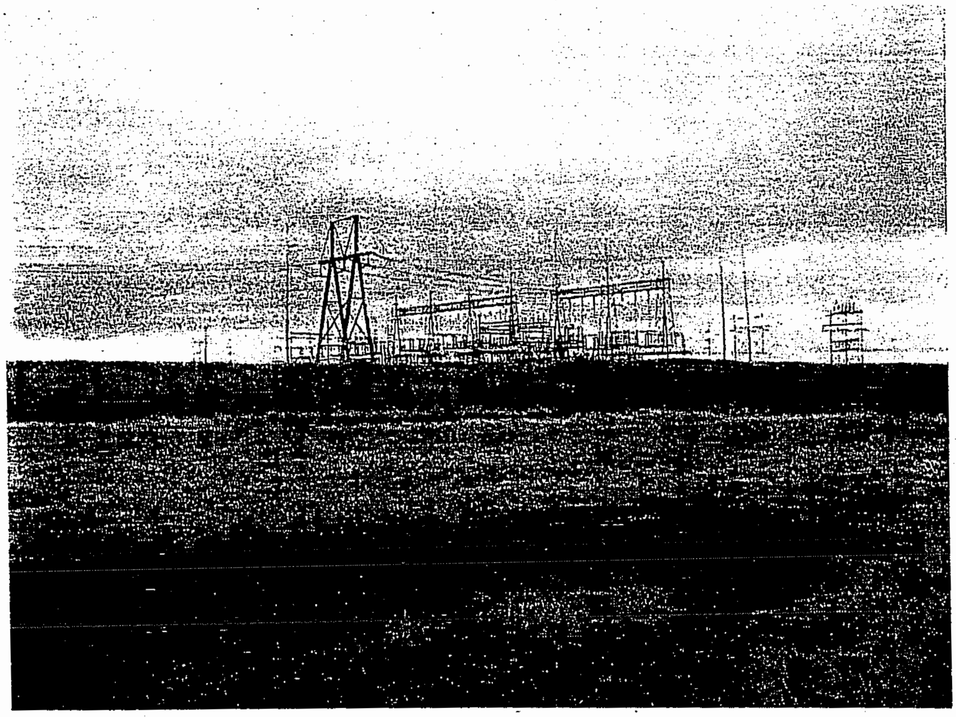
PHOTO LOG
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING

Miles
0 0.5 1 2 3

1/9/04 O:\Basin_Electric\Projects\SDPeaking_GrotonLine_PhotoLog.mxd HP

Photograph Groton-1 **October 2003**
Looking North into Section 18 (on right), Township 122 North, Range 60 West (Photo taken from Southwest corner of ¼ Section, Section 18, Township 122 North, Range 60 West, WAPA substation visible in foreground)

Photograph Groton-2 **October 2003**
Looking North into Section 18, Township 122 North, Range 60 West (Photo taken from Southwest corner of ¼ Section, Section 18, Township 122 North, Range 60 West, WAPA substation visible in foreground Basin Electric Substation visible in background)



Photograph Groton-3 **October 2003**
Looking West-Southwest into Section 18, Township 122 North, Range 60 West (Photo taken from Southwest ¼ of ¼ Section, Section 18, Township 122 North, Range 60 West) at pond between substations (WAPA substation visible in photo)

Photograph Groton-4 **October 2003**
Looking Southwest into Section 18, Township 122 North, Range 60 West (Photo taken from East of substations, Section 18, Township 122 North, Range 60 West) (Basin Electric Substation visible in photo)

Photograph Groton-5 **October 2003**
Looking West into Section 18, Township 122 North, Range 60 West (Photo taken from East of substations, Section 18, Township 122 North, Range 60 West) (Substation visible in photo)

Photograph Groton-6 **October 2003**
Looking West into Section 18, Township 122 North, Range 60 West (Photo taken from East of substations, Section 18, Township 122 North, Range 60 West) (WAPA Substation and retention pond visible in photo)

Photograph Groton-7 **October 2003**
Looking South into Section 19, Township 122 North, Range 60 West (Photo taken Southwest corner Section 18, Township 122 North, Range 60 West)

Photograph Groton-8 **October 2003**
Looking South into Section 30, Township 122 North, Range 60 West (Photo taken from Southwest corner Section 19, Township 122 North, Range 60 West)

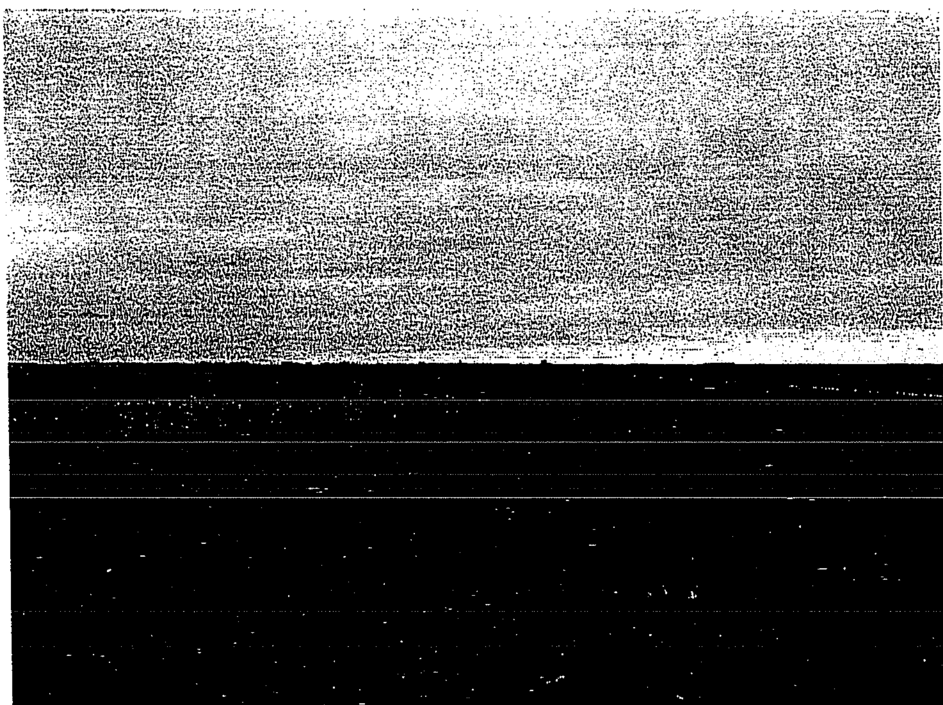
Photograph Groton-9 **October 2003**
Looking South into Section 31, Township 122 North, Range 60 West (Photo taken Southwest corner Section 30, Township 122 North, Range 60 West)

Photograph Groton-10 **October 2003**
Looking South into Section 6, Township 121 North, Range 60 West (Photo taken from Southwest corner Section 31, Township 122 North, Range 60 West)

Photograph Groton-11 **October 2003**
Looking South into Section 7, Township 121 North, Range 60 West (Photo taken from Southwest corner Section 6, Township 121 North, Range 60 West)

Photograph Groton-12 **October 2003**
Looking South into Section 18, Township 121 North, Range 60 (Photo taken from Southwest corner Section 7, Township 121 North, Range 60 West)

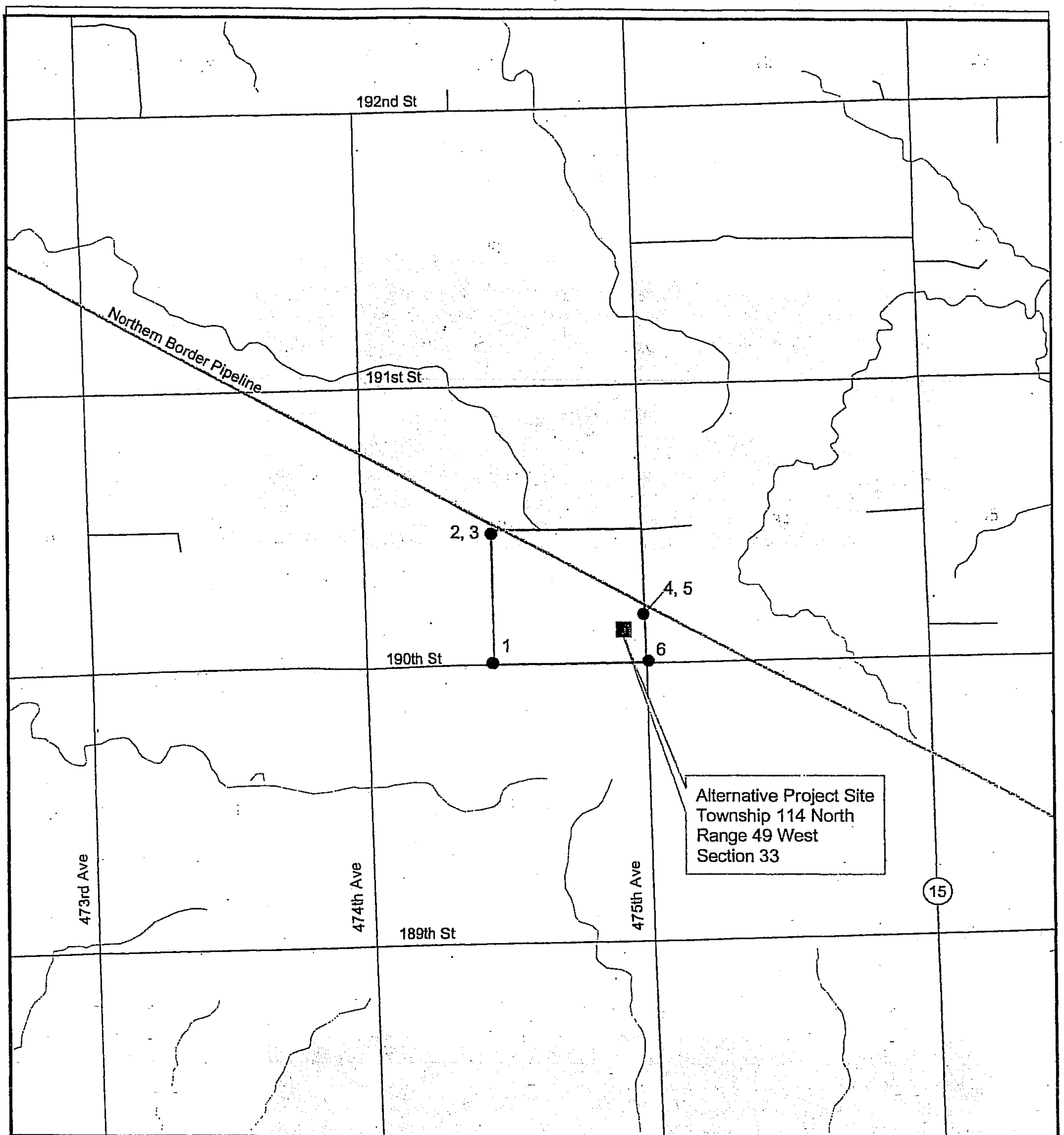
Photograph Groton-13 **October 2003**
Looking South into Section 19, Township 121 North, Range 60 West (Photo taken from Southwest corner Section 18, Township 121 North, Range 60 West)



Photograph Groton-14 **October 2003**
Looking South Section 30, Township 121 North, Range 60 West (Photo taken from Southwest corner Section 19, Township 121North, Range 60 West)

Photograph Groton-15 **October 2003**
Looking South into Section 31, Township 121 North, Range 60 West (Photo taken from Southwest corner Section 30, Township 121North, Range 60 West)

Photograph Groton-16 **October 2003**
Looking South into Section 6 Township 120 North, Range 60 West (Photo taken from Southwest corner Section 31, Township 121 North, Range 60 West)



Legend

Alternative Project Area

Alternative Project Site

Photograph Location

Road

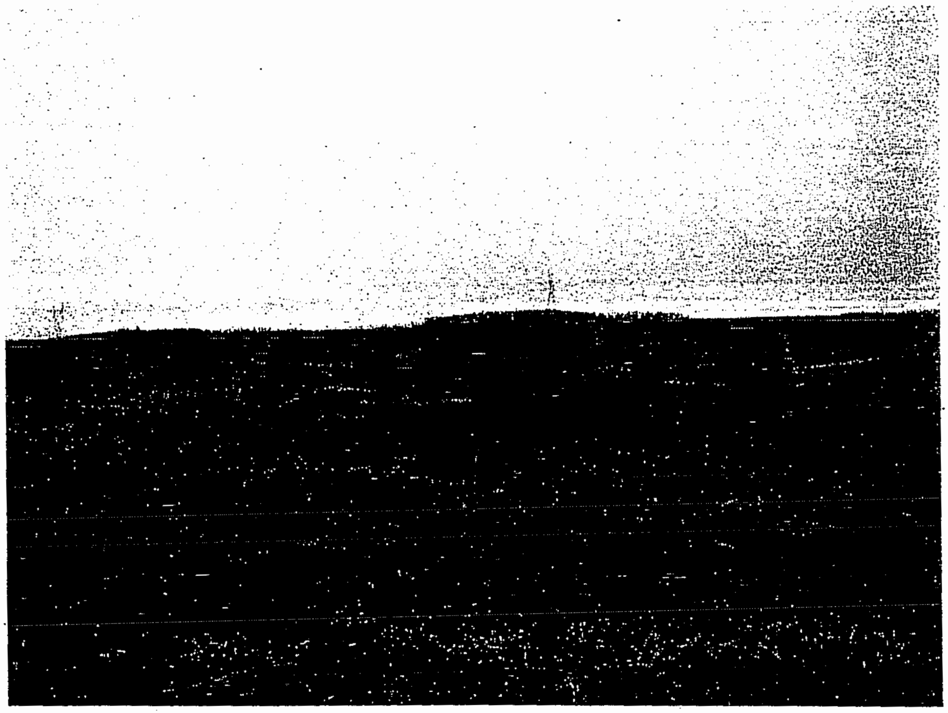
Stream

Section Line

PHOTO LOG
WATERTOWN SE ALTERNATIVE SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

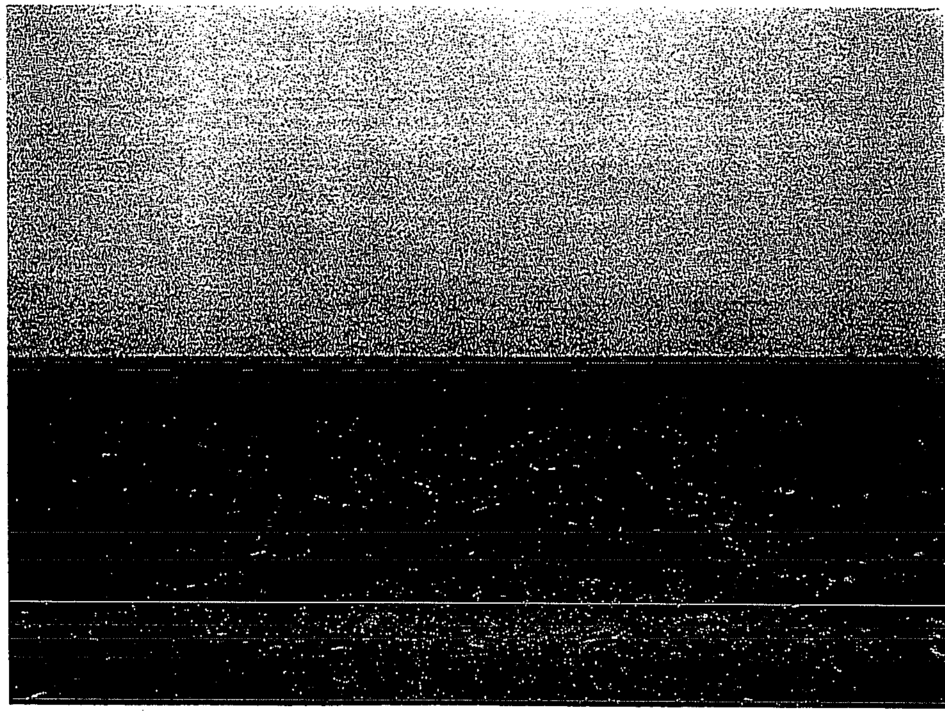
0 0.25 0.5 1 Miles

7/22/04 b:\project\basin_gis\projects\SDPeaking_Watertown_Transportation.mxd hp



Photograph Watertown-1 **October 2003**
Looking Northeast into Section33, Township 114 North , Range 49 West (Photo taken from Southwest corner of ¼ Section, Section 33, Township 114 North, Range 49 West, WAPA transmission line visible in foreground)

Photograph Watertown-2 **October 2003**
Looking Southeast into Section 33, Township 114 North, Range 49 West (Photo taken from Northwest corner of ¼ Section, Section 33, Township 114 North, Range 49 West, WAPA transmission line visible in foreground)



Photograph Watertown-3 **October 2003**
Looking Southwest into Section 33, Township 144 North, Range 49 West (Photo taken from Northeast corner of ¼ Section, Section 33, Township 114 North, Range 49 West, WAPA transmission line visible in foreground)

Photograph Watertown-4 **October 2003**
Looking West into Section 33, Township 114 North, Range49 West (Photo taken from pipeline crossing, Section 33, Township 114 North, Range 49 West, Northern Border Pipeline sign in photo)

Photograph Watertown-5 **October 2003**
Looking West into Section 33, Township 114 North, Range 49 West (Photo taken from pipeline crossing, Section 33, Township 114 North, Range 49 West, Northern Border Pipeline sign and WAPA transmission line in photo)

Photograph Watertown-6 **October 2003**
Looking Northwest into Section 33, Township 114 North, Range 49 West (Photo taken from tower base in the Southeast ¼ Southeast ¼ of Section 33, Township 114 North, Range 49 West WAPA transmission line in photo)

APPENDIX B

CULTURAL RESOURCES REPORT

A CLASS I CULTURAL RESOURCE SURVEY
FOR BASIN ELECTRIC POWER COOPERATIVE'S
PROPOSED TURBINE STATION AND GAS LINE
IN BROWN AND SPINK COUNTIES, SOUTH DAKOTA

Prepared for:
Tetra Tech EM Inc.
4940 Pearl East Circle, Suite 100
Boulder, CO 80301

Prepared by:
Donna L. Stubbs
Principal Investigator

ACR Consultants, Inc.
806 Avoca Avenue, Suite 2
Sheridan, Wyoming 82801

Report No. ACRC-140

September 10, 2004

ABSTRACT

In October 2003, Tetra Tech, Denver, Colorado, requested that ACR Consultants, Inc. (ACR), Sheridan, Wyoming, perform a cultural resource background research and reconnaissance level survey for an Environmental Assessment in South Dakota of a proposed turbine facility and gas pipelines. In August and September 2004, ACR surveyed a re-alignment of the pipeline.

ACR inventoried a total of 160 block acres and 24.9 linear miles (347.9 acres) and encountered one previously recorded site and three new sites. Site 39BN2003/39SP2003 is the Chicago & North Western Railroad. The site is eligible for the National Register of Historic Places (NRHP); however this segment is recommended as not contributing. An existing transmission line occupies the abandoned grade. This project will not adversely affect the site. Site BN-005-01226 (Verdon Cemetery), is recommended eligible for the NRHP. This site is located within the right-of-way on the east side of State Route 37; however, all work will be conducted on the west side of the highway and this project will not adversely affect the site. Site BN-005-00001/00002 (Finnegan/Heiser Farmstead) is recommended not eligible for the NRHP. This site is outside the project area and therefore will not be affected. Site BN-000-00001/00002/00003 (Bloedell/Hoops Farmstead) is recommended not eligible for the NRHP. The site is within the right-of-way on the west side of State Route 37; however, the project will not adversely affect the site. Cultural clearance is recommended for the project.

PROJECT LOCATION

Counties:	Brown and Spink
Legal Locations:	T120N, R60W, Sections 6, 7, and 18
	T121N, R60W, Sections 6, 7, 18, 19, 30, and 31
	T122N, R60W, Sections 18, 19, 30, and 31
	T120N, R61W, Sections 1,11, and 12
	T121N, R61W, Sections 1, 12, 13, 24, 25, and 36
	T122N, R61W, Sections 13, 24, 25, and 36
7.5' USGS quadrangles:	Groton, South Dakota (1954; photorevised 1978), Ferney, South Dakota (1974) and Conde, South Dakota (1954) (Figures 1-5).

INTRODUCTION

In October 2003, Tetra Tech EM, Inc. (Tetra Tech), on behalf of Basin Electric Power Cooperative (Basin), requested that ACR Consultants, Inc. (ACR), conduct a Class I block survey of the southwest quarter of Section 18, T122N, R60W and a Class I linear survey of 11.5 miles of the State Route 37 right-of-way from Section 19, T122N, R60W to Section 18, T120N, R60W in Brown and Spink Counties, South Dakota. In August 2004, Tetra Tech requested that ACR conduct a Class I linear survey of a realignment. The realignment consists of 11.5 miles of the west side of the State Route 37 right-of-way from Section 13, T122N, R61W to Section 12, T120N, R61W plus 1.9 miles paralleling the existing Northern Border Pipeline across Sections 1 and 12, T120N, R61W to a connection in the NESE of Section 11, T120N, R61W.

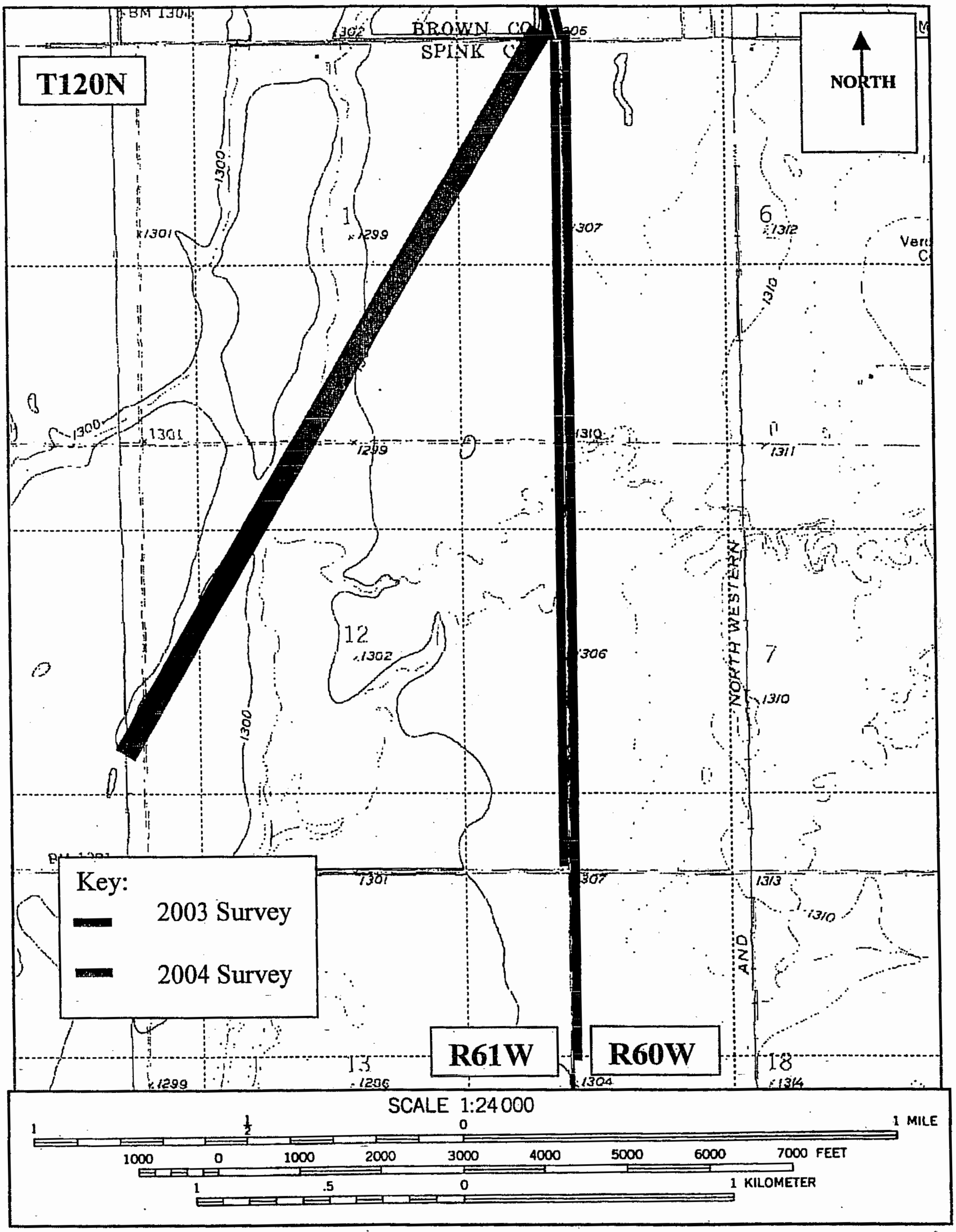


Figure 1. Map showing the Spink County segment of the proposed natural gas pipeline (blue and red lines) surveyed by ACR. Adapted from the 7.5' USGS quadrangle titled Conde, South Dakota (1958).

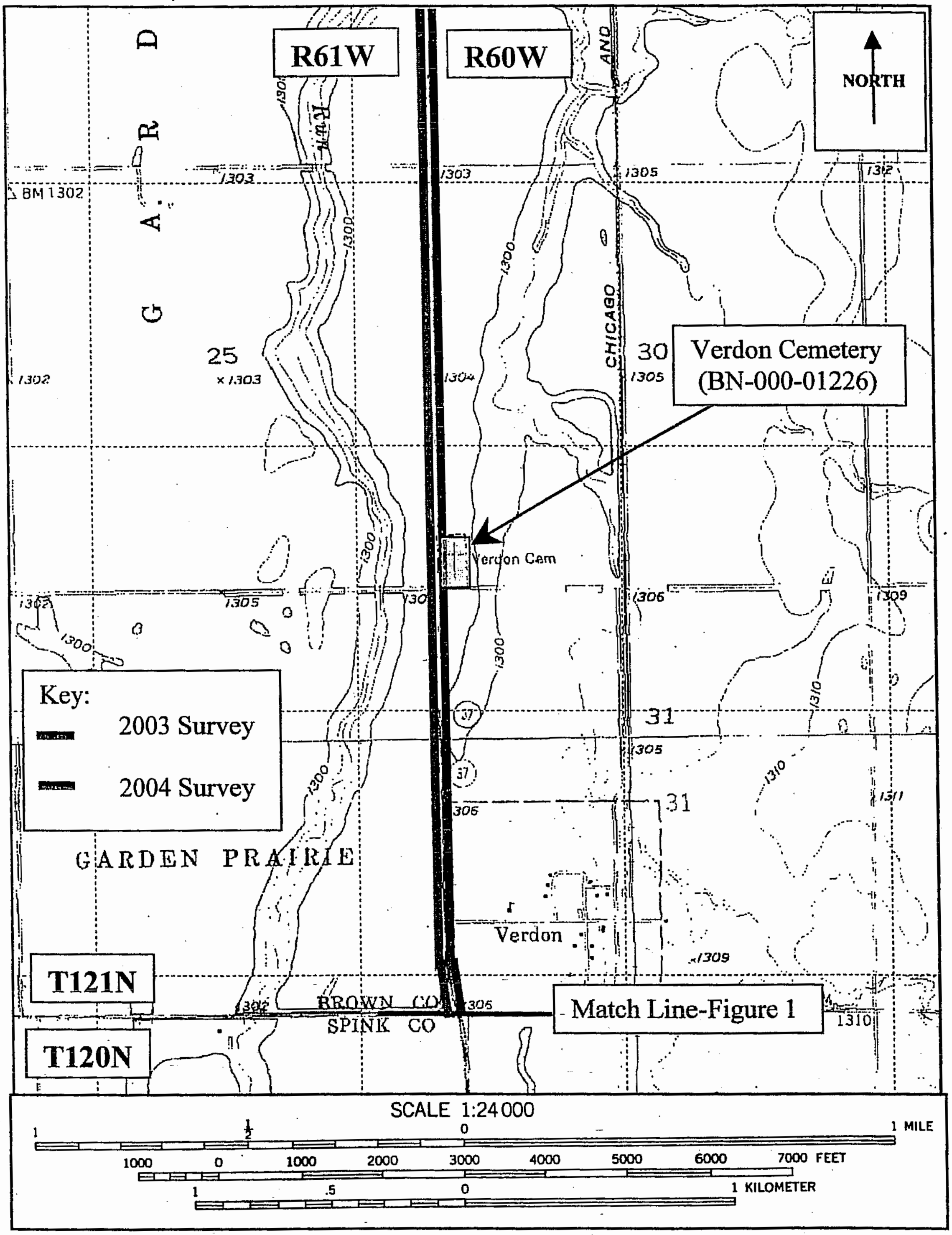


Figure 2. Map showing the southern portion of the Brown County segment of the proposed natural gas pipeline (blue and red lines) surveyed by ACR. Verdon Cemetery (BN-000-01226) is also illustrated. Adapted from the 7.5' USGS quadrangles titled Conde, South Dakota (1958) and Ferney, South Dakota (1954).

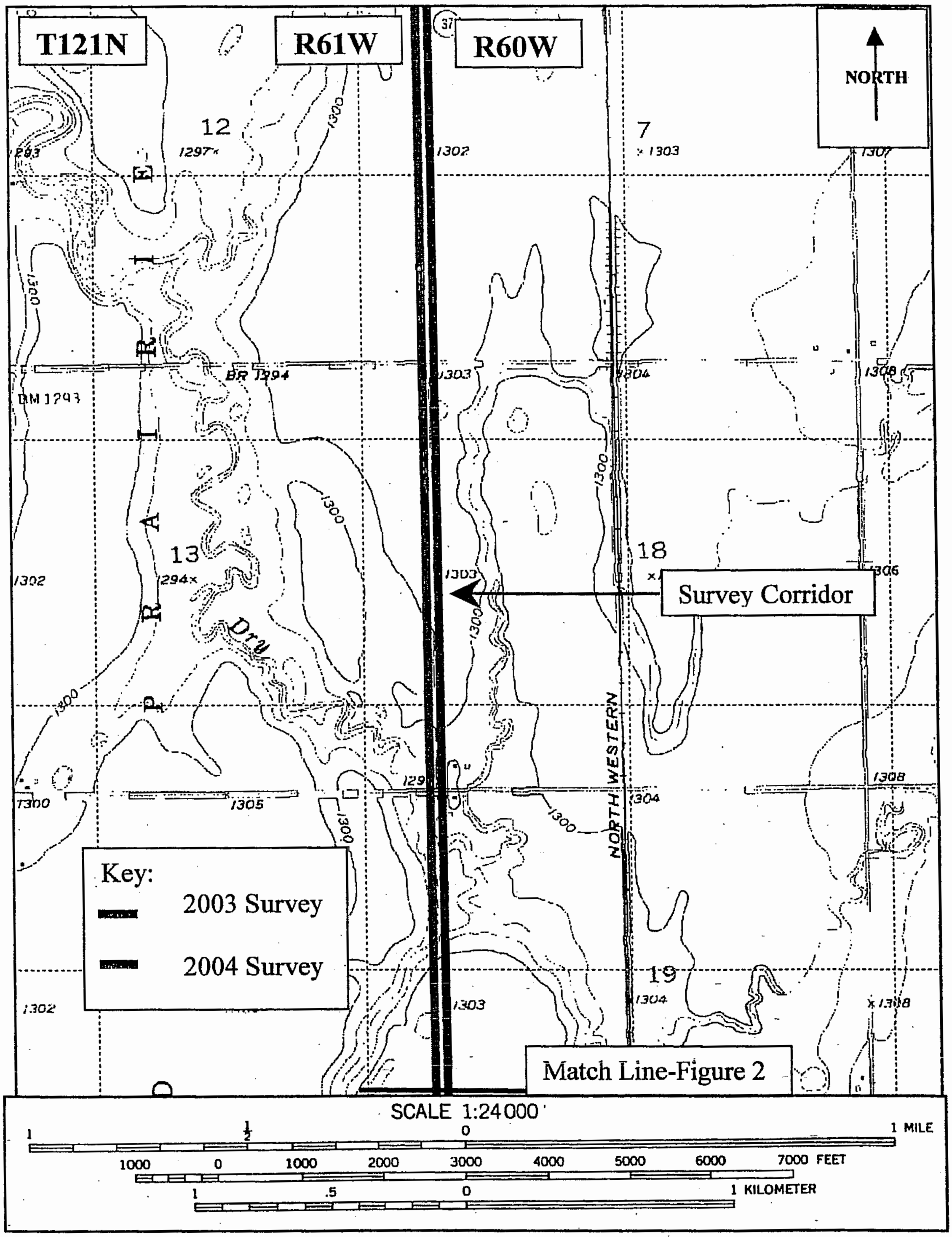


Figure 3. Map showing the center portion of the Brown County segment of the proposed natural gas pipeline (blue and red lines) surveyed by ACR. Adapted from the 7.5' USGS quadrangle titled Ferney, South Dakota (1954).

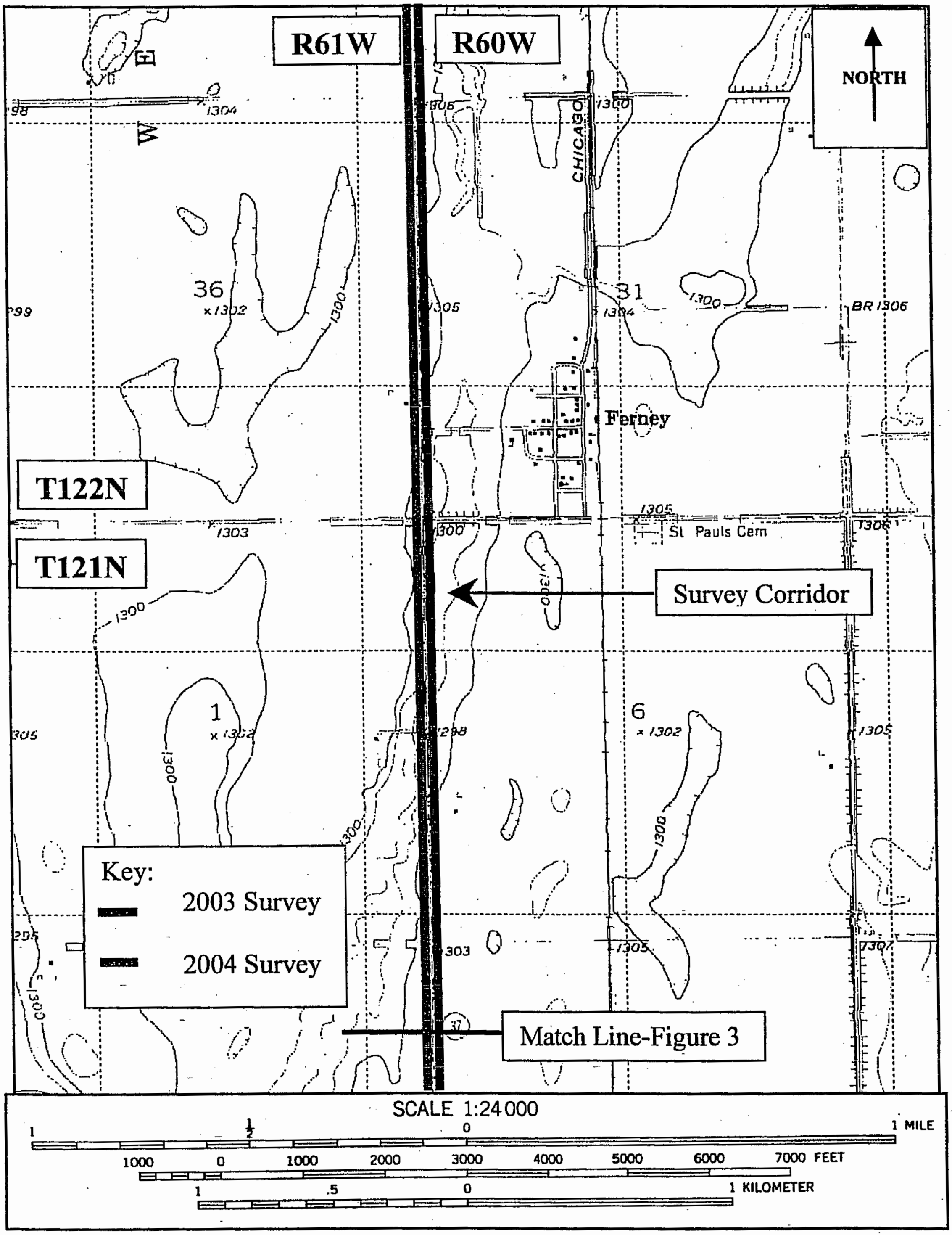


Figure 4. Map showing the center portion of the Brown County segment of the proposed natural gas pipeline (blue and red lines) surveyed by ACR. Adapted from the 7.5' USGS quadrangle titled Ferney, South Dakota (1954).

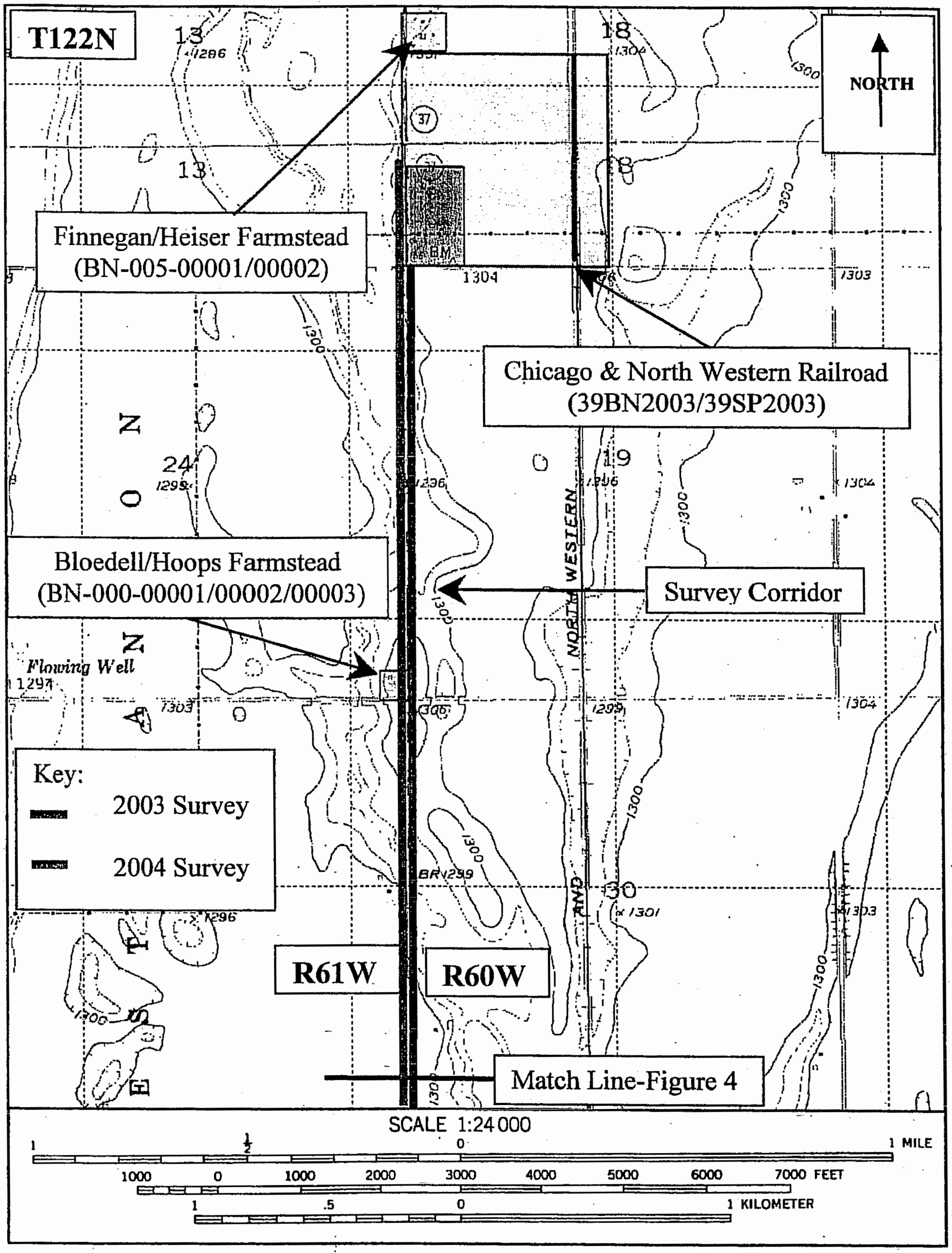


Figure 5. Map showing the 160-acre block (light blue square) surveyed for the Groton turbine facility (dark blue square) and the north portion of the Brown County segment of the proposed natural gas pipeline (blue and red lines) surveyed by ACR. The Chicago & North Western Railroad (39BN2003/39SP2003), Finnegan/Heiser Farmstead (BN-005-00001/00002), and Bloedell/Hoops Farmstead (BN-000-00001/00002/00003) are also illustrated. Adapted from the 7.5' USGS quadrangles titled Groton, South Dakota (1954; photorevised 1978) and Ferney, South Dakota (1974).

Basin proposes to build a gas-fired turbine power generator on 25 acres located in the SW corner of Section 18, T122N, R60W. A gas pipeline, measuring approximately 11½ miles, will also be built. Originally proposed for the east side right-of-way of State Route 37, the most recent proposal is for the west side right-of-way of State Route 37 paralleling the existing Northern Border Pipeline. ACR performed the present cultural resource survey to ensure that compliance with federal laws regulating the protection of historic properties, as defined in Section 106 of the National Historic Preservation Act and 36 CFR 800, is met.

ENVIRONMENTAL SETTING

The project area is located in northern central South Dakota within the Glacial Lake Basins subregion of the Northern Glaciated plains physiographic region. Archaeologically, the site is within the Upper James region. The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift fostering a grassland transitional between the tall and shortgrass prairie. In the project area, the Glacial Lake Basins subregion was once occupied by Lake Dakota, a proglacial lake formed when a major stream or river drainage was blocked by glacial ice during the Pleistocene. The smooth topography of the Glacial Lake Basins resulted from the slow buildup of water-laid sediments. The level, deep soils on the lake plains are intensively cultivated. Soils in the Glacial Lake Basins are mollisols formed in the glacial lake sediments. Natural vegetation is Western wheatgrass, blue grama, needleandthread, and green needlegrass. Currently the land is cultivated with crops such as wheat, sunflowers, flax, corn, and soybeans (USGS 1998).

Specifically, the project area occupies flat cultivated land (Figures 6 and 7). The block survey was in a recently harvested cornfield with chaff remaining. Visibility averaged approximately 40%. The re-survey across Sections 1 and 12 was through a cornfield with standing crop, a recently harvested wheat field, and a wetland (Figures 8 and 9). Transects were walked following the planted rows and staggered to follow the existing pipeline. Visibility in the cornfield averaged 85%. Visibility in the wheat field averaged less than 20%. The wetland had zero ground visibility with a thick growth of grasses, reeds, and thistles. Vegetation in the right-of-way was grass.

The nearest permanent water source is Mud Creek, one mile to the north of the project area. Elevation in the project area is approximately 1,300 feet above sea level.

The City of Groton lies approximately three miles north of the project area and two small rural towns, Ferney and Verdon, are within one mile east of the project area. Several modern impacts are present in the project area. There are two electrical substations within the SW1/4 of Section 18, T122N, R60W (Figure 10). As noted above, an overhead transmission line extends down the abandoned Chicago & North Western Railroad grade in Section 18, T122N, R60W and various additional overhead transmission lines cross the section from the substations (Figure 11). Between the two substations is a bermed water catchment pond, currently covered with grass (Figure 12). The right-of-way has been bermed and grassed adjacent to the road (Figure 13).

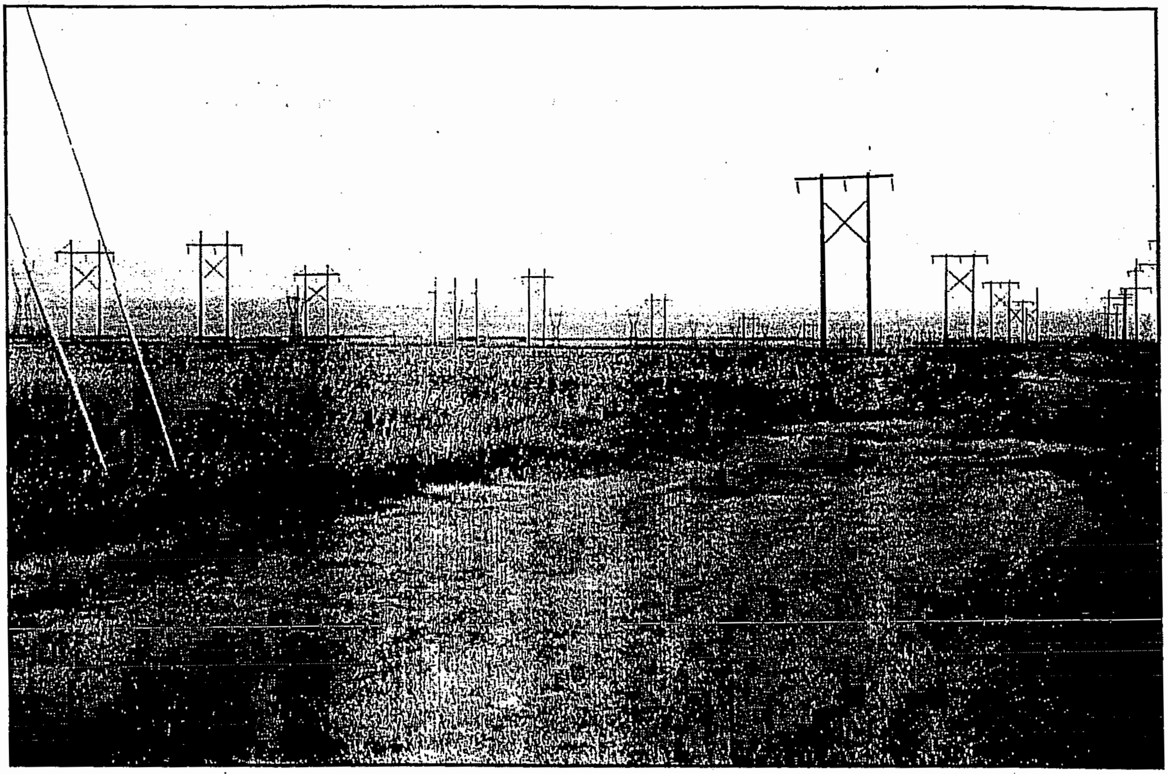


Figure 6. Project overview, block survey, southwest quarter, Section 18, T122N, R60W; looking east. Photo taken by Donna Stubbs, October 28, 2003.

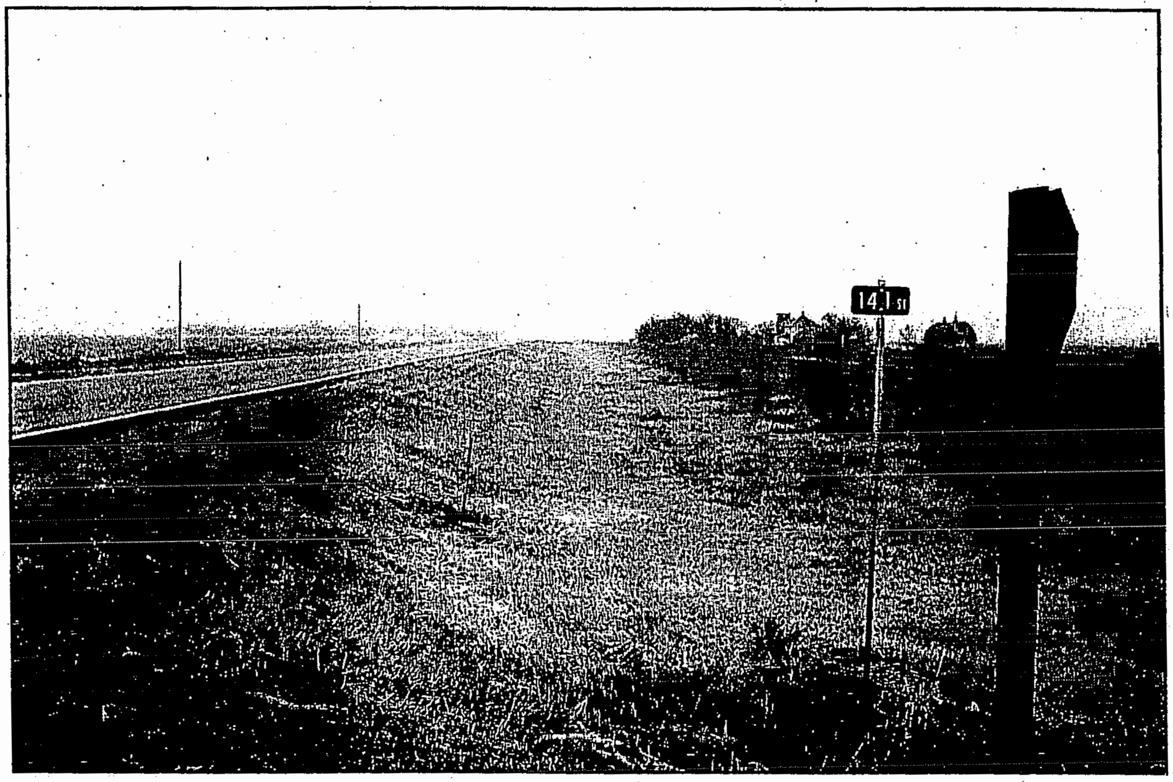


Figure 7. Project overview, linear survey. Center of project area, looking north. Photo taken by Donna Stubbs, October 30, 2003.

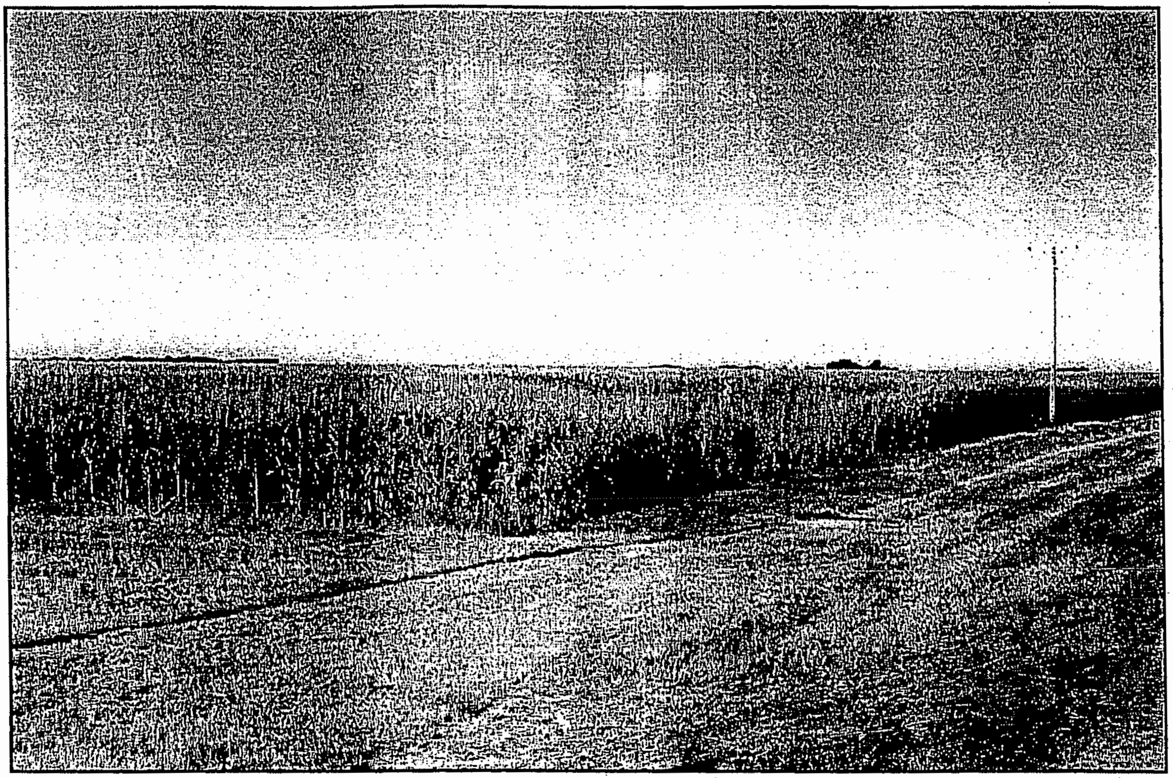


Figure 8. Project overview; north end of 2004 cross-country linear survey through cornfield near Spinks and Brown County line; view to the southwest. Photo taken by Donna Stubbs on August 18, 2004.

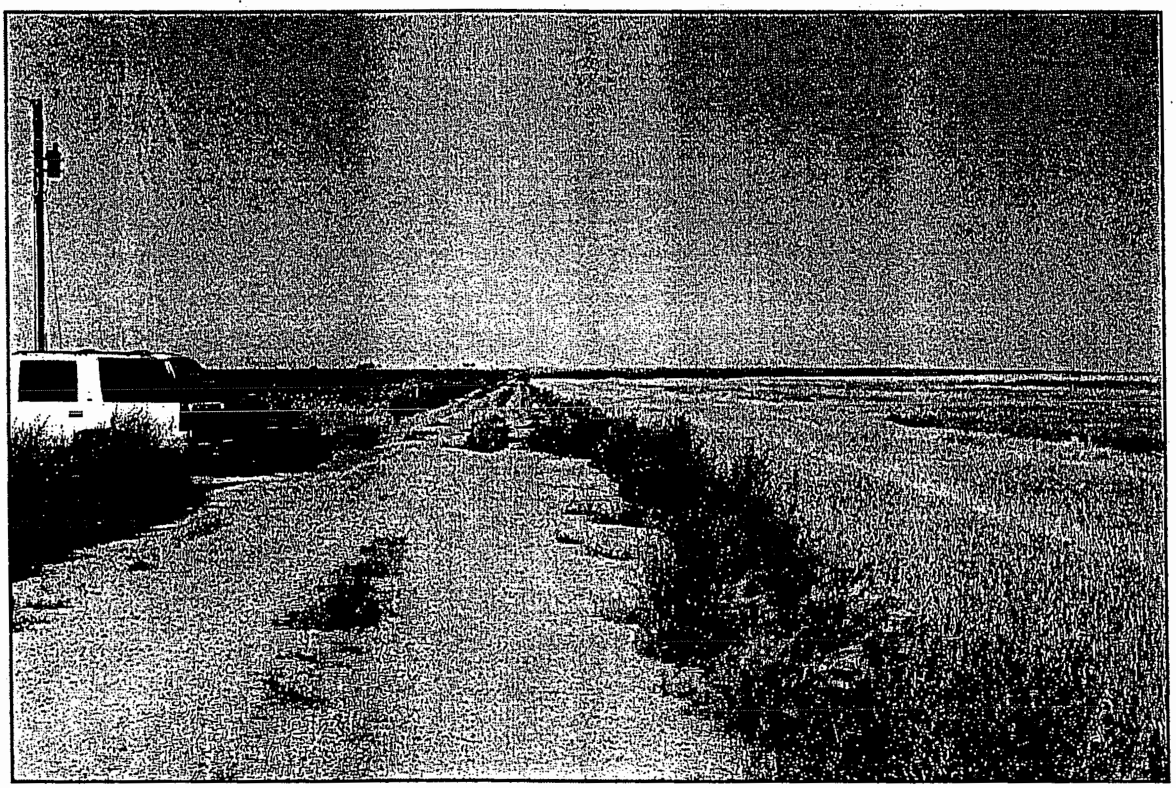


Figure 9. Project overview; south end of 2004 cross-country linear survey at section line between Sections 11 and 12; wheat field to the right. View to the north. Photo taken by Donna Stubbs on August 18, 2004.

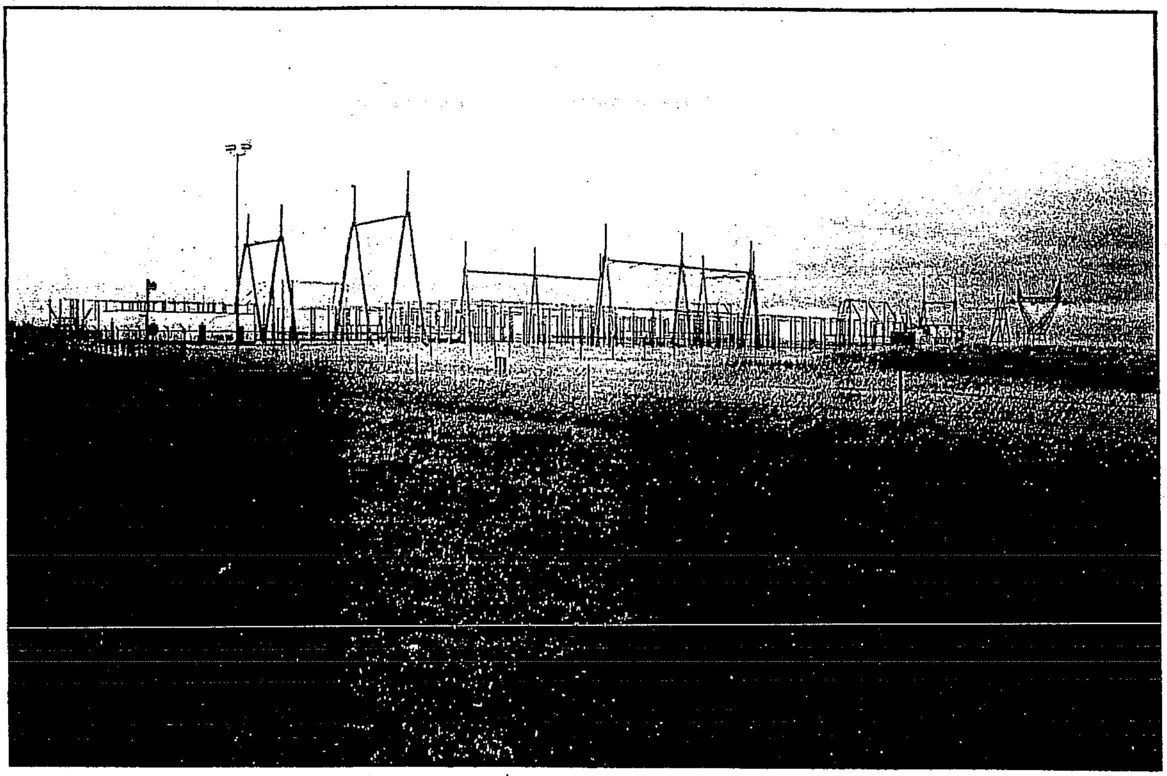


Figure 10. Electrical substation in the southwest corner of Section 18, T122N, R60W, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

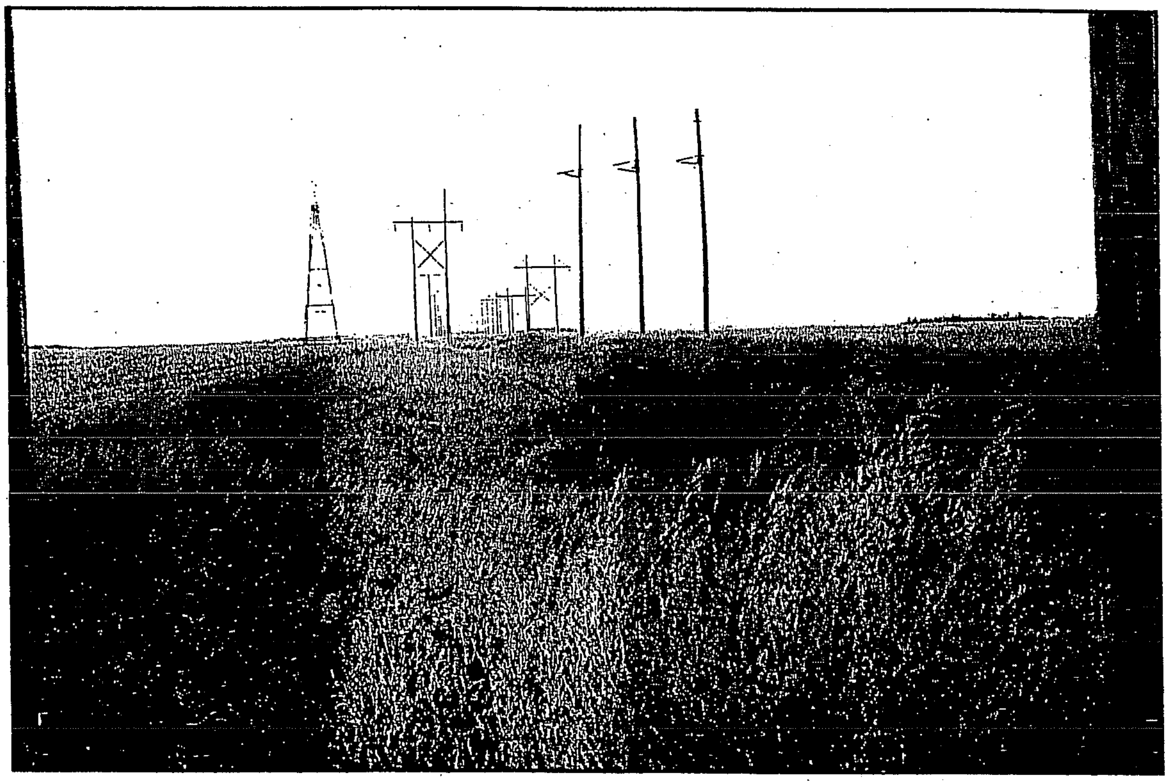


Figure 11. Old Chicago & North Western Railroad grade in Section 18, T122N, R60W; looking north. Photo taken by Donna Stubbs, October 28, 2003.

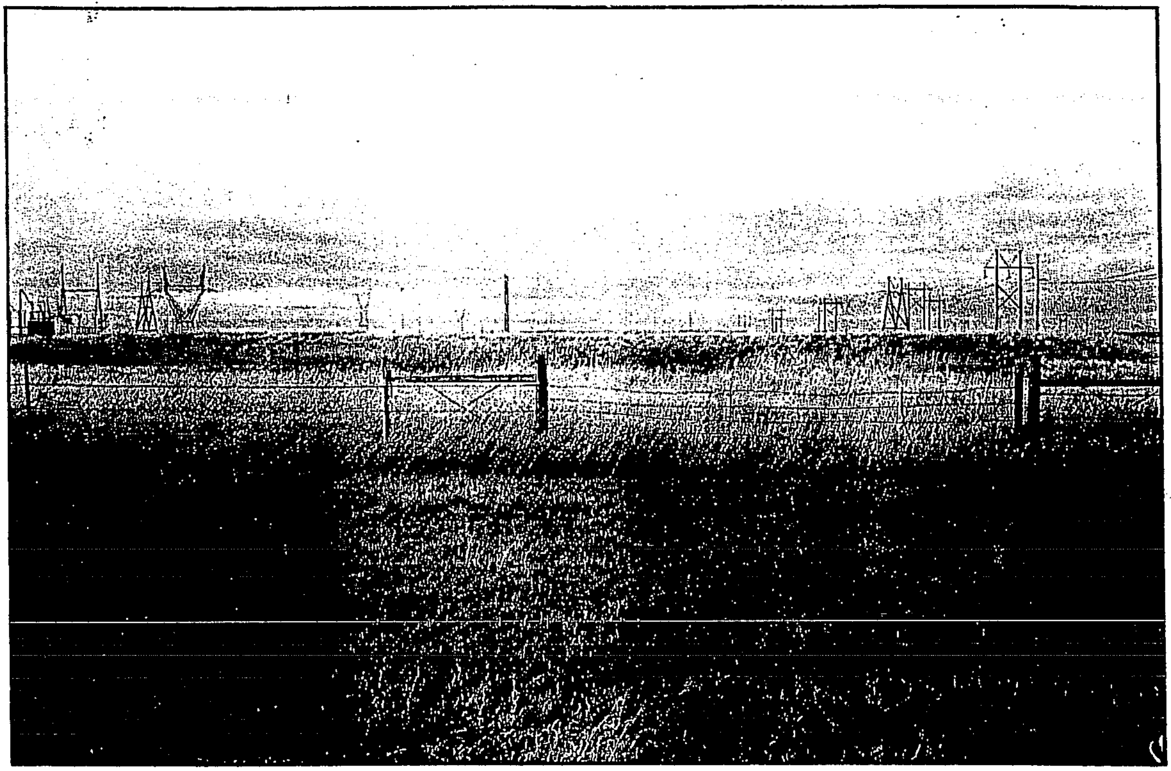


Figure 12. Bermed water catchment pond in Section 18, T122N, R60W, looking east. Photo taken by Donna Stubbs, October 28, 2003.

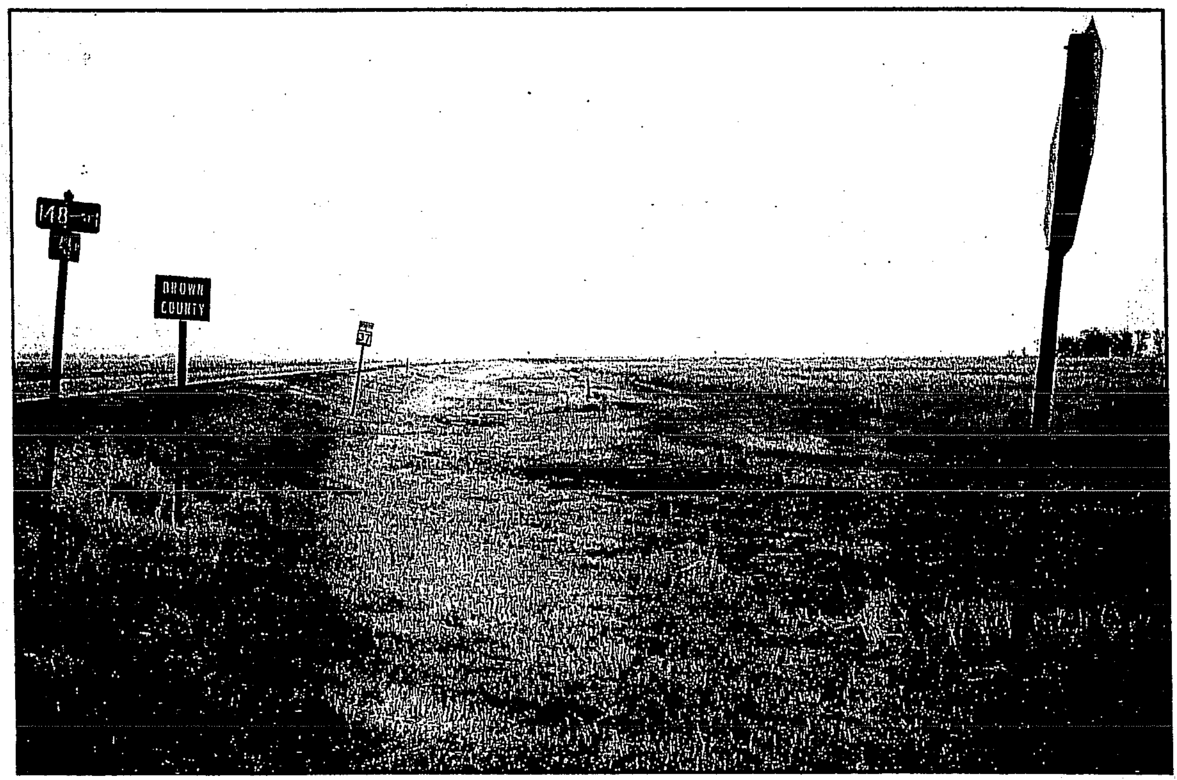


Figure 13. Project overview showing bermed and grassed right-of-way. South end of the project area at the Brown County line, looking north. Photo taken by Donna Stubbs, October 30, 2003.

PREVIOUS RESEARCH

ACR requested and received a file search on October 16, 2003 for Section 18, T122N, R60W from the South Dakota State Historical Society's Archaeological Research Center (SARC), Rapid City, South Dakota for previously conducted projects and previously recorded sites within the project area. An additional file search was requested and received on October 23, 2003 for Sections 18, 19, 30, and 31, T122N, R60W; Sections 13, 24, 25, and 36, T122N, R61W; Sections 6, 7, 18, 19, 30, and 31, T121N, R60W; and Sections 1, 12, 13, 24, 25, and 36, T121N, R61W.

Three surveys have been conducted within a one-mile radius of the current project area.

- South Dakota State University completed a survey for the Northern Border Pipeline Project in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel, and Brookings Counties in 1982 (Hannus 1982).
- Dakota Research Services completed a survey of portions of a rural water distribution system in Brown, Edmunds, and Spink Counties in 1987 (Buechler 1987).
- The Archaeology Laboratory, Augustana College completed a survey of three proposed pipeline projects in eastern South Dakota in 1990 (Winham et al. 1990).

The file search listed one site within the block survey project area and approximately 0.3 miles east of the linear project area.

- **39BN2003/39SP2003 E** is the abandoned Chicago & North Western Railroad grade. The railroad grade passes north-south from Section 18, T122N, R60W to Sections 18, T120N, R60W. The South Dakota SHPO has determined that all railroads are eligible for the NRHP (Hufstetler and Bedeau 1998). The site is described in the results section of this report.

Previous Research Summary and Current Expectations

Only a few surveys have been completed within the project area and adjacent surroundings. No prehistoric sites and only one historic site have been identified. The block survey is in a plowed field and the linear survey is in an already disturbed right-of-way. Based on the file search information for this project and professional experience, ACR expects to encounter few cultural resource sites within the current project area.

FIELDWORK

Donna L. Stubbs (principal investigator) and Glendee Ane Osborne and Gina Klingerman (crew), all of ACR, completed the original fieldwork on October 28 to 30, 2003. Donna Stubbs conducted the re-survey on August 19 and September 8, 2004. The right-of-way surveys used a 100-foot corridor. The 1.9-mile survey used a 300-foot corridor (150 feet each side of the existing pipeline) crossing private lands. During the block survey of Section 18, ACR personnel walked parallel transects, spaced no more than 10 meters apart, across the project area. Transects were oriented north-south. For the 2004 survey across Sections 1 and 12 following the existing pipeline, transects were walked following the planted crop rows and staggered to follow the angle of the pipeline. Because of the chaff remaining in the harvested fields, when visibility dropped below 20% for more than 15 meters, a one-square meter area of chaff was brushed aside to provide a clear view of the ground surface.

Photographs were taken of the project area and the sites. The newly recorded sites were mapped. The linear right-of-way along both sides of State Route 37 was visually inspected and photographed, however, no formal transects were walked, because the right-of-way has been previously disturbed.

Bob Farnes, Chris Mammoliti, and Ed Surbrugg of Tetra Tech, Inc. conducted preliminary background research at the Brown County Courthouse, Aberdeen, South Dakota on October 28, 2003 for information on the two newly identified sites. Donna Stubbs, Glendee Ane Osborne, and Gina Klingerman conducted additional background research at the Brown County Courthouse and the Aberdeen Library in Aberdeen, on October 29, 2003. Additional research was conducted by Donna Stubbs on August 19 and 20, 2004. Plat maps for multiple years were consulted and information on construction dates of the farm buildings was requested.

RESULTS

ACR revisited one previously recorded site (39BN2003/39SP2003) and identified three new sites (BN-000-01226, BN-005-00001/00002, and BN-000-00001/00002/00003). Descriptions of the sites follow.

Site 39BN2003/39SP2003

Location and Environment
Site 39BN2003/39SP2003 is the abandoned railroad grade of the Chicago & North Western Railroad. The railroad grade passes north-south from Section 18, T122N, R60W to Sections 18, T120N, R60W (Figures 1-5). It crosses the current project area in the east half of the southwest quarter of Section 18, T122N, R60W.

Site Description
Per the SD SHPO's *South Dakota Railroads* context (Hufstetler and Bedeau 1998), the Chicago and North Western was one of the two largest railroads in South Dakota in the late 19th and early 20th centuries. The grade running through the current project area was built sometime between 1889 and 1905 as a link between the Chicago & North Western's east-west line crossing the state and the Chicago, Milwaukee and St. Paul Railroad's east-west line running to Aberdeen (Hufstetler and Bedeau 1998:9; Peterson 1905:21). Most of the Chicago & North Western's lines were abandoned in the 1960s and 1970s (Hufstetler and Bedeau 1998:55).

ACR recorded the site in October 2003. Currently the only extant physical remnant of the railroad in the project area is the right-of way consisting of a grassy, depressed grade. The grade is approximately 12 feet wide and up to 3 feet deep. The recorded segment is 0.5 miles long.

Three overhead power lines, two paralleling the grade and one bisecting it, have already impacted the grade (Figure 11). Overgrown fencing lines the outer edges of the grade separating the grade from the cultivated field on either side. A farm road separates the grading at the southern edge of the Section 18 from the grade in Section 19 and a field access road cuts across the grade approximately midway along the half-mile segment.

NRHP Recommendation/ Determination
Due to the importance of railroads in the development and settlement of South Dakota, per the SD SHPO all railroads are eligible for the NRHP (Hufstetler and Bedeau 1998). Per the context cited above, to be eligible for the NRHP the site must retain integrity. The alignment crossing the current project area retains integrity of location because the original right-of-way remains. However, the existing overhead power lines have compromised the integrity of setting. Although the Railroad context states "the act of abandonment of a railway line segment (and the removal of its rail and ties) will not in itself diminish its integrity below the level needed for eligibility" (Hufstetler and Bedeau 1998:46), the complete absence of any materials used for the alignment has compromised the integrity of materials, workmanship, and design. The loss of integrity of these factors has also compromised the integrity of workmanship and association. The grade through the project area does not retain the distinct physical presence or characteristics of a railroad grade. Although the rail line itself is eligible for the NRHP, ACR recommends the segment of the Chicago & North Western Railroad in Section 18, T122N, R60W as a **non-contributing** portion of the line.

Basin Electric has no plans to impact the site during this project. All proposed construction activities will occur 0.3 miles to the west. Therefore the current project will have no effect on the Chicago & North Western Railroad.

Site BN-000-01226

Location and Environment
Site BN-000-01226 is the Verdon Cemetery (Figures 14 and 15) located in Section 30, T121N, R60W. The cemetery is located one mile north of the small rural town of Verdon. It is at an elevation of 1,300 feet above sea level. The nearest water source is Dry Run, located 1,000 feet to the west.

Site Description
ACR recorded the site in October 2003. The cemetery covers approximately 5 acres and measures 705 feet (north-south) by 310 feet (east-west). A wrought-iron arched gate on the south side allows access to cemetery. The gate is labeled with "Verdon Cemetery 1894" in the arch (Figure 16). The cemetery is surrounded with a barbed wire fence and a vehicle path cuts through the center of the cemetery from the gate at the south end almost to the north fence line.

There are approximately 125 marked and 30 unmarked graves. The graves are clustered on both sides of the vehicle path. The grave markers include concrete and stone standing monuments as well as ledger type headstones. The oldest marked grave is for Fred Huson, May 22 1886, Dec 22 1886 (Figure 17). The newest marked grave is for Walter Erdman, 1906-1989. Several graves include a Civil War GAR metal marker (Figure 18).

Three overhead power lines, two paralleling the grade and one bisecting it, have already impacted the grade (Figure 11). Overgrown fencing lines the outer edges of the grade separating the grade from the cultivated field on either side. A farm road separates the grading at the southern edge of the Section 18 from the grade in Section 19 and a field access road cuts across the grade approximately midway along the half-mile segment.

NRHP Recommendation/ Determination

Due to the importance of railroads in the development and settlement of South Dakota, per the SD SHPO all railroads are eligible for the NRHP (Hufstetler and Bedeau 1998). Per the context cited above, to be eligible for the NRHP the site must retain integrity. The alignment crossing the current project area retains integrity of location because the original right-of-way remains. However, the existing overhead power lines have compromised the integrity of setting. Although the Railroad context states "the act of abandonment of a railway line segment (and the removal of its rail and ties) will not in itself diminish its integrity below the level needed for eligibility" (Hufstetler and Bedeau 1998:46), the complete absence of any materials used for the alignment has compromised the integrity of materials, workmanship, and design. The loss of integrity of these factors has also compromised the integrity of workmanship and association. The grade through the project area does not retain the distinct physical presence or characteristics of a railroad grade. Although the rail line itself is eligible for the NRHP, ACR recommends the segment of the Chicago & North Western Railroad in Section 18, T122N, R60W as a **non-contributing** portion of the line.

Basin Electric has no plans to impact the site during this project. All proposed construction activities will occur 0.3 miles to the west. Therefore the current project will have no effect on the Chicago & North Western Railroad.

Site BN-000-01226

Location and Environment

Site BN-000-01226 is the Verdon Cemetery (Figures 14 and 15) located in Section 30, T121N, R60W. The cemetery is located one mile north of the small rural town of Verdon. It is at an elevation of 1,300 feet above sea level. The nearest water source is Dry Run, located 1,000 feet to the west.

Site Description

ACR recorded the site in October 2003. The cemetery covers approximately 5 acres and measures 705 feet (north-south) by 310 feet (east-west). A wrought-iron arched gate on the south side allows access to cemetery. The gate is labeled with "Verdon Cemetery 1894" in the arch (Figure 16). The cemetery is surrounded with a barbed wire fence and a vehicle path cuts through the center of the cemetery from the gate at the south end almost to the north fence line.

There are approximately 125 marked and 30 unmarked graves. The graves are clustered on both sides of the vehicle path. The grave markers include concrete and stone standing monuments as well as ledger type headstones. The oldest marked grave is for Fred Huson, May 22 1886, Dec 22 1886 (Figure 17). The newest marked grave is for Walter Erdman, 1906-1989. Several graves include a Civil War GAR metal marker (Figure 18).

The cemetery fence is 25 feet east of the edge of State Route 37 and the right-of-way ditch extends up to the west fence line. The graves are located in the center of the cemetery and the closest marked grave on the west side is 40 feet from the fence (65 feet from the road edge).

NRHP Recommendation/ Determination

There are no individuals significant to state history buried at the cemetery nor are there any significant architectural features about the gate or the grave markers. However, the cemetery was established over 100 years ago by the small rural town of Verdon, is still in active use, and is well maintained. In addition, several Civil War veterans are buried here. The cemetery retains integrity of setting, location, design, materials, workmanship, feeling, and association. The cemetery is eligible for the NRHP under Criterion A for its contribution to the history of rural South Dakota and the establishment of small agricultural towns. It is also eligible under Criterion D for its research potential. Therefore, ACR recommends the Verdon Cemetery **eligible** for the NRHP.

The current project will be completed on the west side of State Route 37. Therefore, the project will have no effect on the Verdon Cemetery.

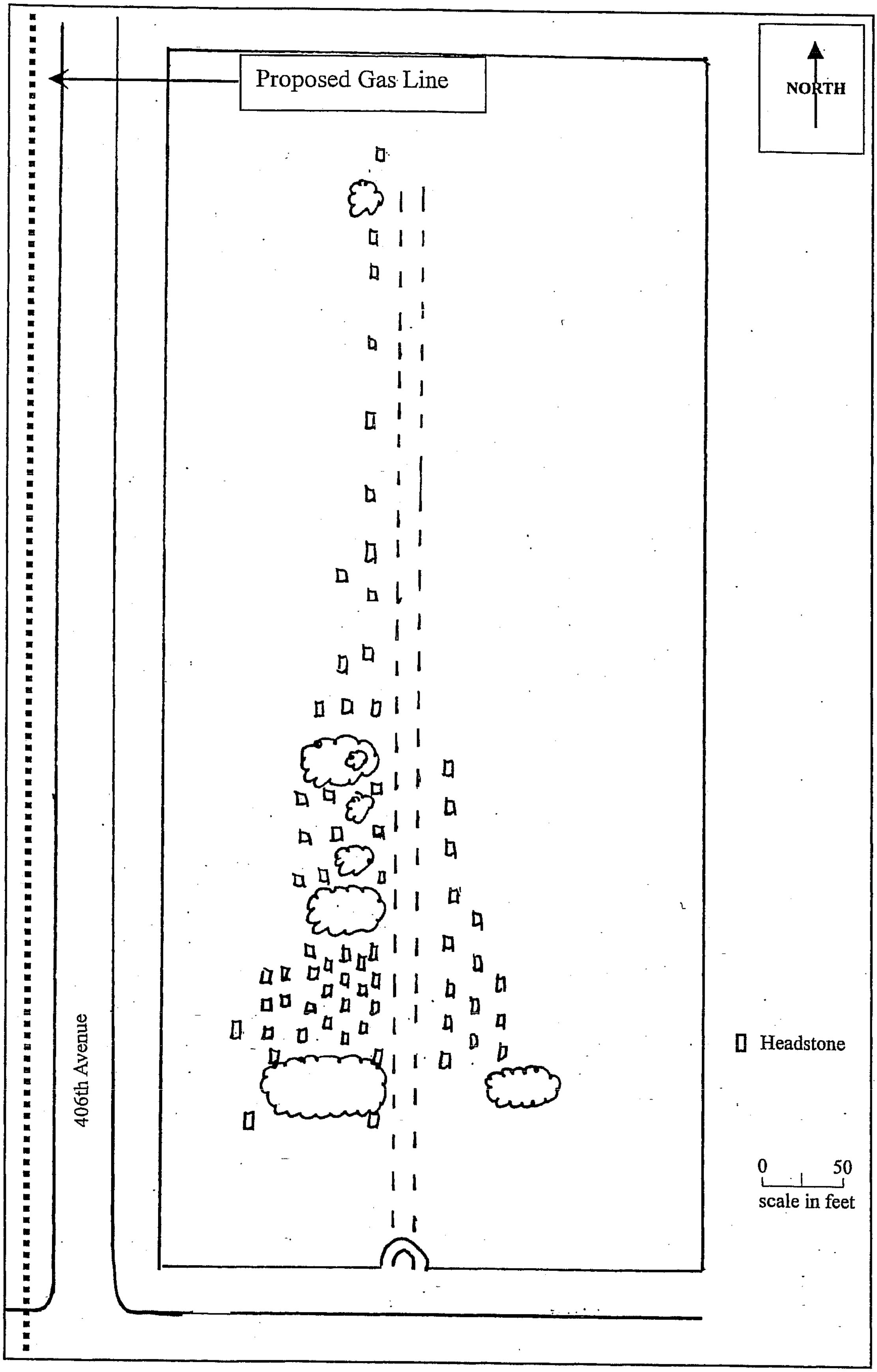


Figure 14. Verdon Cemetery (BN-000-01226), site plan.

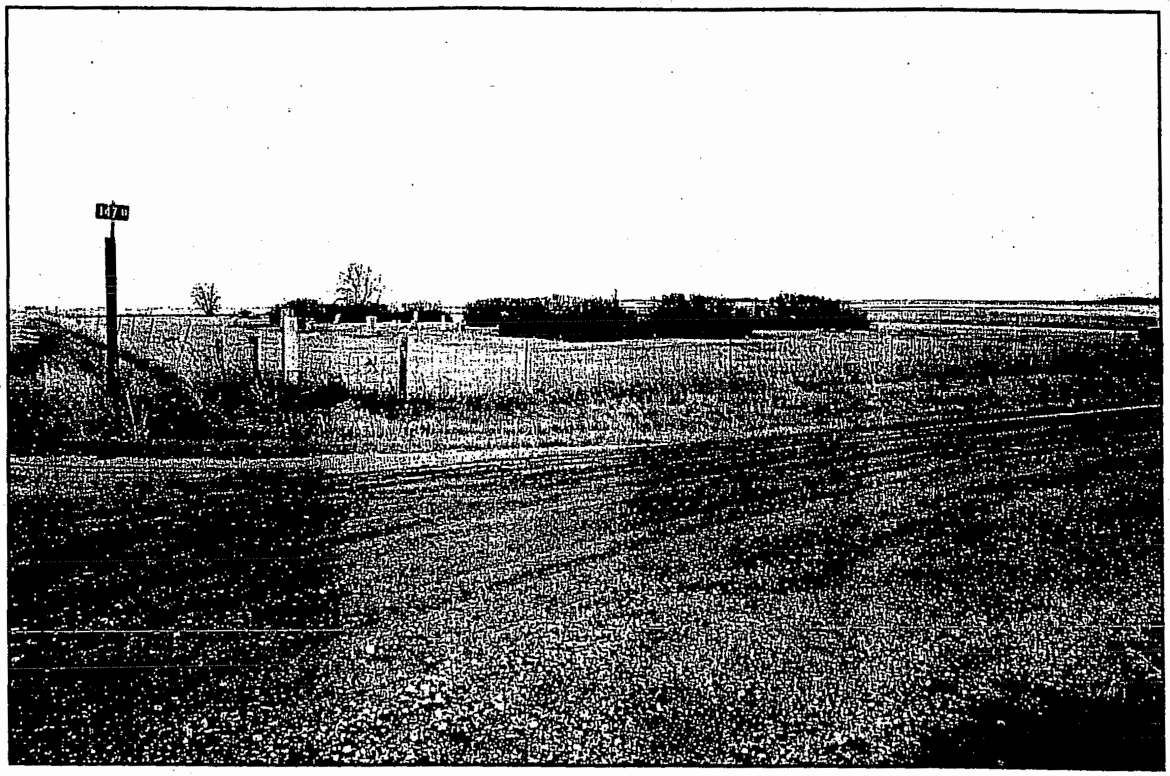


Figure 15. BN-000-01226, Verdon Cemetery. Overview from the south end, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

Figure 16. BN-000-01226, Verdon Cemetery Gate, looking north. Photo taken by Donna Stubbs, October 28, 2003.

Figure 17. BN-000-01226, Verdon Cemetery, oldest grave, detail view. Photo taken by Donna Stubbs, October 28, 2003.

Figure 18. BN-000-01226, Verdon Cemetery, Civil War veteran grave, detail view. Photo taken by Donna Stubbs, October 28, 2003.

Site BN-005-00001/00002

Location and Environment

Site BN-005-00001/00002 is the Finnegan/Heiser Farmstead (Figure 18). The farm is located approximately five miles south of Groton, SD. It is at an elevation of 1,300 feet above sea level. The nearest water source is an unnamed stream located 1,500 feet to the west.

James Finnegan homesteaded the farm sometime prior to 1888 (Centennial Atlas 1988). The current owner, Pam Heiser, purchased the property in January 2003.

Site Description

ACR recorded the site in October 2003. The farmstead consists of seven buildings: a modern house (F1), a summer kitchen (F2), a barn (F3), a detached garage (F4), and three sheds (F5-F7).

The house (F1) is a single-story modern home built in 1976 (Figure 19). The house has an end gable, asphalt shingled roof, with a gable extension over the front door. It has aluminum siding and a poured concrete and concrete block foundation. A set of three poured-concrete steps with a small landing and simple wrought iron railings lead to the front door located on the south façade. To the left of the front door is a set of three 2-light windows. The larger light at the top is fixed, the lower light is an awning type window. To the right of the front door is a picture window with an attached single-light double-hung window on either side. At the east end of the south façade is one single-light double-hung window. Another door on the east side heads out to a small wood frame deck. Single-light, double-hung windows are located on each side of the back door. Two single-light double-hung windows are symmetrically placed on the west façade. All the windows and doors have aluminum frames.

The summer kitchen (F2) is a single-story, side gable-roofed, clapboard-sided structure on poured-concrete foundation (Figure 20). It is located east of the house and may be contemporary with the barn and outbuildings (circa 1920s). A centrally placed door is flanked by two single double-hung windows on the south façade. A single double-hung window is centrally placed on both the east and west facades. The doors and windows are all wood framed. The kitchen is in good condition.

The circa 1920s two-story barn (F3), located northeast of the summer kitchen, has a gambrel roof with a single-story shed extension on the north side, clapboard siding and a poured concrete foundation (Figure 21). A small door is located at the west end of the south façade with five four-light windows equidistantly spaced to the east of the door. On the west façade is the centrally placed main sliding doors. A four-light window is located on each side of the main doors. A boarded over door with a four-light window on each side is located on the second story on the west façade. There are five four-light windows equidistantly spaced along the north façade. On the west façade, there is a centrally placed nine-light window with symmetrically placed four-light windows on each side. A narrow six-light window is in the center of the second story of the west façade. All of the windows and doors are wood-framed. The barn is in fair condition, needing some repairs, but it is still in use.

F4 is a three-bay garage with a side-gabled offset peak roof, clapboard siding, and a poured concrete foundation (Figure 22). A small shed roofed extension is on the south end of the garage. The extension has a centrally placed door on the west façade, flanked on each side by a four-light window. Two attached four-light windows are flanked by single four-light windows on the south façade. Two symmetrically placed four-light windows are on the north façade of the garage. All of the windows and doors are wood-framed.

F5 is chicken or hog barn (Figure 23). It has a side-gabled offset peak roof, poured concrete foundation, and clapboard siding. There are 12 four-light double hung windows spaced equidistantly across the south façade. A door is on the south side of the west façade with a four-light window to the left of the door. One four-light window is located on the east façade. All of the windows and doors are wood-framed.

F6 is small shed with an end gabled rood, clapboard siding, and a stone foundation, located north of F5 (Figure 24). A centrally placed door is on the west façade, with a four-light window to the right and another four-light window above the door. Two symmetrically placed four-light windows are on the south and north facades. All of the windows and doors are wood-framed.

F7 is another small shed with an end gabled rood, clapboard siding, and a stone foundation, located north of F5 (Figure 25). Both the east and west facades have a centrally placed door with a four-light window above. All of the windows and doors are wood-framed.

The three sheds are located east of the barn and the garage is located south of the sheds and southeast of the summer kitchen. All are in need of repairs, but are in fair condition, and are still in use. Construction dates of the outbuildings are unknown.

NRHP Recommendation/ Determination

The barn and other outbuildings appear to date to circa 1920s; however, the house is a modern construction. The current owner owns only the one-acre lot containing the buildings. The barn and other outbuildings (F2-F7) retain integrity of location, workmanship, design, and materials, since they are in their original location with no modern intrusions or materials. The only modifications appear to be historic additions to the barn and the garage, which do not detract from their integrity. Although the outbuildings individually retain integrity, the new house and the lack of the original associated agricultural parcel have compromised the historic integrity of setting, association, and feeling of the farmstead as a whole. Therefore, ACR recommends the site **not eligible** for the NRHP.

The farm is located in the extreme southwest corner of the northwest quarter of Section 18 and is outside project area. The current project will have no effect on the Finnegan/Heiser Farm.

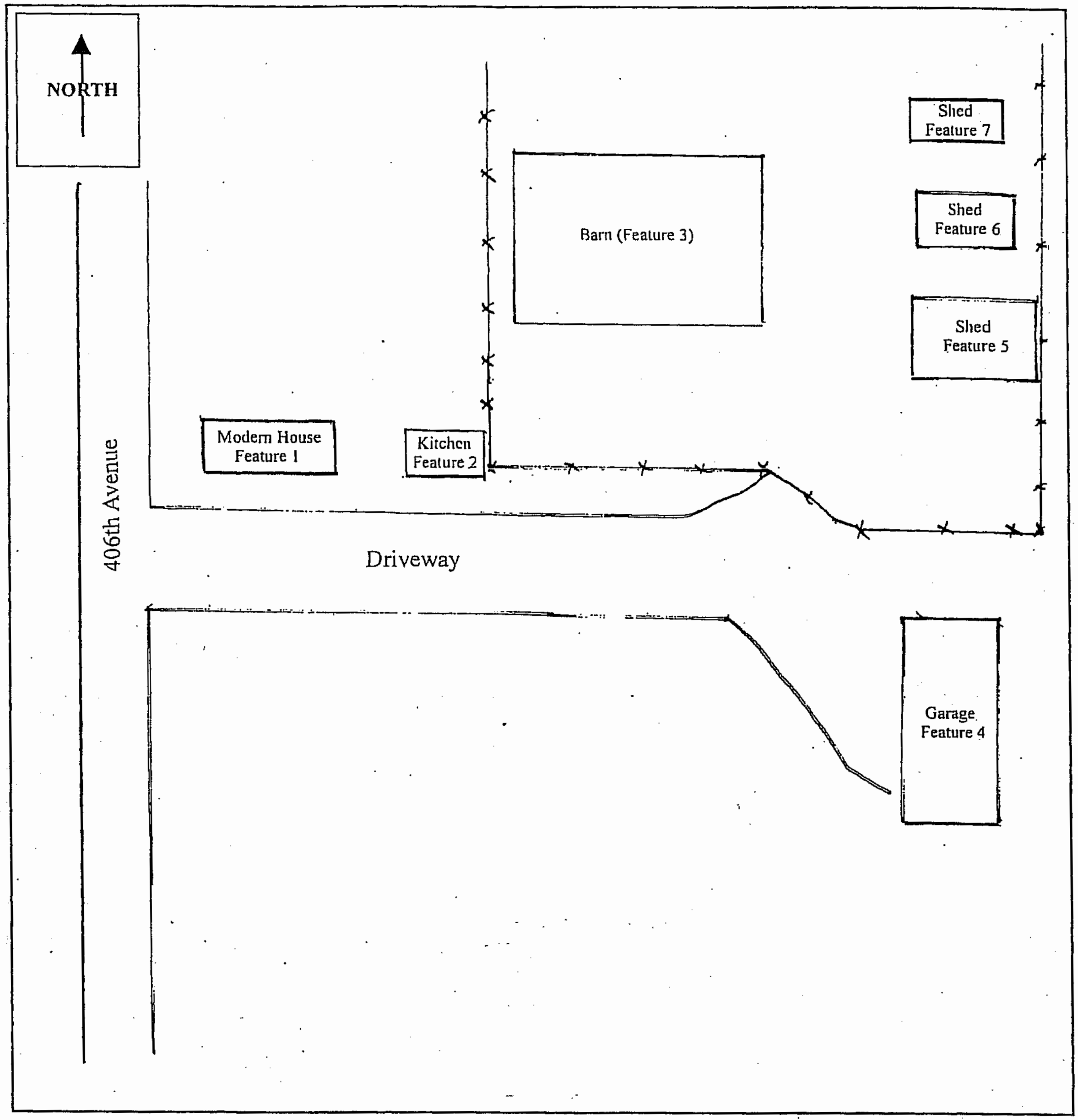


Figure 19. Finnegan/Heiser Farmstead (BN-005-00001/00002), site plan. Not drawn to scale.

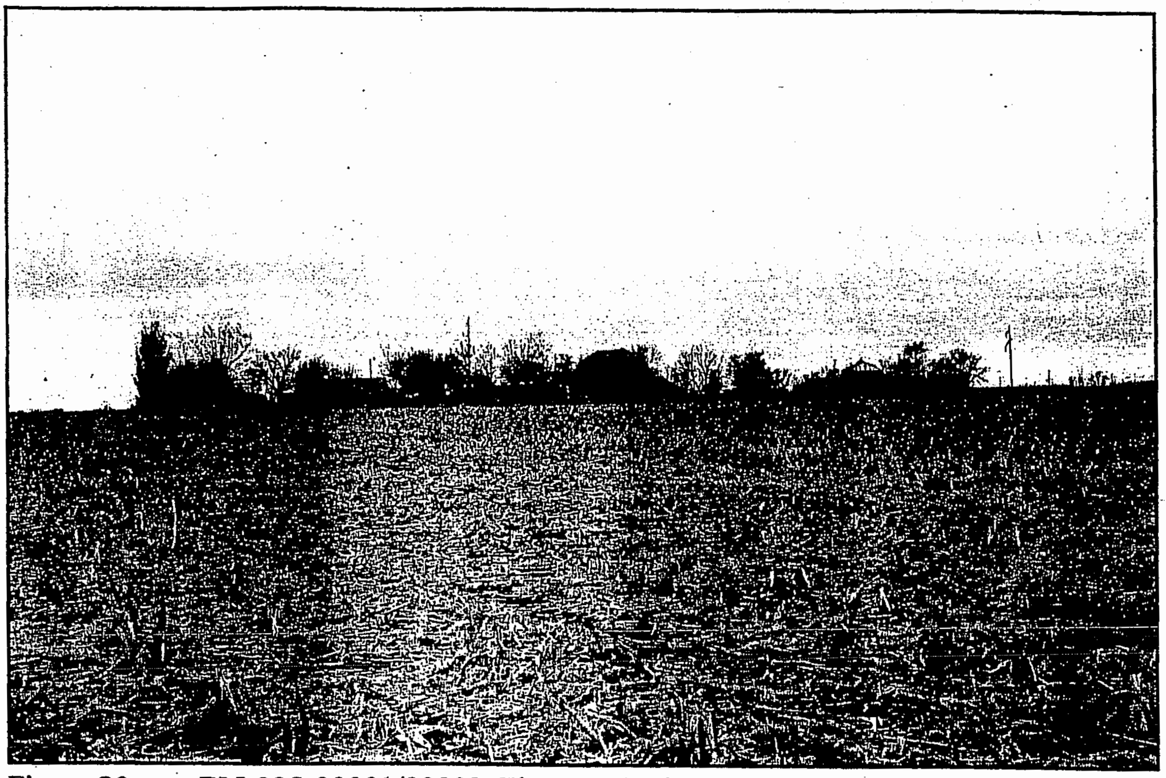


Figure 20. BN-005-00001/00002, Finnegan/Heiser Farmstead, view from back looking west. Photo taken by Donna Stubbs, October 29, 2003.

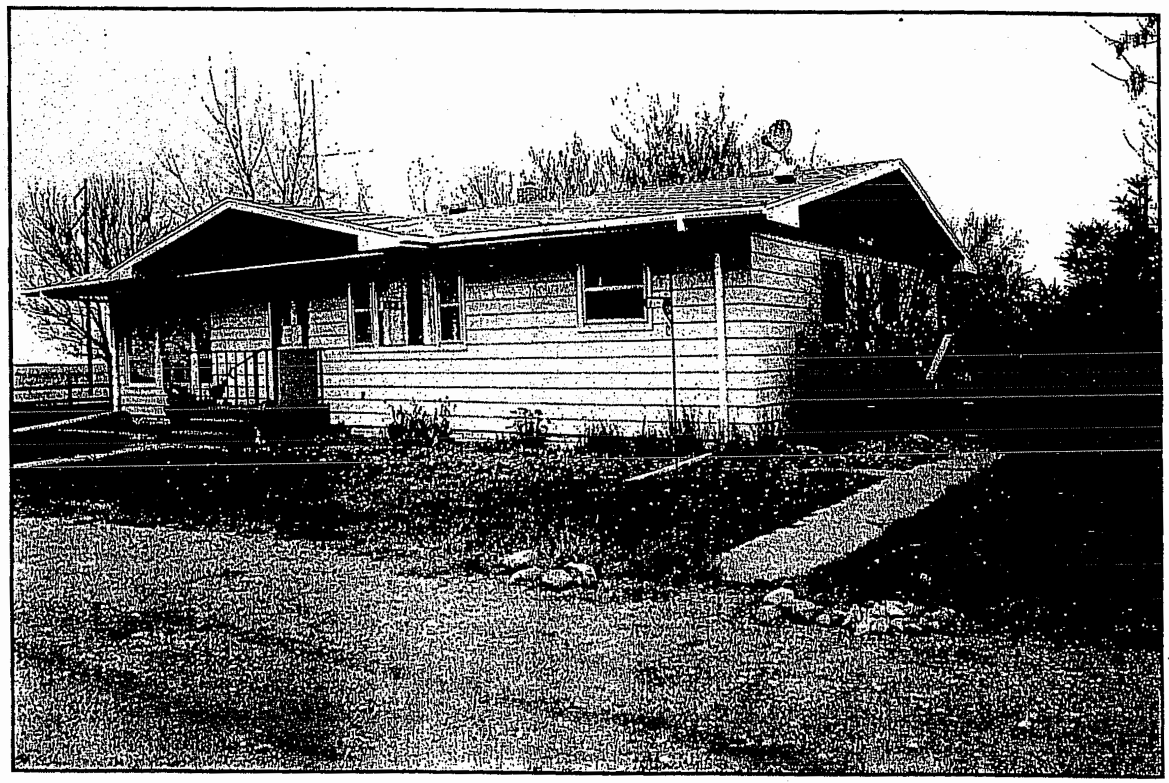


Figure 21. BN-005-00001/00002, Finnegan/Heiser Farmstead. F1, house, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

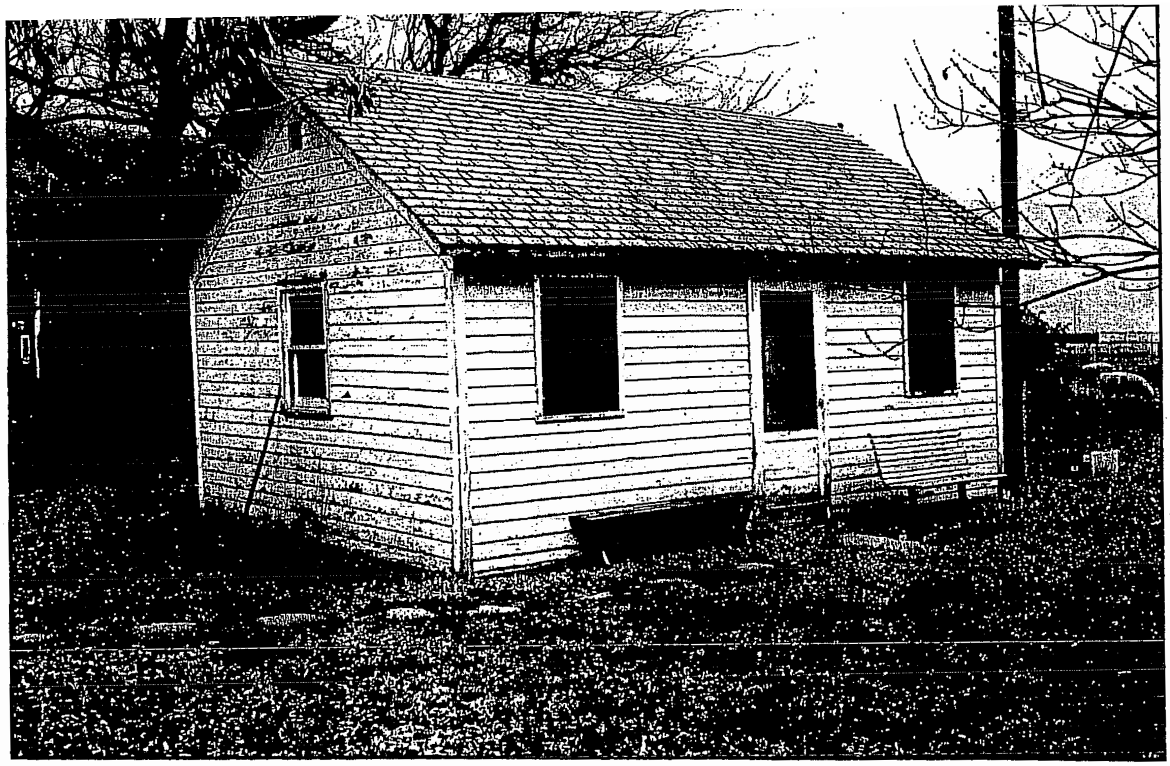


Figure 22. BN-005-00001/00002, Finnegan/Heiser Farmstead. F2, summer kitchen, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

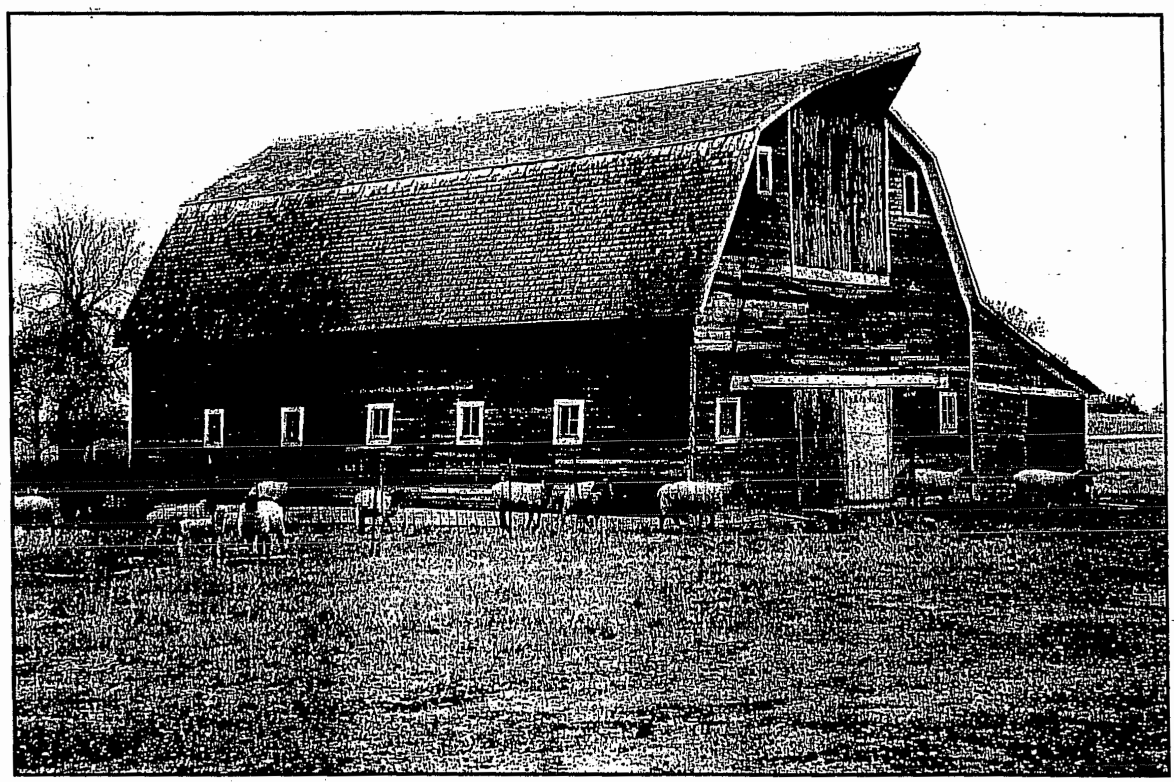


Figure 23. BN-005-00001/00002, Finnegan/Heiser Farmstead. F3, barn. Looking northwest. Photo taken by Donna Stubbs, October 28, 2003.

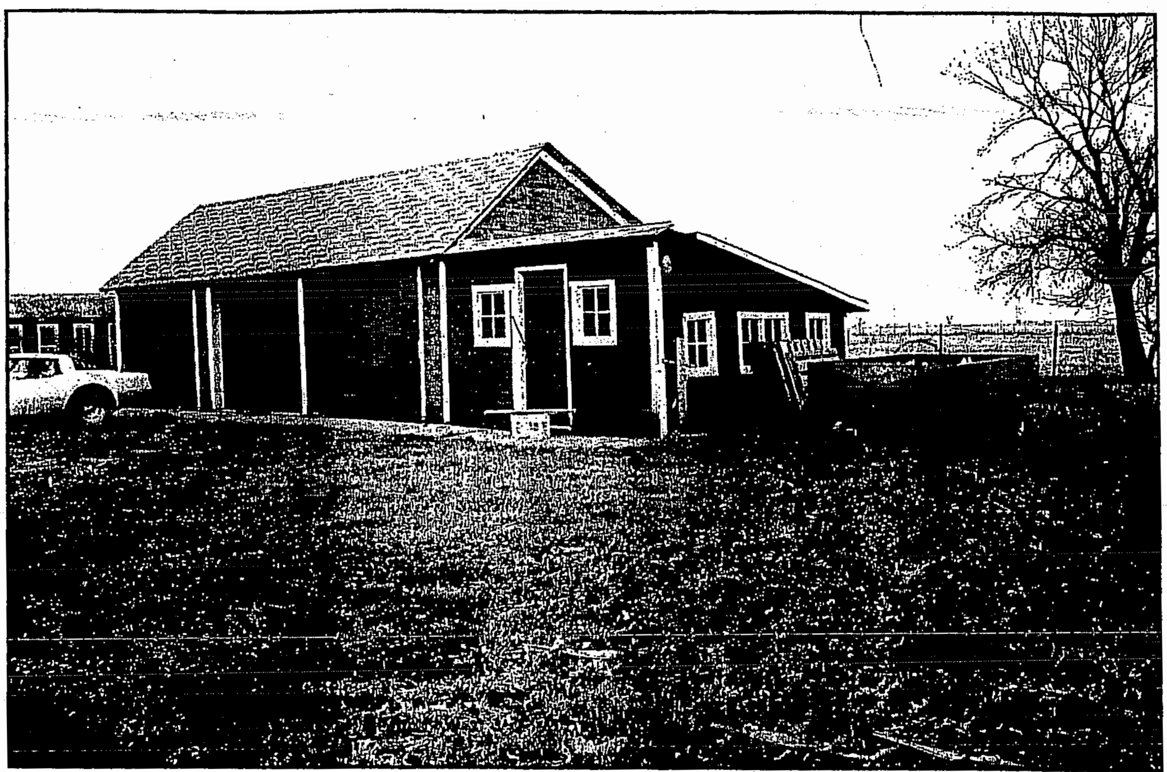


Figure 24. BN-005-00001/00002, Finnegan/Heiser Farmstead. F4, garage, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

Figure 25. BN-005-00001/00002, Finnegan/Heiser Farmstead. F5-F7, sheds, looking northeast. Photo taken by Donna Stubbs, October 28, 2003.

Site BN-000-00001/00002/00003

Location and Environment

Site BN-000-00001/00002/00003 is the Bloedell/Hoops Farmstead (Figures 26 and 27). The farm is located approximately six miles south of Groton, SD. It is at an elevation of 1,300 feet above sea level. The nearest water source is an unnamed stream located 500 feet to the west.

William H. Bloedell purchased the southeast quarter of Section 24, T122N, R61W on November 26, 1883 (Patent Record SDMTAA 130363). In 1900, Josiah Wilson sold the property to Gustave Grieben (Brown County Recorder's Office, Deed Book 54, pg 410). There is no record of a property transfer between Bloedell and Wilson at the Brown County Recorder's Office. Grieben sold the property to John Kimmel in 1908. Again there is no record of the next property transfer, however, the 1911 plat book shows the owner of the property as Henry Bahr (Ogle 1911). Part ownership was deeded by Elizabeth Bahr (widow of Henry Bahr) to Ellen Leonhardt and Lois Warren circa 1954, who, in 1977, sold the E½NE¼SE¼ and the E½SE¼SE¼ portions to James Hoops (Brown County Recorder's Office, Deed Book 231, pg 77-78). The current property owner is Ruth Hoops.

Mrs. Hoops relayed the following information to Donna Stubbs on August 19, 2004. She has lived at the property since 1961. In 1974, the old farmhouse was removed from its foundation and moved to its current location approximately 125 feet to the west. That same year (1974) a house was moved from Randolph, South Dakota to the old farmhouse foundation and additions put on the north and west sides. Mrs. Hoops did not know when the original farmhouse was built.

Site Description

ACR recorded the site in August 2004. The farmstead consists of three buildings: a house (F1), a shed (F2), and the original farmhouse (F3).

The house (F1) measures approximately 44 feet by 26 feet (Figure 28). The original structure was a 1½-story side-gable. Additions have been added to the north and west sides. A concrete block foundation supports asbestos-sided walls and an asphalt shingle roof. The south elevation has a double French door on the addition. There is one double-hung window on the original center structure and one double-hung window on the upper floor. The east elevation of the original structure has a picture window flanked by double-hung windows. The north addition has two double-hung windows on the bottom floor and one double-hung window on the upper floor. The west elevation has a door at the north end with a 6-foot by 6-foot wooden deck leading to the door. To the south of the door there is one double-hung window and one slide or casement window. Dimension lumber was used for all window and door frames and moldings.

The shed (F2) is located approximately 110 feet west of the house (F1) (Figure 29). This gable roof, wood frame structure measures approximately 14 feet by 10 feet. The shed has tongue-and-groove siding and a wood shake covered roof. There is a door on the north elevation and a boarded-up window on the east elevation.

The original farmhouse (F3) is located approximately 15 feet west of the shed (Figure 30). It is a 2-story cross-gable structure measuring approximately 25 feet by 24 feet. There is a shed-roofed extension on the east side. The house has lapped clapboard siding covered with a faux brick asphalt sheeting. The roof has asphalt shingles. The south elevation has three double-hung windows, two on the bottom floor and one on the upper floor. The east elevation has one door and one double-hung window. The west elevation has a cross gable dormer. There are two doors and two windows on the bottom floor and two side-by-side double-hung windows on the upper floor. The windows on the bottom appear to have been double-hung windows with a fixed transom window above. The north elevation has one double-hung window on the upper floor and two windows on the bottom floor. The bottom windows consist of a double-hung window on the east addition and an unknown type window on the original structure. A brick chimney is offset to the south on the crest of the roof.

NRHP Recommendation/ Determination

The original farmhouse possibly dates to late 19^{th} or early 20^{th} century. The newer house dates to the mid-20^{th} century with later additions. Both houses have been moved from their original locations. Although the original farmhouse retains integrity of workmanship, design, and materials, the newer house lacks all of these factors. Both structures also lack integrity of location, setting, feeling, and association. Therefore, ACR recommends the site **not eligible** for the NRHP.

The farm is located in the on the western edge of the State Route 37 right-of-way and is within the project area. All work for the project will be conducted a minimum of 6 feet east of the existing pipeline and approximately 10-12 feet east of the house. The proposed pipeline will not impact the structures. The farm is recommended not eligible for the NRHP and the current project will not adversely affect the Bloedell/Hoops Farm.

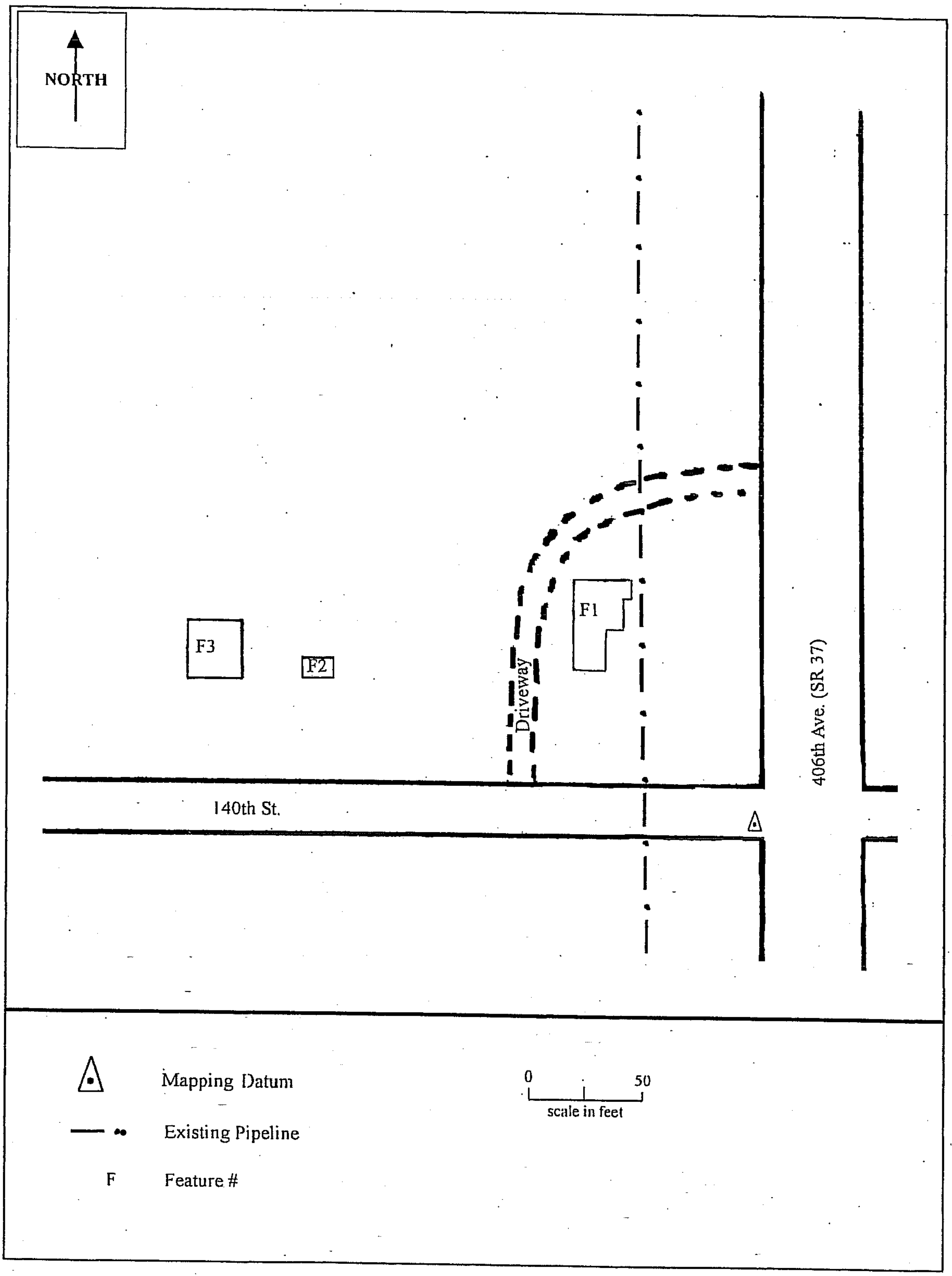


Figure 26. Bloedell/Hoops Farmstead (BN-000-00001/00002/00003), site plan. Drawn by Donna Stubbs.

Figure 27. BN-000-00001/00002/00003, Bloedell/Hoops Farmstead. Overview to the northwest. Photo taken by Donna Stubbs on August 19, 2004.

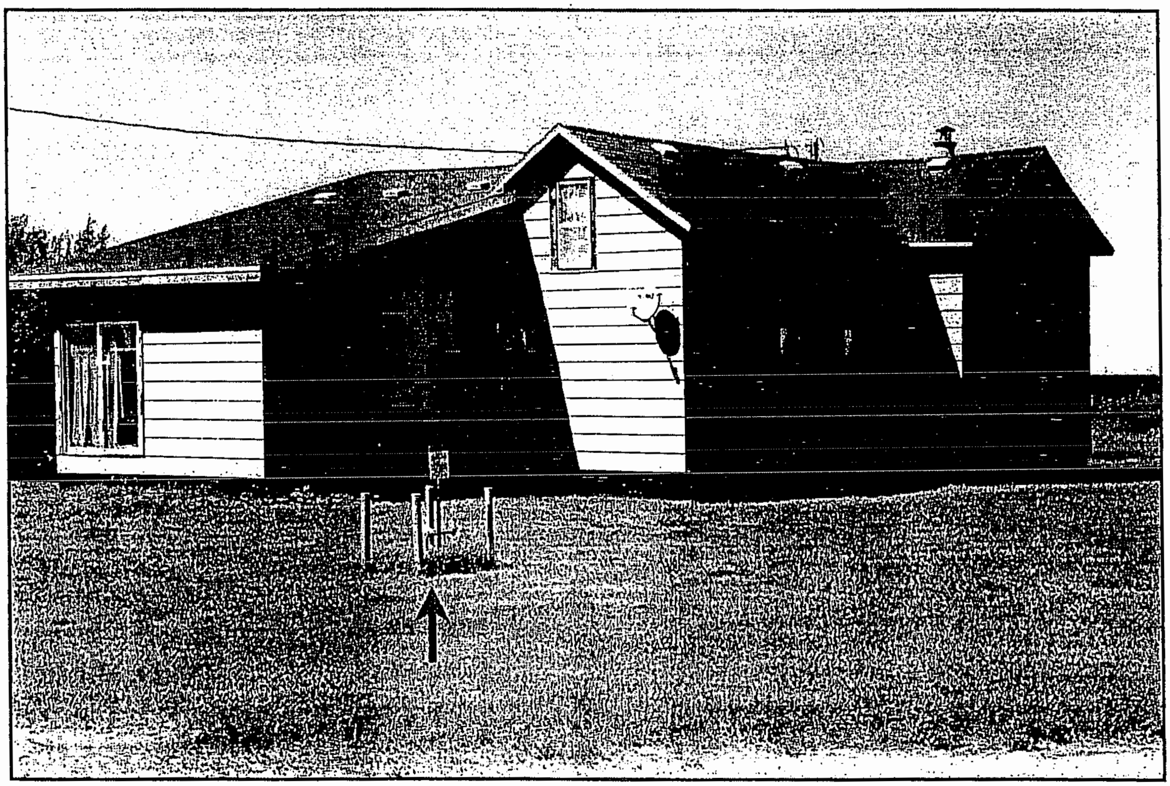


Figure 28. BN-000-00001, Bloedell/Hoops Farmstead. F1, house; view to the northwest. Note pipeline marker in front of house (red arrow). Photo taken by Donna Stubbs on August 19, 2004.

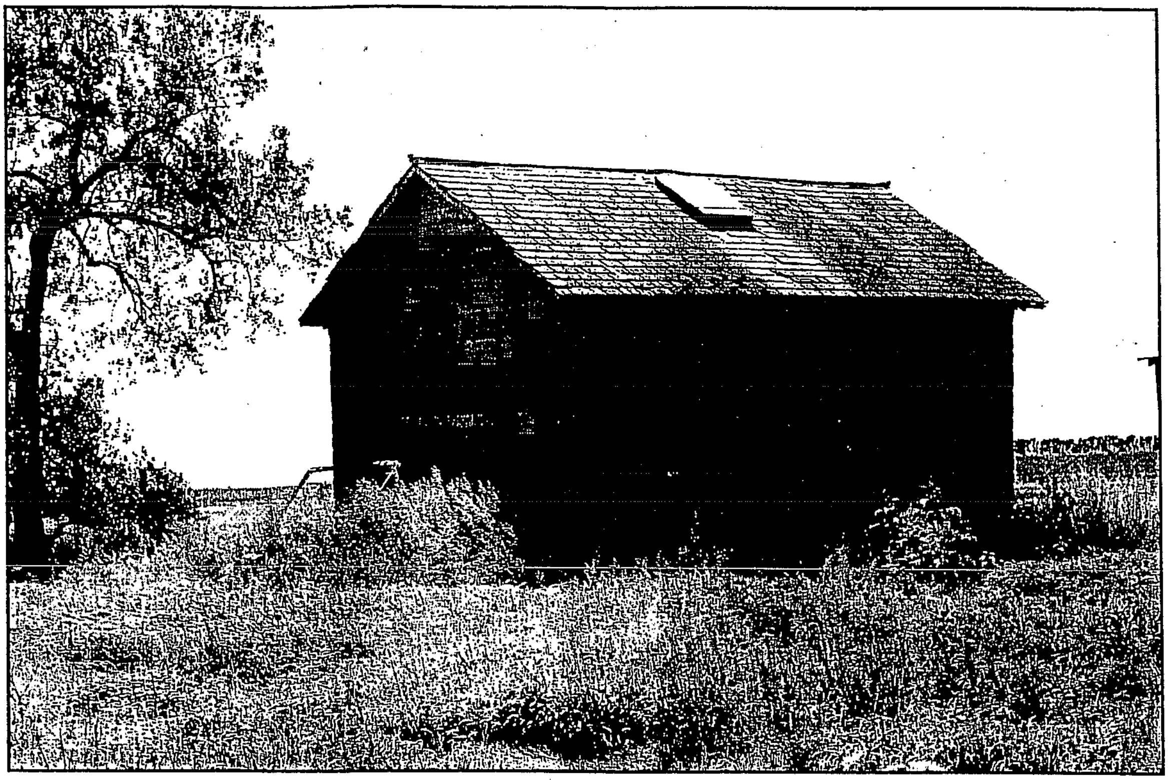


Figure 29. BN-000-00002, Bloedell/Hoops Farmstead. F2, shed; view to the northeast. Photo taken by Donna Stubbs on August 19, 2004.

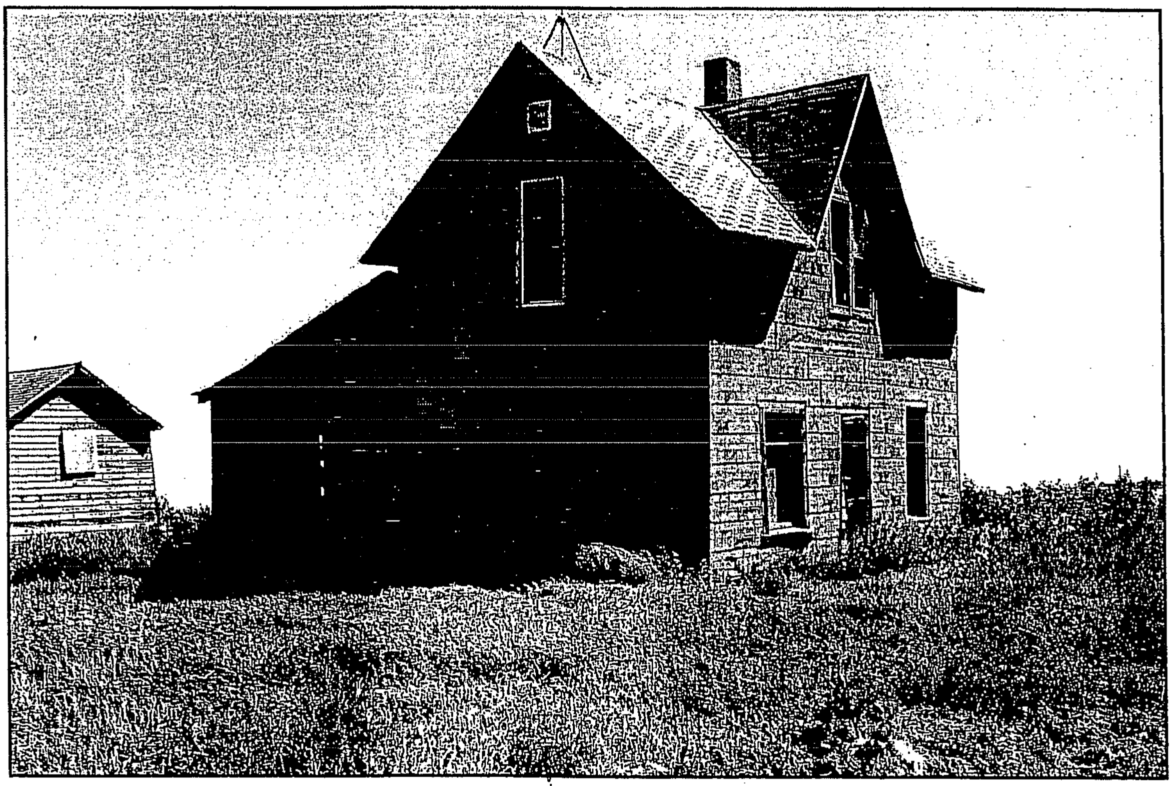


Figure 30. BN-000-00003, Bloedell/Hoops Farmstead. F3, original farmhouse; view to the southeast. Photo taken by Donna Stubbs on August 19, 2004.

RECOMMENDATIONS

During the current inventory, ACR examined 160 block acres and 24.9 linear miles. Based on the file search information for this project and professional experience, ACR anticipated finding few cultural resource sites within the current project area. One previously recorded site and three new sites were recorded during the current project.

Site 39BN2003/39SP2003

This site, the Chicago and North Western Railroad, is located within survey area but is located approximately 700 feet east of the proposed disturbance. The site has previously been impacted by a power line and is recommended not eligible for the NRHP. The current project will avoid the railroad grade and will have no effect on the Chicago and North Western Railroad grade.

Site BN-000-01226

This site, the Verdon Cemetery, is located adjacent to the right-of-way. The site is recommended eligible for the NRHP. All work for this project will be conducted within the existing right-of-way and will have no effect on the Verdon Cemetery.

Site BN-005-00001/00002

This site, the Finnegan/Heiser Farm, is located within survey area but is located approximately 1,500 feet east of the proposed disturbance. Therefore, this project will have no effect on the Finnegan/Heiser farm.

Site BN-000-00001/00002/00003

This site, the Bloedell/Hoops Farm, is located within survey area within the 100-foot right-of-way. An existing pipeline crosses directly in front of a house on the property. The current project is required to be at least 6 feet east of the existing pipeline and would be over 10 feet from the house. Therefore, this project will have no effect on the Bloedell/Hoops farm.

ACR recommends that cultural clearance be granted for the proposed transmission lines. However, should cultural resources be discovered during any ground disturbance, Paige Hoskinson, Historical Archaeologist, South Dakota State Historic Preservation Office, Pierre, SD, should be immediately contacted at 605-773-6004.

STATE PLANNING

The current project lies within the Upper James Archaeological Region. No prehistoric sites were encountered during the survey. Since the project occupies previously disturbed areas, including borrow ditches and plowed fields, ACR did not expect to encounter prehistoric sites.

The negative findings will add to a predictive model for locating prehistoric sites within the archaeological region.

Four historic sites, the Chicago and North Western Railroad (39BN2003/39SP2003), Verdon Cemetery (BN-000-01226), Finnegan/Heiser Farm (BN-005-00001/00002), and Bloedell/ Hoops Farm (BN-000-00001/00002/00003) were encountered during the survey.

REFERENCES CITED

Buechler, Jeff
1987 *Final Report of a Cultural Resource Inventory Survey of Selected Portions of the Web Rural Water Distribution System (Phase 4) in Brown, Edmunds, and Spink Counties, South Dakota.* Dakota Research Services. Prepared for WEB Water Development Association, Inc. Aberdeen, South Dakota.

Brown County Recorder
n.d. Deed Books. Brown County Recorder's Office, Aberdeen, South Dakota.
n.d. Patent Books. Brown County Recorder's Office, Aberdeen, South Dakota.

Centennial Atlas, Ltd.
1988 *Centennial Atlas Limited of Brown County, South Dakota.* Centennial Atlas, Ltd. Watertown, SD.

Hannus, L. Adrien
1982 *Cultural Resource Investigations of the South Dakota Segment of the Northern Border Pipeline Project: Intensive Archaeological Survey, Testing and Mitigation in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel and Brookings Counties, South Dakota.* South Dakota State University. Prepared for Northern Plains Natural Gas Company.

Hoops, Ruth
2004 Personal Communication (interview), August 18.

Hufstetler, Mark and Michael Bedeau
1998 *South Dakota's Railroads: An Historic Context.* Prepared for the South Dakota Historic Preservation Office, Pierre, S.D.

Ogle, George A. & Co.
1911 *Standard Atlas of Brown County.* Complied and Published by George A. Ogle and Co., Chicago.

Peterson, E. Frank
1905 *Atlas of Brown County South Dakota.* Complied and Drawn from a Special Survey and Official Records by E. Frank Peterson, Vermilion, S.D.

U.S. Geological Survey (USGS)
1998 "Ecoregions of North Dakota and South Dakota." U.S. Geological Survey, Northern Prairie Wildlife Research Center. Internet website accessed January 2004, at <http://www.npwrc.usgs.gov/resource /1998/ndsdeco/ndsdeco.htm>.

Winham, R. Peter, William Ranney, and Timothy V. Gillen
1990 *An Intensive Cultural Resources Survey of Sections of Three Proposed Northwester Public Service Gas Pipeline Projects in Eastern South Dakota: Lower James, Northeast Lowland, Upper Big Sioux and Upper James Archaeological Regions.* Archaeology Laboratory, Augustana College, Sioux Falls, SD. Prepared for Pierce and Harris Consulting Engineers, Huron, South Dakota.

A CLASS I CULTURAL RESOURCE SURVEY
FOR BASIN ELECTRIC POWER COOPERATIVE'S
PROPOSED TURBINE STATION
IN T114N, R49W, SECTION 33,
DEUEL COUNTY, SOUTH DAKOTA

Prepared for:
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Prepared by:
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Report No. ACRC-139

January 10, 2004

ABSTRACT

In October 2003, Tetra Tech, Denver, Colorado, requested that ACR Consultants, Inc. (ACR), Sheridan, Wyoming, perform a cultural resource background research and reconnaissance level survey for an Environmental Assessment in South Dakota of a proposed turbine facility.

ACR inventoried 160 block acres in Section 33, T114N, R49W and encountered no sites. Cultural clearance is recommended for the project.

PROJECT LOCATION

Counties:	Deuel
Legal Locations:	T114N, R49W, Section 33
7.5' USGS quadrangles:	Clear Lake South, South Dakota (1978)

INTRODUCTION

In October 2003, Tetra Tech EM, Inc., on behalf of Basin Electric, requested that ACR Consultants, Inc. (ACR), conduct a Class I block survey of the southeast quarter of Section 33, T114N, R49W in Deuel County, South Dakota. ACR performed the present cultural resource survey to ensure that compliance with federal laws regulating the protection of historic properties, as defined in Section 106 of the National Historic Preservation Act and 36 CFR 800, is met.

ENVIRONMENTAL SETTING

The project area is located in eastern South Dakota within the Prairie Couteau of the Northern Glaciated Plains. The project area isalso in the Upper Big Sioux archaeological region. "The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift. The subhumid conditions foster a grassland transitional between the tall and shortgrass prairie. The Prairie Coteau ecoregion is the result of stagnant glacial ice melting beneath a sediment layer. The tightly undulating, hummocky landscape has no drainage pattern; it is perforated with closely spaced semipermanent and seasonal wetlands" (USGS 2003). Specifically, the project area occupies flat cultivated land (Figure 2). An intermittent drainage crosses the quarters ection from the northwest to the southeast. Elevation in the project area is approximately 2000 feet above sea level.

Soils in the project area are Forman series consisting of very deep, well drained, moderately slowly permeable soils formed in Late Wisconsin glacial deposits. Native vegetation is big and little bluestem, switchgrass, indiangrass, blue grama (USGS 2003).

ABSTRACT

In October 2003, Tetra Tech, Denver, Colorado, requested that ACR Consultants, Inc. (ACR), Sheridan, Wyoming, perform a cultural resource background research and reconnaissance level survey for an Environmental Assessment in South Dakota of a proposed turbine facility.

ACR inventoried 160 block acres in Section 18, T122N, R60W and encountered no sites. Cultural clearance is recommended for the project.

PROJECT LOCATION

Counties:	Deuel
Legal Locations:	T114N, R49W, Section 33
7.5' USGS quadrangles:	Clear Lake South, South Dakota (1978)

INTRODUCTION

In October 2003, Tetra Tech EM, Inc., on behalf of Basin Electric, requested that ACR Consultants, Inc. (ACR), conduct a Class I block survey of the southeast quarter of Section 33, T114N, R49W in Deuel County, South Dakota. ACR performed the present cultural resource survey to ensure that compliance with federal laws regulating the protection of historic properties, as defined in Section 106 of the National Historic Preservation Act and 36 CFR 800, is met.

ENVIRONMENTAL SETTING

The project area is located in eastern South Dakota within the Prairie Couteau of the Northern Glaciated Plains. The project area isalso in the Upper Big Sioux archaeological region. "The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift. The subhumid conditions foster a grassland transitional between the tall and shortgrass prairie. The Prairie Coteau ecoregion is the result of stagnant glacial ice melting beneath a sediment layer. The tightly undulating, hummocky landscape has no drainage pattern; it is perforated with closely spaced semipermanent and seasonal wetlands" (USGS 2003). Specifically, the project area occupies flat cultivated land (Figure 2). An intermittent drainage crosses the quarters ection from the northwest to the southeast. Elevation in the project area is approximately 2000 feet above sea level.

Soils in the project area are Forman series consisting of very deep, well drained, moderately slowly permeable soils formed in Late Wisconsin glacial deposits. Native vegetation is big and little bluestem, switchgrass, indiangrass, blue grama (USGS 2003).

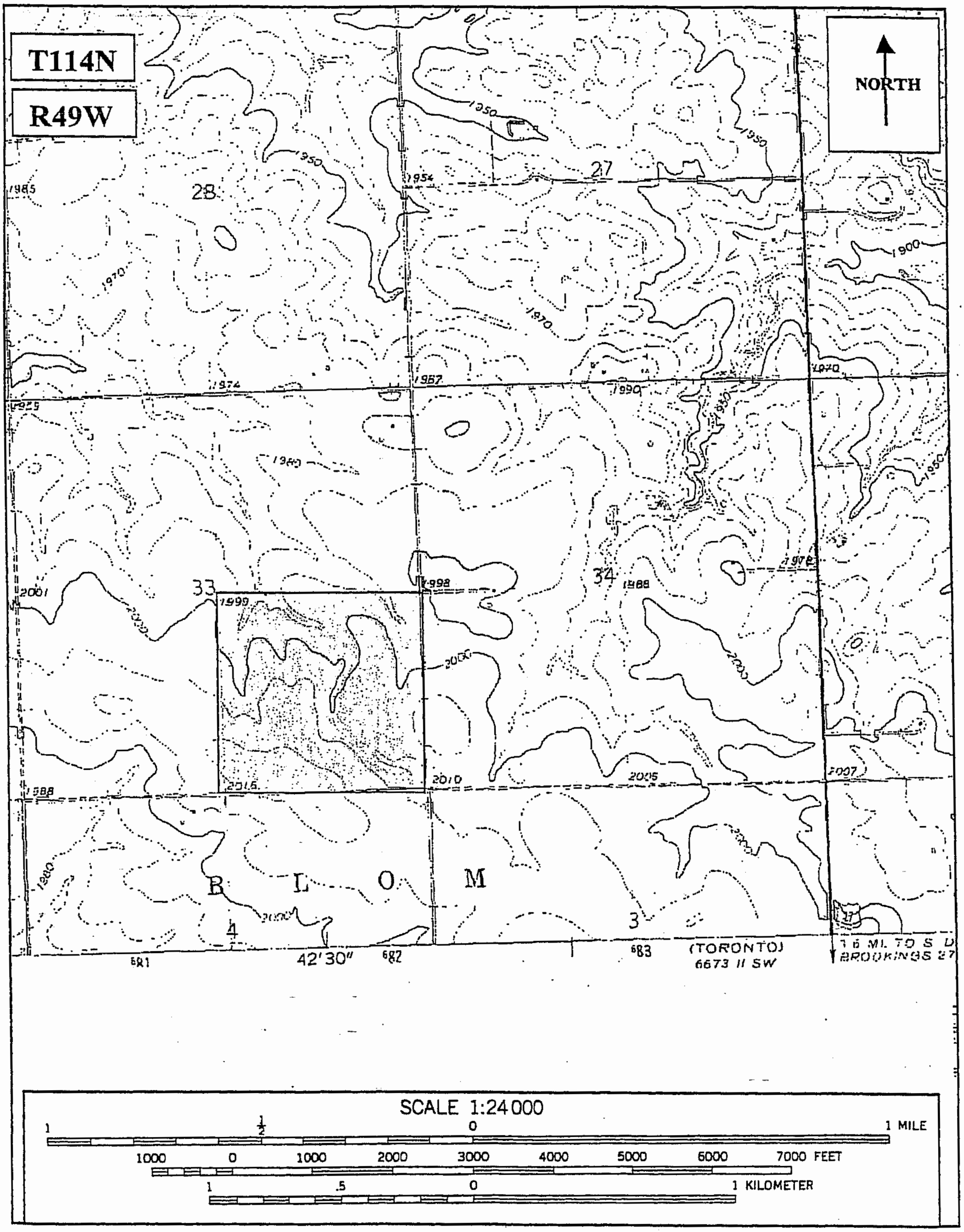


Figure 1. Map showing the 160-acre block (blue line) surveyed by ACR. Adapted from the 7.5' USGS quadrangle titled Clear Lake South, South Dakota (1978).

The 160-acre block survey was in a recently harvested soybean field with chaff remaining. Visibility averaged approximately 50-60%. Prior to the second visit, the field was plowed and visibility increased to 80-90%.

Several modern impacts are present in the project area. There is an overhead transmission line crossing the project area from northwest to southeast (Figure 3). The underground Northern Border Pipeline also crosses the project area from northwest to southeast. The town of Brandt lies approximately six miles northeast of the project area.

PREVIOUS RESEARCH

ACR requested and received a file search on October 16, 2003 for Sections 33 and 34, T114N, R49W from the South Dakota State Historical Society's Archaeological Research Center (SARC), Rapid City, South Dakota for previously conducted projects and previously recorded sites within the project area.

Two previous cultural resource surveys have been conducted within the project area.

- South Dakota State University (SCSU) completed a survey for the Northern Border Pipeline Project in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel, and Brookings Counties in 1982 (Hannus 1982).
- The University of South Dakota completed a survey for a proposed transmission line from Watertown, South Dakota to Moville, Iowa in 1973 (Sigstad 1973).

The file search indicated there are no sites located within the project area. However, there is one site within a one-mile radius of the project area.

- **Site 39DE0035** is a prehistoric artifact scatter located in the northeast quarter of Section 32, T114N, R49W. The site was identified by SCSU and recorded in 1980. The site consists of a wide surface scatter of lithic flakes and a broken biface in a cultivated field. It is over 0.5 miles northwest of the current project area. No information is available on the site's NRHP eligibility. The site is outside the current project area and the project will have no affect on site 39DE0035.

Previous Research Summary and Current Expectations

Only two surveys have been completed within the project area and adjacent surroundings. Two prehistoric sites and no historic sites have been identified. The current survey is in a plowed field. Based on the file search information for this project and professional experience, ACR expects to encounter few cultural resource sites within the current project area.

FIELDWORK

Donna L. Stubbs (principal investigator) and Glendee Ane Osborne and Gina Clingerman (crew) surveyed half of the block on October 29, 2003 and Stubbs and Clingerman completed the fieldwork on November 18, 2003. During the survey, ACR personnel walked parallel transects, spaced no more than 10 meters apart, across the project area. Transects were oriented east-west. Photographs were taken of the project area.

RESULTS

No cultural resources were encountered during this survey.

RECOMMENDATIONS

During the current inventory, ACR examined 160 block acres. Based on the file search information for this project and professional experience, ACR anticipated finding few cultural resource sites within the current project area.

ACR recommends that cultural clearance be granted for the proposed transmission lines. However, should cultural resources be discovered during any ground disturbance, Paige Hoskinson, Historical Archaeologist, South Dakota State Historic Preservation Office, Pierre, SD, should be immediately contacted at 605-773-6004.

STATE PLANNING

The current project lies within the Upper Big Sioux Archaeological Region. No prehistoric sites were encountered during the survey. Since the project occupies previously disturbed areas, including borrow ditches and plowed fields, ACR did not expect to encounter prehistoric sites. The negative findings will add to a predictive model for locating prehistoric sites with the archaeological region.

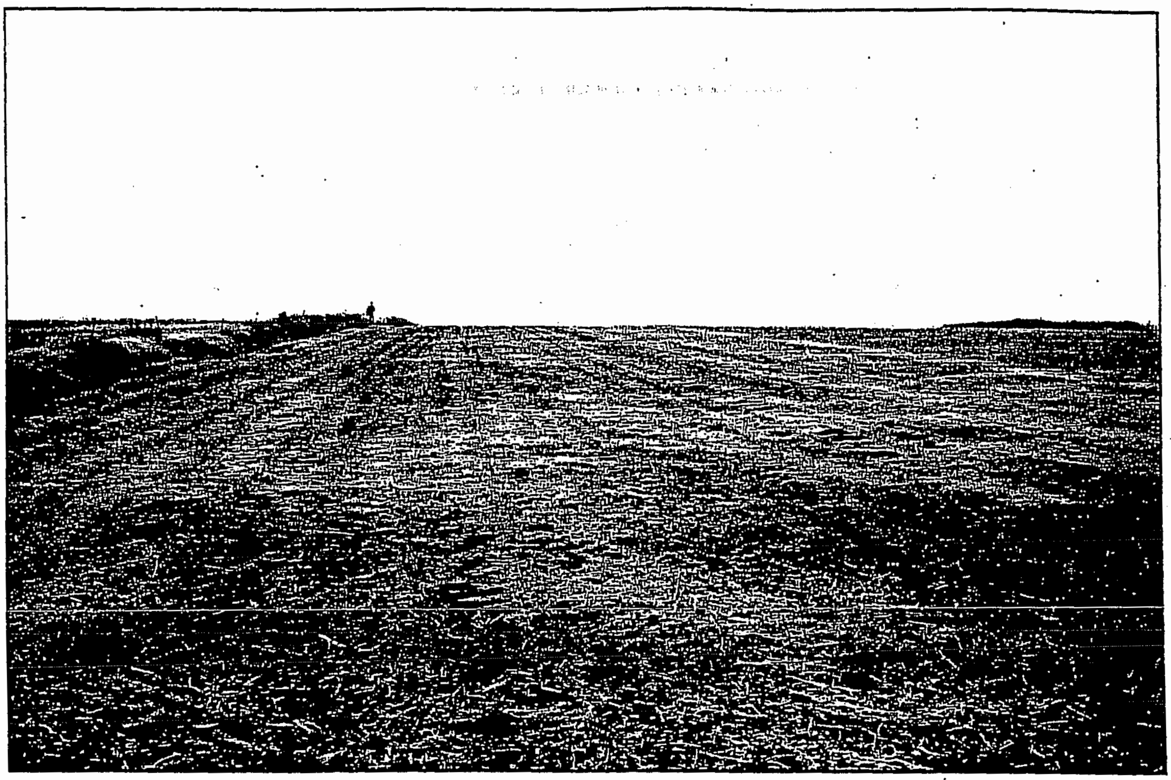


Figure 2. Project overview, southeast quarter, Section 33. Looking north. Photo taken by Donna Stubbs, October 28, 2003.

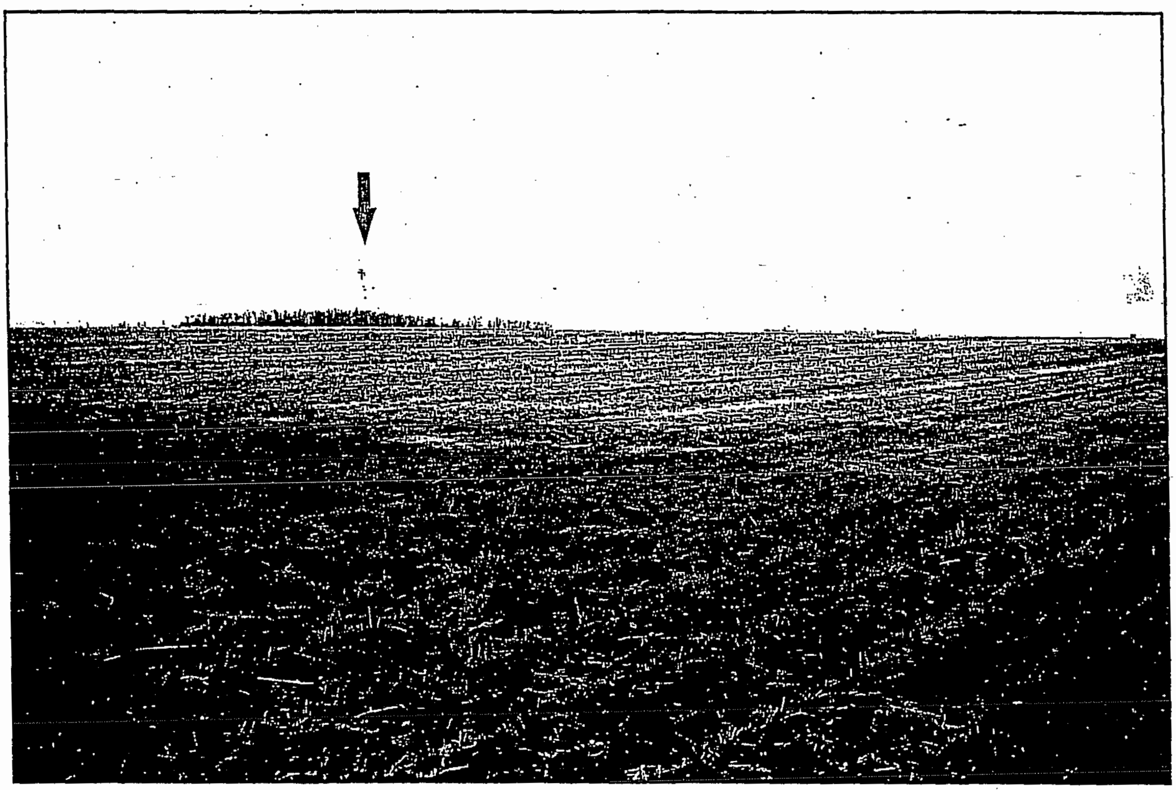


Figure 3. Project overview, southeast quarter, Section 33, looking northeast. The red arrow is pointing at the transmission line tower in the middle of the quarter. Photo taken by Donna Stubbs, October 28, 2003.

REFERENCES CITED

Hannus, L. Adrien

1982 *Cultural Resource Investigations of the South Dakota Segment of the Northern Border Pipeline Project: Intensive Archaeological Survey, Testing and Mitigation in McPherson, Edmunds, Brown, Spink, Clark, Codington, Hamlin, Deuel and Brookings Counties, South Dakota.* South Dakota State University. Prepared for Northern Plains Natural Gas Company.

Sigstad, John S.

1973 An Archaeological Survey of the Proposed Watertown, South Dakota – Moville, Iowa 345 KV Transmission Line 1973. Prepared for the National Park Service.

U.S. Geological Survey (USGS)

1998 "Ecoregions of North Dakota and South Dakota." U.S. Geological Survey, Northern Prairie Wildlife Research Center. Accessed November 24, 2003 on the Internet at: <http://www.npwrc.usgs.gov/resource/1998/ndsdeco/ndsdeco.htm >

APPENDIX C

RARE, THREATENED, ENDANGERED, AND CANDIDATE SPECIES

APPENDIX C
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
RARE, THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Common Name	Scientific Name	Federal Status	State Status	County
BIRDS				
Least Bittern	*Ixobrychus exilis*	G5	S2B	D
Great Blue Heron	*Ardea herodias*	G5	S4B	***B***, S, D
Great Egret	*Casmerodius albus*	G5	S3B	***B***, D
Snowy Egret	*Egretta thula*	G5	S2B	B
Little Blue Heron	*Egretta caerulea*	G5	S2B	B
Green-backed Heron	*Butorides virescens*	G5	S4B	D
Black-Crowned Night Heron	*Nycticorax nycticorax*	G5	S4B	B, D
Yellow-Crowned Night Heron	*Nyctanassa violacea*	G5	SUB	***B***
White-Face Ibis	*Plegadis chihi*	G5	S2B	B
Bald Eagle	*Haliaeetus leucocephalus*	LT	ST	***B***, S
Cooper's Hawk	*Accipiter cooperii*	G5	S3B	B, D
Swainson's Hawk	*Buteo swainsoni*	G5	S4B	D
Ferruginous Hawk	*Buteo regalis*	G4	S4B	B
Whooping Crane	*Grus Americana*	LE	SE	S
Black-Necked Stilt	*Himantopus mexicanus*	G5	S1B	B
Eskimo Curlew	*Numenius borealis*	LE	SE	S
American Woodcock	*Scolopax minor*	G5	S3B	D
Black Tern	*Chilodonias niger*	G4	S3B	D, S
Burrowing Owl	*Athene cunicularia*	G4	S4B	***D***
Henslow's Sparrow	*Ammodramus henslowii*	G4	SUB	D
FISH				
Central Mudminnow	*Umbra limi*	G5	SE	D
Hornyhead Chub	*Nocomis biguttatus*	G5	S3	***D***
Topeka Shiner	*Notropis Topeka*	LE	S2	B, ***D***
Northern Redbelly Dace	*Phoxinus eos*	G5	ST	D
Banded Killifish	*Fundulus diaphanus*	G5	SE	D
Logperch	*Percina caprodes*	G5	S3	D
Blackside Darter	*Percina maculata*	G5	S2	D
MAMMALS				
Swift Fox	*Vulpes velox*	G3	ST	S
Plains Spotted Skunk	*Spilogale putorius interrupta*	G4	S3	B
MOLLUSCS – BIVALVES				
Yellow Sandshell	*Lampsilis teres*	G5	S1	***B***
Creek Heelsplitter	*Lasmigona compressa*	G5	S1	D
Creeper	*Strophitus undulates*	G5	S3	D
Deertoe	*Truncilla truncata*	G5	S2	S

INSECTS (All are butterflies)				
Powesheik Skipperling	*Oarisma powesheik*	G3	S2	D
Ottoe Skipper	*Hesperia ottoe*	G4	S2	D
Dakota Skipper	*Hesperia dacotae*	C	S2	B, D
Iowa Skipper	*Atrytone arogos iowa*	G4	S2	D
Broad-Winged Skipper	*Poanes viator*	G5	S2	D
Regal Fritillary	*Speyeria idalia*	G3	S3	B, D
PLANTS				
Riddell's Goldenrod	*Solidago riddellii*	G5	S1	D
Flattop Aster	*Aster pubentior*	G5	S2	D
Blue Cohosh	*Caulophyllum thalictroides*	G5	S3	D
Kalm's Lobelia	*Lobelia kalmii*	G5	S1	D
Beckwith Clover	*Trifolium beckwithii*	G5	S2	*D*
Downy Gentian	*Gentiana puberulenta*	G5	S4	B, D
Small-Fringed Gentian	*Gentianopsis procera*	G5	S2	*D*
Purple Giant Hyssop	*Agastache scrophulariifolia*	G4	S?	D
Prairie Loosestrife	*Lysimachia quadriflora*	G5	S1	B
Meadowsweet	*Spirea alba*	G5	S3	B
Sage Willow	*Salix candida*	G5	S1	D
Prairie Willow	*Salix humilis*	G5	S1	B
Waxy Bogstar	*Parnassia glauca*	G5	S1	D
Lake Sedge	*Carex lacustris*	G5	S4	D
Tall Cottongrass	*Eriophorum polystachion*	G5	S3	D
Slender Beakrush	*Rhynchospora capillacea*	G5	S1	D
Turk's Cap Lilly	*Lillium canadense*	G5	S1	D
Snow Trillium	*Trillium nivale*	G4	S2	D
Small White Lady's Slipper	*Cypripedium candidum*	G4	S1	D
Nodding Ladies' Tresses	*Spiranthes cernua*	G5	S2	D
Great Plains Ladies' Tresses	*Spiranthes magnicamporum*	G4	S?	B, D
Alpine Rush	*Juncus alpinus*	G5	S3	B
Least Grape-Fern	*Botrychium simplex*	G5	S?	B
Prairie Moonwort	*Botrychium campestre*	G4	S?	B
Large-Leaf Pondweed	*Potamogeton amplifolius*	G5	S3	*D*

Notes:

B Brown County (*B* indicates occurrence within a 10-mile radius of the proposed site.)
D Deuel County (*D* indicates occurrence within a 10-mile radius of the proposed site.)
S Spink County

FC Federal – Candidate
LE Federal – Endangered
LT Federal – Threatened
Status
G5 Global – Demonstrably Secure

SU State – Uncertain Status
S? State – Not Yet Ranked
S#B State – Bird Breeding Season

G4	Global – Apparently Secure
G3	Globally – Rare or Restricted
ST	State – Threatened
SE	State – Endangered
S1	State – Critically Imperiled
S2	State – Imperiled
S3	State – Rare or Restricted
S4	State – Apparently Secure

APPENDIX D

ANIMAL SPECIES OBSERVED AT PROPOSED PROJECT LOCATIONS

APPENDIX D
EAST SIDE PEAKING PROJECT
BASIN ELECTRIC POWER COOPERATIVE
ANIMAL SPECIES OBSERVED AT PROPOSED
PROJECT LOCATIONS (OCTOBER 2003)

Common Name	Scientific Name	Watertown SE	Groton	Groton Pipeline
BIRDS				
Red-Tailed Hawk	*Buteo jamaicensis*			D
Ring-Necked Pheasant	*Phasianus colchicus*	D	D	D
Mourning Dove	*Zenaida macroura*		D	
Horned Lark	*Eremophila alpestris*	D		
Song Sparrow	*Melospiza melodia*	D	D	
American Tree Sparrow	*Spizella arborea*		D	
Dark-Eyed Junco	*Junco hyemalis*	D	D	
Western Meadowlark	*Sturnella neglecta*			D
Yellow-Headed Blackbird	*Xanthocephalus xanthocephalus*			D
Brewer's Blackbird	*Euphagus cyanocephalus*		D	
Snow Goose	*Chen caerulescens*		D	
MAMMALS				
American Badger	*Taxidea taxus*	I	I	
Coyote	*Canis latrans*	I		
White-Tailed Deer	*Odocoileus virginianus*	I	D	
Eastern cottontail	*Sylvilagus floridanus*		D	
Common Raccoon	*Procyon lotor*		I	
Prairie Vole	*Microtus ochrogaster*	D		

Notes:

D - Direct Observation
I - Indirect Observation (tracks, scat, burrow)

Numerous rodent burrows were evident at each site. Although only one rodent was directly observed, burrows were consistent with unidentified species of ground squirrel, pocket gopher, a

APPENDIX E

PLANT SPECIES LIST AND OCCURRENCE

APPENDIX E
PLANT SPECIES LIST AND OCCURRENCE AT TWO POTENTIAL SOUTH DAKOTA GENERATOR SITES (OCTOBER 2003)

Scientific Name	Common Name	Groton Site	Watertown SE Site
Grasses and Grasslike Plants			
Agropyron cristatum	Crested wheatgrass	X	
Agropyron intermedium	Intermediate wheatgrass	X	
Agropyron smithii	Western wheatgrass	X	X
Andropogon gerardii	Big bluestem	X	
Andropogon scoparius	Little bluestem	X	
Bromus inermis	Smooth brome	X	X
Bromus tectorum	Cheatgrass	X	X
Carex spp.	Sedges	X	X
Districlis stricta	Inland saltgrass	X	
Eragrostic cilianensis	Stinkgrass	X	
Festuca octoflora	Sixweeks fescue	X	
Hordeum jubatum	Foxtail barley	X	X
Koleria cristata	Junegrass	X	X
Panicum capillare	Witchgrass	X	
Phalaris arundinacea	Reed canarygrass	X	X
Phleum pratense	Timothy	X	
Poa compressa	Canada bluegrass	X	
Poa pratensis	Kentucky bluegrass	X	X
Setaria glauca	Yellow bristlegrass	X	
Forbs, Shrubs, Trees			
Achillea millefolium	Western yarrow	X	X
Amaranthus hybridus	Smooth pigweed		X
Asclepias speciosa	Showy milkweed	X	X
Cirsium arvense	Canada thistle	X	X
Convolvulus arvensis	Field bindweed	X	X
Eupatorium purpureum	Sweet Joepyeweed	X	X
Gentiana spp.	Gentian species		X
Glycyrrhiza lepidota	American licorice		X
Grindelia squarrosa	Curlycup gumweed	X	
Helianthus annuus	Common sunflower	X	X
Iva xanthifolia	Marshelder		X
Kochia scoparia	Kochia	X	
Kuhnia eupatorioides	False boneset	X	
Melilotus officinalis	Yellow sweetclover	X	X
Prunus virginiana	Chokecherry		X
Rosa arkansana	Arkansas rose	X	X
Rumex altissimus	Pale dock	X	X
Taraxacum officinale	Common dandelion	X	X
Thlaspi arvense	Field pennycress		X
Tragopogon dubius	Western salsify		X
Trifolium repens	White clover	X	
Xanthium strumarium	Cocklebur	X	X

APPENDIX F

SCOPING DOCUMENTS

CORRESPONDENCE FROM BASIN ELECTRIC COOPERATIVE TO AGENCIES AND ORGANIZATIONS

APPENDIX E-1

East Side Peaking Gas-Fired Combustion Turbine

BASIN ELECTRIC POWER COOPERATIVE

SUMMARY OF AGENCY RESPONSES TO BASIN ELECTRIC POWER COOPERATIVE

Company/Agency Name	Date Letter Sent to Agency	Date of Response by Agency	Response from agency
SD Ecological Services Office	6/22/04	6/29/2004	O.k. with project as is, if design changes, need to submit new plans
State Historic Preservation Office	6/22/04		
Spink County Planning and Zoning Commission	6/22/04		
State Historic Preservation Office, Northeast Area	6/22/04	7/6/2004	O.k. with project suggest a cultural response survey
State Historic Preservation Office	6/22/04		
SD Geological Survey	6/22/04		
Flandreau Santee Sioux Executive Committee	6/22/04		
Natural Resource Conservation Service	6/22/04		
Natural Resource Conservation Service	6/22/04		
SD Department of Transportation	6/22/04	7/15/2004	Need to notify DOT maintenance supervisor, prior to installation
SD Department of Game, Fish, and Parks	6/22/04	7/15/2004	No objections
County Courthouse	6/22/04		
SD Department of Environment and Natural Resources	6/22/04	7/15/2004	Miscellaneous comments- all addressed in ER
Brown County Planning and Zoning Commission	6/22/04		
Bureau of Indian Affairs	6/22/04		
SD Public Utilities Commission	7/6/04		

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Jay Vogt
State Historic Preservation Officer
State Historic Preservation Office
Cultural Heritage Center
900 Governors Drive
Pierre, SD 57501

RE: **Historical or Cultural Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Vogt:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and cultural and historical resources requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Historical or Cultural Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known historical and cultural resources within or near the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE
1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Ms. Barb Lening
Auditor
Spink County Planning and Zoning Commission
210 East 7th Avenue
Redfield SD, 57469

RE: **Spink County Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Ms. Taylor:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding sensitive or important local issues or resources within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Donald (Pete) Gober
Field Supervisor
South Dakota Ecological Services Office
U.S. Fish & Wildlife Service
420 South Garfield Avenue, Suite 400
Pierre, SD 57501-5408

RE: **Wildlife Resources and Threatened and Endangered Species Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Gober:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and wildlife refuge and threatened and endangered species requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Wildlife Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known wildlife resources within or near the study area, especially state- or federally- listed threatened and endangered species. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive wildlife resources.
If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Jason Haug
Historic Preservation Specialist
Northeast Area
State Historical Preservation Center
900 Governors Drive
Pierre, SD 57501

RE: **Historical or Cultural Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Haug:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and cultural and historical resources requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Historical or Cultural Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known historical and cultural resources within or near the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Paige Hoskinson
Historical Archaeologist
State Historical Preservation Center
900 Governors Drive
Pierre, SD 57501

RE: **Historical or Cultural Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Ms. Hoskinson:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and cultural and historical resources requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Historical or Cultural Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known historical and cultural resources within or near the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Tim Cowman
Natural Resources Administrator
South Dakota Geological Survey
Akeley Science Center, USD
414 East Clark Street
Vermillion, SD 57069

RE: **Geologic and Paleontological Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Cowman:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and geologic and paleontological resources requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Geologic Resources Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding geologic resources within or near the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Richard P. Allen
Flandreau Santee Sioux Executive Committee
PO Box 283
Flandreau, SD 57028

RE: **Areas of Native American Significance for Proposed East Side Peaking Gas-fired Combustion Turbine**

Dear Mr. Allen:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and Areas of Native American Significance requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Native American Information on the Site — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding areas of Native American significance within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine mitigation measures for sensitive resources should such measures be necessary.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

J. Berg

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

**BASIN ELECTRIC
POWER COOPERATIVE**

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

District Conservationist
Natural Resource Conservation Service
Aberdeen Service Center
1707 4th Ave SD
Aberdeen, SD 57401-5087

RE: **Soil and Other Natural Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear District Conservationist:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and soils, prime farmland, and other natural resources information available from NRCS in accordance with requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Natural Resources Information — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding soils, prime farmland, and other natural resources information within the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

District Conservationist
Natural Resource Conservation Service
Clear Lake Service Center
222 4th Ave S
Clear Lake, SD 57226

RE: **Soil and Other Natural Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear District Conservationist:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and soils, prime farmland, and other natural resources information available from NRCS in accordance with requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Natural Resources Information — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding soils, prime farmland, and other natural resources information within the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Ms. Eileen Dowd Stukel
Coordinator, Wildlife Diversity Program
South Dakota Department of Game, Fish and Parks
523 E. Capitol-Foss Building
Pierre, SD 57501-3182

RE: Wildlife Resources and Threatened and Endangered Species Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine

Dear Ms. Dowd Stukel:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and wildlife refuge and threatened and endangered species requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Wildlife Information on the Site — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known wildlife resources within or near the study area, especially state- or federally- listed threatened and endangered species. Your response will supplement field surveys for threatened and endangered species in the project area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive wildlife resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Toby Wolf
Region Operations Engineer
South Dakota Department of Transportation
PO Box 1767
Aberdeen, SD 57402-1767

RE: **Transportation Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Wolf:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and Areas specific requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Transportation Information — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding transportation resources within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect transportation resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Ms. Pam Lynde
Auditor
P.O. Box 616
County Courthouse
Clear Lake, SD 57226-0616

RE: **Deuel County Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Ms. Lynde:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding sensitive or important local issues or resources within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James A. Berg

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Tim Tollefsrud
Director
SD Department of Environment and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501

RE: **Environmental and Water Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Mr. Tollesfrud:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and environmental and water resource requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Environmental and Water Resources Information on the Site — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding known environmental and water resources within or near the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

J. A. Berg

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Ms. Maxine Taylor
Auditor
Brown County Planning and Zoning Commission
25 Market Street
Aberdeen SD, 57401

RE: **Brown County Resources Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine**

Dear Ms. Taylor:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Information— In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding sensitive or important local issues or resources within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

June 22, 2004

Mr. Delbert Brewer
Aberdeen Area Office
Bureau of Indian Affairs
115 Fourth Avenue SE
Aberdeen, SD 57401

RE: **Areas of Native American Significance for Proposed East Side Peaking Gas-fired Combustion Turbine**

Dear Mr. Brewer:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and Areas of Native American Significance requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities — Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southeast of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Native American Information on the Site — In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding areas of Native American significance within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine mitigation measures for sensitive resources should such measures be necessary.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James Berg

James Berg
Environmental Monitoring Coordinator

cc: James K. Miller, Basin Electric
Robert Hammer, Tetra Tech EMI

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE 701-223-0441
FAX: 701/224-5336

July 6, 2004

Ms. Pam Bonrud
Executive Director
SD Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501-5070

RE: Public Utilities Commission Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine

Dear Ms. Bonrud:

Basin Electric Power Cooperative (Basin Electric) is submitting the following information regarding a proposed gas-fired combustion turbine. Basin Electric is evaluating potential sites in order to obtain a permit to construct a gas-fired combustion turbine from the South Dakota Public Utilities Commission (PUC) and consistent with National Environmental Policy Act (NEPA), and permitting requirements codified in 47 Code of Federal Regulations (CFR), Subpart I, 1.1307 (a) (4).

Planned Activities – Basin Electric is proposing to construct a new 80 to 100 Megawatt (MW) simple cycle gas turbine in Eastern South Dakota and is evaluating potential sites in Brown and Deuel Counties, South Dakota. One site is located approximately 5 miles south of the town of Groton, in Brown County. A second potential site is located approximately 27 miles southwest of Watertown, in Deuel County. Depending on the site selected, associated facilities could include a gas pipeline, water pipeline, and electric transmission facilities. The study areas for the proposed gas-fired turbine associated facilities are illustrated in the enclosed Site Selection Study. To our knowledge, the proposed corridor does not cross land owned by federal, state, or local governments.

Known Information – In compliance with NEPA and in order to obtain a permit to construct a new gas-fired combustion turbine from the PUC, Basin Electric is hereby requesting any information regarding sensitive or important issues or resources within, near, or related to the study area. Further, we would appreciate the opportunity to enter discussion with you to determine any measures that might be necessary to protect sensitive resources.

If you have any questions, please call me at (701) 223-0441. Because Basin Electric hopes to proceed expeditiously with this project, we would like to have your response as soon as possible.

Sincerely,

James A. Berg

James A. Berg
Environmental Monitoring Coordinator

jab:mev
cc: James K. Miller, BEPC
Robert Hammer, Tetra Tech EMI

CORRESPONDENCE FROM AGENCIES AND ORGANIZATIONS TO BASIN ELECTRIC POWER COOPERATIVE

South Dakota
GREAT FACES. GREAT PLACES.

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

July 9, 2004

RECEIVED
JUL 15 2004
PLANT OPERATIONS
RECORDS YES NO

James Berg, Environmental Monitoring Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, ND 58503-0564

Dear Mr. Berg:

I am in receipt of a copy of Basin Electric Power Cooperative's "East Side Peaking Combustion Turbine Generator Site Selection Study" that you sent to Tim Tollefsrud on June 22, 2004. The study identifies Basin Electric Power Cooperative's desire to build a peaking gas-fired combustion turbine at one of two sites (Groton and Watertown SE) in eastern South Dakota. DENR reviewed the study and provides the following comments and recommendations:

1. Basin Electric Power Cooperative is correct in that the two locations are not near a Class I area or a nonattainment area. The proposed peaking plant will require an air quality permit. The potential air emissions will determine the type of air quality permit Basin Electric Power Cooperative would need to obtain before starting construction. DENR recommends that you submit the application at least 180 days in advance of starting construction to ensure the air quality permit is in place and the permitting process does not delay construction. Kyrik Rombough is the contact for air quality permitting issues and can be reached at (605) 773-3151.
2. Wetlands may be impacted at both sites by the project. Wetlands are considered waters of the state and are protected under the South Dakota Surface Water Quality Standards. The discharge of pollutants from any source, including indiscriminate use of fill material, may not cause destruction or impairment to waters of the state except where authorized under Sections 402 or 404 of the Federal Water Pollution Control Act. The U.S. Army Corps of Engineers would need to be contacted concerning these permits.
3. If the turbine has a direct discharge to surface water, it will need a surface water discharge permit. Permit limits vary depending on the discharge characteristics and discharge location. You may need to do instream sampling to determine the limits for the permit. DENR recommends that the application be submitted at least 180 days in advance of the turbine being operated to ensure the surface water discharge permit is in place and the permitting process does not delay the operation of the turbine. Kelli Buscher is the contact for surface water discharge issues and can be reached at (605) 773-3351.
4. If one or more acres of land are disturbed during construction, coverage under the General Permit for Storm Water Discharges Associated with Construction Activities must be obtained for this project. An application for coverage under this permit must be submitted 15 days prior to start of construction. An industrial storm water permit may also be required for the

operation of the peaking plant to control runoff from the site after construction. This permit is also a general permit with the same application process mentioned above. Both permits require you to develop and implement a storm water pollution prevention plan prior to the start of permitted activities. For more information on storm water permitting, please contact Stacy Reed at 1-800-SDSTORM (737-8676) or visit www.state.sd.us/stormwater.

5. If this facility will have an onsite wastewater system, including a septic system, plans and specifications should be submitted to DENR for review and approval prior to construction. Scott Hipple is the contact for these issues and can be reached at (605) 773-3351.
6. The study indicated that Basin Electric Power Cooperative will use rural water as the water source for the turbine. In this case, a water right permit is not required as the supplier will hold its own water right permit for the appropriation of water. However, if the facility develops its own water supply from private wells or a surface water source, even for backup purposes, a water right and possibly a surface water permit will need to be obtained. The Water Rights Program can provide information on local aquifers, known wells in the area and other water rights information. Questions concerning water right permitting requirements or the process for applying for a permit may be directed to Eric Gronlund at (605) 773-3352.
7. The study indicates that fuel oil will be used as a backup fuel source during natural gas curtailment. DENR assumes that an aboveground storage tank would be associated with the facility to store fuel oil. The fuel oil storage tank may be subject to state and federal regulations. Plans and specifications for the tanks must be submitted to DENR 30 days prior to construction for review and approval. These plans and specifications must address DENR's requirements for corrosion protection, release detection and secondary containment. While DENR has no authority to implement the federal Spill Prevention, Control and Countermeasure (SPCC) rules, they do apply to any aboveground storage tanks greater than 1,320 gallons in capacity that contain petroleum products. DENR recommends that you consult a professional engineer familiar with the SPCC requirements to avoid potential violations with the federal government. Questions concerning aboveground tank requirements should be directed to Doug Miller at (605) 773-3296.

The applications for the environmental permits mentioned above are available on the state's website at http://www.state.sd.us/denr/denr_form_program.htm. DENR is ready to assist Basin Electric Power Cooperative in obtaining all the required environmental permits necessary to construct and operate the peaking plant in eastern South Dakota. After Basin Electric Power Cooperative has decided on the site and determined the design of the proposed peaking plant, DENR recommends that you contact us to arrange a meeting to discuss the above issues.

Thank you for contacting us ahead of time to ensure that environmental issues are addressed before construction begins. If you have any questions, feel free to contact the individuals mentioned above or me at (605) 773-3151.

Sincerely,

Brian Gustafson

Brian Gustafson
Administrator
Air Quality Program

South Dakota
GREAT FACES. GREAT PLACES.®

DEPARTMENT OF GAME, FISH AND PARKS
Foss Building
523 East Capitol
Pierre, South Dakota 57501-3182

RECEIVED
JUL 15 2004
PLANT OPERATIONS
RECORDS YES NO

July 8, 2004

James Berg
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismark, North Dakota 58503-0564

RE: Wildlife Resources and Threatened and Endangered Species Information Request for Proposed East Side Peaking Gas-Fired Combustion Turbine

Dear James:

This responds to your letter of June 22, 2004 relative to the referenced subject.

We have reviewed the maps and materials you provided for the sites located in Brown County, South Dakota (Groton Site) and the Watertown S.E. Site Located in Deuel County, South Dakota. As a result of that review we have no adverse comments to make or objections to raise associated with the selection of either site for the identified purpose of the project.

Sincerely

John C. Kirk

John C. Kirk, Chief Environmental Review and Management

241
L-85

UTILITY PERMIT

ISSUED TO:

RECEIVED
JUL 15 2004
PLANT OPERATIONS
RECORDS YES NO

BASIN ELECTRIC POWER CO
1717 E INTERSTATE AVE
BISMARCK, ND 58503

Permit No.: 041085.00
Date: 06/22/2004
Project(s): 0372

Gentlemen:

The South Dakota Department of Transportation on 06/22/2004 has approved your request to occupy highway right-of-way as outlined in your application. You are required to notify the DOT maintenance supervisor prior to utility installation.

Therefore, permission is hereby granted, in accordance with the laws of the State of South Dakota relative thereto, to install PIPELINE facilities within the highway right-of-way of Highway Number(s) SD37 in BROWN County, South Dakota, provided same is done at the expense of the permittee, under the supervision and to the satisfaction of the Area Engineer and according to Exhibit(s) A-H attached.

IN THE EVENT IT IS DEEMED NECESSARY BY THE SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION TO MOVE OR ALTER THE LINE IN ANY WAY DUE TO MAINTENANCE OR HIGHWAY RECONSTRUCTION WITHIN ITS PRESENT RIGHT-OF-WAY WIDTH, THE ALTERATION WILL BE ACCOMPLISHED BY THE OWNER WITHOUT COST TO THE STATE.

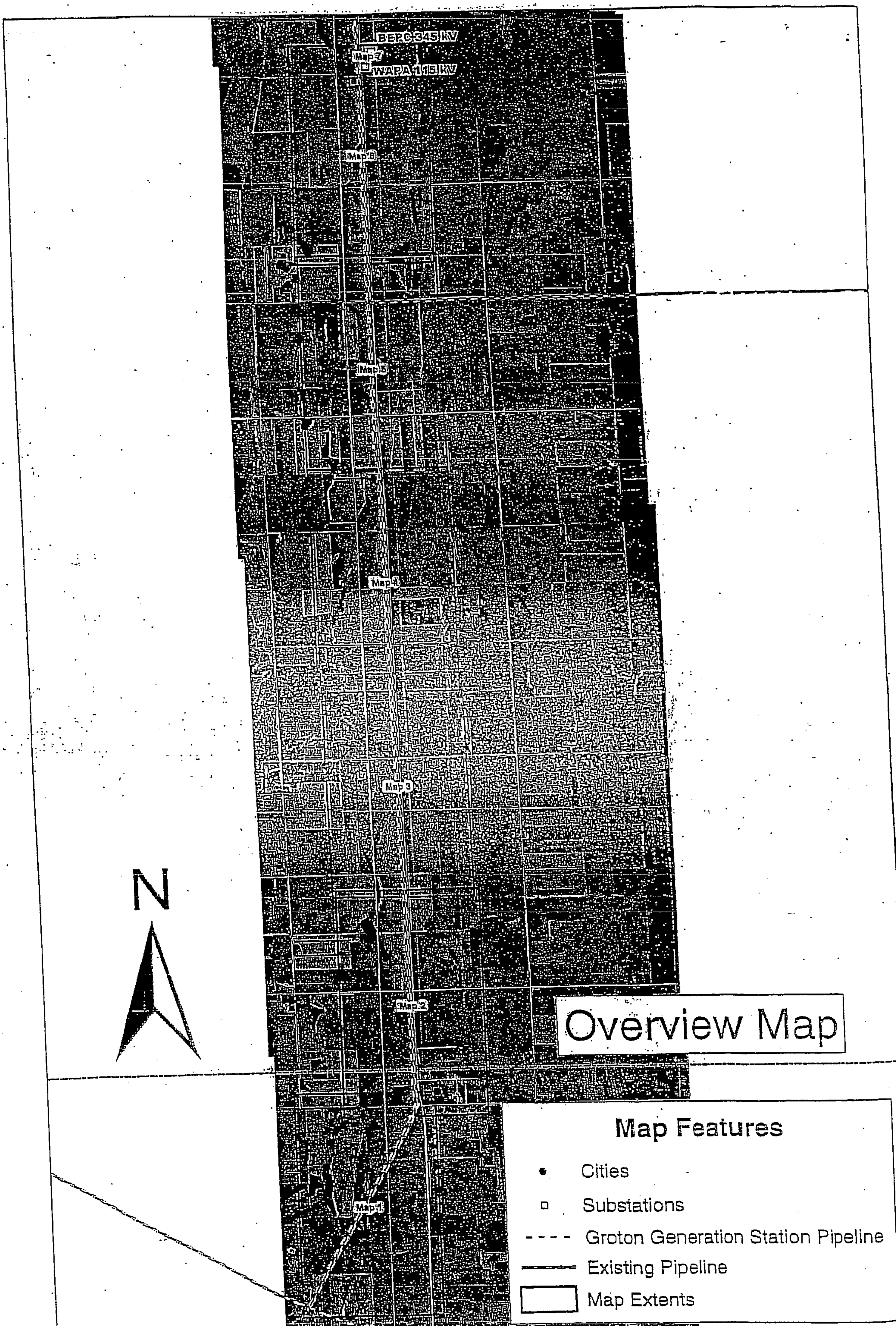
Very truly yours,

DEPARTMENT OF
TRANSPORTATION
Operations Support
Pierre, South Dakota

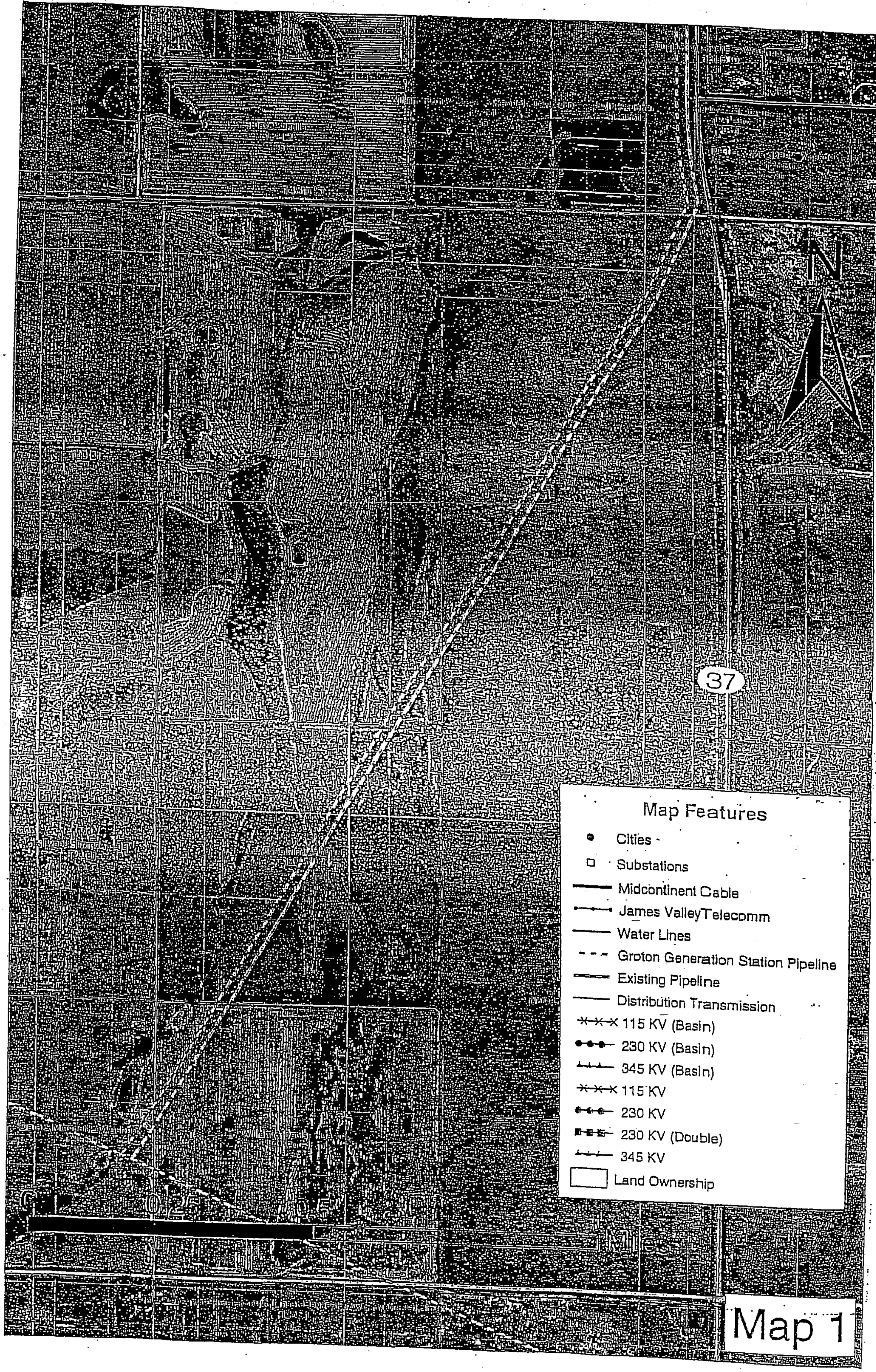
Scott Pretzer

Permit Manager

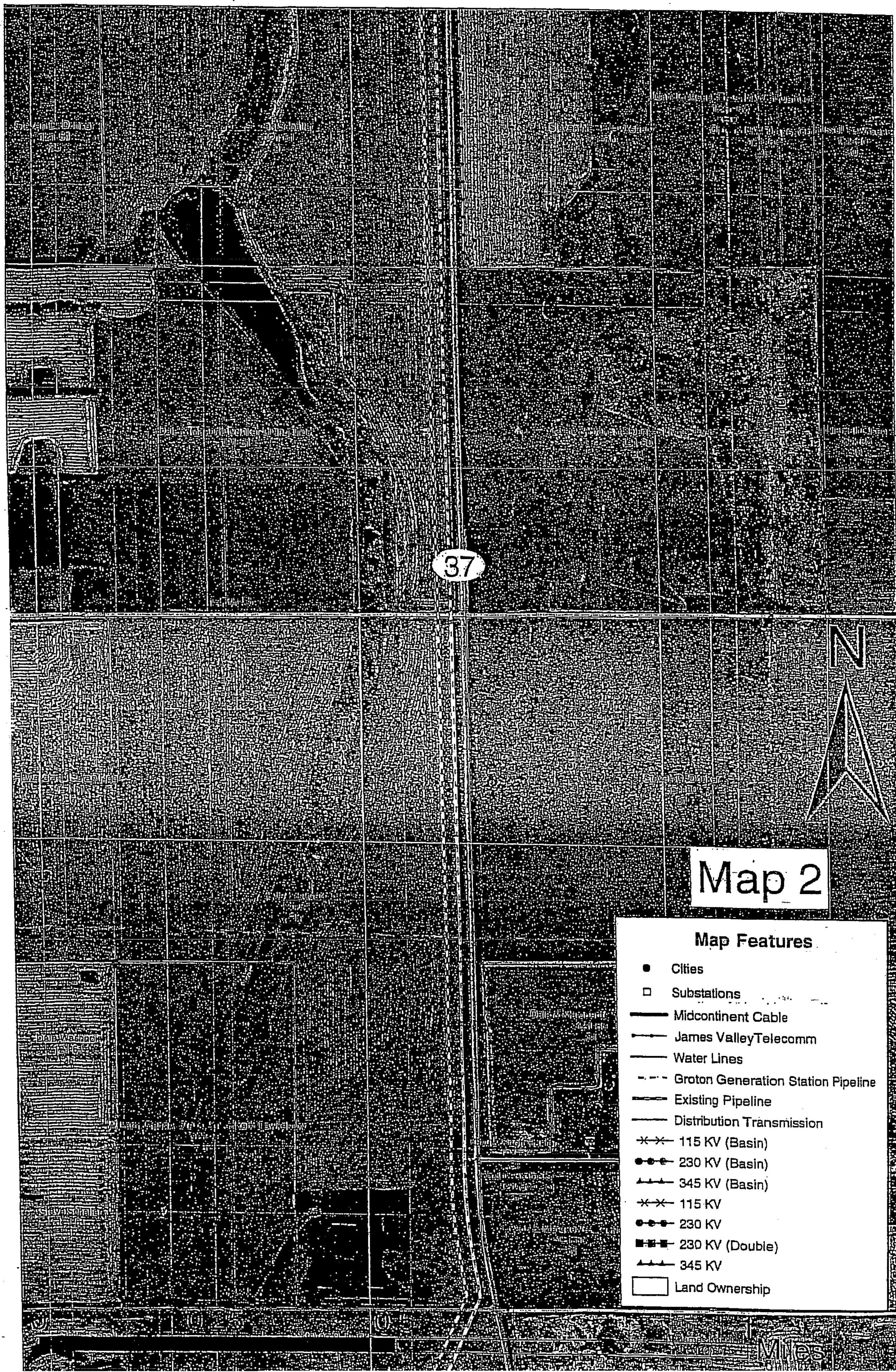
sj
Records Center
Area Engineer (2)



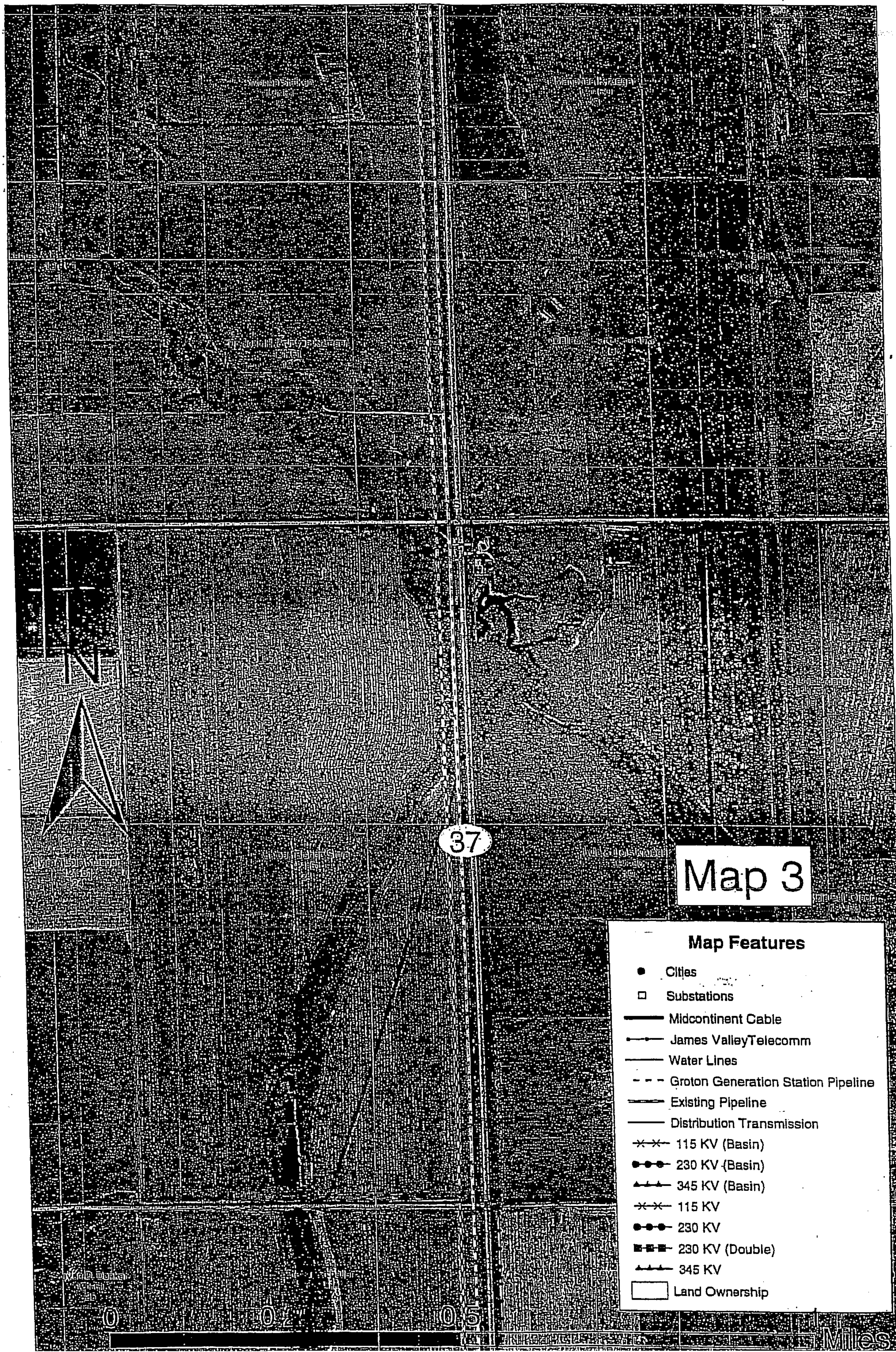
BEPC 345 kV
Map 7
WAPA 115 kV
Map 6
Map 5
Map 4
Map 3
Map 2
Map 1
N
Overview Map
Map Features
Cities
Substations
Groton Generation Station Pipeline
Existing Pipeline
Map Extents



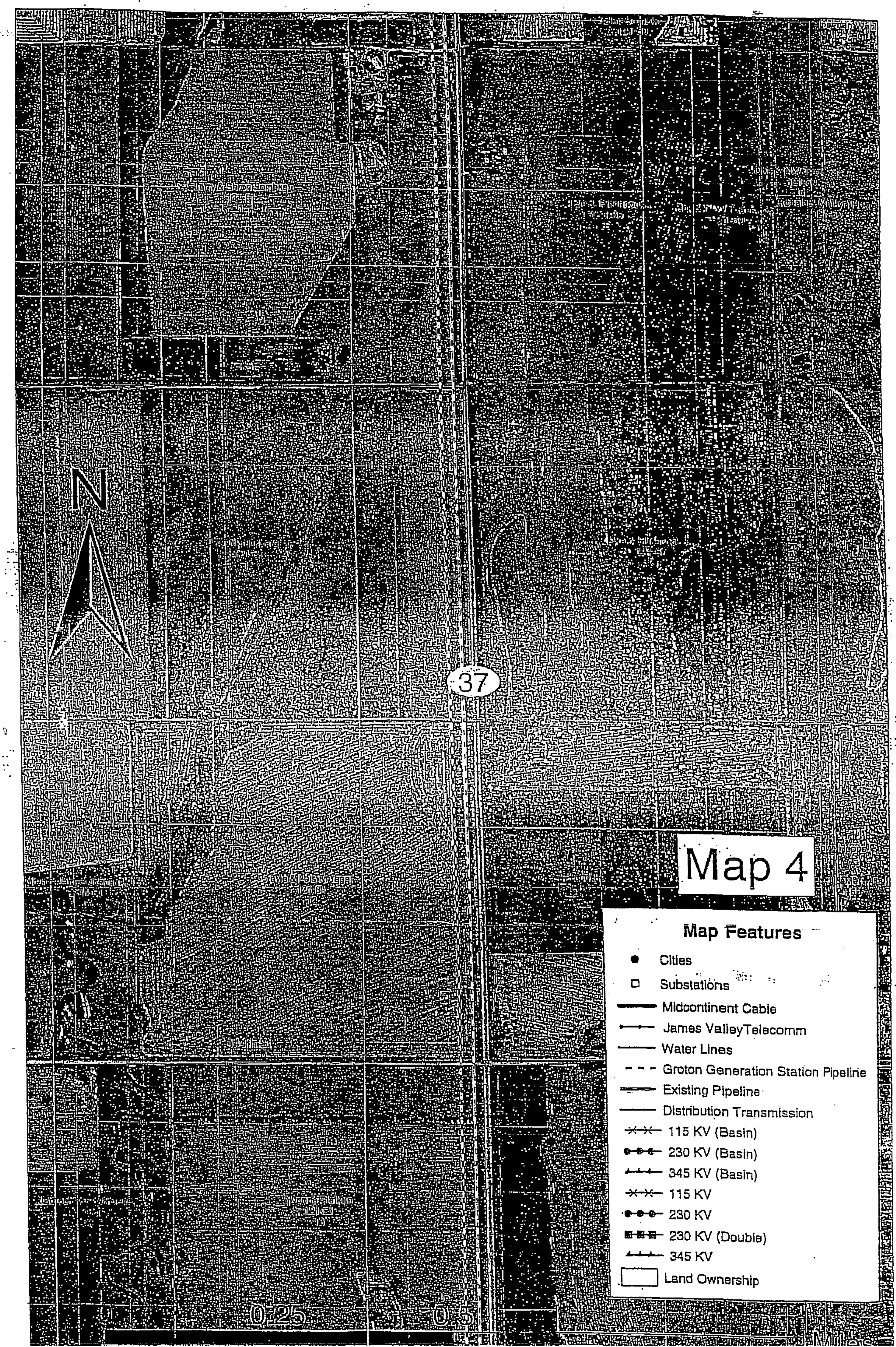
37
N
Map Features
Cities
Substations
Midcontinent Cable
James ValleyTelecomm
Water Lines
Groton Generation Station Pipeline
Existing Pipeline
Distribution Transmission
115 KV (Basin)
230 KV (Basin)
345 KV (Basin)
115 KV
230 KV
230 KV (Double)
345 KV
Land Ownership
Map 1



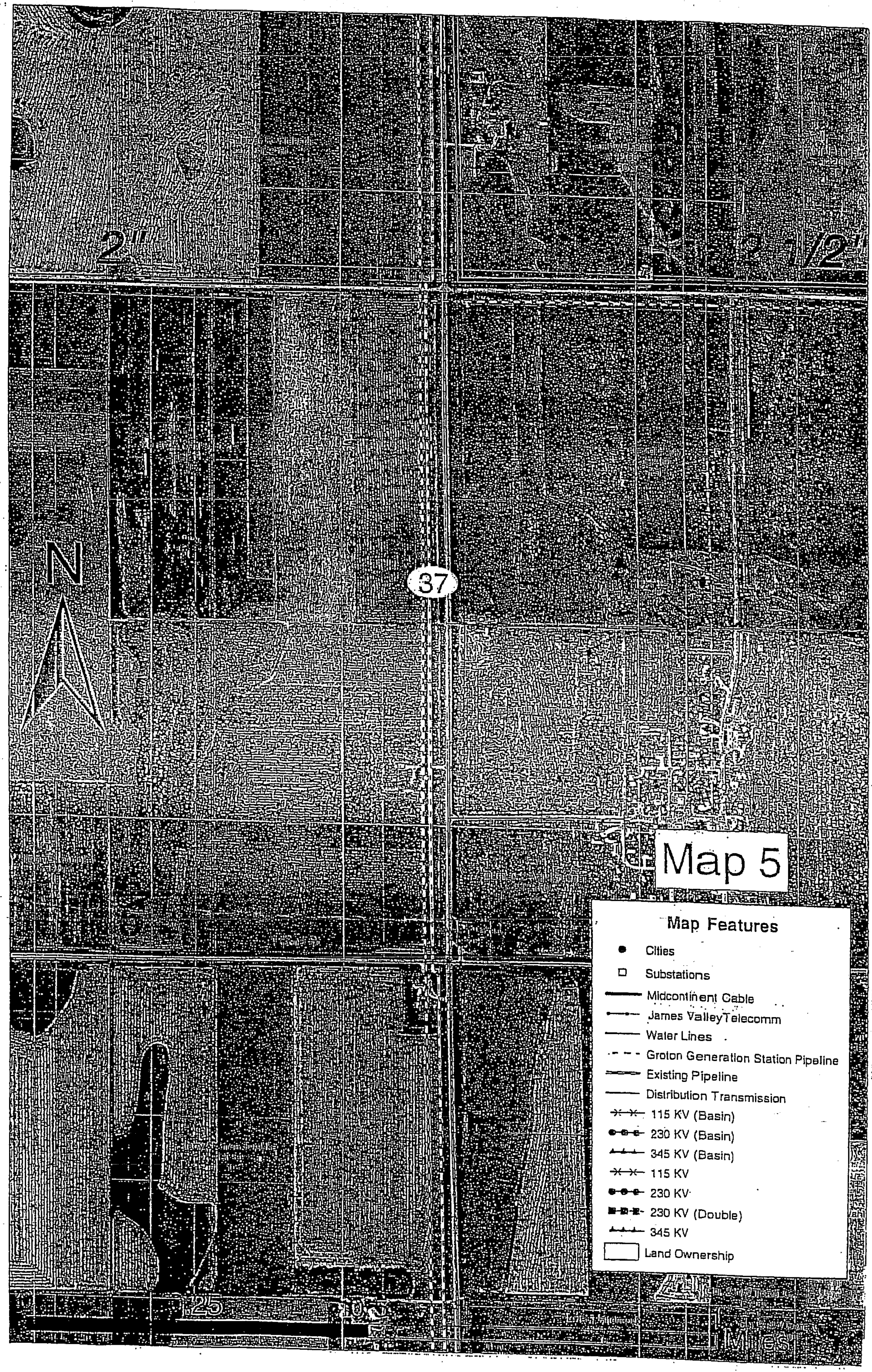
37
N
Map 2
Map Features
Cities
Substations
Midcontinent Cable
James ValleyTelecomm
Water Lines
Groton Generation Station Pipeline
Existing Pipeline
Distribution Transmission
115 KV (Basin)
230 KV (Basin)
345 KV (Basin)
115 KV
230 KV
230 KV (Double)
345 KV
Land Ownership
Miles



37
Map 3
Map Features
Cities
Substations
Midcontinent Cable
James ValleyTelecomm
Water Lines
Groton Generation Station Pipeline
Existing Pipeline
Distribution Transmission
115 KV (Basin)
230 KV (Basin)
345 KV (Basin)
115 KV
230 KV
230 KV (Double)
345 KV
Land Ownership
0
0.25
0.5
Miles



N
37
Map 4
Map Features
Cities
Substations
Midcontinent Cable
James ValleyTelecomm
Water Lines
Groton Generation Station Pipeline
Existing Pipeline
Distribution Transmission
115 KV (Basin)
230 KV (Basin)
345 KV (Basin)
115 KV
230 KV
230 KV (Double)
345 KV
Land Ownership
0.25
0.5


2"
2 1/2"
N
37
Map 5
Map Features
Cities
Substations
Midcontinent Cable
James ValleyTelecomm
Water Lines
Groton Generation Station Pipeline
Existing Pipeline
Distribution Transmission
115 KV (Basin)
230 KV (Basin)
345 KV (Basin)
115 KV
230 KV
230 KV (Double)
345 KV
Land Ownership
Miles

APPENDIX B

GEOLOGIC CROSS-SECTIONS

STATE OF SOUTH DAKOTA
William J. Janklow, Governor

DEPARTMENT OF WATER AND NATURAL RESOURCES
John J. Smith, Secretary

GEOLOGICAL SURVEY
Merlin J. Tipton, State Geologist

Bulletin 25

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA

Part I: Geology

by

Darrel I. Leap

Prepared in cooperation with the
United States Geological Survey,
Oahe Conservancy Sub-District, and
Brown County

Science Center
University of South Dakota
Vermillion, South Dakota
1986

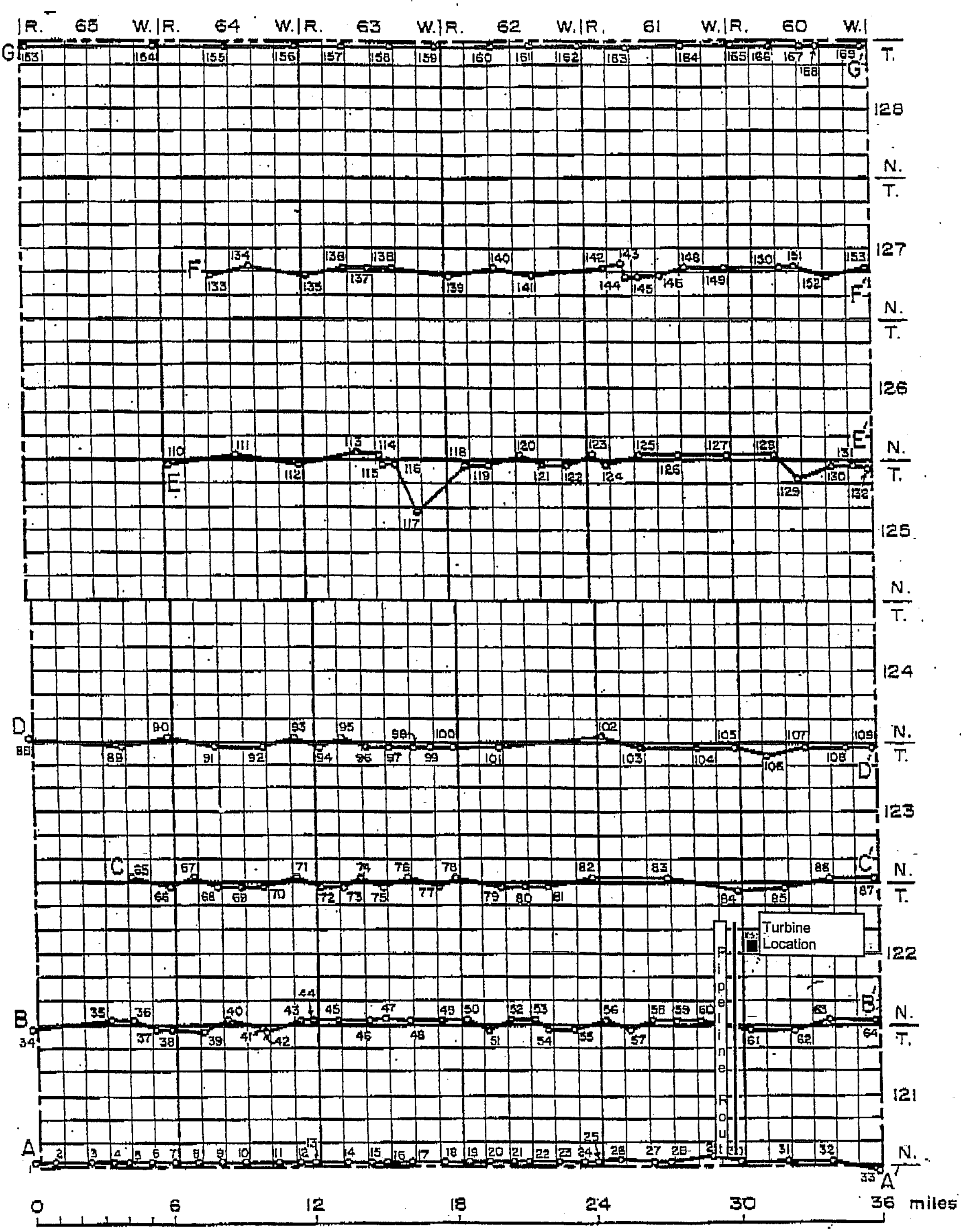


Figure 10. Index map of Brown County showing location of geologic sections A-A' to G-G'.

dj

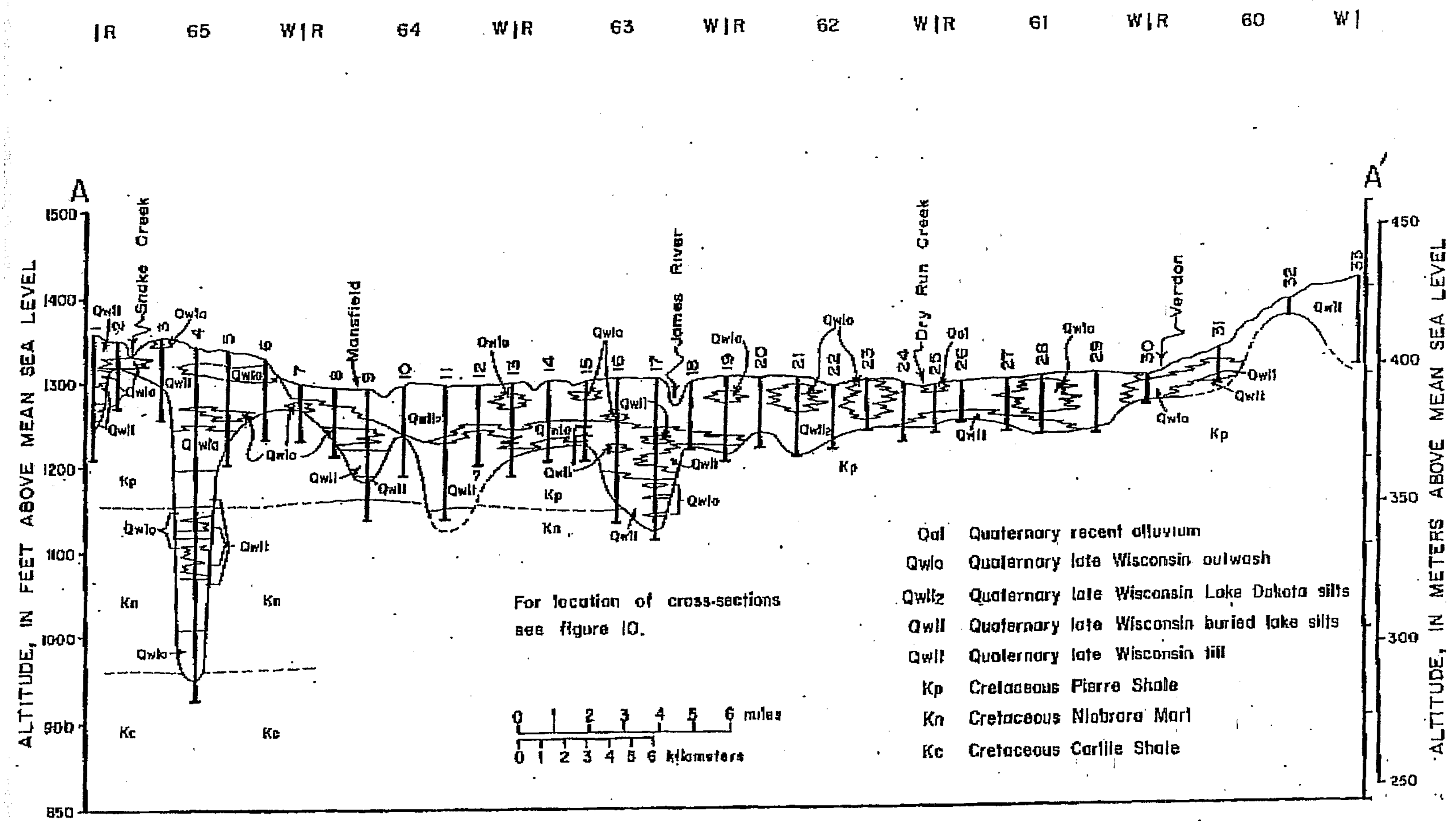


Figure 3. Geologic cross-section A-A′.

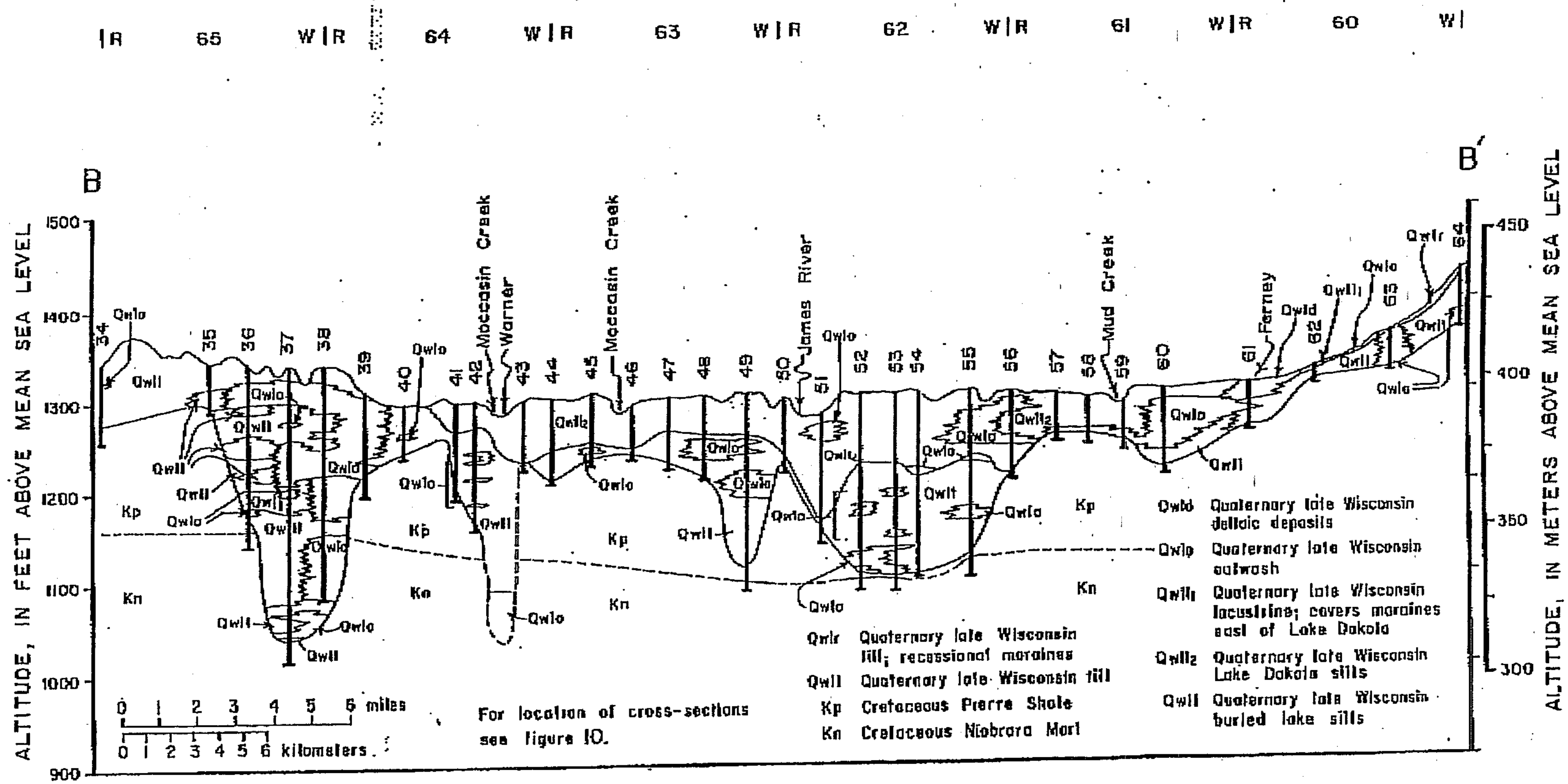


Figure 4. Geologic cross-section B-B'.

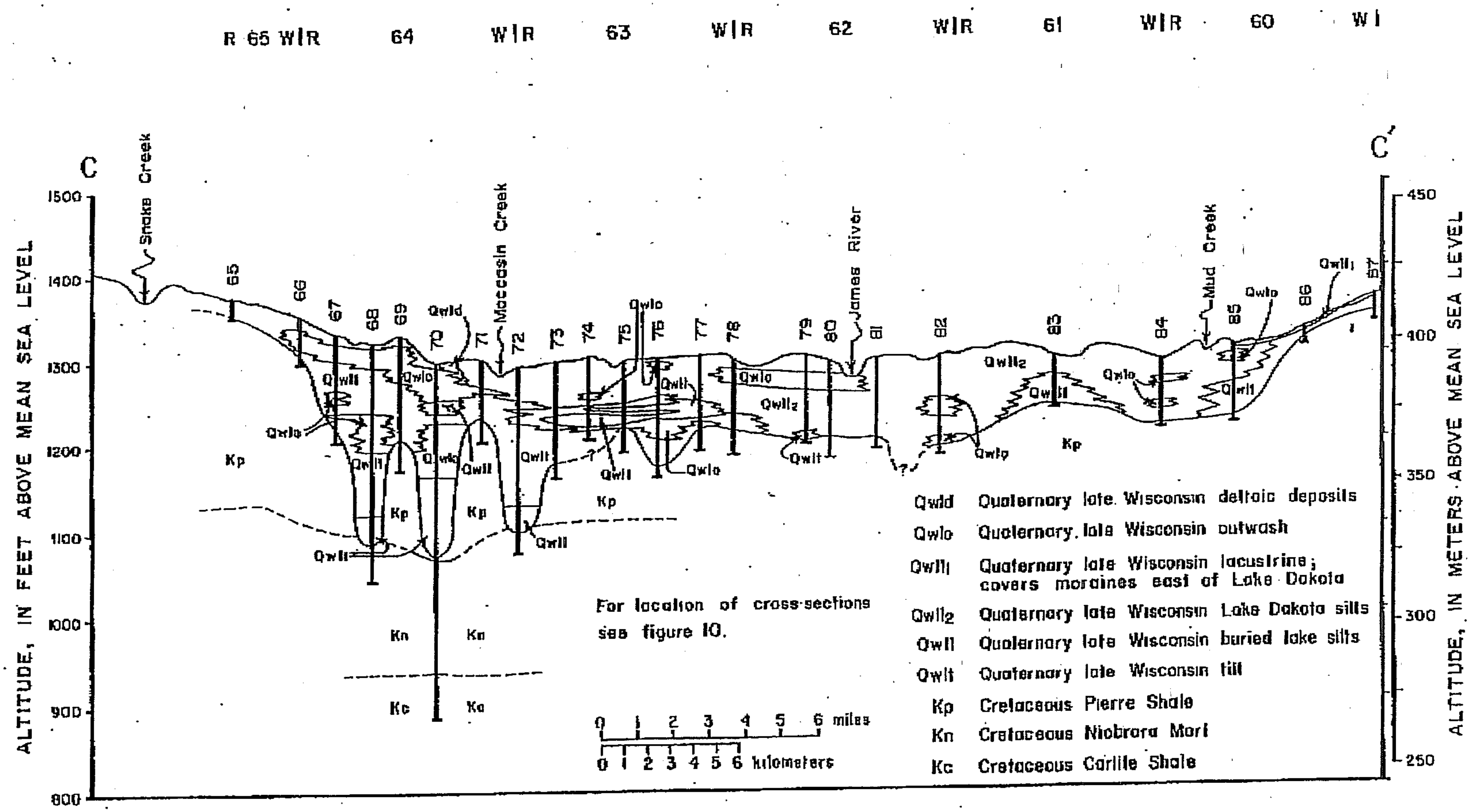


Figure 5. Geologic cross-section C–C′.

APPENDIX C

BROWN COUNTY ZONING VARIANCE

PLANNING & ZONING COMMISSION File

Application for Variance from Zoning Ordinance

Date: 10/25/2004

Brown County
State of South Dakota

Receipt #: 136547

Township: East Hanson

TO: Brown County Planning & Zoning Commission

The undersigned do hereby request a variance from the Brown County Zoning Ordinance to allow construction of the Groton Peaking Project Combustion Turbine.

Legal Description: All of the SW/4 of Section 18-T122N-R60W, except Outlot B-1, except U.S.A. lot B145 P348, except U.S.A. lot B151 P60, and except tract of land owned by the Pacific Northwest Railroad.

Owners Signature: Elvera Lane

ELVERA LANE
2 LINDA LANE
ABERDEEN SD 57401-4830

Agents Signature: James Miller

BASIN ELECTRIC POWER COOPERATIVE
1717 EAST INTERSTATE AVENUE
BISMARCK ND 58503-0564

Planning Commission Action: APPROVED or DENIED

By: W Waller
Mick Waller

Date: 11/3/2004

HEARING DATE: 11/3/2004

County Zoning Administrator
25 Market Street • Aberdeen, SD 57401
(605) 626-7144

BROWN COUNTY PLANNING & ZONING COMMISSION

NOVEMBER 3, 2004

CALL TO ORDER	The meeting was called to order by Chairman Jerry Streckfuss at 7:15 p.m. in the Community Room of the Brown County Courthouse.
ROLL CALL	Members present were Streckfuss, Audrey Jacobson, Harley Gage, Punch Podoll, and Pat Hansen. Mick Waller, Planning & Zoning Director, was also present and served as secretary.
AGENDA APPROVSL	Moved by Hansen and seconded by Jacobson to approve the agenda that was mailed to members of the commission. All members voting aye, motion carried.
MINUTES APPROVAL	Moved by Gage and seconded by Podoll to approve the minutes of the October 5, 2004 meeting. All voting aye, motion carried.
OLD BUSINESS	None
NEW BUSINESS	Effie A. Larson requested a variance and plat approval for Larson 1st Subdivision in SW¼ 25-128-65. Moved by Jacobson and seconded by Podoll to approve. All voting aye, motion carried.
	Arlene Weismantel requested a variance and plat approval for Weismantel Subdivision in NE¼ 4-124-62. Moved by Gage and seconded Hansen to approve. All voting aye, motion carried.
	Shirley A. Everson requested a variance and plat approval for Everson 1st Subdivision in SW¼ 22-124-62. Moved by Jacobson and seconded by Podoll to approve. All aye, motion carried.
	Jim Berg and Myron Steckler of Basin Electric Power Cooperative were present to request a special exception to construct the Groton Peaking Project Combustion Turbine in the SW¼ 18-122-60. Arnold Bahr was present with questions concerning noise and water retention. Mr. Berg and Mr. Steckler answered to Mr. Bahr's satisfaction. It was moved by Gage and seconded by Podoll to approve the special exception. All members voting aye, motion carried.

ADJOURNMENT

Moved by Gage and seconded by Jacobson to adjourn the meeting. All members voting aye, motion carried.

Mick Waller

APPENDIX D

AIR QUALITY OPERATING PERMIT APPLICATION

SOUTH DAKOTA AIR POLLUTION CONTROL PROGRAM ARTICLE 74:36 OPERATING PERMIT APPLICATION

FOR

GROTON GENERATING STATION

Prepared for:

BASIN ELECTRIC POWER COOPERATIVE
BISMARCK, NORTH DAKOTA

Prepared by:

TETRA TECH EM INC.
4940 PEARL EAST CIRCLE, SUITE 100
BOULDER, COLORADO 80301
(303) 441-7900

October 2004

CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
Basin Electric	Basin Electric Power Cooperative
BPIP	Building Profile Input Program
CAM	Compliance Assurance Monitoring
CFR	Code of Federal Regulations
CO	Carbon monoxide
DEQ	Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
HAP	hazardous air pollutant
Km	Kilometer
kW	kilowatts
lb/MMBtu	pounds per million British thermal units
MMBtu/hr	million British thermal units per hour
MMSCF/yr	million standard cubic feet per year
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
NSPS	New Source Performance Standards
NSR	New Source Review
O_2	Oxygen
PM_{10}	Particulate matter with a diameter of 10 micrometers or less
ppmv	parts per million by volume
PSD	Prevention of Significant Deterioration
SIC	Standard Industrial Classification
SO_2	Sulfur dioxide
tpy	tons per year
TSP	Total suspended pollutants
VOC	Volatile organic compound
WAQSR	Wyoming Air Quality Standards and Regulations
WDEQ	State of Wyoming, Department of Environmental Quality

1.0 INTRODUCTION

This document presents technical and regulatory compliance information in support of an application for a South Dakota Department of Environment and Natural Resources (DENR) Air Pollution Control Program Article 74:36 Title V (Part 70) Operating Permit. This operating permit application is for an electricity generating station near the town of Groton in Deuel County, South Dakota, referred to as the Groton Generating Station. The Groton Generating Station consists of one General Electric (GE) LMS100 natural gas fired turbine, and includes a secondary dry cooling system and other ancillary operations. Because total facility emissions for carbon monoxide (CO) and nitrogen oxides (NO_x) exceed 100 tons per year (tpy), the facility is a "major source" under SD DENR Air Pollution Control Program Article 74:36:01:08, and is required to submit a Title V permit application. Fuel use limits will be maintained for the unit that keep potential emissions for each criteria pollutant below the 250 tpy threshold for preconstruction permits, required for Prevention of Significant Deterioration (PSD).

The required information outlined in SD DENR Air Pollution Control Program Article 74:36:05:09, is fully contained in this document. The applicant is Basin Electric Power Cooperative (Basin Electric) at the following mailing address:

Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58501-0564

It is the understanding of Basin Electric that compliance with the conditions and terms of the Operating Permit shall be deemed in compliance with all applicable requirements for the facility. This operating permit application demonstrates the following compliance items for the Groton Generating Station:

- The facility complies with all applicable rules and regulations of the SD DENR Air Pollution Control Program.
- The proposal does not involve a "major modification" for federal and state New Source Review (NSR) permitting purposes.
- The proposed facility will not prevent the attainment or maintenance of any ambient air quality standard.
- The proposed facility will not cause significant deterioration of existing ambient air quality in the region.
- The proposed facility will not emit any air pollutant in amounts which will

(i) prevent attainment or maintenance by any other state of any such national primary or secondary Ambient Air Quality Standard or

(ii) interfere with measures required by the Federal Clean Air Act to be included in the applicable Implementation Plan for any other state to prevent significant deterioration of air quality or to protect visibility.

This document contains the following sections that will serve to meet the operating permit application requirements of the SD DENR Air Pollution Control Program Article 74:36:05:09. Section 2.0 describes the proposed facility. Section 3.0 discusses air emissions associated with the proposed facility. Section 4.0 describes applicable requirements for the proposed facility. Section 5.0 presents an air quality impact analysis for the proposed source configuration. Section 6.0 summarizes the results of the analysis, and Section 7.0 presents references. Appendix A contains the SD DENR permit application forms. Appendix B and Appendix C contain emission estimation documentation. Appendix D contains a diskette of the electronic modeling files.

2.0 PROJECT DESCRIPTION

The proposed Groton Generating Station is a natural gas-fired, turbine-powered electricity generating station, located approximately 5 miles south of the town of Groton, in Brown County, South Dakota. Ferney, is located 3 miles south of the site. Aberdeen, SD is located 18 miles northwest of the site. The Spink County line is 9 miles south, The Day County line is 6 miles east, and the Edmunds County line is 30 miles west of the site. The North Dakota state line is 39 miles north of the site. Figure 2-1 shows a site location map, and Figure 2-2 is a plot plan of the Groton Generating Station layout.

The elevation of the site is approximately 1,300 feet above mean sea level (msl). The terrain in the region is relatively flat with some rolling hills. The area surrounding the Groton site is fairly flat and well drained by topographic relief throughout the site. There are isolated wetlands associated with intermittent streams, creeks, and rivers in the general area of the site. The only river in the region is the James River that flows generally north and south located approximately 10 miles west of the site at the closest point. Mud Creek, a tributary to the James River, is located 1 mile north of the site.

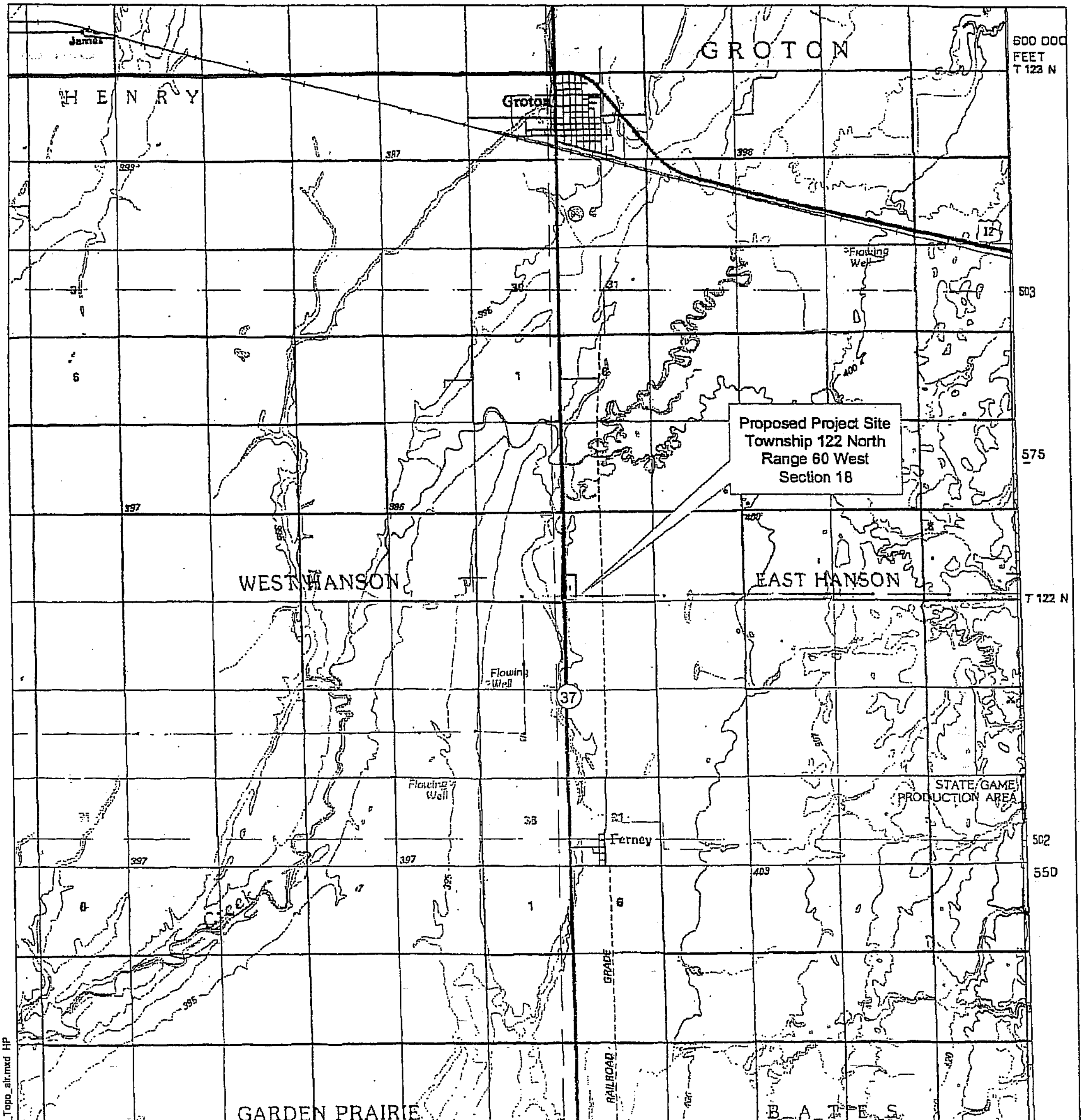
The Groton Generating Station will be powered by one General Electric (GE) LMS100 gas turbine, fired by natural gas. The turbine is site rated at 93,464 kilowatts (kW) of output at 78 degrees Fahrenheit (°F). The associated secondary dry cooling system will operate with an air flow rate of 25,750,000 pounds per hour (lb/hr).

The site will be enclosed in a secure fenced area. The turbine will be situated on a concrete pad and enclosed in a structure.

The Standard Industrial Classification (SIC) number for the facility-wide process is 4911.

2.1 ALTERNATIVE OPERATING SCENARIOS

There are no alternative operating scenarios associated with the Groton Generating Station.



Legend

Proposed Project Area

Proposed Gas Turbine Site

U.S. Geological Survey (USGS).

FIGURE 2-1
PROJECT SITE LOCATION
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE

0 0.5 1 2 3 Miles

07/21/04 b:\project\basin_gis\projects\SDPeaking_GrotonLine_Topo_air.mxd HP

3.0 PROJECTED EMISSIONS

This section presents emissions data for criteria pollutants and hazardous air pollutants (HAPs). Criteria pollutants include:

- Nitrogen dioxide (NO_2) – measured as nitrogen oxides (NO_X)
- Carbon monoxide (CO)
- Volatile Organic Compounds (VOCs)
- Total suspended pollutants (TSP)
- Particulate matter with a diameter of 10 micrometers or less (PM_{10})
- Sulfur dioxide (SO_2)
- Lead

General Electric has guaranteed a maximum concentration of 25 parts per million by volume (ppmv) for NO_X, 28 ppmv for CO, and 5 ppmv for VOCs at 15% oxygen (O_2) and 78°F with the use of a CO reactor, as shown in Appendix C. Emissions from the secondary dry cooling system are assumed to be negligible.

This application reflects fuel use limits that keep potential emissions below the 250 ton per year threshold for preconstruction permits, required for PSD. This is done by adhering to a fuel use limit of 5,977,397 million British thermal units per year (MMBtu/yr), assuming a lower heating value of 21,530 Btu/lb for the fuel and operation of the generator for 7,600 hours per year, assuming worst case operating conditions.

3.1 EMISSION CALCULATIONS

The emission data for both criteria pollutants and HAPs includes a summation of facility-wide emission rates and a breakdown of emission rates for individual emission units. Facility-wide emissions are primarily generated from the natural gas-fired turbine. Appendix B provides the calculations used to derive the emissions from the facility. Appendix C contains manufacturer's data for the natural gas-fired turbine.

NO_X, CO and VOC emission estimates for the natural gas-fired turbine are based on manufacturer provided information. Emission factors for TSP, PM_{10}, and SO_2 were obtained from AP-42, Table 3.1-2a (dated 4/00). An emission factor for lead was not available from AP-42, 3.1-2a, and was obtained from

AP-42, Table 1.4-2 (dated 7/98). The emission factor for lead was calculated by dividing 0.0005 lb/10^6scf by 1,020 MMBtu/10^6scf.

As the secondary air cooling system is a dry air system, emissions are assumed to be negligible.

3.2 LOAD ANALYSIS

Manufacturer's specifications were used to derive emissions for various load conditions. The turbine manufacturer provided estimated operating conditions for sixteen emission scenarios. These emission scenarios covered the combination of ambient temperatures of -30 degrees Fahrenheit (°F), 0° F, 40° F, 59° F, 78° F, and 92° F and equipment loads of 50 percent (%), 75%, and 100%. The manufacturer-specified guarantee emission rates, under variable operating conditions were used for the following pollutants:

- NO_X
- CO
- VOCs

Appendix C contains manufacturer's data for sixteen sets of operating conditions, as well as the "Guarantee" condition at 100% load and 78°F. Manufacturer information was used to calculate stack emissions rates, as shown in Appendix B. Table 3-1 presents a summary of NO_X, CO and VOC emissions for the sixteen different load scenarios for the natural gas-fired turbine.

Table 3-2 summarizes criteria pollutant emissions for the entire facility. NO_X, CO and VOC emissions for the natural gas-fired turbine are based on annual average conditions (approximately 40°F, at 100% load) with manufacturer "Guarantee" information. Table 3-3 summarizes facility HAP emissions.

TABLE 3-1

GROTON GENERATING STATION
GE LMS100 TURBINE LOAD SCREENING SCENARIO EMISSIONS

Percent Base Load	%	100	75	50	100	75	50	100	75	50	100	75	50	100	75	50	100	75	50
Ambient Temperature	Deg F	-30	-30	-30	0	0	0	40	40	40	59	59	59	78	78	78	92	92	92
Exhaust Temperature	Deg F	729.0	727.9	744.5	735.9	737.6	754.9	769.2	750.9	768.7	780.3	758.2	776.1	791.4	770.8	788.5	808.9	792.3	817.2
Exit Velocity	m/s	45.2	38.0	30.4	45.3	38.2	30.6	46.1	38.6	30.9	45.8	38.4	30.7	44.5	37.4	30.0	42.6	35.9	28.9
Exhaust Emissions																			
NO_x	ppmvd	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	lb/hr	66	56	45	65	55	44	64	55	44	63	54	43	60	52	41	56	49	39
CO	ppmvd	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
	lb/hr	45	38	30	44	38	30	44	38	30	43	37	29	41	35	28	38	33	26
HC	ppmvd	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	lb/hr	13	11	9	13	11	8	12	11	8	12	10	8	12	10	8	11	9	7

TABLE 3-2
GROTON GENERATING STATION
GE LMS100 TURBINE EMISSIONS SUMMARY FOR CRITERIA POLLUTANTS

Emission Unit: **GE LMS100 Natural Gas Combustion Turbine Generator**
Fuel Flow: **786.5 MMBtu/hr**
Control Equipment: **Water Injected NOx Controls and CO Converter**

Criteria Pollutants	Emission Factor[A] (lb/MMBtu)[C]	Emission Rate[B] (lb/hr)[D]	Emission Rate (tons/yr)[E]
TSP	6.60E-03	5.19	19.7
PM_{10}	6.60E-03	5.19	19.7
SO_2	3.40E-03	2.67	10.16
NOx	NA	64.0	243
CO	NA	43.6	166
VOC	NA	12.3	46.6
Lead	4.90E-07	3.85E-04	1.46E-03

Notes:

NA Not applicable

[A] The emission factors for TSP, PM_{10}, and SO_2 were obtained from AP-42, Table 3.1-2a (dated 4/00). An emission factor for lead was not available from AP-42, 3.1-2a, and was obtained from AP-42, Table 1.4-2 (dated 7/98). (The emission factor for lead was calculated by dividing 0.0005 lb/10^6scf by 1,020 MMBtu/10^6scf).

[B] The NO_X, CO and VOC emission rates were provided by the manufacturer in units of lb/MMBtu and converted to pounds per hour or tons per year based on fuel flow data at 78°F under 100 percent load conditions. A safety factor was applied to the NO_X and CO emission rates to account for variable temperature conditions, creating maximum emissions. Calculations are provided in Appendix B.

[C] lb/MMBtu => pounds per million British thermal units

[D] lb/hr => pounds per hour

[E] tons/yr => tons per year; assuming operation of 7600 hours per year

TABLE 3-3
GROTON GENERATING STATION
GE LMS100 TURBINE EMISSIONS SUMMARY FOR HAZARDOUS AIR POLLUTANTS

Emission Unit: **GE LMS100 Natural Gas Combustion Turbine Generator**
Fuel Flow: **786.5 MMBtu/hr**
Control Equipment: **Water Injected NOx Controls and CO Converter**

Hazardous Air Pollutants	Emission Factor[A] (lb/MMBtu)[B]	Emission Rate (lb/hr)[C]	Emission Rate (tons/yr)[D]
1,3-Butadiene	4.3E-07	3.38E-04	9.81E-04
Acetaldehyde	4.0E-05	3.15E-02	9.12E-02
Acrolein	6.4E-06	5.03E-03	1.46E-02
Benzene	1.2E-05	9.44E-03	2.74E-02
Ethylbenzene	3.2E-05	2.52E-02	7.30E-02
Formaldehyde	7.1E-04	5.58E-01	1.62E+00
Naphthalene	1.3E-06	1.02E-03	2.97E-03
PAH[E]	2.2E-06	1.73E-03	5.02E-03
Propylene[F]	NA	NA	NA
Propylene Oxide	2.9E-05	2.28E-02	6.61E-02
Toluene	1.3E-04	1.02E-01	2.97E-01
Xylenes	6.4E-05	5.03E-02	1.46E-01
Total Hazardous Air Pollutants		**8.08E-01**	**2.34E+00**

Notes:

NA Not Applicable

[A] The emission factors were obtained from AP-42, Table 3.1-3 (dated 4/00).
A fuel flow value of 793.5 MMBtu/hr was used to simulate condition at 78°F under 100 percent load.

[B] lb/MMBtu => pounds per million British thermal units. The emission factor was derived by dividing lb/10^6 scf by 1,020 btu/scf.

[C] lb/hr => pounds per hour.

[D] tons/yr => tons per year; assuming operation of 5800 hours per year

[E] PAH => Polycyclic aromatic hydrocarbons

[F] Propylene was not listed in AP-42, Table 3.1-3 as a pollutant for turbines. AP-42, Table 3.3-2 does list it as a pollutant for startup generators (see Table 3-4 in this document). It was added to this table as a placeholder.

4.0 APPLICABLE REQUIREMENTS

This section presents state and federal applicable requirements specific to the proposed new Groton Generating Station natural gas-fired turbine.

The Groton Generating Station is subject to South Dakota's Air Pollution Control Program, Article 74:36, which contain 18 separate chapters relating to air quality. The facility is subject to the general provisions contained in Chapter 1, Definitions; Chapter 2, Ambient Air Quality; Chapter 5, Operating Permits for Part 70 Sources; Chapter 6, Regulated Air Pollutant Emissions; Chapter 7, New Source Performance Standards (NSPS); Chapter 8, National Emission Standards for Hazardous Air Pollutants; Chapter 9, PSD; Chapter 10, NSR; Chapter 11, Performance Testing; Chapter 12, Control of Visible Emissions; Chapter 13, Continuous Emission Monitoring Systems (CEMs); and Chapter 16, Acid Rain Program.

The facility does not contain sources or have emissions that make it subject to the provisions of Chapter 3, Air Quality Episodes, Chapter 4, Operating Permits for Minor Sources; Chapter 17, Rapid City Sanding and Deicing, and Chapter 18, Regulations for the State Facilities in the Rapid City Area.

The remainder of this section addresses the applicability of specific sections of Chapter 2, Ambient Air Quality, Chapter 5, Operating Permits for Part 70 Sources, Chapter 7, NSPS, Chapter 8, National Emission Standards for Hazardous Air Pollutants, Chapter 9, PSD, Chapter 10, NSR, Chapter 13, CEMs, and Chapter 16, Acid Rain Program.

Chapter 2 establishes air quality goals for the state of South Dakota, including protection of public health; prevention of damage to buildings, property, animals, plants, forests, and agricultural crops; optimization of visibility; and minimization of the corrosion of or damage to metals or other materials. This section identifies ambient air quality standards for the state of South Dakota as equivalent to the Federal National Ambient Air Quality Standards (NAAQS). Methods of sampling and analysis for criteria pollutants and ambient air monitoring requirements are defined.

Chapter 5 establishes the permitting requirements to be followed in the preparation of an application. Since the proposed facility-wide emissions, as described in Section 2.0, are below 250 tpy, but above 100 tpy for two criteria pollutants; below 10 tpy for all individual HAPs, and below 25 tpy for all HAPs combined, the proposed facility is a major source as defined in Chapter 1 of this rule. The proposed facility-wide emission limits are based on facility-wide fuel use limits of 5,035 MMSCF/yr, assuming a fuel heating value of 21,530 Btu/lb and 6,062 hours of operation per year.

Chapter 7, incorporates, by reference, the federal NSPS from Title 40 of the Code of Federal Regulations Part 60 (40 CFR 60) Subpart GG – Standards of Performance for Stationary Gas Turbines. The NSPS Subpart GG establishes NO_X emissions limits for gas turbines with a heat input at peak load equal to or greater than 10 MMBtu/hr. The proposed GE LMS100 turbine has a maximum fuel input of 786.5 MMBtu/hr. The NO_X emission limits from NSPS Subpart GG are presented in Table 4-1 and are dependent on the size and application of the turbine. Based on the size of the proposed GE LMS100 turbine, 786.5 MMBtu/hr, the NSPS emission limit will be 75 ppmv. The proposed emission limit for the GE LMS100 turbine, as presented in Section 3.0, is 25 ppmv, which is below the NSPS Subpart GG limit.

Chapter 8 identifies the applicable requirements for the proposed source in relation to the National Emission Standards for Hazardous Air Pollutants. Predicted HAP emissions are below 10 tpy for any one HAP, and below 25 tpy for all HAPs combined. Therefore, this source will not qualify as a major source for HAPs as defined in Chapter 8, and will not be subject to the requirements of this section.

Chapter 9 incorporates, by reference, the federal PSD regulations. This regulation can affect sources that are within attainment or unclassified areas, such as the area surrounding the Groton site. Chapter 6, Section 4 of the PSD requirements are not triggered since the facility-wide emissions will be below the major source threshold of 250 tpy for PSD as defined in 40 CFR 52.21.

Chapter 10 establishes the requirements of the federal NSR program as applicable to the state of South Dakota. NSR permitting requirements are not triggered because the facility is located within attainment or unclassified areas and will not cause or contribute to a violation of any national ambient air quality standards, as shown in Section 6 of this report.

CEM requirements are established in Chapter 13. Chapter 13, Section 8 establishes that owners and operators of any unit subject to 40CFR64.2, must comply with 40CFR64.1 and 40CFR64.3 through 40CFR64.10. 40CFR64.2 states that "the requirements of this part shall apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if the unit satisfies all of the following criteria:

1. The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or surrogate thereof), other than an emission limitation or standard that is exempt under paragraph (b)(1) of this section;

TABLE 4-1

NEW SOURCE PERFORMANCE STANDARDS FOR GAS TURBINES – NO_X EMISSION LIMITS

Fuel Input (MMBtu/hr)	**Gas Turbine Size (MW)**	**NO_x Emission Limit (ppmv at 15% O_2, dry^{AB})**
< 10	1^C	None
10 – 100	$1 - 10^C$	150
> 100	$10+^C$	75

Notes:

A	Based on thermal efficiency of 25 percent. This limit may be increased for higher efficiencies by multiplying the limit in Table 4-1 by 14.4/actual heat rate, in kJ/watt-hr.
B	A fuel-bound nitrogen allowance may be added to the limits listed in Table 4-1 based on 40 CFR §60.332(a)(3)
C	Based on gas turbine heat rate of 10,000 Btu/kW-hr
MMBtu/hr	Million British thermal units per hour
MW	Megawatt
ppmv	Parts per million by volume

2. The unit uses a control device to achieve compliance with an such emission limitation or standard; and

3. The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source."

The proposed natural gas turbine does fall under the definition of sources requiring CEM, and will be subject to the requirements of 40CFR64.1 and 40CFR64.3 through 40CFR64.10. These regulations include descriptions of definitions; monitoring design criteria; submittal requirements; deadlines for submittals; approval of monitoring; operation of approved monitoring; quality improvement plan requirements; reporting and record keeping requirements; and savings provisions.

Chapter 16 references the requirements of 40CFR Part 75 for Acid Rain Provisions. This section identifies CEM requirements for NO_X, SO_2, CO_2 (or O_2), and stack flow, with calculation of emission rates. The proposed natural gas turbine does fall under the definition of sources subject to 40CFR Part 75 for Acid Rain Provisions.

5.0 AIR QUALITY IMPACT ANALYSIS

Dispersion modeling was used to estimate the air quality impact of potential emissions of NO_X and CO from the combustion turbine generator proposed for the Groton Generating Station. The dispersion modeling followed the guidance and protocols outlined in the *New Source Review Workshop Manual* (EPA 1990), and EPA's *Guideline on Air Quality Models (Revised)* (EPA 2003). Modeling was conducted to demonstrate that potential air pollution impacts from the generator emissions are below National Ambient Air Quality Standards (NAAQS) and South Dakota Ambient Air Quality Standards, in accordance with South Dakota Air Regulation §74:36:05:06, *Standard for Issuance of Operating Permit.* Proposed emissions for the combustion turbine are below the major source threshold of 250 tpy with respect to PSD, but above the South Dakota Title V Operating Permit major source threshold of 100 tpy, for CO and for NO_2. The proposed turbine site is located in an area that is designated as attainment for all criteria pollutants. The remainder of this section describes the procedures used to conduct the dispersion modeling analysis, and discusses the modeling results.

5.1 MODEL SELECTION

Based on approval of SD DENR (communication 06/17/04), dispersion modeling was conducted using the Industrial Source Complex Plume Rise Model Enhancements (ISC-PRIME, *version 99020*). ISC-PRIME uses a set of algorithms that are being evaluated as the next generation building downwash model. This set of algorithms has been incorporated into the latest version of the Industrial Source Complex Short-Term model, version 3 (ISCST3), and the revised model has been named ISC-PRIME. The *Guideline on Air Quality Models (Revised)* (EPA 2001) recommends that ISCST3, be used for source-specific analysis of an industrial complex. ISC-PRIME is a steady-state Gaussian plume model that is appropriate for estimating pollutant concentrations, accounting for building downwash, in flat or rolling terrain at distances up to 50 kilometers, and averaging times from 1 hour to 1 year. The recommended applications of ISC-PRIME are consistent with the needs of the Groton Generating Station impact analysis; therefore, ISC-PRIME was selected.

ISC-PRIME was run using all regulatory default options. These options included the use of stack-tip downwash, buoyancy-induced dispersion, calms processing routines, upper-bound downwash concentrations for super-squat buildings, default wind speed profile exponents, and vertical potential temperature gradients. The model was run using rural dispersion parameters, incorporating the local, flat terrain into the calculations.

5.2 LAND USE CLASIFICATIONS

The elevation of the site is approximately 1,300 feet above msl. The terrain in the region is relatively flat with some rolling hills. The area surrounding the Groton site is well-drained although there is little topographic relief throughout the site. There are no significant urban centers within a 50-km radius of the proposed site; therefore, rural dispersion parameters were used in the modeling.

5.3 METEOROLOGICAL DATA

Dispersion modeling was conducted using five years of surface meteorological data from the Huron Regional Airport (WBAN 14936) and upper air data (i.e., mixing height data) from the Aberdeen Regional Airport (WBAN 14929). This data set is representative of meteorological conditions that will affect dispersion of stack effluent plumes from the Groton site. Meteorological data suitable for use with ISC-PRIME was developed using the EPA PCRAMMET program (version 99169).

A windrose representing the five years of meteorological data from the Huron site is presented in Figure 5-1. The meteorological data is included with this permit application on diskette in Appendix D.

5.4 MODELED EMISSION SOURCES

The only source associated with the proposed Groton Generating Station is a simple cycle, natural gas-fired turbine with no backup fuel. The generating capacity of the unit is 100 megawatts (MW). Water injection is used for control of nitrogen oxides (NO_x) and a catalyst reactor is used for the control of CO and VOCs. Yearly average emissions of NO_x and short term (hourly) average emissions of CO were modeled for this source to obtain annual and short term average pollutant concentrations, respectively. Modeled NO_x emissions from the turbines are dependent on ambient temperature and specified load. GE, the turbine manufacturer, provided emission information based on these variables (see Appendix C). Sixteen NO_x and CO model runs were conducted to account for the variability in ambient temperature and specified load. Table 5-1 presents stack parameters and emission rates used to model NO_x and CO under the various scenarios.

For NAAQS modeling, only current/proposed emission sources will be considered. Compliance with the NAAQS will be demonstrated by taking the highest modeled concentration for each pollutant, adding the

FIGURE 5-1
HURON METEOROLOGY DATA WINDROSE

DRAFT

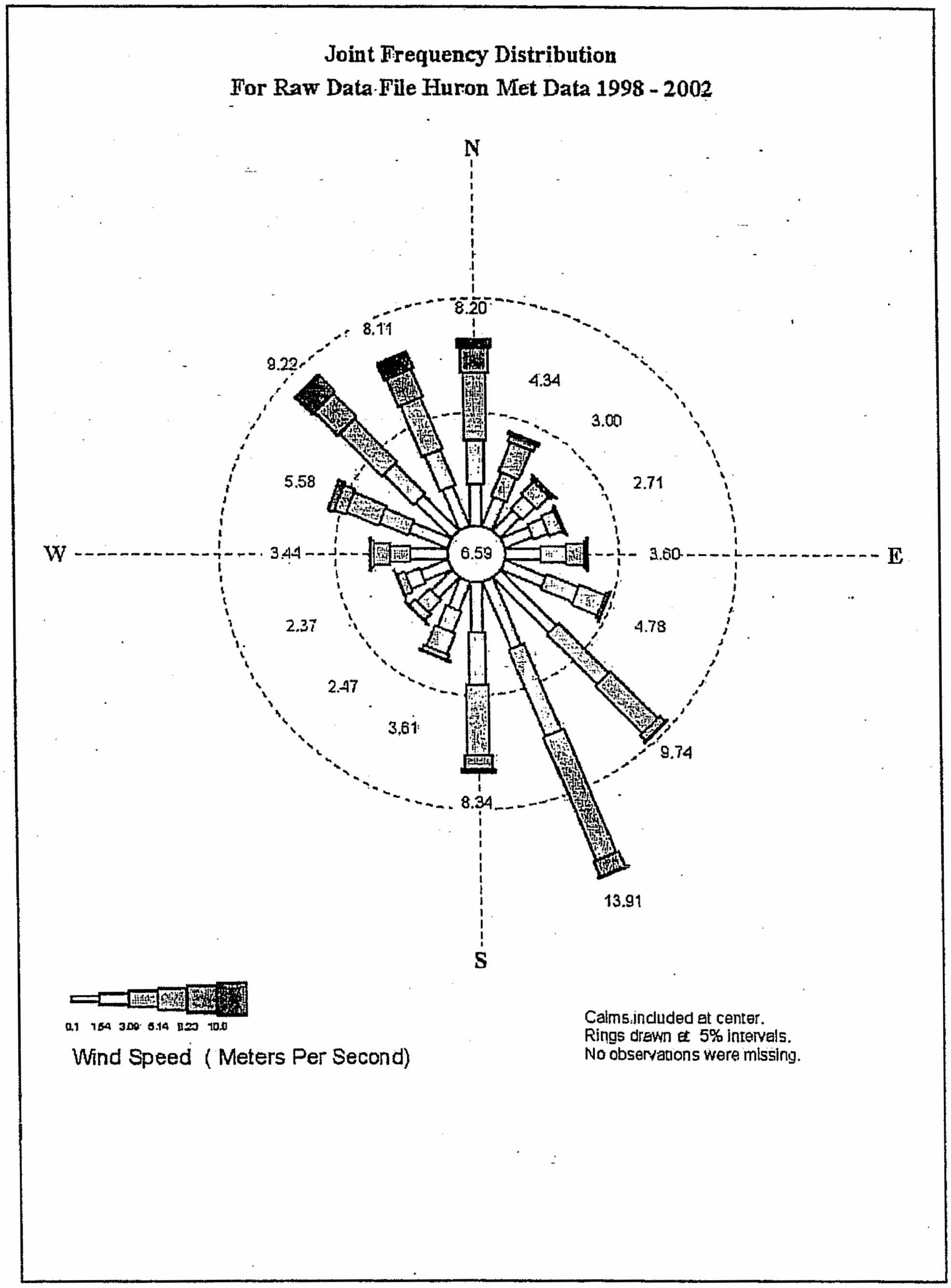


TABLE 5-1

BASIN ELECTRIC COMBUSTION TURBINE GENERATORS MODELED SOURCE PARAMETERS

Scenario #	Load (%)	Ambient Temp (°F)	NO_X Emission Rate (g/s)	CO Emission Rate (g/s)	Stack Height (m)	Exit Temperature (K)	Stack Diameter (m)	Exit Velocity (m/s)
Scenario 1	100	-30	10.31	7.03	26.2	660.37	3.51	45.20
Scenario 2	75	-30	8.11	5.53	26.2	659.76	3.51	38.03
Scenario 3	50	-30	5.95	4.05	26.2	668.98	3.51	30.44
Scenario 4	100	0	10.38	7.07	26.2	664.21	3.51	45.35
Scenario 5	75	0	8.18	5.58	26.2	665.15	3.51	38.18
Scenario 6	50	0	6.00	4.09	26.2	674.76	3.51	30.55
Scenario 7	100	40	10.66	7.27	26.2	682.71	3.51	46.09
Scenario 8	75	40	8.33	5.68	26.2	672.54	3.51	38.62
Scenario 9	50	40	6.11	4.16	26.2	682.43	3.51	30.88
Scenario 10	100	59	10.57	7.21	26.2	688.87	3.51	45.85
Scenario 11	75	59	8.26	5.63	26.2	676.59	3.51	38.41
Scenario 12	50	59	6.06	4.13	26.2	686.54	3.51	30.73
Scenario 13	45	78	10.14	6.92	26.2	695.04	3.51	44.50
Scenario 14	100	78	7.94	5.41	26.2	683.59	3.51	37.39
Scenario 15	75	78	5.84	3.98	26.2	693.43	3.51	29.97
Scenario 16	50	92	9.51	6.48	26.2	704.76	3.51	42.58

Notes:

A Micrograms per cubic meter

NA Not applicable

appropriate background concentration, and comparing the sum to the applicable NAAQS. To ensure that PSD requirements do not apply to the proposed source, resultant concentrations will also be compared to applicable PSD significance thresholds.

5.5 BUILDING DOWNWASH

The ISCPRIME model inputs included building dimensions to assess the potential for downwash effects on emissions from associated nearby structures. ISCPRIME includes several advances over ISCST3 in building downwash effects including enhanced dispersion in the wake, reduced plume rise due to streamline deflection and increased turbulence, and a continuous treatment of near and far wakes (Schulman and others 1998). The direction-specific downwash parameters were calculated using facility plot-plan maps, and BPIPPRM software, which is the building downwash program associated with the ISCPRIME model. Output from BPIPPRM was incorporated into the ISCPRIME modeling input files. All output files from BPIPPRM are provided with this permit application on a compact disk provided in Appendix D.

5.6 MODEL RECEPTORS

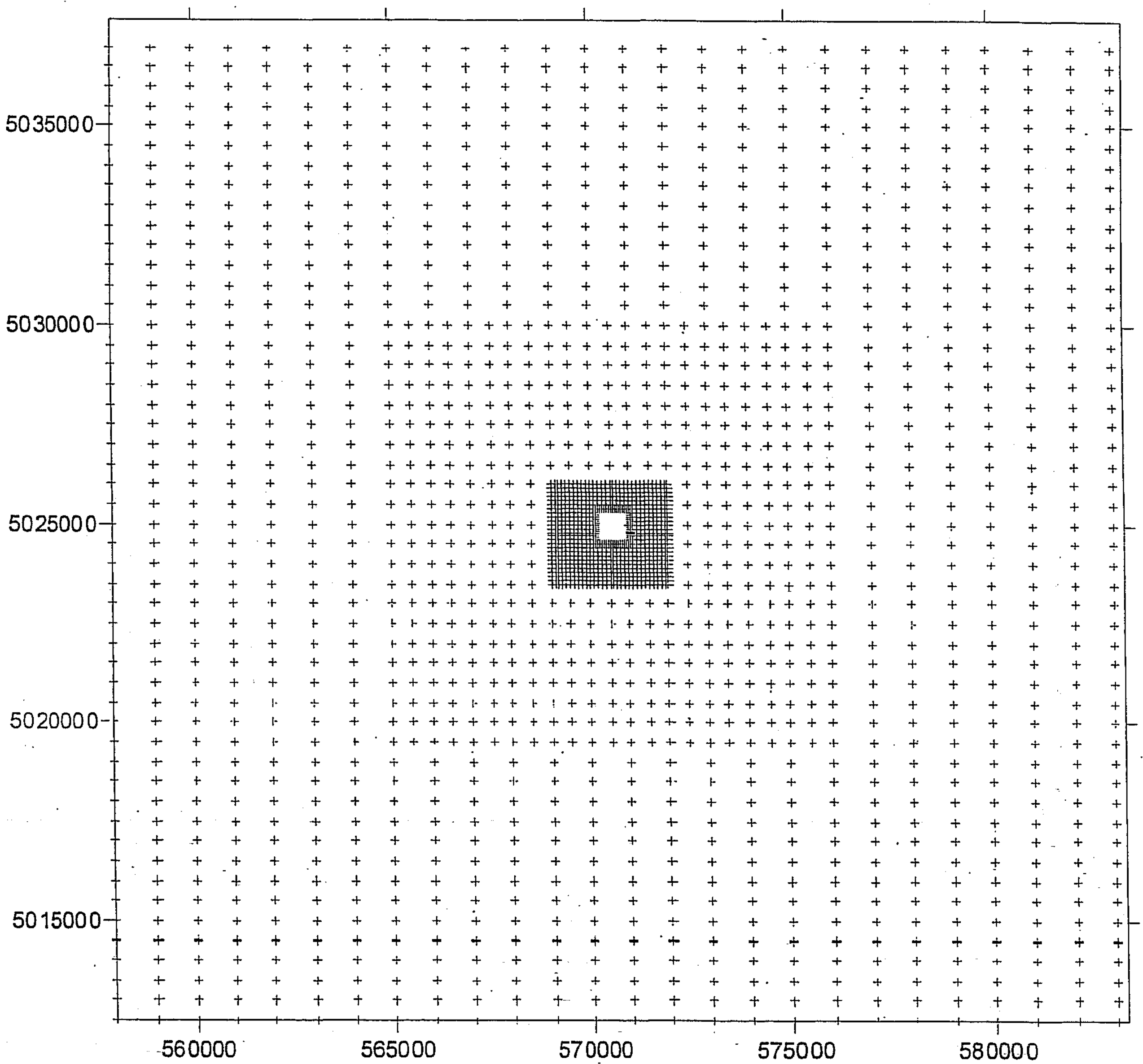
The modeling for the proposed facility was completed using an extensive receptor grid to ensure that the maximum estimated impacts are identified. Following EPA guidelines, receptor locations were identified with sufficient density and spatial coverage to isolate the area where the highest impacts are anticipated. The following receptor spacing was used:

- 50-meter (m) spacing (approximately) along the proposed perimeter fenceline;
- 100-m spacing from the fenceline to 1.0 kilometer (km) from the fenceline;
- 500-m spacing from 1.0 km to 5.0 km from the fenceline; and
- 1000-m spacing from 5.0 km to 12.0 km from the fenceline.

All coordinates were input as Universal Transverse Mercator (UTM) eastings and northings, in horizontal datum NAD83. Terrain elevations for all the receptors were determined using digital elevation model data files. A total of 1,532 model receptors were included in the modeling analysis. Figure 5-2 shows a plot of the receptors.

FIGURE 5-2

MAP OF MODELED RECEPTORS



5.7 BACKGROUND CONCENTRATIONS

Ambient background concentrations represent the contribution of pollutant sources not included in the modeling analysis, including naturally occurring sources. The background concentration for each criteria pollutant is added to the maximum modeled concentration to calculate the total estimated pollutant concentration for comparison with the NAAQS. Published concentrations for NO_2 and CO near the study area are not available because there are no nearby monitoring stations for these criteria pollutants. Therefore, no background concentrations will be added to the modeled concentrations for the proposed source. As shown in the following sections of this report, background concentrations will not be of concern given the low level of predicted impacts.

5.8 MODELING RESULTS

The predicted maximum impacts from the proposed Basin Electric combustion turbine demonstrate that operation of the generator will not cause or contribute to violations of applicable air quality standards.

Predicted maximum modeled concentrations of NO_X and CO are well below the applicable PSD Significance Levels, as well as South Dakota Ambient Air Quality Standards and NAAQS. Maximum impacts were predicted largely northwest of the site. Table 5-2 compares the PSD Significance Levels and NAAQS with maximum modeled concentrations.

All modeling input and output files are provided with this permit application on diskette in Appendix D.

TABLE 5-2

BASIN ELECTRIC COMBUSTION TURBINE GENERATORS DISPERSION MODELING RESULTS

Scenario #	Maximum Modeled Concentration ($\mu g/m^3$)		
	Annual NO_X	**1-Hour CO**	**8-Hour CO**
Scenario 1	0.060	3.4	0.84
Scenario 2	0.062	3.0	0.88
Scenario 3	0.062	3.6	0.87
Scenario 4	0.059	3.4	0.84
Scenario 5	0.445	2.9	0.83
Scenario 6	0.061	3.6	0.85
Scenario 7	0.056	3.1	0.81
Scenario 8	0.059	2.9	0.79
Scenario 9	0.059	2.4	0.83
Scenario 10	0.054	3.0	0.79
Scenario 11	0.058	2.9	0.78
Scenario 12	0.052	2.3	0.82
Scenario 13	0.054	3.1	0.76
Scenario 14	0.057	2.7	0.78
Scenario 15	0.057	3.4	0.80
Scenario 16	0.375	2.9	0.73
Prevention of Significant Deterioration Significance Level	1	2,000	500
National Ambient Air Quality Standard	100	40,000	10,000

Notes:

($\mu g/m^3$) Micrograms per cubic meter

6.0 SUMMARY AND CONCLUSIONS

Basin Electric Power Cooperative is proposing to install and operate a natural gas-fired, turbine powered, electric generating station in Brown County, South Dakota, approximately 18 miles southeast of Aberdeen. Emissions were calculated for criteria pollutants and HAPs. This analysis demonstrates that the applicable requirements identified in Section 4.0 would be met by the proposed facility. An air quality impact analysis has shown that this proposed facility will have no significant impact on ambient air quality. Based on the information provided, all applicable requirements of South Dakota's Air Pollution Control Program, Article 74:36 will be met.

7.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1990. "New Source Review Workshop Manual - Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft)." Office of Air Quality Planning and Standards. Research Triangle Park, NC. October.

EPA. 2003. "Guideline on Air Quality Models (Revised)." 40 Code of Federal Regulations, Part 51, Appendix W. Office of Air Quality Planning and Standards. Research Triangle Park, NC.

Schulman, L.L., D.G. Strimaitis, and J.S. Scire. 1998. "Development and Evaluation of the PRIME Plume Rise and Building Downwash Model." Submitted to Journal of the Air & Waste Management Association.

APPENDIX A

PERMIT APPLICATION FORM

South Dakota Department of Environment & Natural Resources
Protecting SD's Tomorrow...Today

Air Quality Permit Application Form
Title V (Part 70) Operating Permit

General Information Form
And
Certification of Applicant Form

SEND ALL MATERIALS TO:

SD Department of Environment and Natural Resources
Air Quality Program
523 East Capitol
Pierre, South Dakota 57501-3181

(Please complete shaded areas - if you have questions call (605) 773-3151)

GENERAL INFORMATION

If permit is being renewed or amended, give existing permit number:	
1. Facility name:	Groton Generating Station
2. Mailing address:	
Street and/or box number	1717 East Interstate Avenue
City, state, zip code	Bismarck, North Dakota 58503-0564
3. Facility location (if plant is portable, enter location at time of submittal):	
Street and city	5 miles south of the town of Groton, in Brown County, South Dakota
Legal description and county	SW ¼ of Section 18, Township 122 North, Range 60 West
	(Quarter, Section, Township, Range)
4. Permit contact:	
Name/title	Jerry Menge
Telephone number	(701) 223-0441
5. Facility contact, if different than permit contact (Person to contact for arranging inspections):	
Name/title	
Telephone number	
6. Responsible official:	
Name/title	Vernon Laning (Designated Representative) Vice President of Operations Jim K. Miller (Designated Alternate Representative) Manager of Environmental Affairs
Telephone number	(701) 233-0441

A responsible official is defined as a president, vice president, secretary, or treasurer for a corporation; general partner or the proprietor for a partnership; and principal executive officer or ranking elected official for municipal, state, federal or public agency.

B. PLANT DESCRIPTION

1. Standard Industrial Classification Code (SIC code):

Primary SIC code: 4911-Electricity Generation Secondary SIC code (if applicable):

Please contact the Department if unable to determine your SIC code.

2. Briefly describe the operations at the facility, including raw materials and finished products:

Natural gas-fired turbine for electricity generation

Please attach one copy, if available, of any prepared plans and the manufacturer's specifications of any equipment, including pollution control devices. If additional space is needed to describe operations, please attach the additional paper to this application.

3. A **new source or modification to an existing source** is required to demonstrate that the operation of the new source or modification will not prevent or interfere with the attainment or maintenance of an applicable ambient air quality standard. Please attach air dispersion modeling or other documents that will demonstrate the new source or modification will not prevent or interfere with the attainment or maintenance of an applicable ambient air quality standard.

Has air dispersion modeling been conducted (please check one)? [X] Yes [ ] No

If air dispersion modeling has been conducted, please attach a copy of the report to this application unless the Department has a copy already.

C. COMPLIANCE PLAN

If it is anticipated that a permitted unit will not be operating in compliance at the time of permit issuance, a proposed compliance plan shall be included with the application. The proposed compliance plan shall include a narrative description of the following:

1. The requirements (i.e., statutes, air quality rules, permit conditions, etc.) the source is not in compliance with at the time of submittal of this application or permit issuance;
2. How the facility intends to bring the unit(s) into compliance; and
3. A compliance schedule for when the source will achieve compliance with such requirements;

The compliance schedule must include a statement that progress reports will be submitted at least once every six months and must be at least as stringent as that contained in any judicial consent decree or administrative order to which the applicant is subject.

D. MAPS

For stationary sources only, please enclose a map or a drawing showing roadways, location of plant and the nearest residents in each direction from the source. Include other structures, which may be affected.

E. AIR QUALITY EMISSIONS SUMMARY

If air quality emissions are available, please complete the following table:

Pollutant	Actual (tons per year)	Potential Controlled (tons per year)	Potential Uncontrolled (tons per year)
Particulate		See Table 3-2	
Sulfur Dioxide		See Table 3-2	
Nitrogen Oxide		See Table 3-2	
Carbon Monoxide		See Table 3-2	
Volatile Organic Compounds		See Table 3-2	
Hazardous Air Pollutants (if applicable).			
		See Table 3-3	

Remember that potential emissions are calculated assuming that the permitted unit is operated 24 hours per day, 7 days per week, 52 weeks per year at maximum design capacity. Attach all calculations, MSDS sheets for all products containing volatile organic compounds and/or hazardous air pollutants, and other supporting documentation.

Please contact the Department if assistance is needed for calculating emissions for the permitted units such as emission factors, clarifying what potential emissions are, efficiency for control equipment, etc.

F. ADDITIONAL FORMS

The following forms must be completed for each piece of specific equipment at the facility and submitted with this form:

Boiler	Incinerator	Kiln Dryer
Miscellaneous Process	Paint Booth	Storage Tank

The following forms must be completed for each piece of specific air control equipment at the facility and submitted with this form:

Baghouse	Cyclone	Electrostatic Precipitator
Miscellaneous Control	Thermo Oxidizer	Wet Scrubber

G. CERTIFICATION OF COMPLIANCE

I certify the following:

1. The methods such as monitoring, record keeping, reporting, and stack test performance results described within this application shall be used to determine continuous or intermittent compliance;
2. A compliance certification document will be submitted to the Department at least annually or at other times designated by the Department for the duration of the permit;
3. The source is in compliance and will continue to demonstrate compliance with all applicable requirements, except for those designated in the attached compliance plan (if applicable); and
4. This application is submitted in accordance with the provisions of the South Dakota Codified Laws 34A-1 and Administrative Rules of South Dakota 74:36. To the best of my knowledge, after reasonable inquiry, the statements and information contained in the application and supporting documents are true, accurate, and complete. In accordance with South Dakota Codified Laws 1-40-27, I have also enclosed a completed Certification of Applicant form.

Signature:		
Print Name:	Vernon Laning	Date:
	Responsible Official	

South Dakota
Department of Environment
& Natural Resources
Protecting SD's Tomorrow...Today

CERTIFICATION OF APPLICANT

(please complete shaded areas - if you have questions call (605) 773-3151)

In the Matter of the Application of	Groton Generating Station
	(Facility Name)
State of	South Dakota
County of	Brown

I, ____________________, the applicant in the above matter after being duly sworn upon oath hereby certify the following information in regard to this application:

South Dakota Codified Laws Section 1-40-27 provides:

"The secretary may reject an application for any permit filed pursuant to Titles 34A or 45, including any application by any concentrated swine feeding operation for authorization to operate under a general permit, upon making a specific finding that:

(1) The applicant is unsuited or unqualified to perform the obligations of a permit holder based upon a finding that the applicant, any officer, director, partner or resident general manager of the facility for which application has been made:

(a) Has intentionally misrepresented a material fact in applying for a permit;

(b) Has been convicted of a felony or other crime involving moral turpitude;

(c) Has habitually and intentionally violated environmental laws of any state or the United States which have caused significant and material environmental damage;

(d) Has had any permit revoked under the environmental laws of any state or the United States; or

(e) Has otherwise demonstrated through clear and convincing evidence of previous actions that the applicant lacks the necessary good character and competency to reliably carry out the obligations imposed by law upon the permit holder; or

(2) The application substantially duplicates an application by the same applicant denied within the past five years which denial has not been reversed by a court of competent jurisdiction. Nothing in this subdivision may be construed to prohibit an applicant from submitting a new application for a permit previously denied, if the new application represents a good faith attempt by the applicant to correct the deficiencies that served as the basis for the denial in the original application.

All applications filed pursuant to Titles 34A and 45 shall include a certification, sworn to under oath and signed by the applicant, that he is not disqualified by reason of this section from obtaining a permit. In the absence of evidence to the contrary, that certification shall constitute a prima facie showing of the suitability and qualification of the applicant. If at any point in the application review, recommendation or hearing process, the secretary finds the applicant has intentionally made any material misrepresentation of fact in regard to this certification, consideration of the application may be suspended and the application may be rejected as provided for under this section.

Applications rejected pursuant to this section constitute final agency action upon that application and may be appealed to circuit court as provided for under chapter 1-26."

Pursuant to SDCL 1-40-27, I certify that I have read the forgoing provision of state law, and that I am not disqualified by reason of that provision from obtaining the permit for which application has been made.

Dated this ______, day of ______, 20 ______

Applicant (signature)

Subscribed and sworn before me this:

Dated this ______, day of ______, 20 ______

Notary Public (signature)

My commission expires: ______

(SEAL)

PLEASE ATTACH SHEET DISCLOSING ALL FACTS PERTAINING TO SDCL 1-40-27 (1) (a) THROUGH (e).
ALL VIOLATIONS MUST BE DISCLOSED, BUT WILL NOT AUTOMATICALLY RESULT IN THE REJECTION OF AN APPLICATION.

South Dakota Department of Environment & Natural Resources
Protecting SD's Tomorrow...Today

Air Quality Permit Application Form

Boiler Turbine or Furnace

This form is to be submitted, if necessary, along with the Title V (Part 70) Operating Permit or Minor Operating Permit. (please complete shaded areas)

1. Facility identification (i.e., Boiler #1, Unit #1, etc):	Boiler		
2. Manufacturer:	GE	Manufacture date:	NA
3. Model number:	LMS100		

4. Type (i.e., steam boiler, simple cycle combustion turbine, generator, etc.)

Natural Gas Turbine

5. Maximum designed operating rate (name plate):

	786.5	million Btus per hour heat input	
or		horsepower with boiler efficiency:	
or		kilowatts with boiler efficiency:	

6. Check the appropriate box(es) for primary and secondary fuels:

X	Natural gas			Propane
	Distillate oil	Sulfur content		Weight percent
	Residual oil	Sulfur content		Weight percent
	Bituminous Coal		Subbituminous Coal		Lignite Coal

Coal sulfur content ____ Weight percent | Coal ash content ____ Weight percent

☐ Other (please specify) ____

7. Has a stack test been conducted (check appropriate box)? ☐ Yes [X] No

If a stack test has been conducted, please attach a copy of the most recent stack test report to this application. If the Department already has a copy of the most recent stack test, please specify the date of most recent stack test.

Date of most recent stack test: ____

Control Equipment: If applicable, types of air pollution control equipment (Examples: baghouse, cyclone, wet scrubber, electrostatic precipitator, thermal oxidizer, miscellaneous control device, etc.):

CO catalyst

Please complete the appropriate air quality permit application form for each type of control equipment that controls air emissions from this operation.

Stack Information: If this application is a renewal, contact the air program. We may have this information.

X- Coordinate or Easting:	1871214	feet	570346	meters
Y- Coordinate or Northing:	16485676	feet	5024834	meters
Base Elevation of Stack:	1300	feet	396.2	meters
Stack Height:	85.92	feet	26.2	meters
Exit Stack Diameter	11.5	feet	3.51	meters
Exit Stack Temperature	850	degrees Fahrenheit		

Exit Stack Velocity and/or Flow Rate:

Velocity: 146 feet per second 44.5 meters per second

and/or

Flow Rate: 946,472 actual cubic feet per minute 446.7 actual cubic meters per second

APPENDIX B

EMISSION CALCULATIONS

Average Molecular Weight of Exhaust:

$MW_{exh} = (\%AR \times MW_{AR}) + (\%N_2 \times MW_{N2}) + (\%O_2 \times MW_{O2}) + (\%CO_2 \times MW_{CO2}) + (\%H_2O \times MW_{H2O}) + (\%CO \times MW_{CO}) + (\%HC \times MW_{HC}) + (\%NO_X \times MW_{NOX})$

Volume of 1 mole of exhaust gas (V): $Va = \dfrac{TaVsPs}{TsPa}$ m^3/g-mole

where:

Ta =	actual temperature	K	
Vs =	0.022415	m^3	standard volume of air
Ts =	273	K	standard temperature
Pa =	actual pressure	psia	
Ps =	14.7	psia	standard pressure

Density of Exhaust: $\rho_{exh} = \dfrac{MW_{exh}\ (g/g\text{-mole})}{Va\ (m^3/g\text{-mole})}$ (g/m^3)

Exhaust Flow Rate: $Qa = \dfrac{Q\ (lb/hr)}{\rho_{exh}\ (lb/ft^3)} \times \dfrac{hr}{60\ min}$ acfm

$Qd,s = \dfrac{Qa \times (Ts + 20)}{Ta} \times (1 - \%H_20/100)$ dscfm

Exhaust Velocity: $v = \dfrac{Qa}{A}$

Hourly Mass Emission Rates:

CO (lb/hr) = (CO ppmvd) x (28 lb/lbmole CO) x (Q dscfm) x (60 min/hr) x (10^6-lbmoles/ 10^6 1-lbmole)/(385.5 ft^3/lbmole Air)

NOx (lb/hr) = (NOx ppmvd) x (46 lb/lbmole NO2) x (Q dscfm) x (60 min/hr) x (10^6-lbmoles/ 10^6 1-lbmole)/(385.5 ft^3/lbmole Air)

VOC (lb/hr) = (VOC ppmvd) x (44.1 lb/lbmole VOC) x (Q dscfm) x (60 min/hr) x (10^6-lbmoles/ 10^6 1-lbmole)/(385.5 ft^3/lbmole Air)

APPENDIX C

TURBINE DATA

GE Aero Energy Products
A GE Power Systems Business

TURBINE GEN SET PERFORMANCE
FOR
Basin Electric Capacity Addition

GUARANTEED PARAMETERS JOBSITE LOCATION: ND, USA

Btu/kW-hr, LHV	AT	NET PLANT KW	NOx EMISSIONS
8,415		93,464	25 PPMVD AT 15 % O2
kJ/kW-hr, LHV			
8,878		GUARANTEE	GE SUPPLIED CO CATYLYST
			CO EMISSIONS 28 PPMVD AT 15 % O2
		Date: 3/17/04	VOC EMISSIONS 5 PPMVD AT 15 % O2

NOT VALID WITHOUT STAMP

BASIS OF GUARANTEE:	BASE LOAD, GAS FUEL NOZZLE SYSTEM NO BLEED OR EXTRACTED POWER
ENGINE:	(1) GE LMS100 GAS TURBINE
FUEL:	21530 Btu/lb / (50076 kJ/kg) LHV, GAS FUEL
FUEL TEMP:	50°F(28°C) above dew p @ GEAEP BASEPLATE Fuel Temperature 365°F(185°C)
GENERATOR OUTPUT:	13.8 kV, 60 Hz
POWER FACTOR:	≥ .9
AMBIENT TEMP:	78.3°F / (25.7°C)
AMBIENT RH:	53.0%
INLET CONDITIONING:	NONE
ALTITUDE:	1302 ft/ (396.8 m)
AMBIENT PRESSURE:	14.018 PSIA
INLET FILTER LOSS:	≤ 4.0 inH_2O/ (101.6 mmH_2O)
EXHAUST LOSS:	≤ 12.0 inH_2O/ (304.8 mmH_2O)
NOX CONTROL:	Water
INJECTION RATE:	33778 PPH/ (15322 KG/hr) ±20% FLOW
ENGINE CONDITION:	NEW AND CLEAN ≤ 200 SITE FIRED HOURS
FIELD TEST METHOD:	
PERFORMANCE:	GE AERO ENERGY PRODUCTS SGTGPTM
NOX:	EPA Method 20
CO:	EPA Method 10
VOC:	EPA Method 25/18

** SI values are for reference purposes only

THIS GUARANTEE SUPERSEDES ANY PREVIOUS GUARANTEES PRESENTED

LMS100-0000401509-455R1 3/17/2004

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: Johnny Metcalf
Project Info:

Engine: LMS100 PA
Deck Info: G0179C-87o.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (85404)
Fuel: Site Gas Fuel#900-771, 19000 Btu/lb,LHV

Date: 03/23/2004
Time: 6:02:34 PM
Version: 3.0.32

Case #	100	
Ambient Conditions		
Dry Bulb, °F	78.3	
Wet Bulb, °F	65.1	
RH, %	53.0	
Altitude, ft	1300.0	
Ambient Pressure, psia	14.018	
Engine Inlet		
Comp Inlet Temp, °F	78.3	
RH, %	53.0	
Conditioning	NONE	
Tons or kBtu	0	
Pressure Losses		
Inlet Loss, inH2O	4.00	
Exhaust Loss, inH2O	12.00	
KW, Gen Terms	96709	93464
Est. Btu/KW-hr, LHV	7882	8415
Guar. Btu/KW-hr, LHV	8210	
AUX LOADS	3335	
Fuel Flow		
MMBtu/hr, LHV	762.9	
lb/hr	40154	
NOx Control	Water	
Water Injection		
lb/hr	33778	
Temperature, °F	100.0	
Intercooler	Air-Air	
Spray Mist Cooler	OFF	
IC Heat Extraction, btu/s	26300	
KOD Water Extraction, lb/s	0.0	
Control Parameters		
HP Speed, RPM	9370	
LP Speed, RPM	5316	
PT Speed, RPM	3600	
P3 - CDP, psia	535.4	
T23 - Intcl Inlet Temp, °F	255.7	
T25 - HPC Inlet Temp, °F	100.0	
T3 - CDT, °F	725.0	
T48, °R	2091	
Exhaust Parameters		
Temperature, °F	790.5	
lb/sec	438.6	
lb/hr	1582568	
Energy, Btu/s - ref 0 °R	143248	
Cp, Btu/lb-R	0.2775	
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)		
REF @ 15% O2	15	
NOx ppmvd Ref 15% O2	25	
NOx as NO2, lb/hr	77	
CO ppmvd Ref 15% O2	157	
CO, lb/hr	253.54	
HC ppmvd Ref 15% O2	0	
HC, lb/hr	0.00	

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: Johnny Metcalf
Project Info:

Engine: LM6000 PA
Deck Info: G01790 - 870.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (25404)
Fuel: Site Gas Fuel#900-772, 19000 Btu/lb,LHV

Date: 03/11/2004
Time: 6:03:24 PM
Version: 3.0.32

Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	1.2139
N2	71.4003
O2	12.8348
CO2	6.5771
H2O	8.0615
SO2	0.0000
CO	0.0180
HC	0.0005
NOX	0.0073

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.9712
N2	81.4617
O2	12.9101
CO2	4.6314
H2O	0.0000
SO2	0.0000
CO	0.0212
HC	0.0010
NOX	0.0034

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.8407
N2	71.2686
O2	11.2947
CO2	4.0519
H2O	12.5178
SO2	0.0000
CO	0.0185
HC	0.0009
NOX	0.0030

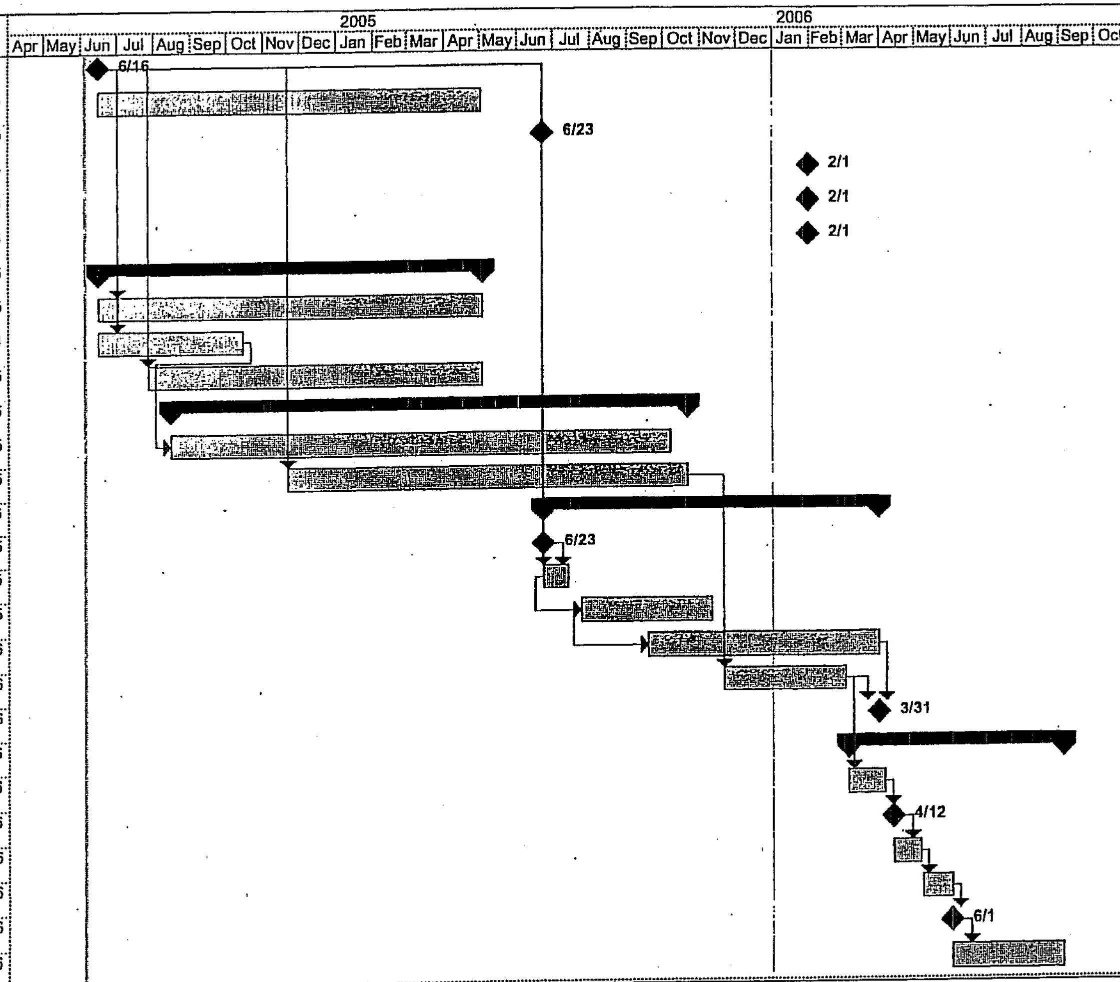
Aero Energy Fuel Number	900-772 (DEFAULT GAS 385) Volume %	Weight %		MW	weighted MW
Hydrogen	0.0300	0.0000			
Methane	84.5000	71.8447	- CH_4	16	13.52
Ethane	5.5800	8.8924	- C_2H_6 -	30.1	1.68
Ethylene	0.0000	0.0000			
Propane	2.6500	4.7002	- C_3H_8 -	44.09	5.90
Propylene	0.0000	0.0000			
Butane	0.7800	2.4027			
Butylene	0.0000	0.0000			
Butadiene	0.0000	0.0000			
Pentane	0.1800	0.6003			
Cyclopentane	0.0000	0.0000			
Hexane	0.1700	0.7764			
Heptane	0.0000	0.0000			
Carbon Monoxide	0.0000	0.0000			
Carbon Dioxide	0.6700	1.5828			
Nitrogen	5.0300	8.8044	- N_2 -	28.02	1.66
Water Vapor	0.0000	0.0000			
Oxygen	0.1400	0.2374			
Hydrogen Sulfide	0.0000	0.0000			
Ammonia	0.0000	0.0000			17.76

Btu/lb, LHV	19000
Btu/scf, LHV	947
Btu/scf, HHV	1047
Btu/lb, HHV	21007
Fuel Temp, °F	365.0
NOx Scalar	1.121
Specific Gravity	0.65

APPENDIX E

TIME SCHEDULE

ID	Task Name	Start	Finish
1	Project Notice to Proceed (Owner)	Wed 6/16/04	Wed 6/16/04
2	Environmental Permitting (Owner)	Wed 6/16/04	Mon 5/2/05
3	PUC Approval (Owner)	Thu 6/23/05	Thu 6/23/05
4	Electrical Interconnection Complete (Owner)	Wed 2/1/06	Wed 2/1/06
5	Fuel Gas Available at Site (Owner)	Wed 2/1/06	Wed 2/1/06
6	Water Available at Site (Owner)	Wed 2/1/06	Wed 2/1/06
7	**Engineering**	**Wed 6/16/04**	**Tue 5/3/05**
8	Plant Design Engineering	Wed 6/16/04	Tue 5/3/05
9	Equipment Design Specifications	Wed 6/16/04	Fri 10/15/04
10	Detailed Plant Design	Wed 7/28/04	Tue 5/3/05
11	**Equipment Procurement / Manufacture**	**Mon 8/16/04**	**Fri 10/21/05**
12	Equipment Procurement	Mon 8/16/04	Fri 10/7/05
13	CGTG Manufacture	Mon 11/22/04	Fri 10/21/05
14	**Site Construction**	**Thu 6/23/05**	**Fri 3/31/06**
15	Site Available for Mobilization	Thu 6/23/05	Thu 6/23/05
16	Site Construction Mobilization	Thu 6/23/05	Wed 7/13/05
17	Site Preparation, Foundations, U/G	Mon 7/25/05	Thu 11/10/05
18	Installation of BOP Equipment	Mon 9/19/05	Fri 3/31/06
19	Installation of CGTG Centerline Equipment	Mon 11/21/05	Fri 3/3/06
20	Mechanical Completion	Fri 3/31/06	Fri 3/31/06
21	**Commissioning and Testing**	**Mon 3/6/06**	**Mon 9/4/06**
22	Pre-Commissioning	Mon 3/6/06	Wed 4/5/06
23	First Fire CGTG	Wed 4/12/06	Wed 4/12/06
24	Commissioning	Thu 4/13/06	Fri 5/5/06
25	Testing	Mon 5/8/06	Thu 6/1/06
26	Begin Commercial Operation Period	Thu 6/1/06	Thu 6/1/06
27	Target Final Acceptance	Fri 6/2/06	Mon 9/4/06



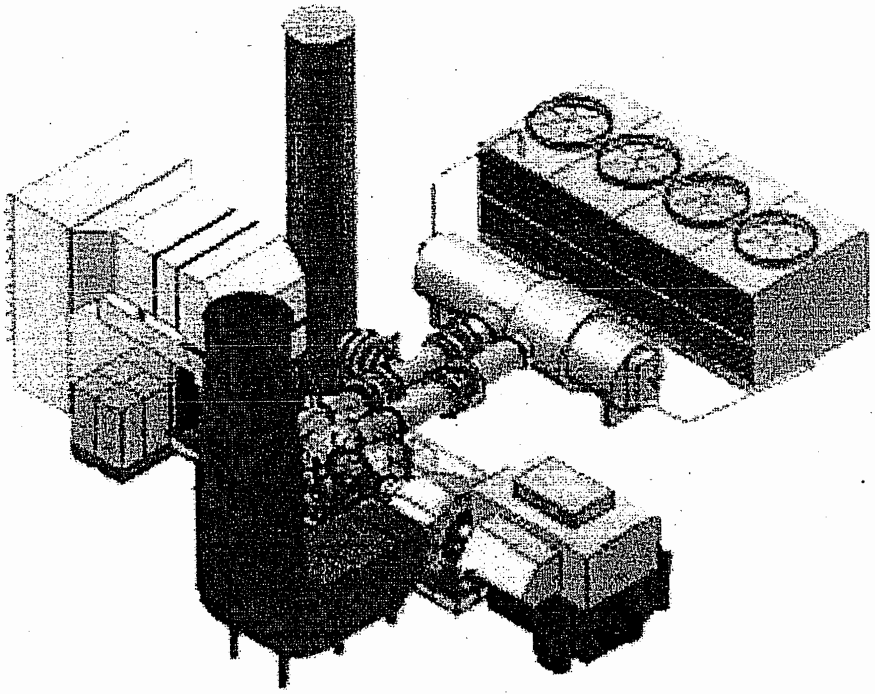
GE Aero Energy
Basin LMS100 EPC Schedule
June 4, 2004 (A)

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

APPENDIX F

NOISE STUDY

GROTON GENERATING STATION NOISE STUDY



Prepared for:
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58503-0564

October 2004

Prepared by:
Tetra Tech EM Inc.
Suite 100
4940 Pearl East Circle
Boulder, Colorado 80301

CONTENTS

FIGURES

CONTENTS (Continued)

TABLES

ACRONYMS AND ABBREVIATIONS

Basin Electric	Basin Electric Power Cooperative
dBa	Decibel A-weighted
FHWA	Federal Highway Administration
GE	General Electric
HVAC	Heating, ventilation, and air conditioning
Hz	Hertz
Leq	1-minute average sound levels
MAPP	Mid-Continent Area Power Pool
mph	Miles per hour
MW	Megawatts
NAC	Noise abatement criteria
NBPL	Northern Border Pipeline
OSHA	Occupational Safety and Health Administration
Tetra Tech	Tetra Tech EM Inc.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Basin Electric Power Cooperative (Basin Electric) is a consumer-owned, regional cooperative headquartered in Bismarck, North Dakota. Basin Electric operates a total of 3,407 megawatts (MW) of electric generating capacity, of which 953 MW is for participants in the Missouri Basin Power Project. This project is a group of six consumer-owned utilities, including Missouri River Energy Services and Heartland Consumers Power District. Basin Electric also holds ownership rights to 73 MW in two projects it does not operate and generates 85 MW of wind energy. Basin Electric manages and maintains 2,424 miles of high-voltage transmission lines; 40 switchyards and substations, and 58 microwave installations used for communications and system protection. This noise study was developed in support of a proposal to add a peaking resource to serve projected growth in the system load.

Basin Electric has identified the need to add a peaking resource to serve projected load growth among its member companies. An 80 to 100 MW simple-cycle, natural gas-fired turbine was deemed the least-cost, self-build resource option to provide for future peaking requirements. Load growth is expected to be highest in Basin Electric's membership areas in eastern South Dakota and northwestern Iowa (known as the East Side). As a result, a new Basin Electric peaking resource in this region is needed to serve member loads.

Therefore, Basin Electric is proposing to construct a new 80 to 100 MW simple-cycle gas turbine in eastern South Dakota. The project would include a gas-fired combustion turbine using natural gas for fuel. An assured gas supply and firm transportation agreements are in place and satisfy Mid-Continent Area Power Pool (MAPP) accreditation requirements. If required, the gas-fired turbine can be modified later to use fuel oil.

The plant design evaluated was based on a General Electric (GE) LMS100 gas turbine. The LMS100 gas turbine is the newest produced by GE in this size range and offers the advantages of an aero-derivative gas turbine in achieving higher efficiency. The high efficiency design of this turbine results in exhaust temperatures below 800°F (427°C).

The proposed project consists of constructing one 80 to 100 MW simple-cycle, natural gas-fired turbine. The natural gas would be supplied by Northern Border Pipeline (NBPL), a 1,249-mile interstate system that transports natural gas from the Montana-Saskatchewan border near Port of Morgan, Montana, to interconnecting pipelines in the upper Midwest of the United States. For 2001, it was estimated that NBPL transported approximately 20 percent of the total amount of natural gas imported from Canada to the United States.

The preferred site for the proposed gas turbine is near Groton, in Brown County, South Dakota, as shown in Figures 1-1 and 1-2. The Groton location would require a modification to an existing substation. In addition, approximately 0.5 mile of new transmission lines and a new gas supply pipeline would be constructed to supply the natural gas.

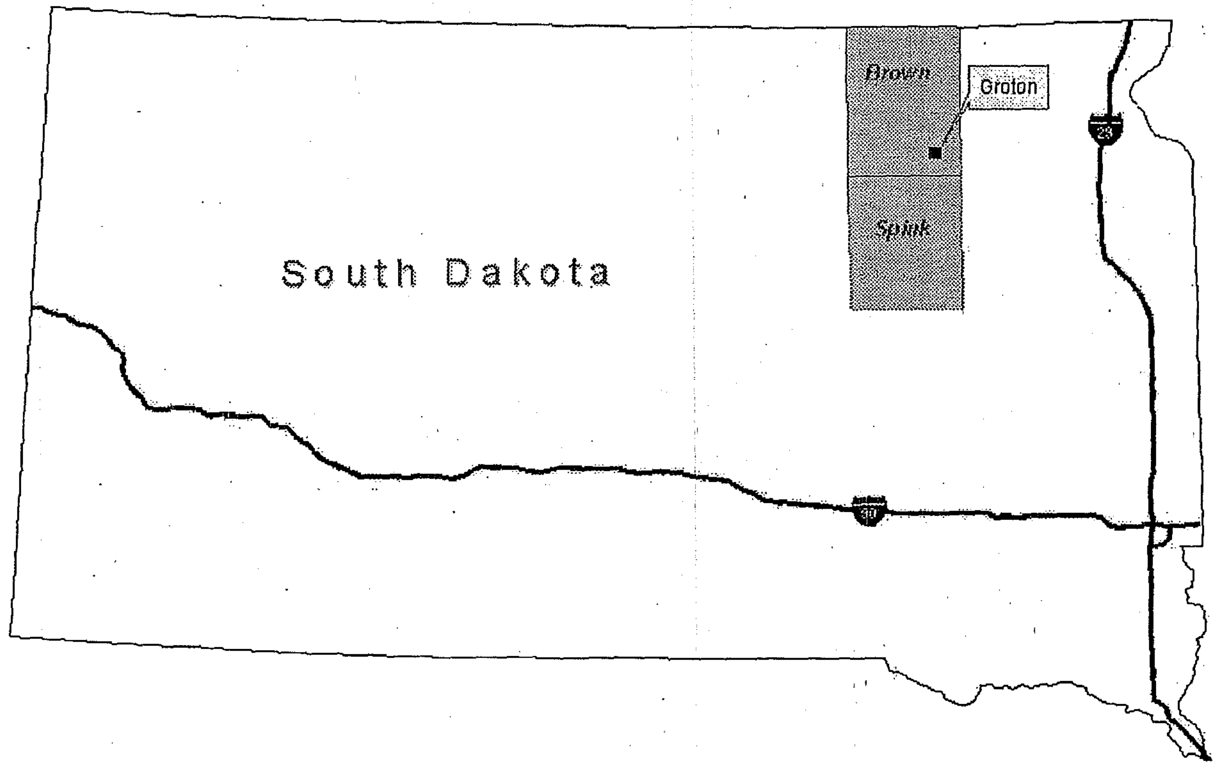
One gas turbine site is planned, with 80 to 100 MW of peaking generation capacity. The total area of the proposed project site would be less than 15 acres. The gas turbine would be sized to best match project loads, environmental requirements, and overall economics.

The proposed project site would include one gas turbine, factory assembled to the greatest extent possible, with a summer peaking capacity of 80 to 100 MW. The gas turbine is capable of operating at all loads from 3 percent to 100 percent of rated capacity, but would normally operate between 50 percent and 100 percent of rated capacity.

An enclosure would be constructed to protect the gas turbine from ambient conditions, which include temperatures between minus 30° and 105°F and winds up to 100 miles per hour (mph). The gas turbine would include an inlet air filter system capable of removing airborne dust, and a short exhaust gas stack (approximately 40 feet high) (Figure 1-3). The gas turbine will have fast-start capability and would be fueled by locally available natural gas.

A foundation for the gas turbine, associated control building, and ancillary equipment would be built on site. The site would include a chain-link fence with locking gate. A building to house the control systems to support the gas turbine would be constructed. This building would house metal-enclosed switchgear, control systems, communication systems, battery systems, and other equipment. This building would require a heating, ventilation, and air conditioning (HVAC) system.

Basin Electric will provide the design and equipment for the gas turbine, plant equipment, generator breaker, site station service transformer, and ancillary equipment and systems. Basin Electric will also provide the design and equipment needed for connections to the existing transmission system. This system equipment will include the buss structure, breaker, dead-end structure, line protection relaying, motor-operated sectionalizing switches, and associated power and control cabling.

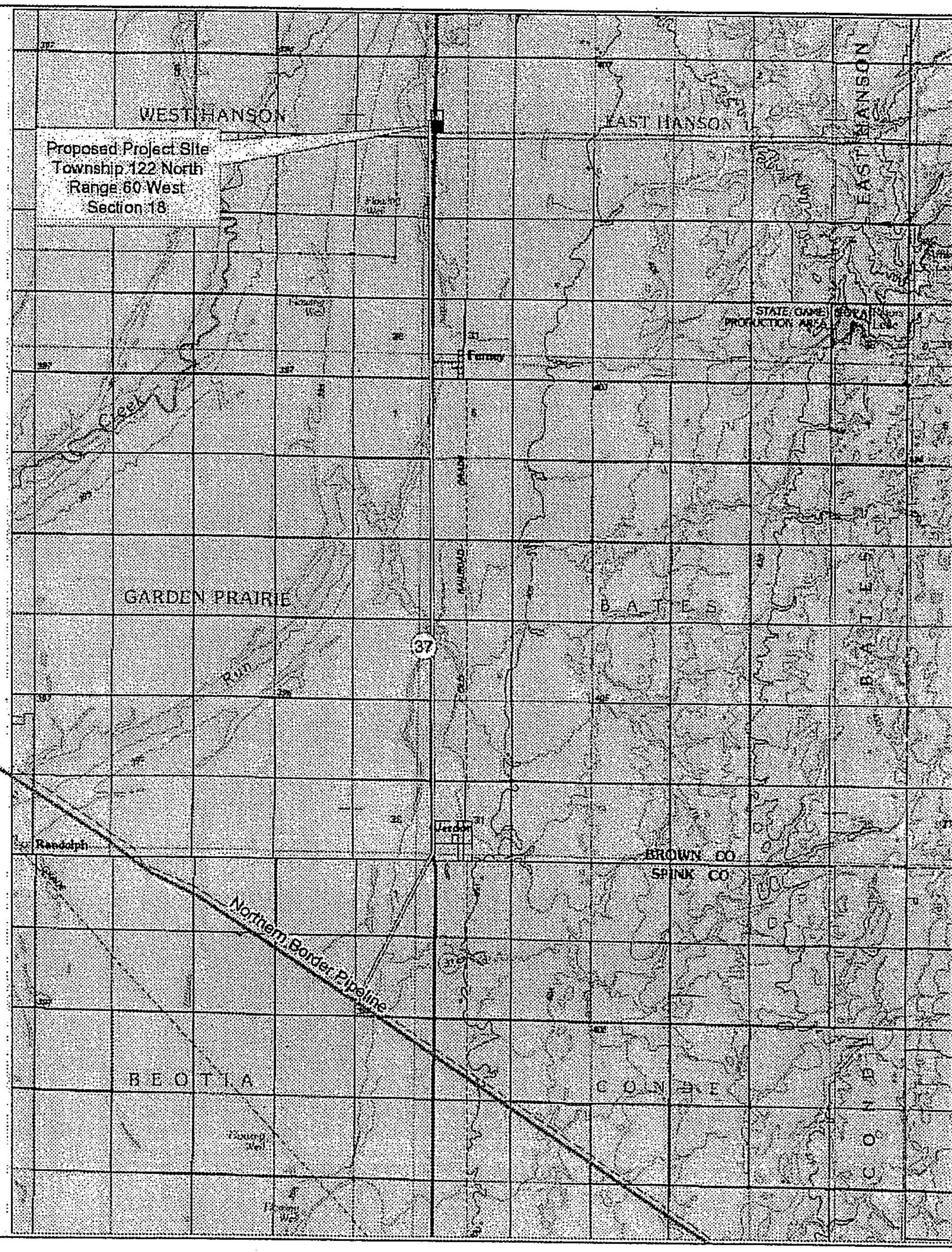


Legend

- Proposed Gas Turbine Location
- Interstate Highway
- Proposed Project County

0 15 30 60
Miles

FIGURE 1-1
PROJECT REGION
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT



Legend

Proposed Gas Pipeline

Proposed Project Area

Proposed Gas Turbine Site

U.S. Geological Survey (USGS).

FIGURE 1-2
PROJECT SITE LOCATION
PROPOSED GROTON SITE
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Miles

Example Gas Turbine Site

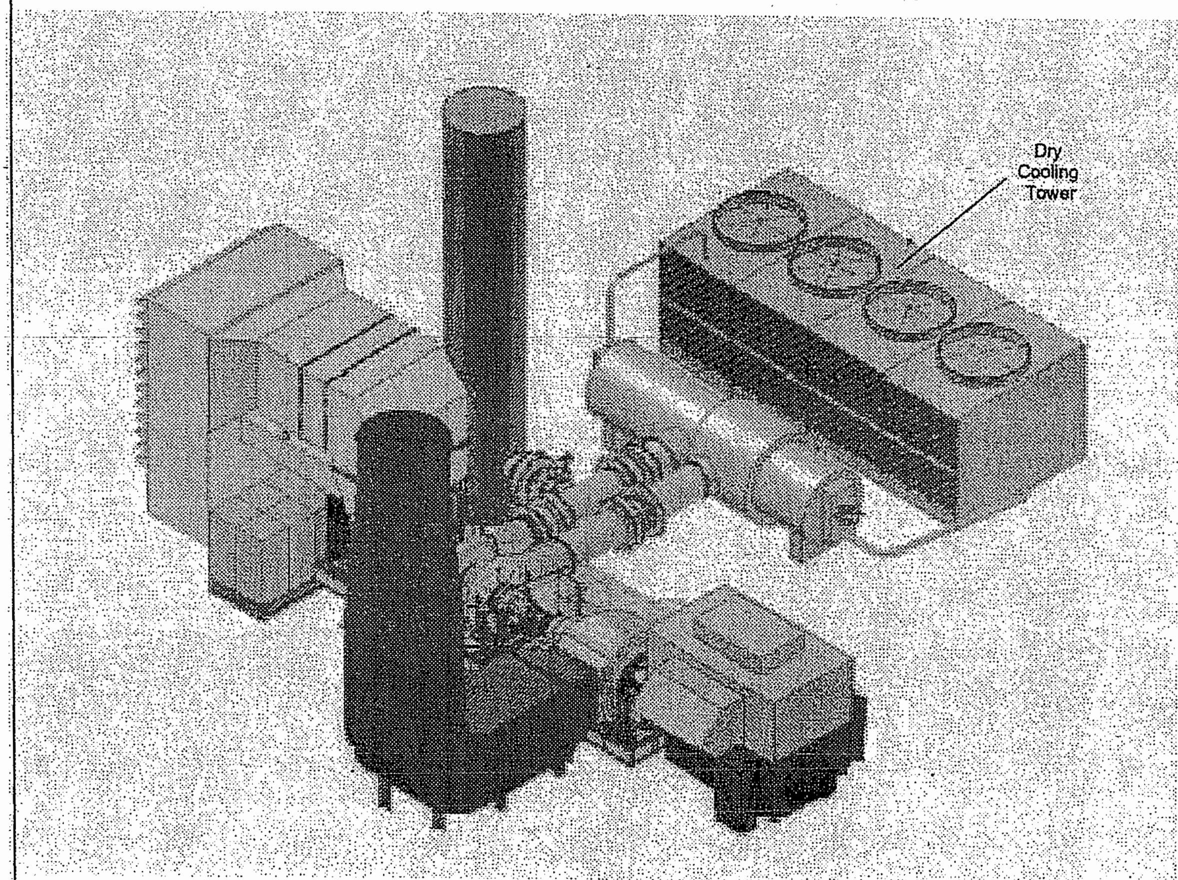


FIGURE 1-3
GENERAL ELECTRIC LMS100
CONCEPTUAL CONFIGURATION
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

Source: General Electric

1.2 NOISE STUDY

The primary focus of the noise study was to develop information on the following issues:

- Background noise (sound level) at and near the site
- The impacts of noise currently emanating from the electrical substation located at the proposed site
- The potential impact of noise generated by the proposed new turbine.

The noise study included three main elements. The first element was a real-time survey of existing sound levels created by the transformers at the current substation at various distances and directions, north, south, east, and west, from the sources. The second element of the study consisted of gathering sound-level measurements continuously at two locations: at the fenceline of the current substation and near the occupied residence north of the site. The third element of the study was to estimate the potential impact of noise from the proposed turbines on the existing environment.

2.0 PROJECT SCOPE

Tetra Tech EM Inc. (Tetra Tech) conducted noise surveys at the location of the proposed turbine on two occasions, looking at separate noise level rangess on each occasion. Survey 1, which occurred from August 26 to August 28, 2004, examined an upper range of noise levels, and Survey 2, which occurred from September 29 to October 1, 2004, examined a lower range. Two separate surveys were conducted because the noise monitors used function in two noise ranges. Both the higher and lower noise ranges were of interest for this survey to assure that the full range of possible noise levels were documented. The methods used and the results of those noise surveys are presented in this report. The surveys were designed to measure existing noise in the area proposed for the new turbine.

This project also examined the potential impact of noise generated by the proposed new turbine. Tetra Tech analyzed and estimated potential noise impact from the proposed turbine on the existing environment.

2.1 NOISE SURVEYS

In each of the two surveys of existing noise, Survey 1 and Survey 2, Tetra Tech used two Quest Model M-27 noise-logging dosimeters manufactured by Quest Electronics. The instruments used are listed below:

- Survey 1
  - Serial number GW5080065, used for continuous monitoring at the nearest residence
  - Serial number GW1060093, used for vector monitoring and continuous monitoring at the substation fenceline
- Survey 2
  - Serial number GW4020060, used for continuous monitoring at the substation fenceline
  - Serial number GW4020063, used for continuous monitoring at the nearest residence

The dosimeters were set to record 1-minute average sound levels (Leq) and calibrated in the field before they were used by using a 114 decibel A-weighted (dBA) calibration standard, also manufactured by Quest. The instruments recorded the results of the calibrations.

2.1.1 Vector Readings

Existing sound levels were measured at various distances and directions from the existing substation during Survey 1 using instrument SN GW1060093 as a survey tool. The sound levels at various distances from the substation were measured by starting at the concrete curb that surrounds the transformer located at the northwestern corner of the equipment area. Readings were taken along four vectors that lay roughly north, south, east, and west from the transformer. The State Highway along the west side of the substation was used for reference since it traverses a roughly north-south orientation. While the surveyor stood at the concrete curb near the center of the transformer, the survey instrument was held at a height of approximately 1.5 meters above the ground and the display readings were observed until they stabilized. The stable reading was recorded, and the next noise data collection point was stepped off to a location along the vector studied. The process was repeated for each of the four vectors, north, south, east, and west, from the transformer.

The distances along each vector measured for this study were selected by doubling the previous distance from the point of origin of the vector. The locations of the readings are indicated in Figure 2-1. The second measurement on each vector was 5 meters from the curb, which was located about 2.5 meters from the center of the transformer wall. Subsequent measurements were made at 10, 20, 40, 80, and 160 meters from the curb, where practical. These distances were estimated by pacing along the vector, which is adequate to meet the needs of this study. The actual locations of the sound measurements were confirmed to be within 1 to 2 meters of the estimates after the field work was completed. The results of the measurements are presented in Table 2-1. All sound level measurements recorded for this element of the study were made when no traffic was passing by the site to eliminate the influence of vehicular noise on the results.

2.1.2 Continuous Readings

The second part of this study collected continuous data on noise at two monitoring locations Tetra Tech selected after the vector reading survey task was complete. Continuous readings were gathered during Survey 1 and during Survey 2. The monitoring locations are presented in Figure 2-1 and were chosen to represent where the sound levels originating within the substation were most likely to have an impact on persons who reside in the area. The two locations selected were a point on the substation fence along the north side closest to the nearby home, and another at the edge of the field north of the substation, near the edge of the boundary to the residential property. The noise dosimeters were set up at the monitoring locations selected with the electronics module secured in weatherproof plastic.

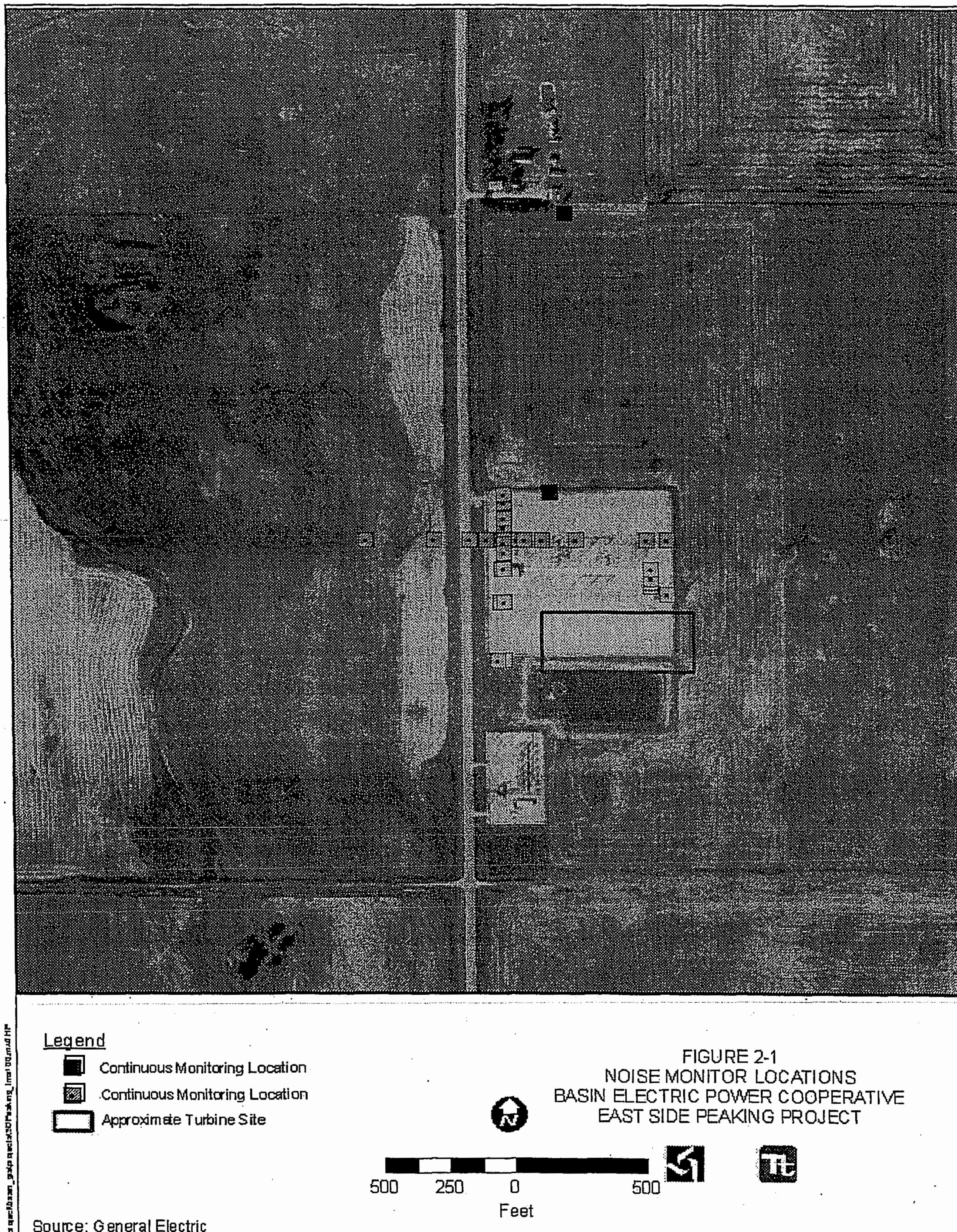


FIGURE 2-1
NOISE MONITOR LOCATIONS
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

TABLE 2-1
COMPARISON OF DISTANCE DATA

	mm from photo	Distance from Transformer (meters)	Estimated Distance [1] (meters)
100 m scale	26	100	N/A
East Fence	50	192.3	188
West Fence	5	19.23	23
West-Road Center	12.5	48.08	43
South Fence	34	130.8	130
North Fence	14	53.85	50
Monitor at North	106	407.7	N/A

Notes:

(1) Includes 3 meters added as distance from the concrete curb to starting point.
Scale Factor from Photo = 3.846154 meters per millimeter.

Each microphone was placed 1.5 meters above the ground pointing downward and was protected from inclement weather using thin plastic to prevent rain from damaging the instrument, although the plastic would not add reflected sound to the measurement.

Photos of the monitoring sites after the noise dosimeters were placed are included in Appendix A. Each meter was calibrated immediately before it was placed at the monitoring location. The noise source emitted a 1,000-hertz (Hz) tone at 114 dBA. At the start of Survey 1, both meters recorded a sound level of 114.2 dBA for the calibration source provided for this project. The measurement error at the start of Survey 1 was less than 0.2 percent. At the start of Survey 2, both meters recorded a sound level of 114.3 dBA for the calibration source provided for this project. The measurement error at the start of Survey 2 was less than 0.3 percent.

The noise dosimeters used in the study have two separate noise range settings. The higher range setting is from 50 dBA to 146 dBA, and the lower range of the noise dosimeters is 30 dBA to 115 dBA. Two Surveys were conducted in order to assure the noise study would record possible sound levels over the full range of both settings, from 30 dBA to 146 dBA. During Survey 1, the noise dosimeters were set up to record sound levels at the higher range, between 50 dBA and 146 dBA, in order to assure louder noise levels that might occur would be recorded. During Survey 2, the noise dosimeters were set up to record sound levels at the lower range in order to record noise levels below 50 dBA. The results of Survey 1 and Survey 2 are presented in Section 3.

Once the continuous noise measurements were started, Tetra Tech remained on site for several hours to observe noise-producing activities and highway traffic at the site. During Survey 1, vehicular traffic was counted, recorded into one of three categories: automobiles, light-duty trucks (including vans) with only two axles, and heavy-duty trucks, with more than two axles. Data on vehicular traffic are useful in understanding the results and the likely impacts of noise from traffic on the survey data. Vehicular traffic observations are presented in Section 3.

After the field monitoring had been completed and the data storage capacity of the sound level meters was reached, Tetra Tech removed the analyzers from the site and returned with them to the Tetra Tech office to download and process the data. The data were transferred from the on-board memory to a computer file where they could be processed. After the instruments were returned to the office, the calibrations were rechecked and the results recorded. The calibration data were added to the files already transferred. The data collected were then imported into spreadsheets, where they were processed into a format that could be used to obtain average results and prepare graphical presentations. The 1-minute averages were used to prepare plots of sound levels that show the results for the studies. The 1-minute data were also averaged to obtain average sound levels by clock hour for evaluation. Finally, daily averages were computed. The 50 dBA detection limit was used as the lowest value during calculation of the averages since the sound levels in Survey 1 were below the minimum measurable value for the dosimeters used during portions of the study period. Therefore, the averaged results for Survey 1 should be slightly higher than the actual data for the periods presented.

2.2 PROJECT NOISE

Operation of the combustion turbine will result in slightly increased noise levels nearby. The turbine manufacturer, GE, provided data to Basin Electric, guaranteeing that the noise level caused by the turbine will not exceed 65 dBA at a distance of 400 feet from the source. This guaranteed level was used to calculate the expected sound level at the nearest residential dwelling.

Sound pressure falls inversely with distance. Doubling the distance from a point source produces a reduction of sound of 6 dBA. The equation to calculate the noise levels some distance away from a point or industrial source is:

$$\mathbf{SPL2 = SPL1 - 20\log(R2/R1)}$$

Where SPL2 = sound pressure level in dB at distance R2
SPL1 = sound pressure level in dB at distance R1

Tetra Tech used the equations above, the distance to sensitive receptors, and the manufacturer-supplied data to estimate noise levels at nearby sensitive receptors. The results of the noise impacts calculated for the proposed project are presented in Section 3 of this report.

3.0 PROJECT RESULTS AND DISCUSSIONS

3.1 NOISE SURVEYS

Tetra Tech analyzed the existing noise level at the proposed turbine location and nearby sensitive receptors in Survey 1 and Survey 2, as described in Section 2 of this report. Tetra Tech measured existing sound levels at various distances and directions from the existing substation during vector surveys conducted during Survey 1. Tetra Tech also collected continuous data on noise at two monitoring locations during Survey 1 and during Survey 2.

3.1.1 Vector Readings

The results of the survey measurements for each vector path are summarized in Table 3-1. The sound levels measured near the transformers were between 66.5 and 75.6 dBA. The reading on the north and south sides of the transformer nearest the residence, at the northwest corner of the equipment area, were lower by 5 to 8 dBA than the results for the other two sides of that unit and that for the unit on the southeastern side of the area. This disparity may be a result of the spatial geometry of vibration inside the transformer, which cause the humming noise heard nearby. The results measured approached levels of about 50 dBA at 40 meters from the transformer along all vectors except toward the west. The sound level at that location was about 52 dBA, probably because this point is in the center of the paved highway and is underneath the high-voltage transmission lines. Hard surfaces are more likely to reflect sound waves, which can result in increased noise levels. The sound levels at the fenceline of the substation were less than 51 dBA for all locations monitored except along the east and west fences, which are about 27 and 20 meters from the two transformers.

3.1.2 Continuous Readings

Existing sound levels from the continuous monitoring near the existing substation are provided in Appendix B. The 1-minute average sound levels were combined into 1-hour averages for this analysis. Appendix B includes a complete listing of the 1-hour average sound levels (Leq) recorded at each monitoring station during Survey 1 and Survey 2.

Appendix C contains concurrent data on wind speed and temperature from nearby airports at Aberdeen, Watertown, and Sisseton. The data on wind speed and temperature from Aberdeen, Watertown, and Sisseton are believed to represent conditions in the vicinity of the Groton site. As seen in Figure 3-1, the sources of the airport weather data, relative to the proposed Groton site, are as follows:

TABLE 3-1
VECTOR PATH SOUND LEVEL RESULTS

Direction from Source Distance (m)	Vector Identification				
	North (dBA)	East (dBA)	West (dBA)	South (6) (dBA)	North (8) (dBA)
2.5 (approximately)	66.5	75.6	71.2	67.5	71.9
5	63.1	66.3	64.1	61.7	67.3
10	58.2	57.3	62.6	54.7	56.2
20	55.6	51.2	56.6	51.6	50.7
40	50.6	50.5	52.5 (4)	51.5/50.7	50.3 (9)
Fenceline	50.5 (1)	50.3 (3)	56.6 (5)	50.4/50.3 (7)	52.3 (10)
80	Not read	50.2	50.4	50.6/50.4	Not read
160	50.3 (2)	50.3	50.3	Not read	Not read
Start Time	7:44	8:10	9:00	9:16	8:27
End Time	7:54	8:25	9:11	9:36	8:39

Notes:

(1) At 50 meters.
(2) At N. monitoring location (Z meters).
(3) At 185 meters.
(4) Near center of roadway.
(5) Same as 20 m point.
(6) The second number was recorded along the actual vector but behind the building.
(7) At 130 m.
(8) N vector from transformer at SE corner of site.
(9) Same point as East vector at 160 m.
(10) At fence 27 meters east of transformer #2.

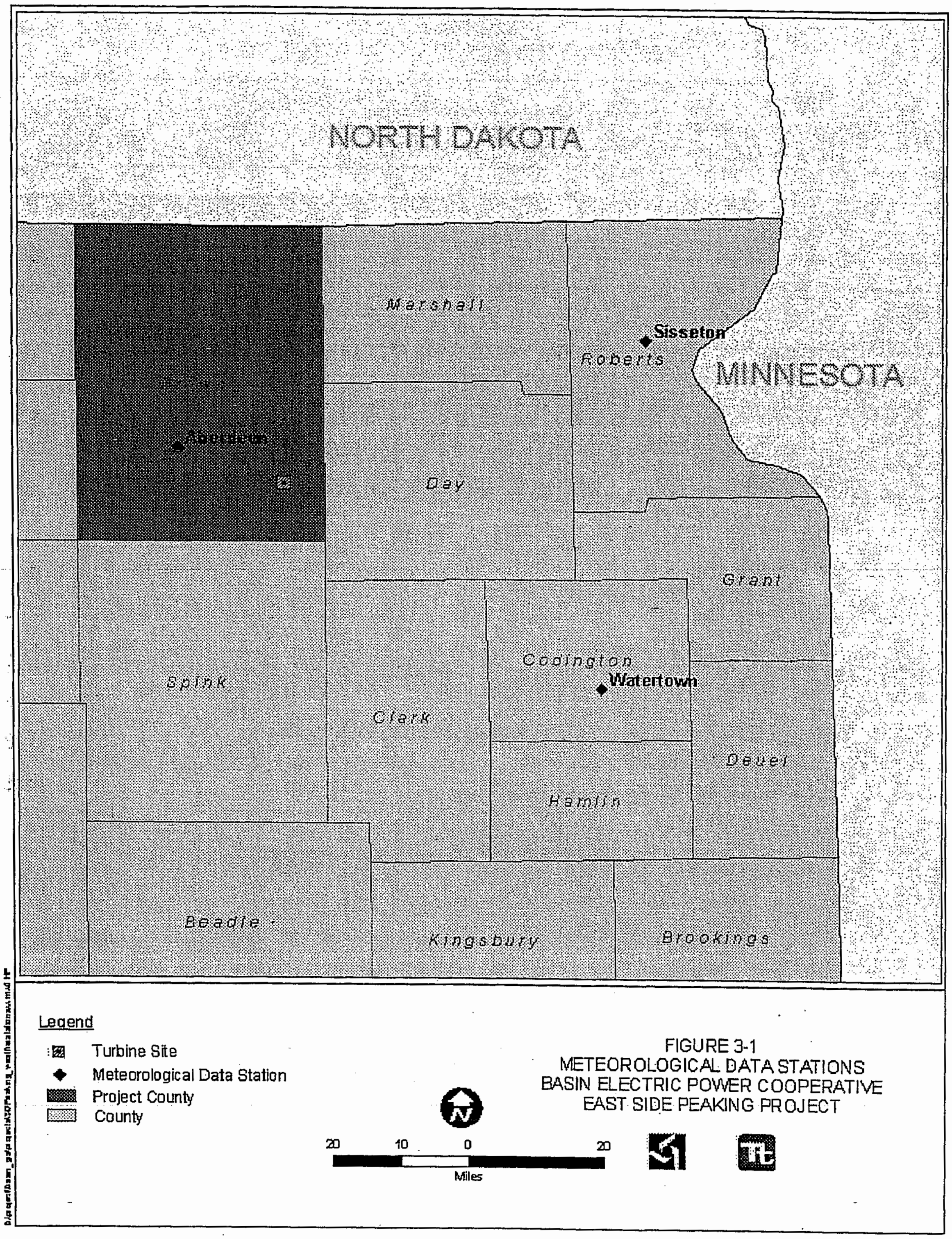


FIGURE 3-1
METEOROLOGICAL DATA STATIONS
BASIN ELECTRIC POWER COOPERATIVE
EAST SIDE PEAKING PROJECT

- Aberdeen is located 17 miles west,
- Watertown is 56 miles southeast
- Sisseton is 58 miles northeast

The continuous noise measurements recorded during Survey 1 and Survey 2 showed sound levels generally at or slightly above the daily average measurements recorded during the daytime. However, the noise measurements dropped to less than 50 dBA in the early evening, probably as a result of decreased vehicular traffic. Survey 1 was restricted to a lower limit of 50 dBA based on the settings on the monitor, which was the major reason Tetra Tech proceeded with Survey 2.

Survey 1

The highest 1-minute average obtained during Survey 1 was 79 dBA, recorded at 17:03 on August 27 near the residence. The maximum 1-minute value recorded at the fenceline site during Survey 1 was 73 dBA on two occasions: at 18:18 on August 26 and at 17:08 on August 27. The data for Survey 1 are consistent with the sound levels observed when heavy-duty trucks passed by the substation. The maximum 1-hour average result of 61.8 dBA for Survey 1was recorded between 17:00 and 18:00 on August 27 near the residence. The maximum 1-hour average for the fenceline location during Survey 1 was 56.9 dBA, recorded between 18:00 and 19:00 on August 26. The average of all results for the Survey 1 monitoring period was slightly higher at the fenceline of the substation than at the residential site, with results of 51.8 and 51.5 dBA. This difference is probably not significant and is almost certainly skewed high. The lower noise-detection threshold was used to calculate the average, although numerous results were probably below that value.

Survey 2

During Survey 2, the noise levels decreased to as low as 33 dBA near the residence and to 46 dBA at the fenceline of the substation. The sound levels then increased slightly as the day began. The sound levels were consistent, ranging from about 46 to 60 dBA during the day at the substation fence, but were lower at the residence. Levels were similar during the early morning and late afternoon, but were less than 50 dBA during the late morning to early afternoon period on September 30.

Results were affected significantly by weather conditions during both the evening of September 29 and the late evening and morning hours of October 1. A strong wind was blowing from the south/southwest when Tetra Tech placed the noise dosimeters at the site on September 29, but diminished to a slight breeze during the overnight period, remaining light throughout the following day. However, a strong front and rainstorm moved through the Groton area at about 22:30 on September 30. The weather data for Aberdeen, Watertown, and Sisseton presented in Appendix C presents the pattern described here.

The highest 1-minute average noise measurement obtained during this study was 91 dBA, recorded at 7:07 and again at 7:16 on October 1 near the residence, while readings of 84 dBA were recorded at 22:52 and 22:53 on September 30. The maximum 1-minute value recorded at the fenceline site was 87 dBA, at 22:52 on September 30, corresponding to the period of high noise at the residence, and again at 7:03 on October 1. These data are believed to be associated with the periods of high winds observed during Survey 2 and reflected in Appendix C.

The maximum full 1-hour average of 75.3 dBA was recorded between 6:00 and 7:00 on October 1 at the north fenceline of the substation. A partial hour (21 minute) data point, including the period from 7:00 to 7:21 on the same day, indicated a noise level of 82.4 dBA. The noise level near the residence was 74.2 dBA during the same hour that the maximum was recorded at the substation fence. These results are virtually identical. A partial hour of data, from 7:00 to 7:31 on October 1, indicated a noise level of 86 dBA, actually above the Occupational Safety and Health Administration (OSHA) 8-hour limit for workplace exposures. The timing and consistency of the measurements indicates that they arose from a source general to the area, most likely from high winds when a weather front passed through the area.

The average of all results for the Survey 2 monitoring period was slightly higher at the fenceline of the substation than at the residential site, with results of 57.7 dBA at the fenceline and 54.0 dBA at the residence. This difference is probably not significant, but is higher than the noise levels measured during Survey 1, even though the first study used a lower threshold for noise of 50 dBA. The difference between the two studies is almost certainly a result of the windy conditions that prevailed during much of this monitoring period. The data for September 30, which included only about 1.5 hours of windy weather, were 54.0 dBA at the substation fence and 49.0 dBA near the residence. These values did not differ greatly from the levels measured previously in Survey 1at these locations.

In addition to the windy conditions, a road crew was carrying out maintenance at two locations about 1 and 3 miles north of the substation during daylight hours of the monitoring period during Survey 2. This maintenance disrupted the normal flow of traffic because the road crews had closed one lane of the highway, requiring traffic stops to facilitate flow. As a consequence of this action, southbound traffic was concentrated into groups of vehicles of various sizes, depending on the length of time that the southbound lane was halted and on the volume of traffic at that time. Disruption in the traffic may account for some louder 1-minute readings when numerous large trucks were in the same group that was allowed to pass the work site. However, these temporary readings should have had little effect on the hourly average data.

Traffic Count

The traffic count during Survey 1showed only light traffic on this rural asphalt- and gravel-paved highway. The traffic count covered two full clock hours and 20 minutes of a third during Survey 1. This period began at 12:40 and concluded at 15:00 on August 26, 2004, when classes at the Groton school should have ended. Passing vehicles were assigned to one of three categories, based on vehicle type. The direction the vehicle was traveling was also recorded. These data indicated that automobile traffic was about 19 vehicles per hour, light truck traffic was about 34 vehicles per hour, and heavy truck traffic was about 17 vehicles per hour. The data for the partial hour were compared using a multiplier of three (20 minutes is ⅓ of an hour) and indicated similar results for heavy trucks. The automobile traffic was slightly lower for the 2-hour period, while light truck traffic was about ½ that value. This period included the normal lunch hour for most people, perhaps accounting for the volume of traffic. Results of this study are summarized in Table 3-2.

3.2 PROJECT NOISE

The residence north of the existing substation is 1,700 feet from the planned location of the power generation system, and GE guarantees a noise level of 65 dB from the proposed turbine at 400 feet. Using the equation to calculate the level of sound described in Section 2, the reduction in noise level at the residence should be 12.57 dB from the guaranteed level at 400 feet.

$$\mathbf{SPL2 = 65 - 20\log(1700/400)}$$
$$SPL2 = 65 - 12.57$$
$$SPL2 = 52.43$$

Where 65 = SPL1 *or* guaranteed sound level
1700 = R2 *or* distance from turbine to nearest residence
400 = R1 *or* distance to guaranteed sound level

TABLE 3-2
SUMMARY OF HOURLY VEHICLE TRAFFIC FLOW
GROTON SUBSTATION
August 26, 2004

Vehicle Type / Time	12:00-13:00[1]	12:00-13:00	12:00-13:00	Full-hour average
Automobiles Northbound	6	8	11	9.5
Automobiles Southbound	9	10	9	9.5
Total Automobiles	15	18	20	19
Light Trucks Northbound	6	16	13	14.5
Light Trucks Southbound	12	17	21	19
Total Light Trucks	18	33	34	33.5
Heavy Trucks Northbound	3	7	13	10
Heavy Trucks Southbound	15	7	7	7
Total Heavy Trucks	18	14	20	17
Total Vehicles	51	65	74	69.5

Notes:

[1] Based on 20-minute count multiplied by 3

The estimated noise level at the nearest residential location from operation of the turbine would be 52 to 54 dBA, depending on the exact configuration of the equipment, weather, air absorption, ground attenuation effects, and barriers and reflections. Additional information on the predicted noise levels of the proposed turbine are presented in Section 4.

4.0 CONCLUSIONS

4.1 NOISE SURVEYS

The measurements of background noise levels obtained at the Groton substation site demonstrate that the location is relatively unaffected by any activity other than traffic noise and probably by activities that occur outside at the residence. The data show that late-night sound levels are as low as 33 dBA and that daytime values are typically between 50 and 80 dBA as 1-minute averages, with some spikes as high as 91 dBA. The data included spikes indicating that events such as strong winds, the passage of a loud vehicle or an airplane were the likely causes. The hourly average daytime results peaked at about 62 dBA at the residential location. The higher sound levels at the residence monitoring site were not duplicated the substation site and may have been the result of noise-producing outdoor activity at the residence. Daytime noise levels were typically in the 45- to 55-dBA range at the substation and residence most of the time. The spatial distribution of the data on background noise indicates that the existing equipment at the substation is causing virtually no impact beyond about 50 meters of the boundary in any direction.

Tetra Tech has compared these results with the guidelines established by the Federal Highway Administration (FHWA) of the U.S. Department of Transportation (USDOT). According to the USDOT criteria, the current sound levels are well below the noise abatement criteria (NAC) values that are listed for Class B areas. Class B areas, where the NAC criterion is 67 dBA as an hourly Leq, include picnic areas, playgrounds, residential areas, hospitals, churches, and rural land. Most of the values recorded during this study meet the 52 dBA hourly Leq NAC criterion for Class E areas, which include the interiors of motels, churches, schools, hospitals, and residences. According to FHWA guidance, noise controls are recommended and are sometimes required if a highway project will cause an increase in noise that will "approach or exceed" the NAC for the existing land use classification and conditions or that will cause a "substantial increase" above the current baseline noise levels. The FHWA regulations do not define either the terms "substantial increase" or "approach or exceed;" however, most states, which are responsible for compliance, use a 15 dBA 1-hour Leq increase in the sound level as the threshold for a "significant increase." The FHWA classifies developed land used for purposes not defined in other classifications as "Class C," which includes commercial and industrial areas and so would encompass the planned power plant project. The NAC for these areas is set at 72 dBA 1-hour Leq. These FHWA guidelines may be useful in Basin Electric's planning process for the proposed project and may be helpful in discussions with South Dakota agency personnel during permitting. According to the FHWA documents reviewed, South Dakota is one of the six states that have not required or constructed any highway noise barriers as of 2000.

Based on these data, Tetra Tech concludes that, any controls required because of the noise impacts produced by the planned power plant project are likely to be relatively simple and inexpensive. Effective mitigation of expected turbine generated noise could include the use of trees, soil berms, or engineered solutions such as placement of structures or enclosure of the noise source. However, since it appears no highway noise abatement projects may have been conducted to date in South Dakota, some sharing of information and negotiations may be required to achieve a permit that contains an acceptable fenceline noise limit.

The baseline data indicate that highway traffic is the most likely source of existing noise at the proposed plant site. However, construction and operation of the planned gas-turbine-powered generation system will probably increase the perceived noise levels at the nearby residence. The magnitude of the increase should be relatively simple and manageable using routine construction management techniques.

4.2 PROJECT NOISE

The estimated noise level at the nearest residential location from operation of the turbine would be approximately 52 to 54 dBA, depending on the exact configuration of the equipment, weather, air absorption, ground attenuation effects, and barriers and reflections. The residence is protected by rows of trees, so the actual sound level at the residence would probably be less. The noise level at the residence is within the range typically considered acceptable by most regulatory agencies and is comparable to a normal conversation at 3 feet. Table 4-1 presents some typical noise sources for reference. The predicted noise levels at the residence are within the range of residential noise and much quieter than simply being within 100 feet of an average highway.

Table 4-1

Typical Noise Levels

Typical Noise Source	Noise Level (dBA)
Ambulance siren at 100 feet	100
Motorcycleat 25 feet	90
Typical construction site	85
Single truck at 25 feet	80
Urban shopping center	70
Single car at 25 feet	65
Typical highway at 100 feet	60
Residential area during day	50
Residential area at night	40
Rural area during day	40
Rural area at night	35
Quiet whisper	30
Threshold of hearing	20

Source: USEPA, 1974, Harris 1991, and Bell 1982, Impacts caused by construction of the gas turbines are expected to be minimal and to cause only a temporary impact. Short-term noise associated with vehicular traffic for deliveries and off-loading of equipment would be created during the normal workday. The approximate noise level for existing vehicular traffic is 78 dBA. Noise from vehicular traffic involved in construction of the sites would not differ significantly from existing traffic-related noise. A significant portion of existing traffic on major regional thoroughfares is heavy trucks associated with agricultural operations. Other construction noises, including drilling, pounding, and air compressors, would contribute noise to the areas over a relatively short period, stopping when construction is complete. Nighttime disturbance should not be significant because most equipment will be installed during daylight hours. Noise levels are expected to reach 85 to 105 dBA during construction of the gas turbine facility, but construction would have little cumulative effect on the area.

4.3 SUMMARY

The study area is predominantly rural, and existing ambient noise levels in the vicinity of the proposed project are generally low because the land is used for agriculture. The study area consists of large tracts of pasture, crops, rangeland, and undeveloped grassland, with unpaved and infrequently traveled roads, typically constructed along section lines. Sources of noise in the study area include wind, livestock, wildlife, farm equipment, farm truck traffic, and adjacent substations. Elevated levels of noise occur in the portion of the project area near transportation corridors and are generally associated with automobile and truck traffic and farm equipment. One residence is located 1,700 feet north of the proposed facility, adjacent to State Highway 37. Evergreen and deciduous trees are planted along the southern side of the house. Other residences in the region are 4,400 northwest and 5,700 feet southeast.

Background noise levels obtained at the Groton site demonstrate that the location is relatively unaffected by any activity other than traffic noise. Data from the noise survey show that the late-night sound levels are as low as 33 dBA and that daytime values are typically between 45 and 90 dBA as 1-minute averages. The higher values were spikes, indications that the likely causes were events such as wind gusts or passage of a loud vehicle or an airplane. The hourly average daytime results peaked at about 62 dBA, but were typically in the 45- to 55-dBA range during the day. During Survey 2, high winds appear to have caused elevated noise levels at times overnight on September 29, 2004 and early on the morning of October 1, 2004. The spatial distribution of the data for background noise indicates that the existing equipment at the substation is causing virtually no impact approximately 160 feet in any direction beyond the boundary of the substation.

Predicted noise levels from the operating turbine are expected to be 65 dBA at 400 feet and drop off to about 54 dBA at the nearest residence, some 1,700 feet away. There is a row of trees between the proposed generator site and the residence, so the sound level from the generator affecting the nearby home would probably be below 54dBA, close to the daytime level observed in noise monitoring.

5.0 REFERENCES

Bell, L.H. 1982. Industrial Noise Control, Fundamentals and Applications. Marcel Dekker, New York, New York.

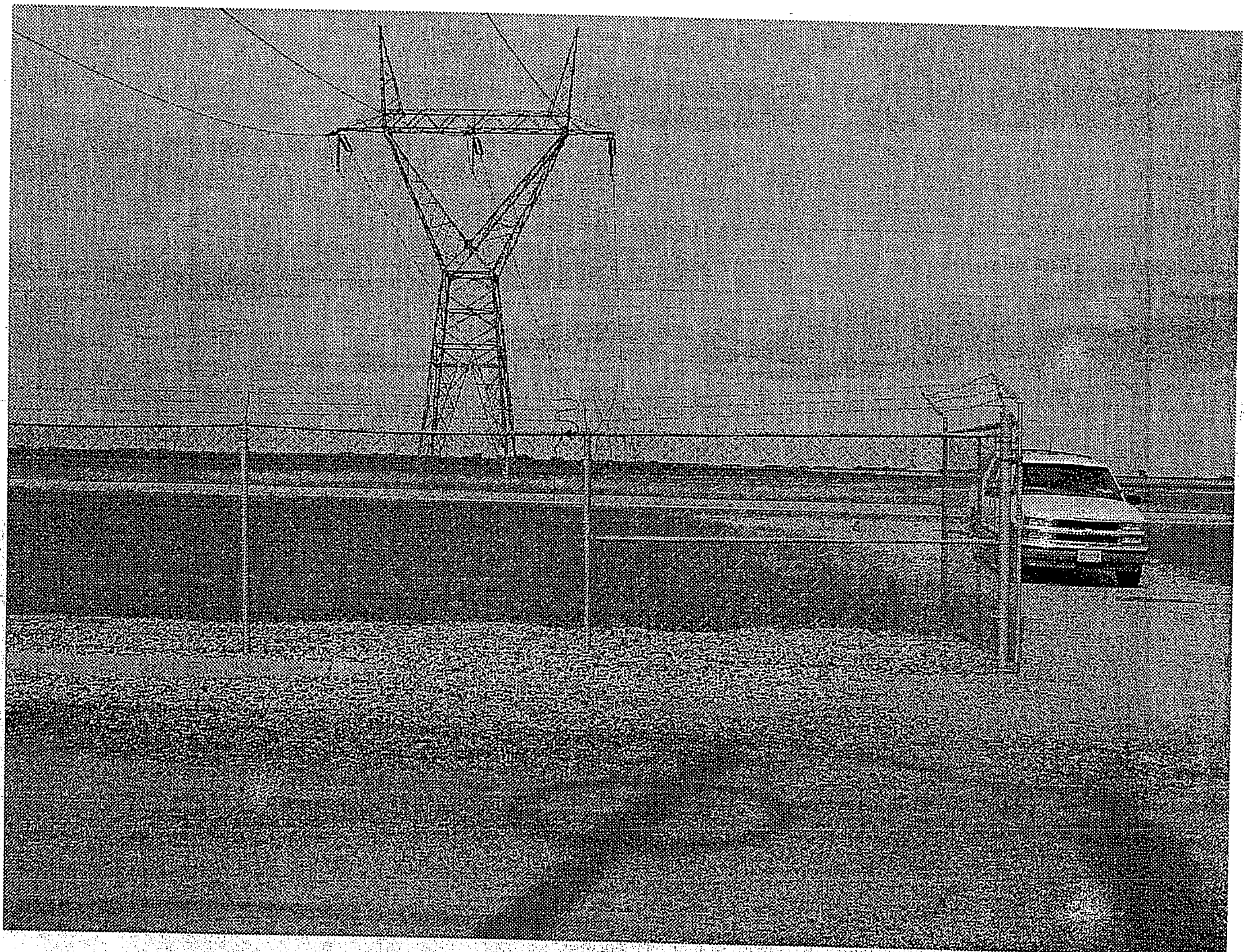
Harris, C.M. 1991. Handbook of Acoustical Measurements and Noise Control. McGraw-Hill, Inc. New York, New York.

U.S. Environmental Protection Agency (USEPA). 1974. Information on Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA-550/9-74-004.

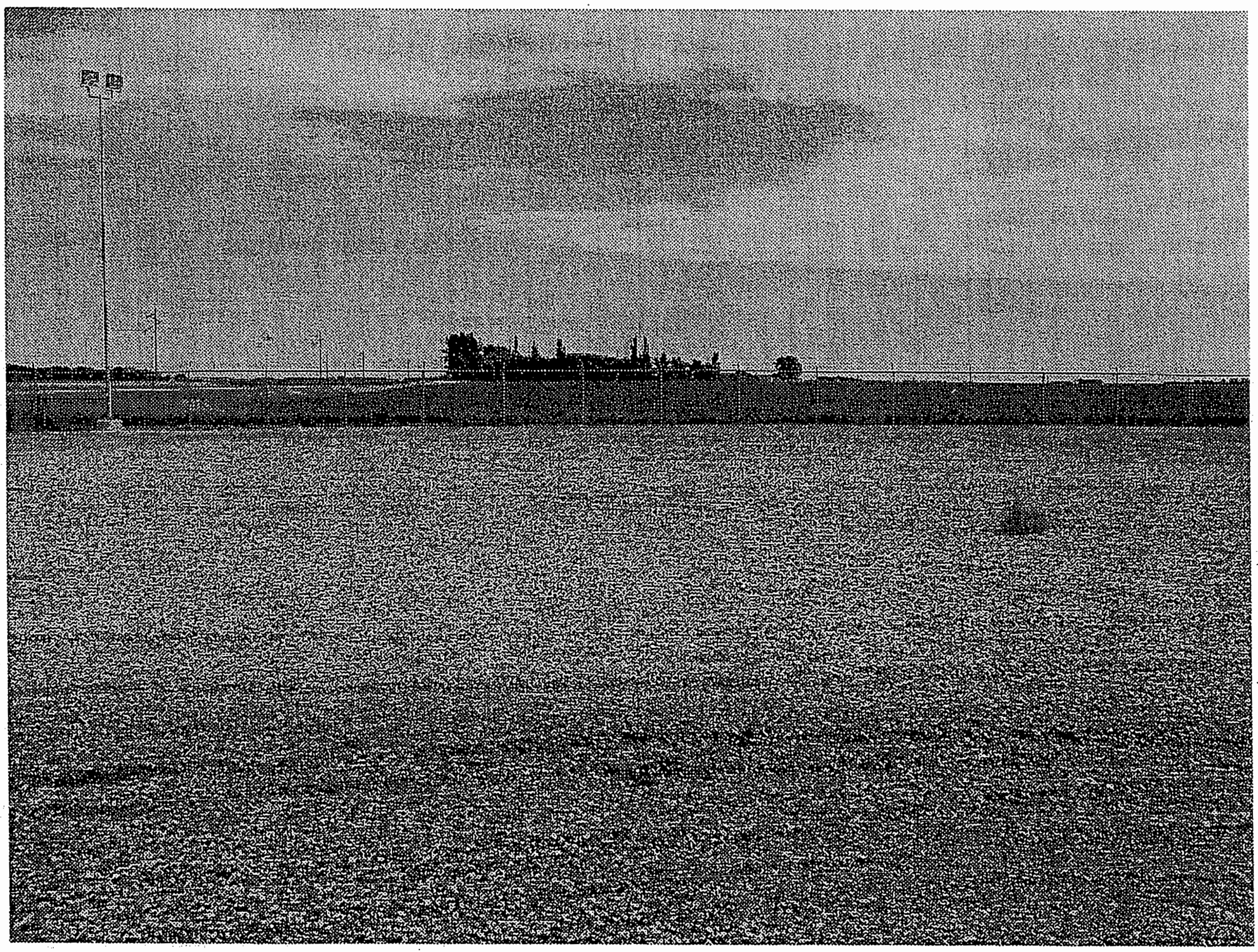
APPENDIX A

PHOTOS OF SITE

Existing Substation from North Continuous Noise Monitoring Location – Looking South



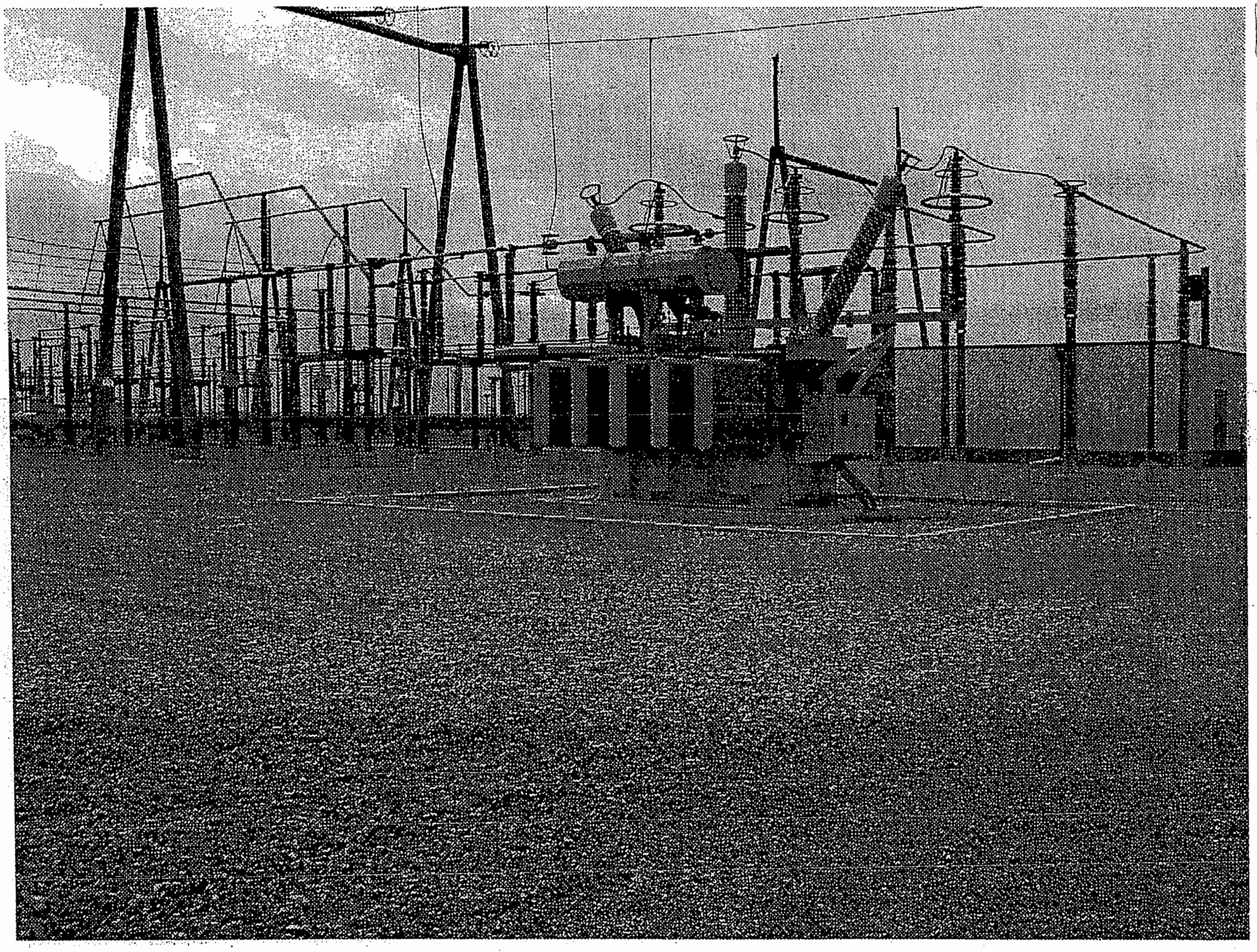
View from Existing Substation Transformer Noise Source Looking West



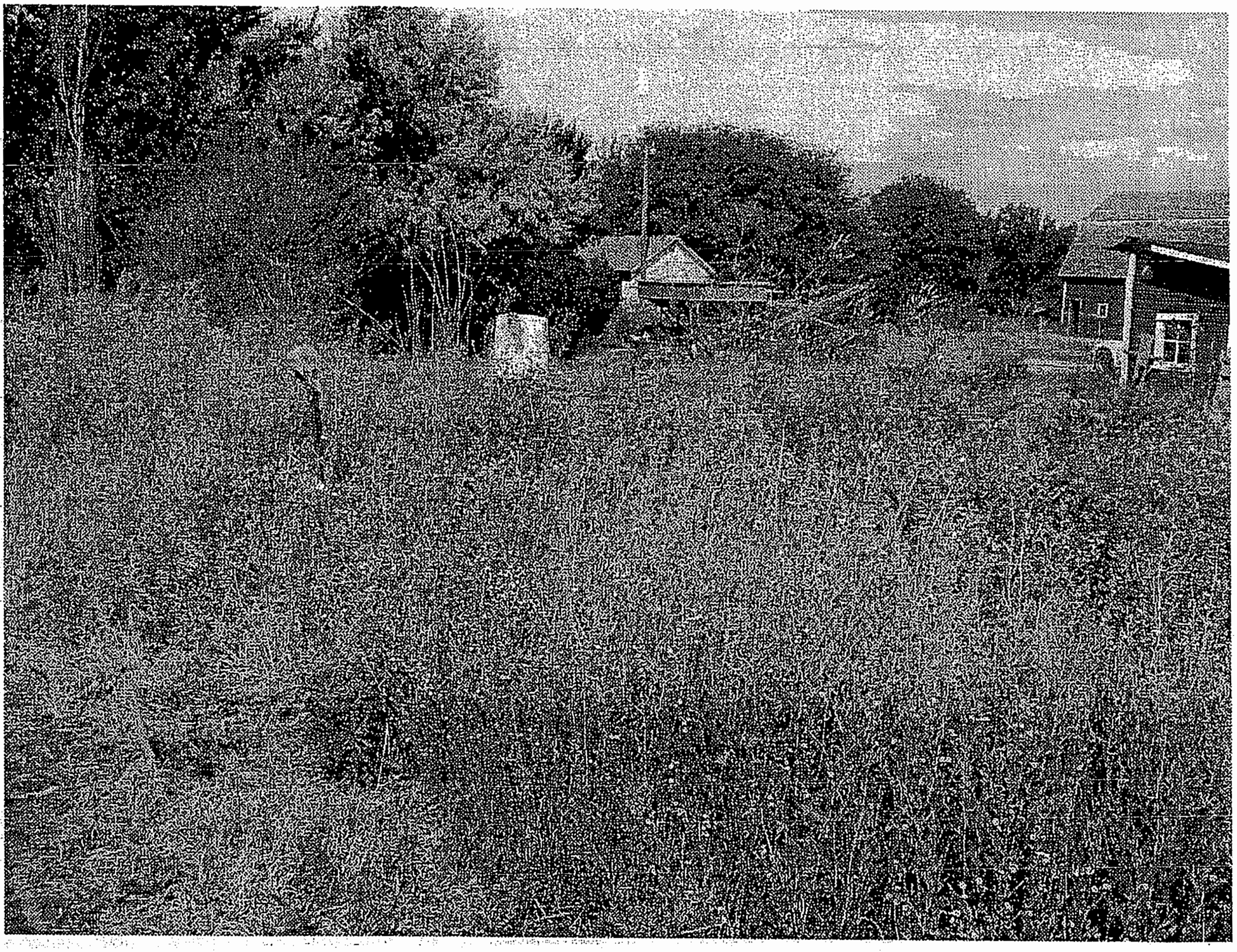
View from Existing Substation Transformer Noise Source Looking North

View from Existing Substation Transformer Noise Source Looking East

View from Existing Substation Transformer Noise Source Looking South



Primary Source of Noise at the Existing Substation Transformers



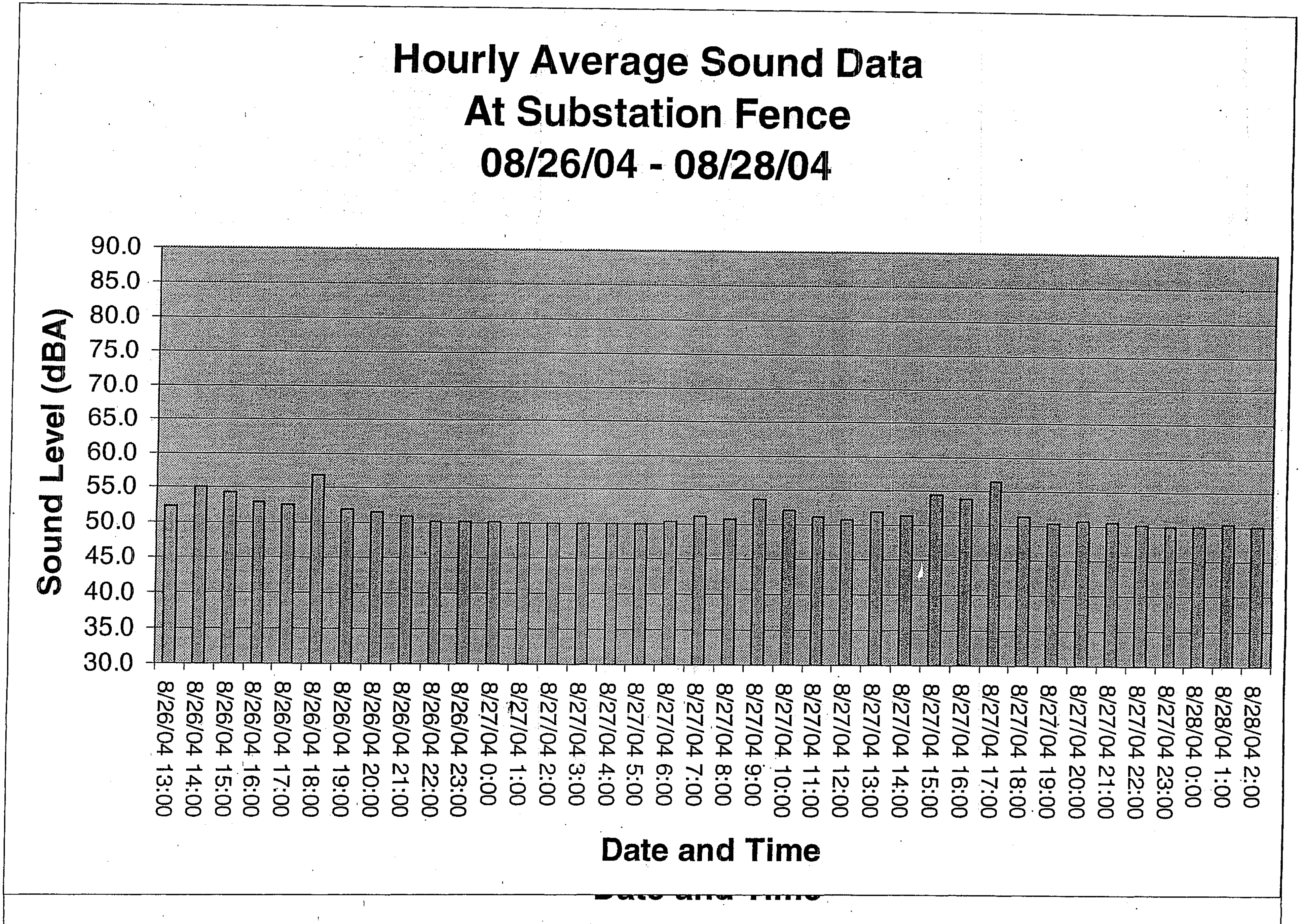
Noise Monitoring Site near Residence

Fenceline Noise Monitoring Site

View of Residence and Substation from North Looking South

APPENDIX B

NOISE SURVEY RESULTS


Hourly Average Sound Data
At Substation Fence
08/26/04 - 08/28/04
Sound Level (dBA)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
8/26/04 13:00
8/26/04 14:00
8/26/04 15:00
8/26/04 16:00
8/26/04 17:00
8/26/04 18:00
8/26/04 19:00
8/26/04 20:00
8/26/04 21:00
8/26/04 22:00
8/26/04 23:00
8/27/04 0:00
8/27/04 1:00
8/27/04 2:00
8/27/04 3:00
8/27/04 4:00
8/27/04 5:00
8/27/04 6:00
8/27/04 7:00
8/27/04 8:00
8/27/04 9:00
8/27/04 10:00
8/27/04 11:00
8/27/04 12:00
8/27/04 13:00
8/27/04 14:00
8/27/04 15:00
8/27/04 16:00
8/27/04 17:00
8/27/04 18:00
8/27/04 19:00
8/27/04 20:00
8/27/04 21:00
8/27/04 22:00
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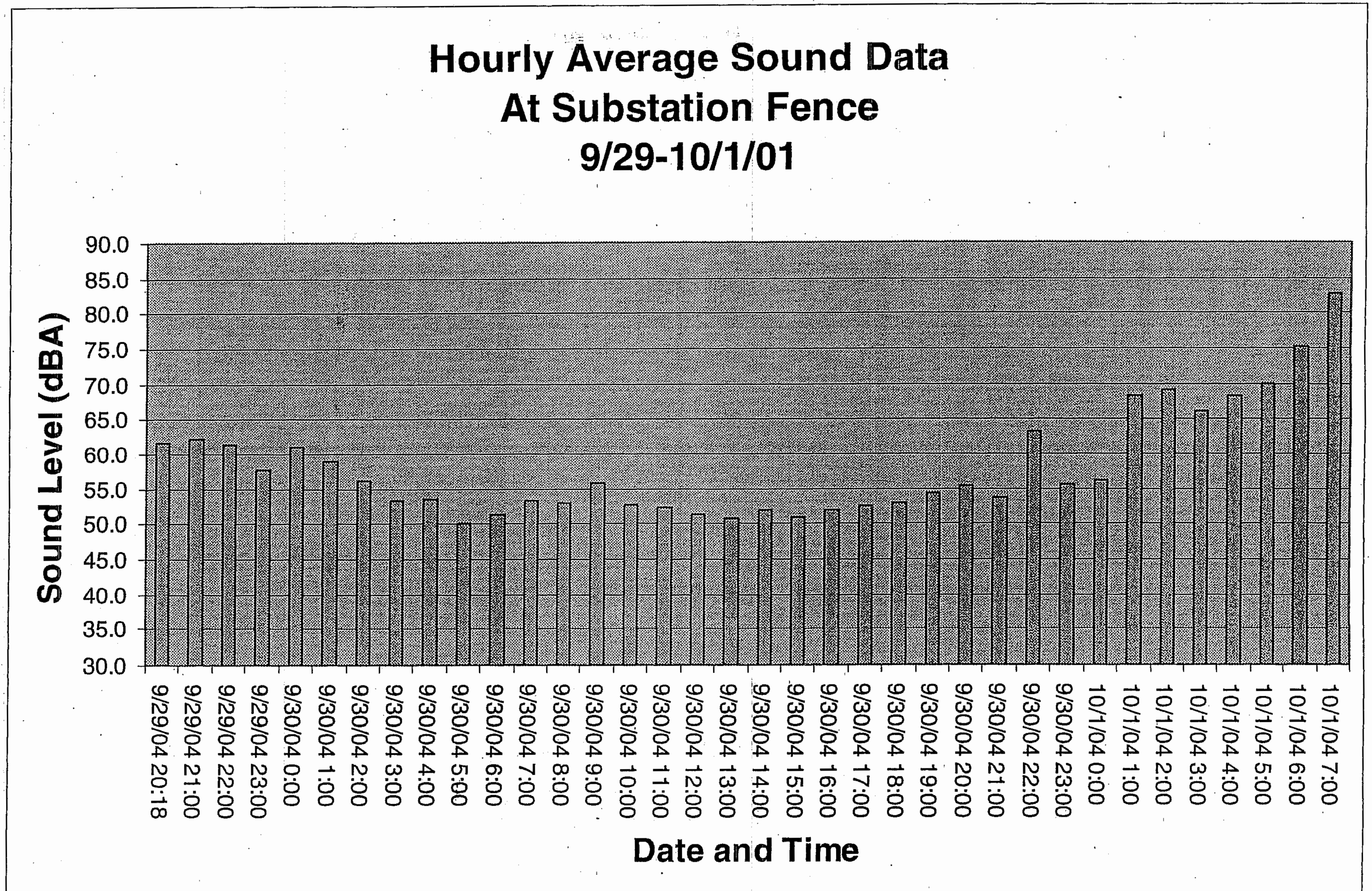
8/28/04 2:00
Date and Time



Hourly Average Sound Data
At Substation Fence
9/29-10/1/01
Sound Level (dBA)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
9/29/04 20:18
9/29/04 21:00
9/29/04 22:00
9/29/04 23:00
9/30/04 0:00
9/30/04 1:00
9/30/04 2:00
9/30/04 3:00
9/30/04 4:00
9/30/04 5:00
9/30/04 6:00
9/30/04 7:00
9/30/04 8:00
9/30/04 9:00
9/30/04 10:00
9/30/04 11:00
9/30/04 12:00
9/30/04 13:00
9/30/04 14:00
9/30/04 15:00
9/30/04 16:00
9/30/04 17:00
9/30/04 18:00
9/30/04 19:00
9/30/04 20:00
9/30/04 21:00
9/30/04 22:00
9/30/04 23:00
10/1/04 0:00
10/1/04 1:00
10/1/04 2:00
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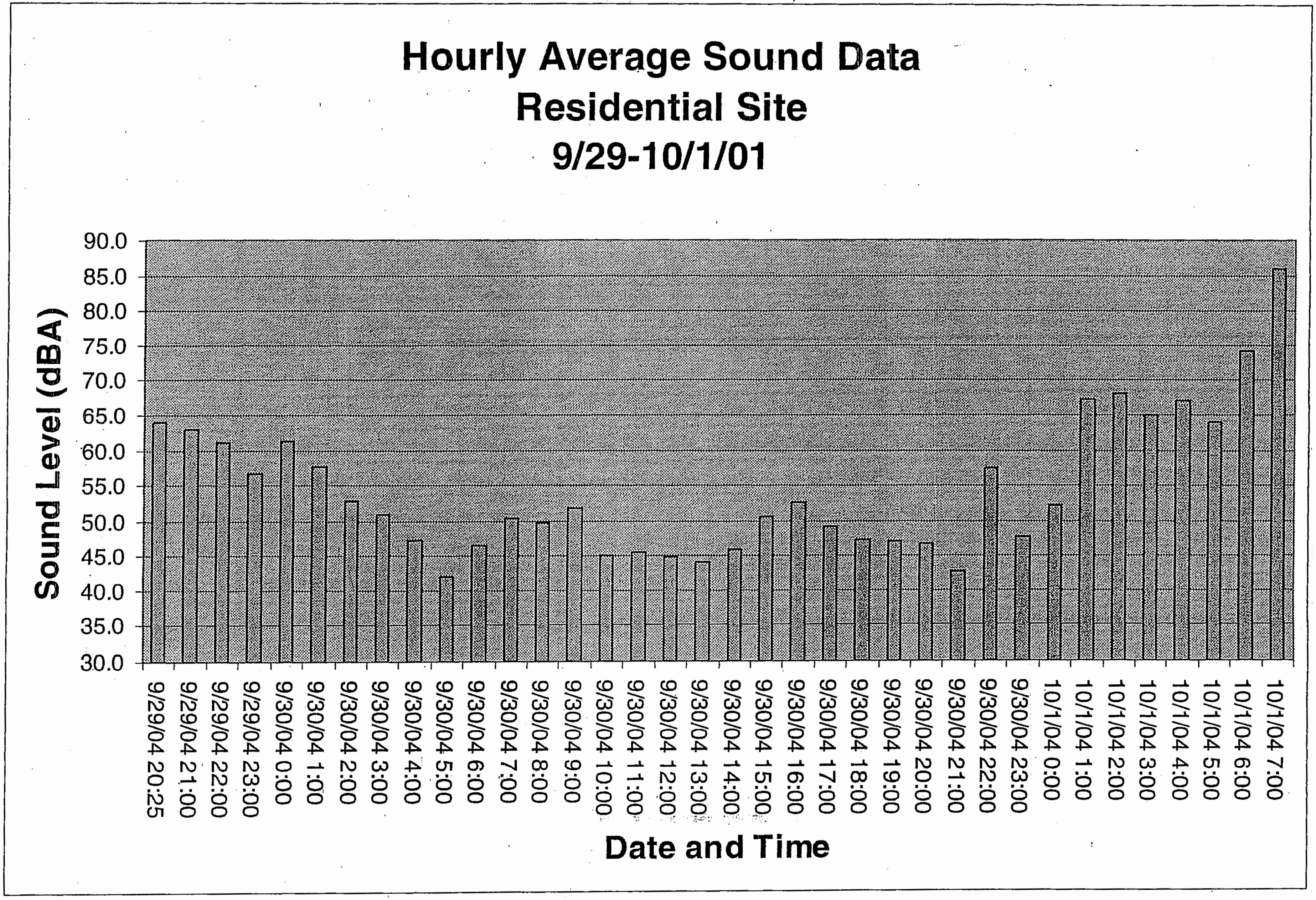
10/1/04 7:00
Date and Time


Hourly Average Sound Data
Residential Site
9/29-10/1/01
Sound Level (dBA)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
9/29/04 20:25
9/29/04 21:00
9/29/04 22:00
9/29/04 23:00
9/30/04 0:00
9/30/04 1:00
9/30/04 2:00
9/30/04 3:00
9/30/04 4:00
9/30/04 5:00
9/30/04 6:00
9/30/04 7:00
9/30/04 8:00
9/30/04 9:00
9/30/04 10:00
9/30/04 11:00
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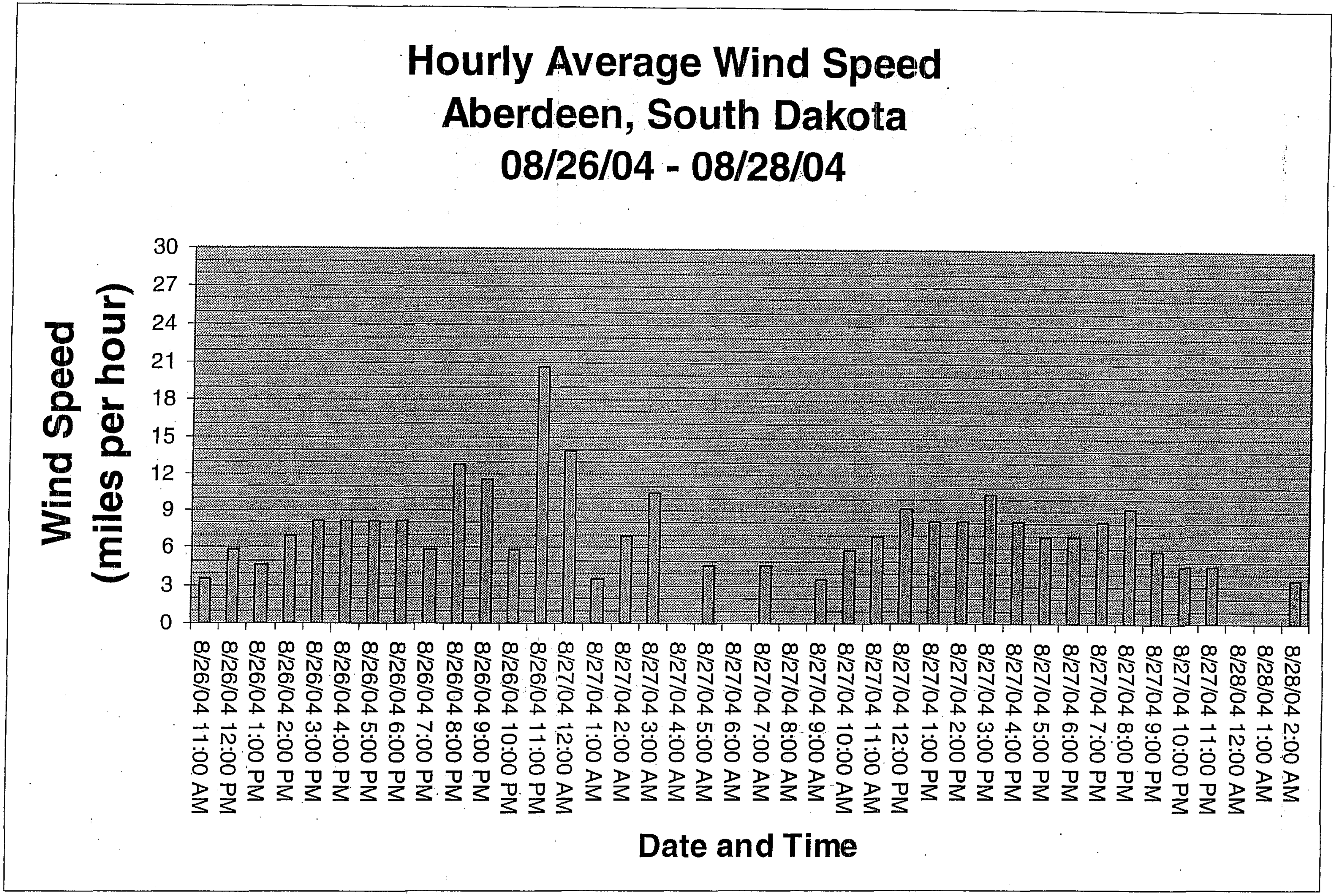
9/30/04 17:00
9/30/04 18:00
9/30/04 19:00
9/30/04 20:00
9/30/04 21:00
9/30/04 22:00
9/30/04 23:00
10/1/04 0:00
10/1/04 1:00
10/1/04 2:00
10/1/04 3:00
10/1/04 4:00
10/1/04 5:00
10/1/04 6:00
10/1/04 7:00
Date and Time

APPENDIX C

WIND SPEED AND TEMPERATURE DATA



Hourly Average Wind Speed
Aberdeen, South Dakota
08/26/04 - 08/28/04
Wind Speed (miles per hour)
0
3
6
9
12
15
18
21
24
27
30
8/26/04 11:00 AM
8/26/04 12:00 PM
8/26/04 1:00 PM
8/26/04 2:00 PM
8/26/04 3:00 PM
8/26/04 4:00 PM
8/26/04 5:00 PM
8/26/04 6:00 PM
8/26/04 7:00 PM
8/26/04 8:00 PM
8/26/04 9:00 PM
8/26/04 10:00 PM
8/26/04 11:00 PM
8/27/04 12:00 AM
8/27/04 1:00 AM
8/27/04 2:00 AM
8/27/04 3:00 AM
8/27/04 4:00 AM
8/27/04 5:00 AM
8/27/04 6:00 AM
8/27/04 7:00 AM
8/27/04 8:00 AM
8/27/04 9:00 AM
8/27/04 10:00 AM
8/27/04 11:00 AM
8/27/04 12:00 PM
8/27/04 1:00 PM
8/27/04 2:00 PM
8/27/04 3:00 PM
8/27/04 4:00 PM
8/27/04 5:00 PM
8/27/04 6:00 PM
8/27/04 7:00 PM
8/27/04 8:00 PM
8/27/04 9:00 PM
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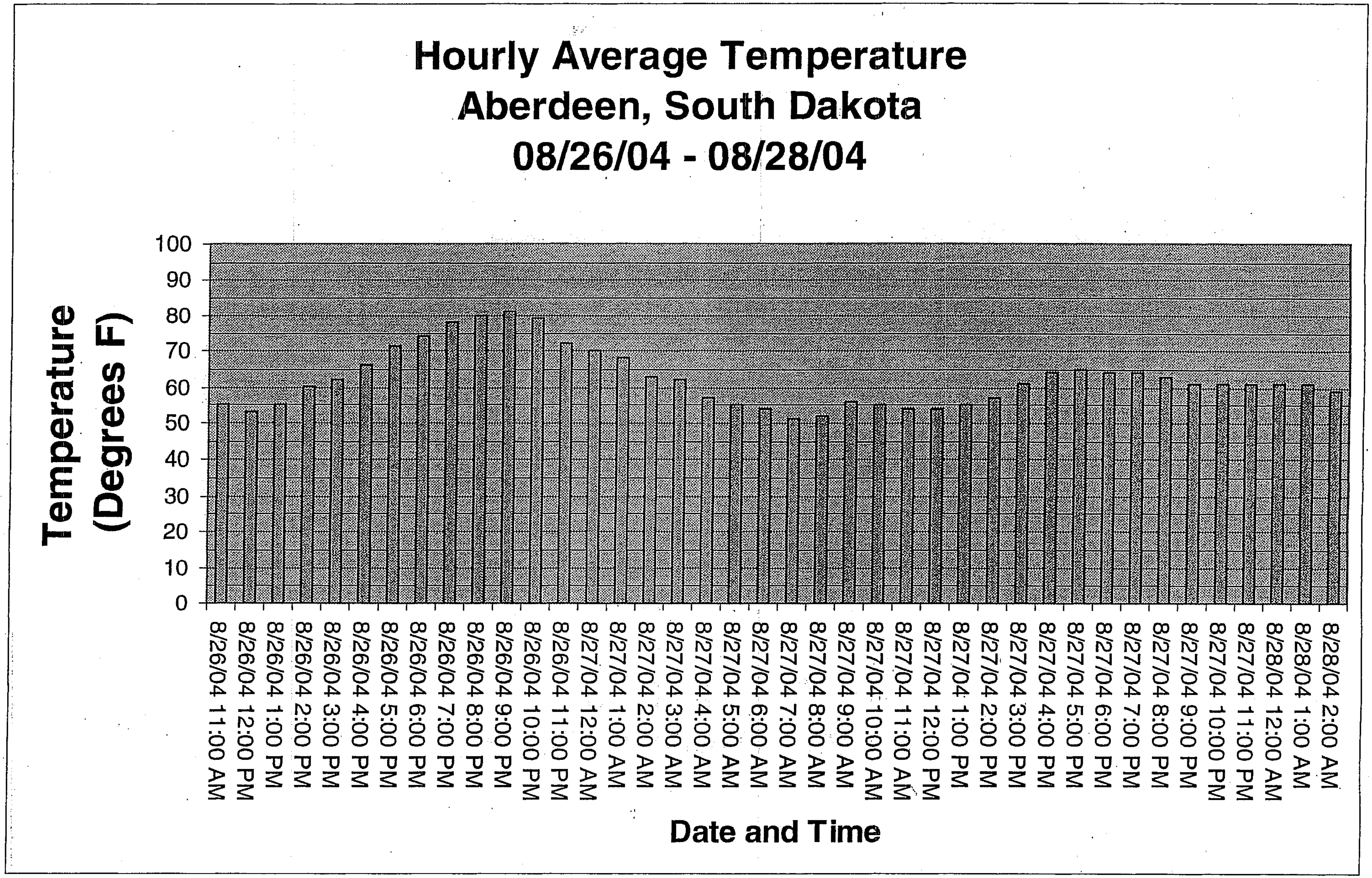
8/28/04 2:00 AM
Date and Time



Hourly Average Temperature
Aberdeen, South Dakota
08/26/04 - 08/28/04
Temperature (Degrees F)
0
10
20
30
40
50
60
70
80
90
100
8/26/04 11:00 AM
8/26/04 12:00 PM
8/26/04 1:00 PM
8/26/04 2:00 PM
8/26/04 3:00 PM
8/26/04 4:00 PM
8/26/04 5:00 PM
8/26/04 6:00 PM
8/26/04 7:00 PM
8/26/04 8:00 PM
8/26/04 9:00 PM
8/26/04 10:00 PM
8/26/04 11:00 PM
8/27/04 12:00 AM
8/27/04 1:00 AM
8/27/04 2:00 AM
8/27/04 3:00 AM
8/27/04 4:00 AM
8/27/04 5:00 AM
8/27/04 6:00 AM
8/27/04 7:00 AM
8/27/04 8:00 AM
8/27/04 9:00 AM
8/27/04 10:00 AM
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8/27/04 2:00 PM
8/27/04 3:00 PM
8/27/04 4:00 PM
8/27/04 5:00 PM
8/27/04 6:00 PM
8/27/04 7:00 PM
8/27/04 8:00 PM
8/27/04 9:00 PM
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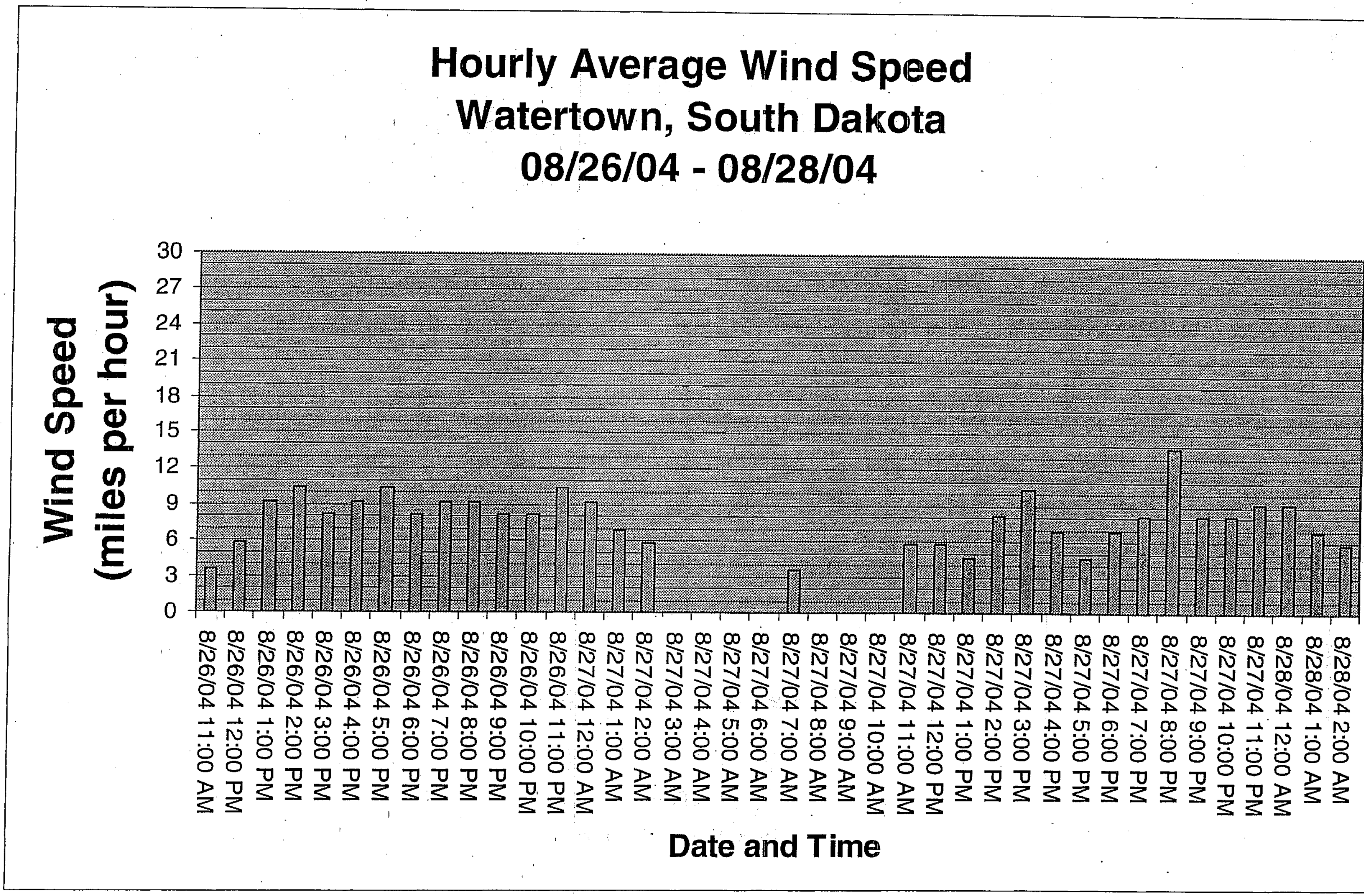
8/28/04 2:00 AM
Date and Time


Hourly Average Wind Speed
Watertown, South Dakota
08/26/04 - 08/28/04
Wind Speed
(miles per hour)
30
27
24
21
18
15
12
9
6
3
0
8/26/04 11:00 AM
8/26/04 12:00 PM
8/26/04 1:00 PM
8/26/04 2:00 PM
8/26/04 3:00 PM
8/26/04 4:00 PM
8/26/04 5:00 PM
8/26/04 6:00 PM
8/26/04 7:00 PM
8/26/04 8:00 PM
8/26/04 9:00 PM
8/26/04 10:00 PM
8/26/04 11:00 PM
8/27/04 12:00 AM
8/27/04 1:00 AM
8/27/04 2:00 AM
8/27/04 3:00 AM
8/27/04 4:00 AM
8/27/04 5:00 AM
8/27/04 6:00 AM
8/27/04 7:00 AM
8/27/04 8:00 AM
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8/27/04 2:00 PM
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8/27/04 7:00 PM
8/27/04 8:00 PM
8/27/04 9:00 PM
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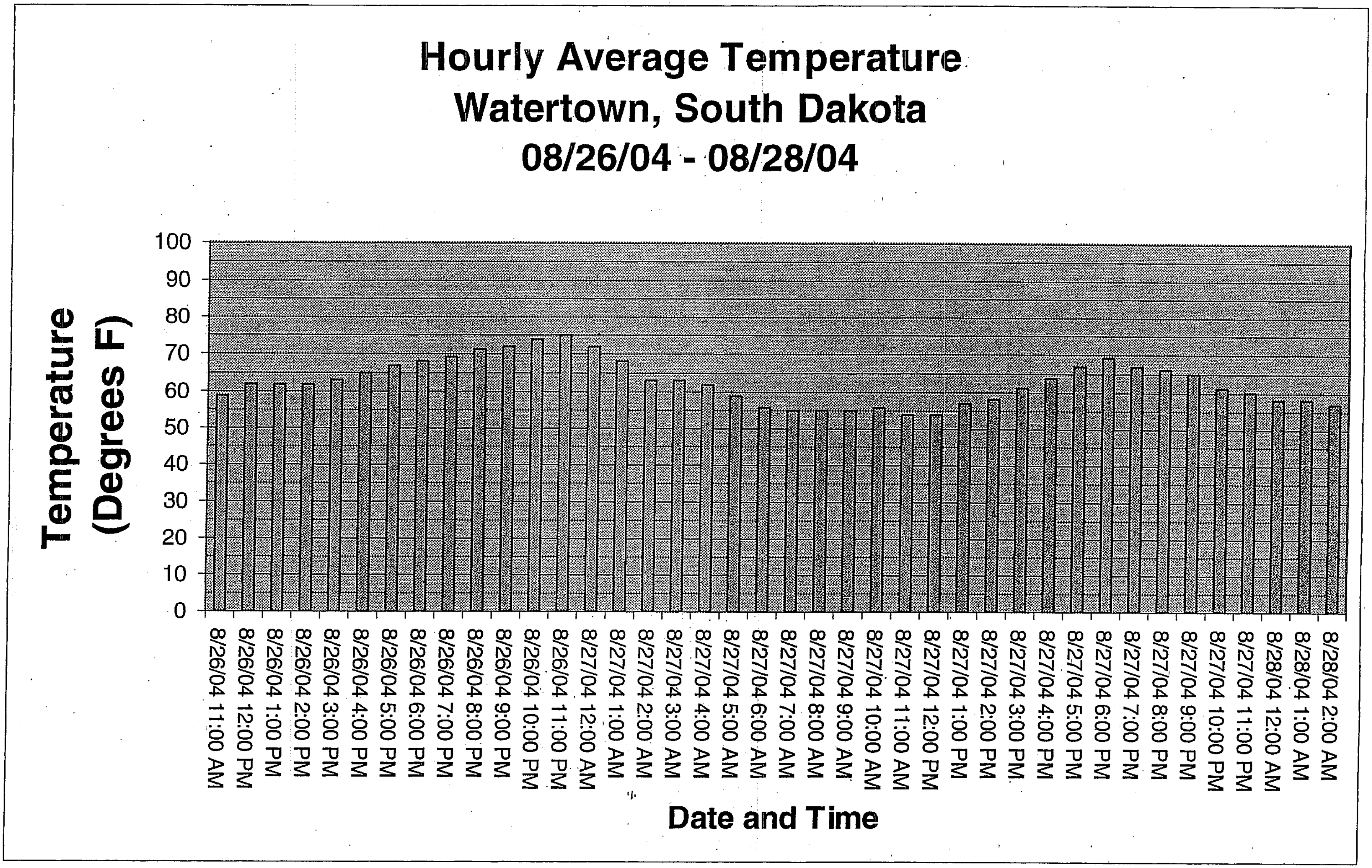
8/28/04 2:00 AM
Date and Time



Hourly Average Temperature
Watertown, South Dakota
08/26/04 - 08/28/04
Temperature (Degrees F)
100
90
80
70
60
50
40
30
20
10
0
8/26/04 11:00 AM
8/26/04 12:00 PM
8/26/04 1:00 PM
8/26/04 2:00 PM
8/26/04 3:00 PM
8/26/04 4:00 PM
8/26/04 5:00 PM
8/26/04 6:00 PM
8/26/04 7:00 PM
8/26/04 8:00 PM
8/26/04 9:00 PM
8/26/04 10:00 PM
8/26/04 11:00 PM
8/27/04 12:00 AM
8/27/04 1:00 AM
8/27/04 2:00 AM
8/27/04 3:00 AM
8/27/04 4:00 AM
8/27/04 5:00 AM
8/27/04 6:00 AM
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8/27/04 8:00 AM
8/27/04 9:00 AM
8/27/04 10:00 AM
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8/27/04 3:00 PM
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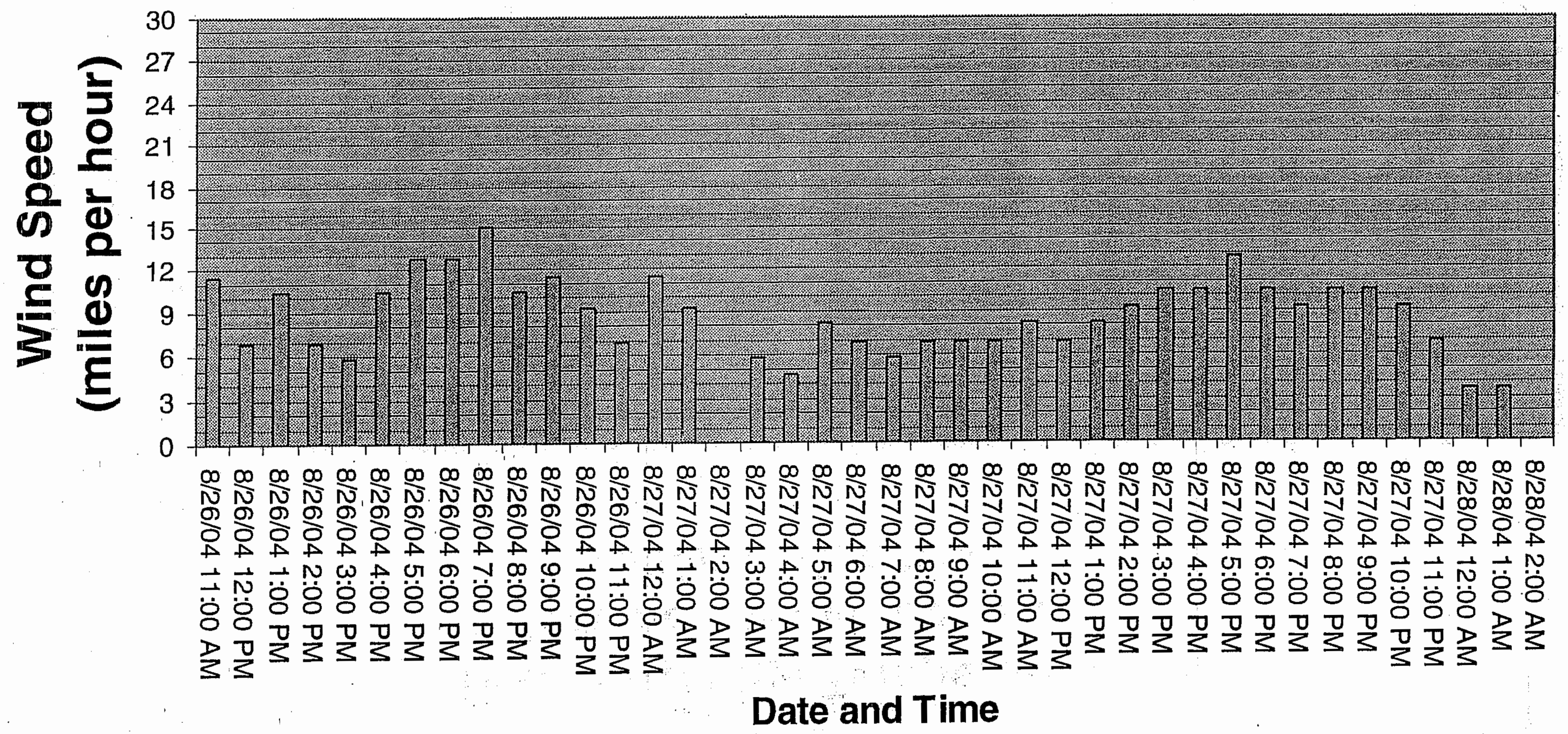
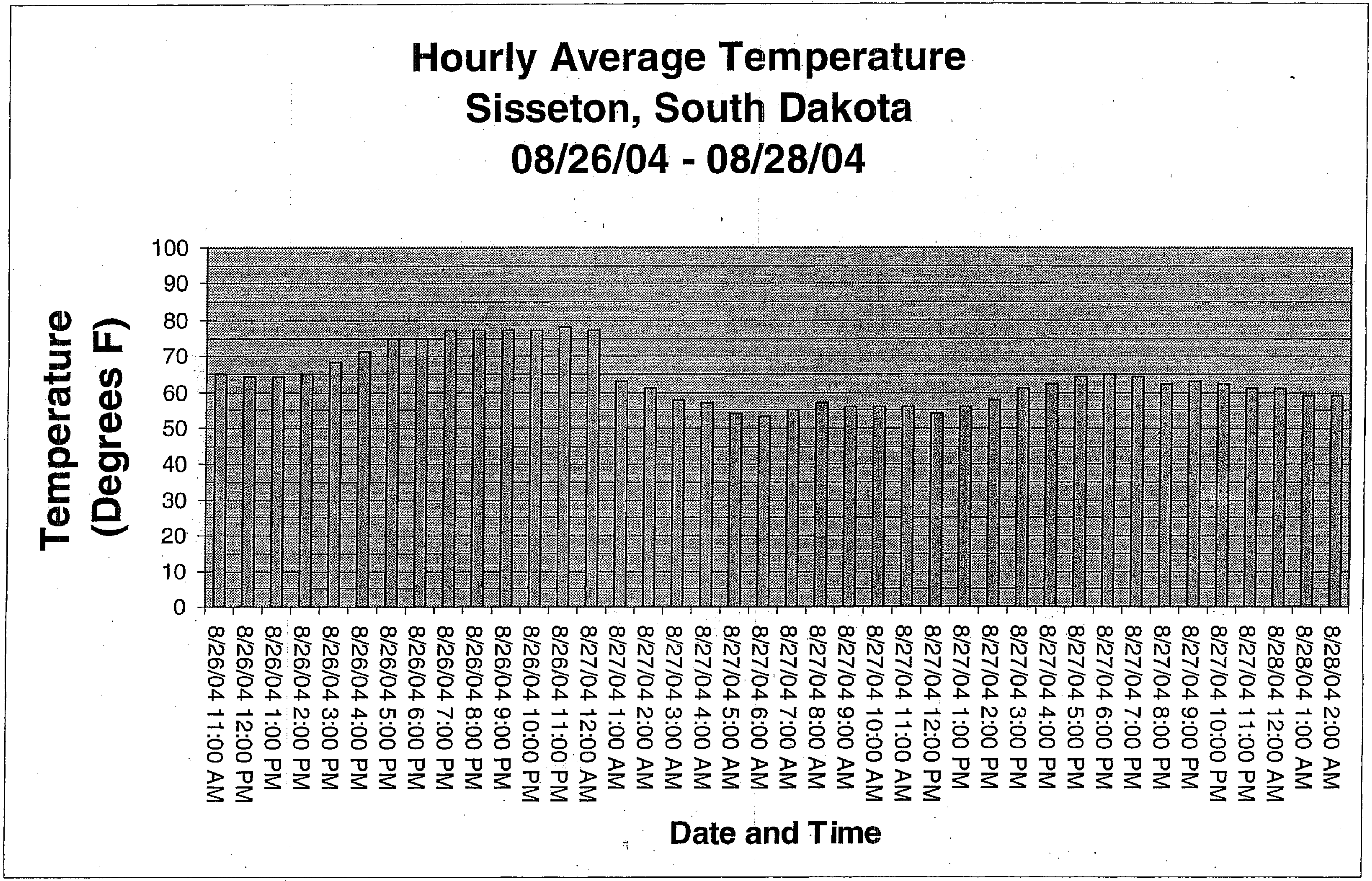
8/27/04 5:00 PM
8/27/04 6:00 PM
8/27/04 7:00 PM
8/27/04 8:00 PM
8/27/04 9:00 PM
8/27/04 10:00 PM
8/27/04 11:00 PM
8/28/04 12:00 AM
8/28/04 1:00 AM
8/28/04 2:00 AM
Date and Time

Hourly Average Wind Speed
Sisseton, South Dakota
08/26/04 - 08/28/04




Hourly Average Temperature
Sisseton, South Dakota
08/26/04 - 08/28/04
Temperature (Degrees F)
100
90
80
70
60
50
40
30
20
10
0
8/26/04 11:00 AM
8/26/04 12:00 PM
8/26/04 1:00 PM
8/26/04 2:00 PM
8/26/04 3:00 PM
8/26/04 4:00 PM
8/26/04 5:00 PM
8/26/04 6:00 PM
8/26/04 7:00 PM
8/26/04 8:00 PM
8/26/04 9:00 PM
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8/27/04 2:00 AM
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8/27/04 9:00 AM
8/27/04 10:00 AM
8/27/04 11:00 AM
8/27/04 12:00 PM
8/27/04 1:00 PM
8/27/04 2:00 PM
8/27/04 3:00 PM
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8/27/04 5:00 PM
8/27/04 6:00 PM
8/27/04 7:00 PM
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8/27/04 9:00 PM
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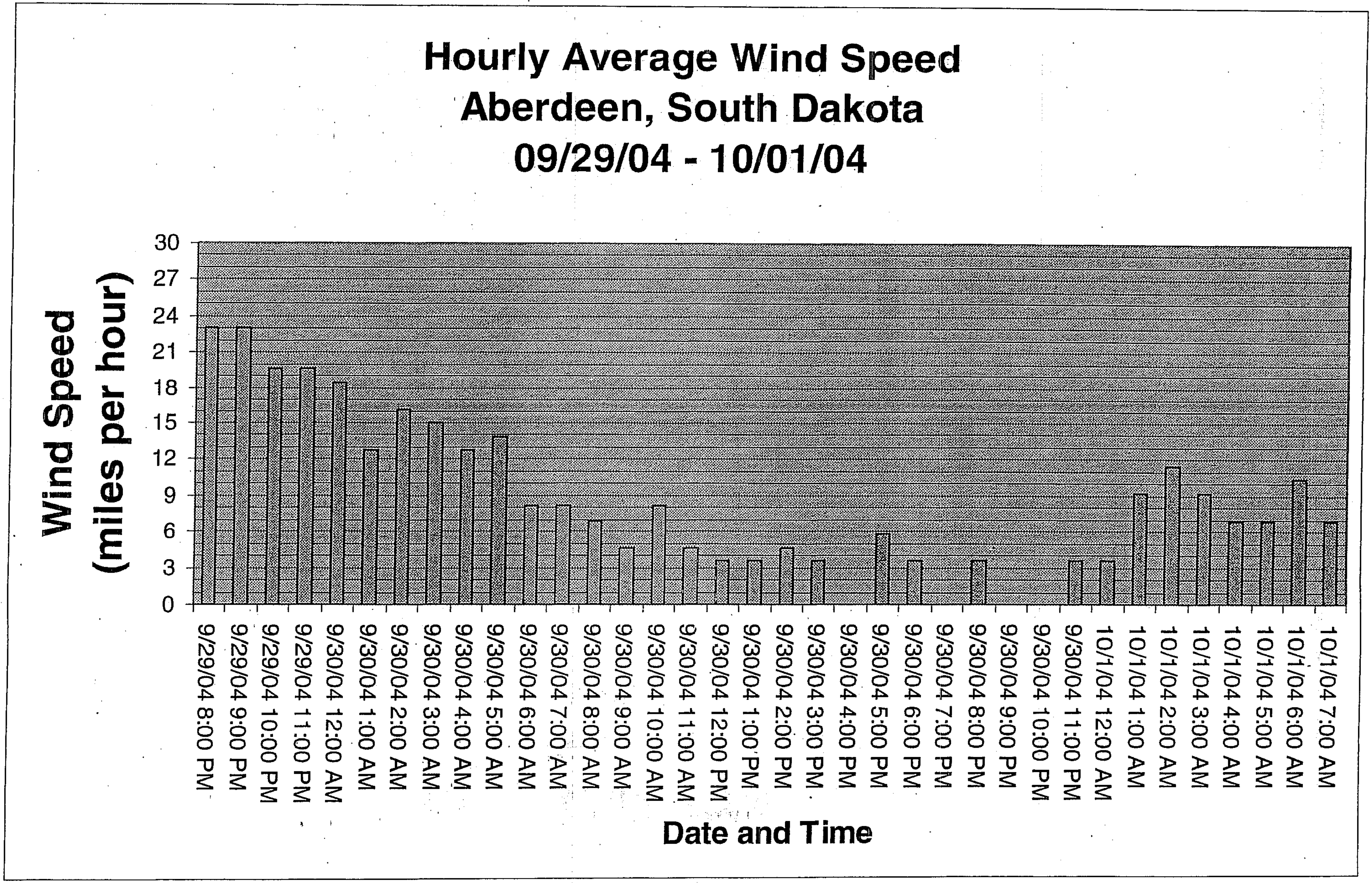
8/28/04 2:00 AM
Date and Time



Hourly Average Wind Speed
Aberdeen, South Dakota
09/29/04 - 10/01/04
Wind Speed
(miles per hour)
0
3
6
9
12
15
18
21
24
27
30
9/29/04 8:00 PM
9/29/04 9:00 PM
9/29/04 10:00 PM
9/29/04 11:00 PM
9/30/04 12:00 AM
9/30/04 1:00 AM
9/30/04 2:00 AM
9/30/04 3:00 AM
9/30/04 4:00 AM
9/30/04 5:00 AM
9/30/04 6:00 AM
9/30/04 7:00 AM
9/30/04 8:00 AM
9/30/04 9:00 AM
9/30/04 10:00 AM
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9/30/04 12:00 PM
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9/30/04 2:00 PM
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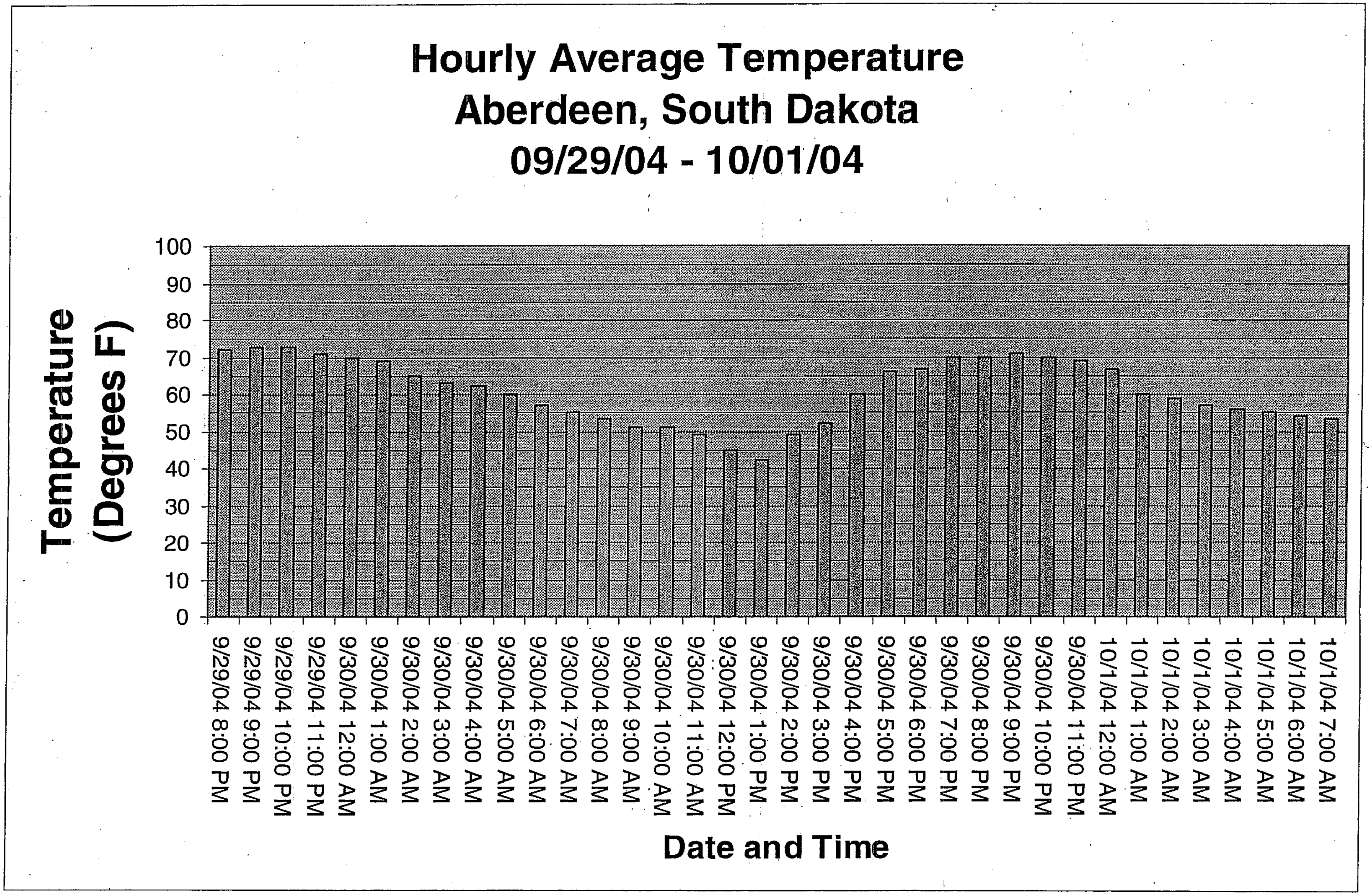
10/1/04 7:00 AM
Date and Time


Hourly Average Temperature
Aberdeen, South Dakota
09/29/04 - 10/01/04
Temperature (Degrees F)
100
90
80
70
60
50
40
30
20
10
0
9/29/04 8:00 PM
9/29/04 9:00 PM
9/29/04 10:00 PM
9/29/04 11:00 PM
9/30/04 12:00 AM
9/30/04 1:00 AM
9/30/04 2:00 AM
9/30/04 3:00 AM
9/30/04 4:00 AM
9/30/04 5:00 AM
9/30/04 6:00 AM
9/30/04 7:00 AM
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9/30/04 9:00 AM
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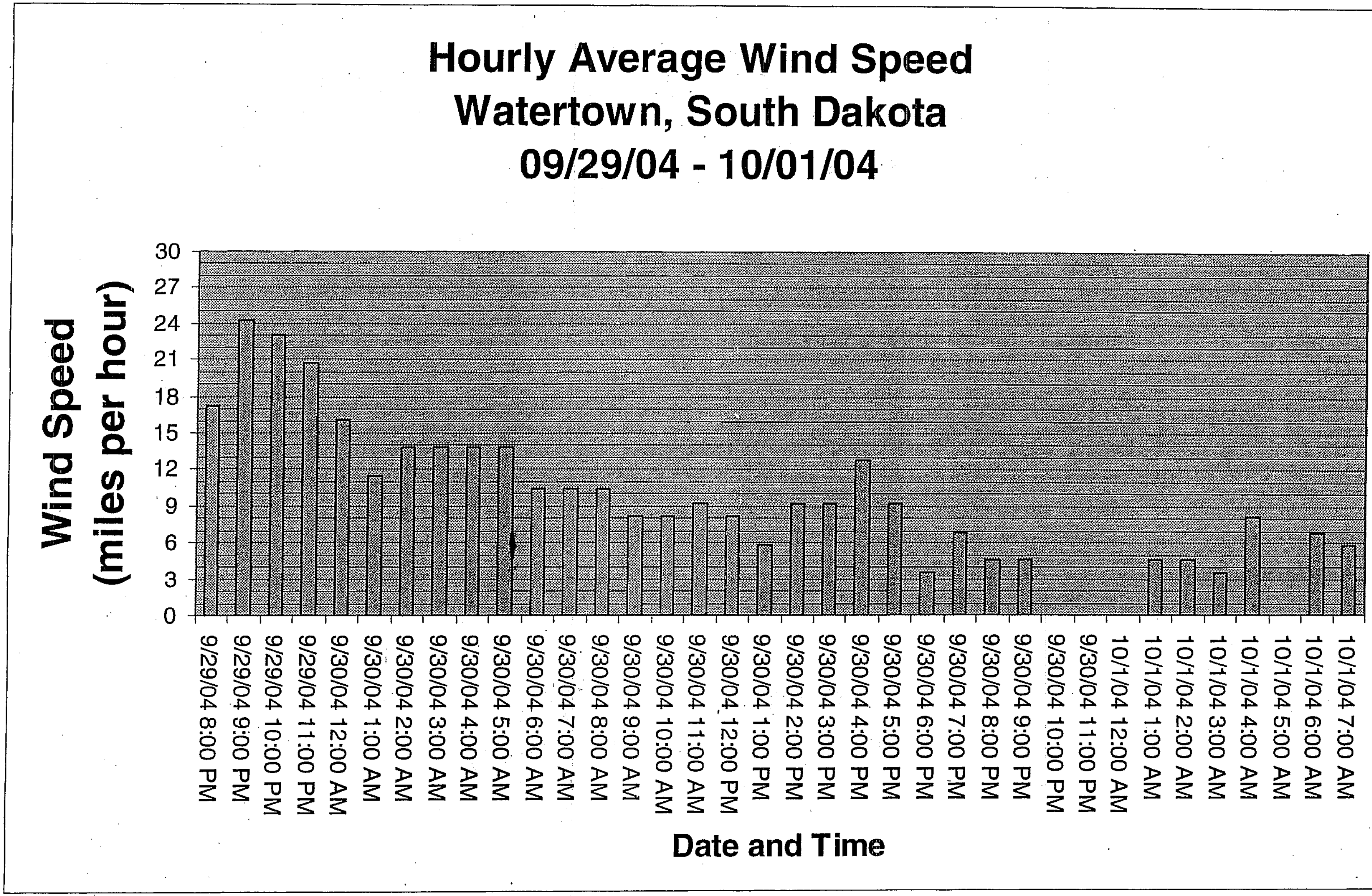
10/1/04 7:00 AM
Date and Time


Hourly Average Wind Speed
Watertown, South Dakota
09/29/04 - 10/01/04
Wind Speed
(miles per hour)
30
27
24
21
18
15
12
9
6
3
0
9/29/04 8:00 PM
9/29/04 9:00 PM
9/29/04 10:00 PM
9/29/04 11:00 PM
9/30/04 12:00 AM
9/30/04 1:00 AM
9/30/04 2:00 AM
9/30/04 3:00 AM
9/30/04 4:00 AM
9/30/04 5:00 AM
9/30/04 6:00 AM
9/30/04 7:00 AM
9/30/04 8:00 AM
9/30/04 9:00 AM
9/30/04 10:00 AM
9/30/04 11:00 AM
9/30/04 12:00 PM
9/30/04 1:00 PM
9/30/04 2:00 PM
9/30/04 3:00 PM
9/30/04 4:00 PM
9/30/04 5:00 PM
9/30/04 6:00 PM
9/30/04 7:00 PM
9/30/04 8:00 PM
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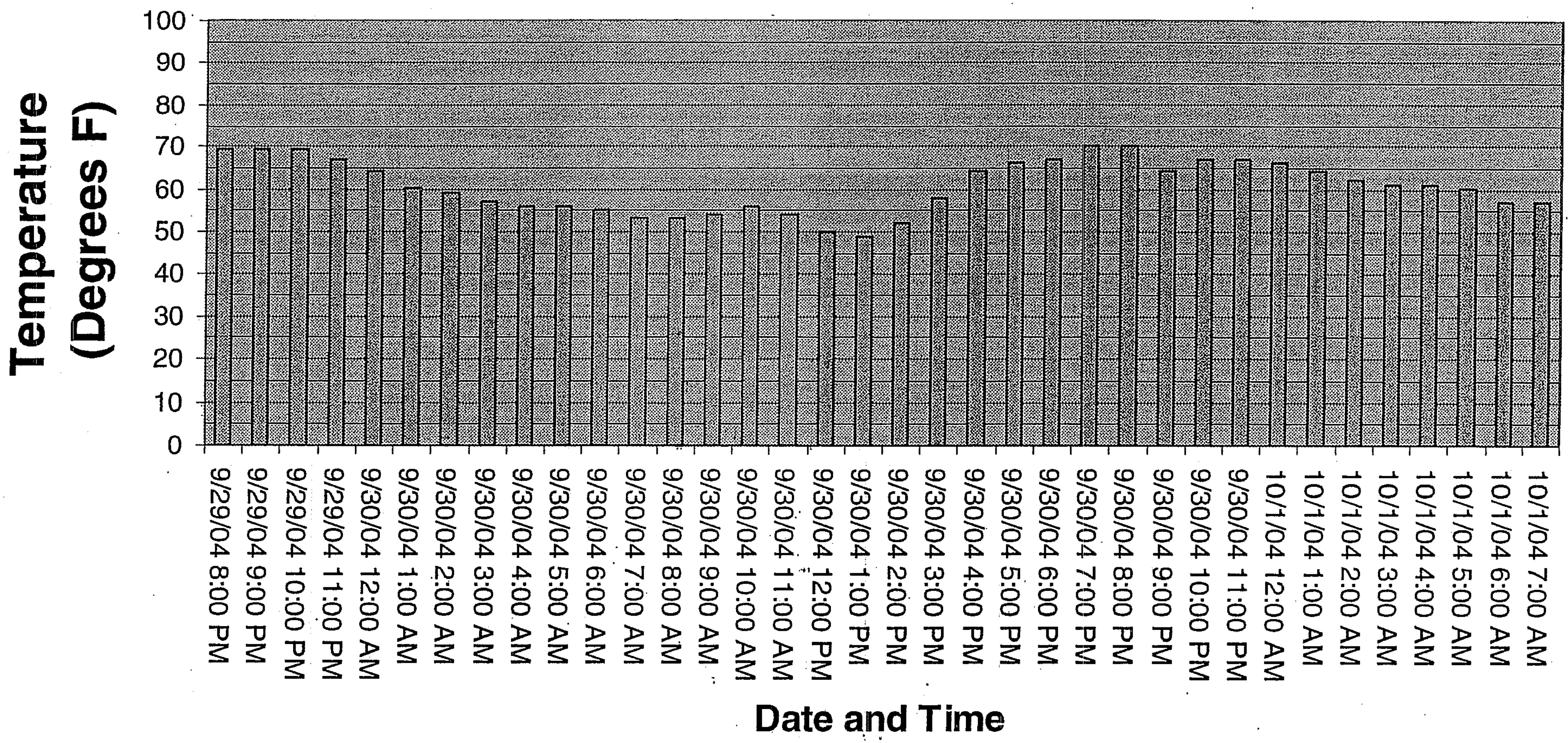
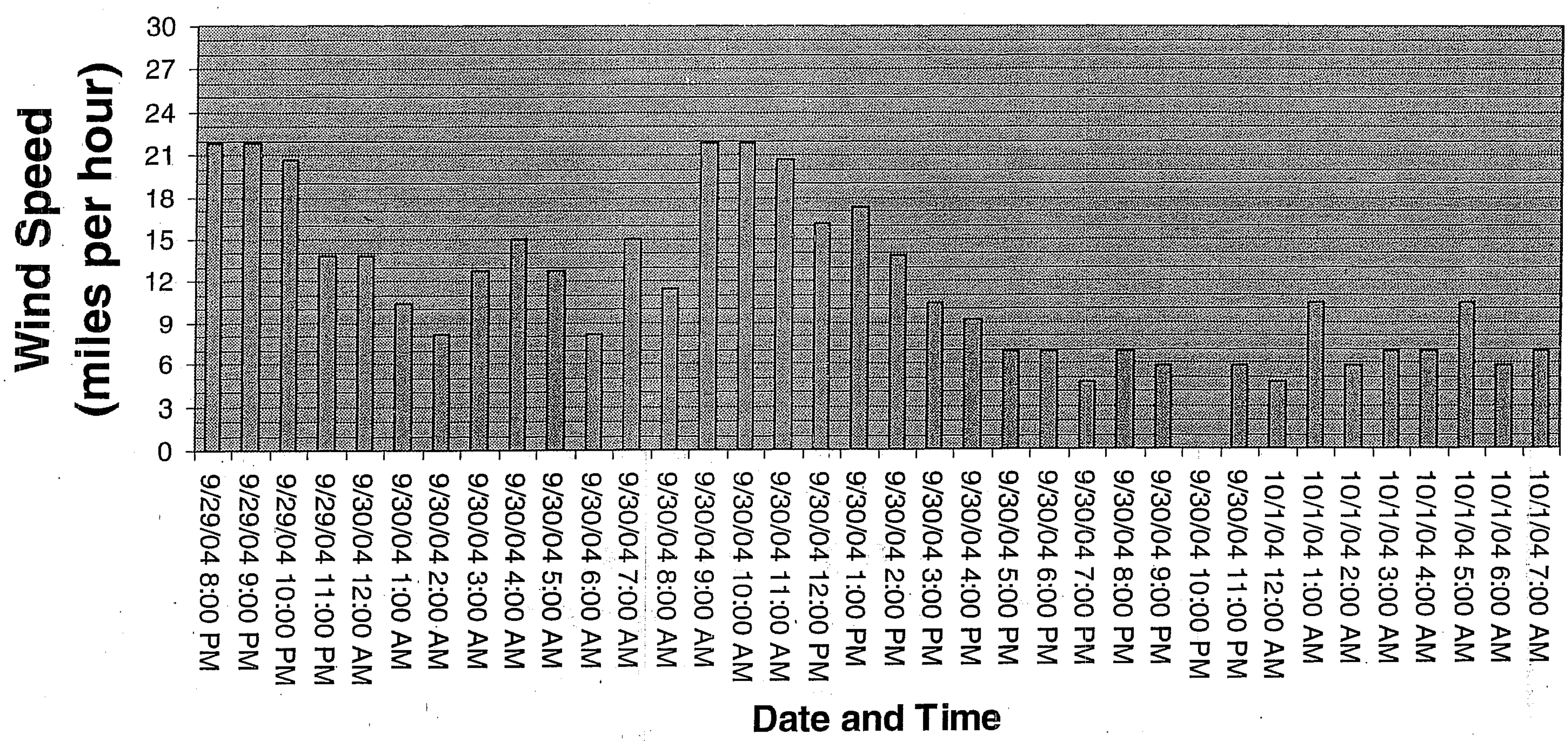
10/1/04 12:00 AM
10/1/04 1:00 AM
10/1/04 2:00 AM
10/1/04 3:00 AM
10/1/04 4:00 AM
10/1/04 5:00 AM
10/1/04 6:00 AM
10/1/04 7:00 AM
Date and Time

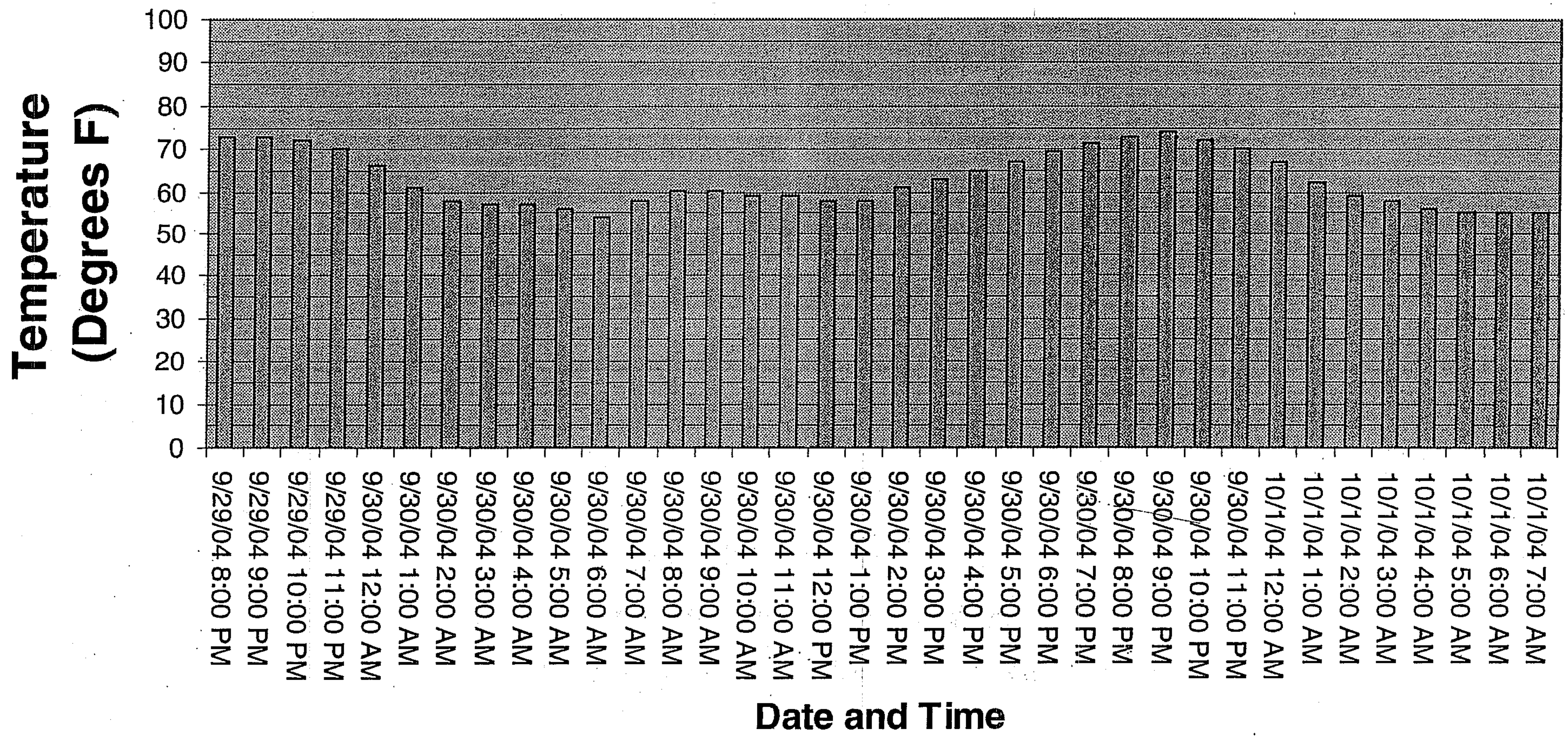
Hourly Average Temperature
Watertown, South Dakota
09/29/04 - 10/01/04



Hourly Average Wind Speed
Sisseton, South Dakota
09/29/04 - 10/01/04



Hourly Average Temperature
Sisseton, South Dakota
09/29/04 - 10/01/04



APPENDIX G

GE LMS100 SPECIFICATIONS

TURBINE GEN SET PERFORMANCE
FOR
Basin Electric Capacity Addition

GUARANTEED PARAMETERS JOBSITE LOCATION: GROTON, SD

Btu/kW·hr, LHV	AT	NET PLANT KW	NOx EMISSIONS
8370		94289	25 PPMVD AT 15 % O2
(kJ/kW·hr, LHV) 8830		GUARANTEE Kenneth Lloyd Kenneth Lloyd Date: 06/07/04	**GE SUPPLIED CO CATYLYST** CO EMISSIONS 28 PPMVD AT 15 % O2
Degradation Not to Exceed 1,000hrs of Operation 1.0% Degradation for Power 0.5% Degadation for Heat Rate NOT VALID WITHOUT STAMP			VOC EMISSIONS 5 PPMVD AT 15 % O2

BASIS OF GUARANTEE:	BASE LOAD, GAS FUEL NOZZLE SYSTEM NO BLEED OR EXTRACTED POWER
ENGINE:	(1) GE LMS100PA GAS TURBINE
FUEL:	21404 Btu/lb / (49786 kJ/kg) LHV, GAS FUEL (#900-791)
FUEL TEMP:	50°F(28°C) above dew point,@ GEAEP BASEPLATE Fuel Temperature 360°F(182.2°C)
GENERATOR OUTPUT:	13.8 kV, 60 Hz
POWER FACTOR:	≥ .9
AMBIENT TEMP:	78.2°F / (25.7°C)
AMBIENT RH:	53.0%
INLET CONDITIONING:	EVAP TO 67.6°F / (19.8°C)
ALTITUDE:	1300.0 ft/ (396.2 m)
AMBIENT PRESSURE:	14.019 PSIA (96.656 kPA)
INLET FILTER LOSS:	≤ 4.50 inH_2O/ (114.3 mmH_2O)
EXHAUST LOSS:	≤ 12.00 inH_2O/ (304.8 mmH_2O)
NOX CONTROL:	WATER
INJECTION RATE:	32168 PPH/ (14591 KG/hr) ±20% FLOW
INJECTION TEMP:	100 °F/ (37.8 °C) @ GEAEP BASEPLATE
ENGINE CONDITION:	NEW AND CLEAN ≤ 200 SITE FIRED HOURS
FIELD TEST METHODS	
PERFORMANCE:	GE AERO ENERGY SGTGPTM
NOX:	EPA METHOD 20
CO:	EPA METHOD 10
VOC:	EPA Method 25/18

** SI values are for reference purposes only

THIS GUARANTEE SUPERSEDES ANY PREVIOUS GUARANTEES PRESENTED

TURBINE GEN SET PERFORMANCE
FOR
Basin Electric Capacity Addition

GUARANTEED PARAMETERS JOBSITE LOCATION: GROTON, SD

Far Field Noise:
65 dba at 400ft from any near point of the scope of supply equipment as measured 5ft. Above grade over a flat hard ground plane.

GUARANTEE
Kenneth Lloyd
Kenneth Lloyd
Date: 06/07/04

Near Field Noise:
85 dba average around the package (Vertical Distance of 5ft. above grade at a horizontal distance of 3ft. from the exterior plane of equipment or if equipment enclosed, its enclosure)

NOT VALID WITHOUT STAMP

BASIS OF GUARANTEE:	BASE LOAD, GAS FUEL NOZZLE SYSTEM NO BLEED OR EXTRACTED POWER
ENGINE:	(1) GE LMS100PA GAS TURBINE
FUEL:	21404 Btu/lb / (49786 kJ/kg) LHV, GAS FUEL (#900-791)
FUEL TEMP:	50°F (28°C) above dew point, @ GEAEP BASEPLATE Fuel Temperature 360°F (182.2°C)
GENERATOR OUTPUT:	13.8 kV, 60 Hz
POWER FACTOR:	≥ .9
AMBIENT TEMP:	78.2°F / (25.7°C)
AMBIENT RH:	53.0%
INLET CONDITIONING:	EVAP TO 67.6°F / (19.8°C)
ALTITUDE:	1300.0 ft/ (396.2 m)
AMBIENT PRESSURE:	14.019 PSIA (96.656 kPA)
INLET FILTER LOSS:	≤ 4.50 inH_2O/ (114.3 mmH_2O)
EXHAUST LOSS:	≤ 12.00 inH_2O/ (304.8 mmH_2O)
NOX CONTROL:	WATER
INJECTION RATE:	32168 PPH/ (14591 KG/hr) ±20% FLOW
INJECTION TEMP:	100 °F/ (37.8 °C) @ GEAEP BASEPLATE
ENGINE CONDITION:	NEW AND CLEAN ≤ 200 SITE FIRED HOURS
FIELD TEST METHODS PERFORMANCE:	GE AERO ENERGY SGTGPTM
NEAR FIELD NOISE:	ANSI / ASME PTC - 36
FAR FIELD:	ANSI B 133.8

** SI values are for reference purposes only

THIS GUARANTEE SUPERSEDES ANY PREVIOUS GUARANTEES PRESENTED

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: Kenneth Lloyd
Project Info: Basin Electric Capacity Addition - Guar Basis R4
CMS# 401509

Engine: LMS100 PA
Deck Info: G0179C - 87o.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)
Fuel: Site Gas Fuel#900-791, 21404 Btu/lb,LHV

Date: 04/27/2004
Time: 5:38:51 PM
Version: 3.0.44

Case #	**100**	
Ambient Conditions		
Dry Bulb, °F	78.2	
Wet Bulb, °F	65.8	
RH, %	53.0	
Altitude, ft	1300.0	
Ambient Pressure, psia	14.019	
Engine Inlet		
Comp Inlet Temp, °F	67.6	
RH, %	91.1	
Conditioning	EVAP	
Tons or kBtu	0	
Pressure Losses		
Inlet Loss, inH20	4.50	
Exhaust Loss, inH20	12.00	
kW, Gen Terms	**97624**	94289
Est. Btu/kW-hr, LHV	**7841**	8370
Guar. Btu/kW-hr, LHV	**8084**	
AUX LOADS	3335	
Fuel Flow		
MMBtu/hr, LHV	765.5	
lb/hr	35765	
NOx Control	**Water**	
Water Injection		
lb/hr	32168	
Temperature, °F	100.0	
Intercooler	Dry Water-Air	
Spray Mist Cooler	OFF	
IC Heat Extraction, btu/s	26082	
KOD Water Extraction, lb/s	0.7	
Control Parameters		
HP Speed, RPM	9362	
LP Speed, RPM	5285	
PT Speed, RPM	3600	
PS3 - CDP, psia	538.5	
T23 - Intcrl Inlet Temp, °F	342.7	
T25 - HPC Inlet Temp, °F	100.0	
T3 - CDT, °F	723.2	
T48, °R	2031	
Exhaust Parameters		
Temperature, °F	791.4	
lb/sec	442.2	
lb/hr	1592034	
Energy, Btu/s- ref 0 °R	143903	
Cp, Btu/lb-R	0.2774	
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)		
REF @ 15% O2	15	
NOx ppmvd Ref 15% O2	25	
NOx as NO2, lb/hr	77	
CO ppmvd Ref 15% O2	129	
CO, lb/hr	241.57	
HC ppmvd Ref 15% O2	6	
HC, lb/hr	6.00	

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: **Kenneth Lloyd**
Project Info: **Basin Electric Capacity Addition - Guar Basis R4**
CMS# 401509

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

Date: **04/27/2004**
Time: **5:38:51 PM**
Version: **3.0.44**

Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	1.2184
N2	71.4389
O2	13.0065
CO2	6.2303
H2O	8.0870
SO2	0.0000
CO	0.0152
HC	0.0004
NOX	0.0033

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.9746
N2	81.4906
O2	12.9893
CO2	4.5239
H2O	0.0000
SO2	0.0000
CO	0.0173
HC	0.0008
NOX	0.0034

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.8524
N2	71.2674
O2	11.3598
CO2	3.9564
H2O	12.5453
SO2	0.0000
CO	0.0151
HC	0.0007
NOX	0.0029

Aero Energy Fuel Number	900-791 (Basin Electric 360F)	
	Volume %	**Weight %**
Hydrogen	0.4990	0.0593
Methane	95.9180	90.7531
Ethane	2.1490	3.8110
Ethylene	0.0000	0.0000
Propane	0.4330	1.1261
Propylene	0.0000	0.0000
Butane	0.3440	1.1792
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.3300	1.4042
Cyclopentane	0.0000	0.0000
Hexane	0.3280	1.6670
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.0000	0.0000
Nitrogen	0.0000	0.0000
Water Vapor	0.0000	0.0000
Oxygen	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

Btu/lb, LHV	21404
Btu/scf, LHV	959
Btu/scf, HHV	1062
Btu/lb, HHV	23708
Fuel Temp, °F	360.0
NOx Scalar	1.167
Specific Gravity	0.59

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: **Kenneth Lloyd**
Project Info: **Basin Electric Capacity Addition - Guar Basis R4**
CMS# 401509

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

Date: **04/27/2004**
Time: **5:39:04 PM**
Version: **3.0.44**

Case #	**100**	
Ambient Conditions		
Dry Bulb, °C	25.7	
Wet Bulb, °C	18.8	
RH, %	53.0	
Altitude, m	396.2	
Ambient Pressure, kPa	96.656	
Engine Inlet		
Comp Inlet Temp, °C	19.8	
RH, %	91.1	
Conditioning	EVAP	
Tons or kBtu	0	
Pressure Losses		
Inlet Loss, mmH2O	114.30	
Exhaust Loss, mmH2O	304.80	
kW, Gen Terms	**97624**	94289
Est. kJ/kWh, LHV	**8273**	8830
Guar. kJ/kWh, LHV	**8529**	
AUX LOADS	3335	
Fuel Flow		
GJ/hr, LHV	807.6	
kg/hr	16223	
NOx Control	**Water**	
Water Injection		
kg/hr	14591	
Temperature, °C	37.8	
Intercooler	**Dry Water-Air**	
Spray Mist Cooler	OFF	
IC Heat Extraction, kJ/s	27518	
KOD Water Extraction, kg/s	0.3	
Control Parameters		
HP Speed, RPM	9362	
LP Speed, RPM	5285	
PT Speed, RPM	3600	
PS3 - CDP, kPa	3712.5	
T23 - Intcrl Inlet Temp, °C	172.6	
T25 - HPC Inlet Temp, °C	37.8	
T3 - CDT, °C	384.0	
T48, °K	1129	
Exhaust Parameters		
Temperature, °C	421.9	
kg/sec	200.6	
kg/hr	722142	
Energy, J/s- ref 0 °K	151825904	
Kj/kg-R	1.1612	
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)		
REF @ 15% O2	15	
NOx mg/Nm3 Ref 15% O2	51	
NOx as NO2, kg/hr	35	
CO mg/Nm3 Ref 15% O2	161	
CO, kg/hr	109.58	
HC mg/Nm3 Ref 15% O2	4	
HC, kg/hr	2.72	

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: **Kenneth Lloyd**
Project Info: **Basin Electric Capacity Addition - Guar Basis R4**
CMS# 401509

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

Date: **04/27/2004**
Time: **5:39:04 PM**
Version: **3.0.44**

Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	1.2184
N2	71.4389
O2	13.0065
CO2	6.2303
H20	8.0870
SO2	0.0000
CO	0.0152
HC	0.0004
NOX	0.0033

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.9746
N2	81.4906
O2	12.9893
CO2	4.5239
H20	0.0000
SO2	0.0000
CO	0.0173
HC	0.0008
NOX	0.0034

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.8524
N2	71.2674
O2	11.3598
CO2	3.9564
H20	12.5453
SO2	0.0000
CO	0.0151
HC	0.0007
NOX	0.0029

Aero Energy Fuel Number **900-791 (Basin Electric 360F)**

	Volume %	Weight %
Hydrogen	0.4990	0.0593
Methane	95.9180	90.7531
Ethane	2.1490	3.8110
Ethylene	0.0000	0.0000
Propane	0.4330	1.1261
Propylene	0.0000	0.0000
Butane	0.3440	1.1792
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.3300	1.4042
Cyclopentane	0.0000	0.0000
Hexane	0.3280	1.6670
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.0000	0.0000
Nitrogen	0.0000	0.0000
Water Vapor	0.0000	0.0000
Oxygen	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

kJ/kg, LHV	49785
kJ/Nm3, LHV	37655
kJ/Nm3, HHV	41715
kJ/kg, HHV	55145
Fuel Temp, °C	182.2
NOx Scalar	1.167
Specific Gravity	0.59

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: **Kenneth Lloyd**
Project Info: **Basin Electric Capacity Addition**
CMS# 401509

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

Date: **04/27/2004**
Time: **4:19:56 PM**
Version: **3.0.44**

Case #	**100**	**101**	**102**	**103**	**104**	**105**
Ambient Conditions						
Dry Bulb, °F	0.0	40.0	59.0	78.2	92.0	92.0
Wet Bulb, °F	-1.4	33.8	49.8	65.8	72.1	77.3
RH, %	53.0	53.0	53.0	53.0	39.5	53.0
Altitude, ft	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0
Ambient Pressure, psia	14.019	14.019	14.019	14.019	14.019	14.019
Engine Inlet						
Comp Inlet Temp, °F	0.0	40.0	51.2	67.6	75.1	79.5
RH, %	53.0	53.0	91.3	91.1	87.1	90.9
Conditioning	NONE	NONE	EVAP	EVAP	EVAP	EVAP
Tons or kBtu	0	0	0	0	0	0
Pressure Losses						
Inlet Loss, inH20	4.50	4.50	4.50	4.50	4.50	4.50
Exhaust Loss, inH20	12.00	12.00	12.00	12.00	12.00	12.00
kW, Gen Terms	**102629**	**104147**	**102857**	**97624**	**92249**	**90155**
Est. Btu/kW-hr, LHV	**7636**	**7729**	**7758**	**7841**	**7908**	**7956**
Guar. Btu/kW-hr, LHV	**7955**	**8051**	**8081**	**8168**	**8238**	**8287**
Fuel Flow						
MMBtu/hr, LHV	783.7	804.9	798.0	765.5	729.5	717.2
lb/hr	36616	37606	37283	35765	34083	33510
NOx Control	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Water Injection						
lb/hr	37609	38631	35989	32168	29103	28283
Temperature, °F	100.0	100.0	100.0	100.0	100.0	100.0
Intercooler	**Dry Water-Air**	**Dry Water-Air**	**Dry Water-Air**	**Dry Water-Air**	**Dry Water-Air**	**Dry Water-Air**
Spray Mist Cooler	OFF	OFF	OFF	OFF	OFF	OFF
IC Heat Extraction, btu/s	17838	23597	24642	26082	24410	25827
KOD Water Extraction, lb/s	0.0	0.0	0.0	0.7	0.4	1.7
Control Parameters						
HP Speed, RPM	9236	9328	9354	9362	9399	9398
LP Speed, RPM	5029	5299	5343	5285	5203	5205
PT Speed, RPM	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	567.0	567.0	560.0	538.5	516.1	507.7
T23 - Intcrl Inlet Temp, °F	262.2	317.1	329.2	342.7	348.4	351.0
T25 - HPC Inlet Temp, °F	100.0	100.0	100.0	100.0	109.0	109.0
T3 - CDT, °F	713.5	726.1	726.6	723.2	729.7	728.9
T48, °R	1978	2021	2031	2031	2032	2032
Exhaust Parameters						
Temperature, °F	735.9	769.2	780.3	791.4	804.1	808.6
lb/sec	474.4	467.9	460.4	442.2	423.6	416.7
lb/hr	1707844	1684423	1657281	1592034	1525051	1500048
Energy, Btu/s- ref 0 °R	145747	148616	148069	143903	139609	137855
Cp, Btu/lb-R	0.2726	0.2751	0.2764	0.2774	0.2785	0.2787
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)						
REF @ 15% O2	15	15	15	15	15	15
NOx ppmvd Ref 15% O2	25	25	25	25	25	25
NOx as NO2, lb/hr	79	81	80	77	73	72
CO ppmvd Ref 15% O2	178	160	144	129	120	118
CO, lb/hr	339.89	314.40	281.08	241.57	213.36	206.35
HC ppmvd Ref 15% O2	10	8	7	6	5	5
HC, lb/hr	10.00	9.00	8.00	6.00	5.00	5.00

Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy
A GE Power Systems Business

Performance By: Kenneth Lloyd
Project Info: Basin Electric Capacity Addition
CMS# 401509

Engine: LMS100 PA
Deck Info: G0179C - 87o.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)
Fuel: Site Gas Fuel#900-791, 21404 Btu/lb,LHV

Date: 04/27/2004
Time: 4:19:56 PM
Version: 3.0.44

Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)						
AR	1.2314	1.2262	1.2218	1.2184	1.2151	1.2151
N2	72.2011	71.8963	71.6367	71.4389	71.2468	71.2433
O2	13.6494	13.2043	13.0560	13.0065	12.9926	12.9953
CO2	5.9395	6.1863	6.2361	6.2303	6.2002	6.1978
H20	6.9549	7.4644	7.8286	8.0870	8.3276	8.3310
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0199	0.0187	0.0170	0.0152	0.0140	0.0138
HC	0.0006	0.0005	0.0005	0.0004	0.0003	0.0003
NOX	0.0032	0.0033	0.0033	0.0033	0.0033	0.0033

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)						
AR	0.9722	0.9741	0.9746	0.9746	0.9745	0.9745
N2	81.2900	81.4441	81.4847	81.4906	81.4825	81.4813
O2	13.4543	13.0954	13.0018	12.9893	13.0091	13.0123
CO2	4.2567	4.4609	4.5153	4.5239	4.5138	4.5122
H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0224	0.0211	0.0193	0.0173	0.0160	0.0157
HC	0.0012	0.0011	0.0009	0.0008	0.0007	0.0007
NOX	0.0032	0.0033	0.0033	0.0034	0.0033	0.0033

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)						
AR	0.8667	0.8609	0.8560	0.8524	0.8488	0.8488
N2	72.4661	71.9796	71.5737	71.2674	70.9716	70.9663
O2	11.9938	11.5736	11.4204	11.3598	11.3310	11.3331
CO2	3.7947	3.9425	3.9661	3.9564	3.9315	3.9299
H20	10.8549	11.6209	12.1631	12.5453	12.8997	12.9047
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0200	0.0187	0.0169	0.0151	0.0139	0.0137
HC	0.0011	0.0010	0.0008	0.0007	0.0006	0.0006
NOX	0.0028	0.0029	0.0029	0.0029	0.0029	0.0029

Aero Energy Fuel Number	900-791 (Basin Electric 360F)	
	Volume %	Weight %
Hydrogen	0.4990	0.0593
Methane	95.9180	90.7531
Ethane	2.1490	3.8110
Ethylene	0.0000	0.0000
Propane	0.4330	1.1261
Propylene	0.0000	0.0000
Butane	0.3440	1.1792
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.3300	1.4042
Cyclopentane	0.0000	0.0000
Hexane	0.3280	1.6670
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.0000	0.0000
Nitrogen	0.0000	0.0000
Water Vapor	0.0000	0.0000
Oxygen	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000

Btu/lb, LHV	21404.0000
Btu/scf, LHV	959.0000
Btu/scf, HHV	1062.0000
Btu/lb, HHV	23708.0000
Fuel Temp, °F	360.0000
NOx Scalar	1.1670
Specific Gravity	0.5900

APPENDIX H

EFFICIENCY CALCULATIONS

GE LMS100 EFFICIENCY CALCULATIONS

ENGINE: (1) GE LMS100PA GAS TURBINE
FUEL: Natural Gas 21404 Btu/lb (49786 kJ/kg) LHV

DATA FROM GENERAL ELECTRIC SPECIFICATION SHEET

Generator Output	94,289	kilowatts
Fuel Flow	35,765	lb/hr
Fuel LHV	21,404	Btu/lb
Generator Output	97,624	Kilowatts/hr
Maximum Heat Consumption	8084	Btu/kW-hr (Guaranteed)

Calculated Heat Input	765.51	MMBtu/hr, LHV

Heat Input (Btu/hr) = Fuel Input (lb/hr) * Fuel LHV (Btu/lb) = 35,765 * 21,404 = 765,514,060

Heat Input (MMBtu/hr) = Heat Input (Btu/hr) / 1,000,000 = 765,514,060 / 1,000,000 = 765.51

Conversion Factor	0.293255	watts per Btu/hr

Heat Input (watts/hr) = Heat Input (Btu/hr) * 0.293255 (watts/Btu)
Heat Input (watts/hr) = 765,514,060 (Btu/hr) * 0.293255 (watts/Btu) = 224,490,927
Heat Input (KWatts/hr) = Heat Input (Watts/hr) / 1,000 = 224,490,927 / 1,000 = 224,490

Calculated Efficiency

Percent Heat Conversion
Efficiency (%) = Power Output (KW/hr) / Heat Input (KW/hr) * 100
Efficiency (%) = 97,624 (KW/hr) / 224,490 (KW/hr) * 100 = 43.487 %

Heat Consumption
Btu/kW-hr = Heat Input (Btu/hr) / Power Output (KW/hr)
Btu/kW-hr = 765,514,060 (Btu/hr) / 97,624 (KW/hr) = 7841.45

Results from GE's Guaranteed Efficiency

Heat Consumption 8084 Btu/kW-hr
Heat Input (Btu/hr) = Heat Consumption (Btu/KW-hr) * Power Output (KW/hr)
Heat Input (Btu/hr) = 8084 (Btu/KW-hr) * 97,624 (KW/hr) = 789,192,416

Heat Input (watts/hr) = Heat Input (Btu/hr) * 0.293255 (watts/Btu)
Heat Input (watts/hr) = 789,192,416 (Btu/hr) * 0.293255 (watts/Btu) = 231,434,622
Heat Input (KWatts/hr) = Heat Input (Watts/hr) / 1,000 = 231,434,622 / 1,000 = 231,435

Guaranteed Efficiency

Percent Heat Conversion
Efficiency (%) = Power Output (KW/hr) / Heat Input (KW/hr) * 100
Efficiency (%) = 97,624 (KW/hr) / 231,435 (KW/hr) * 100 = 42.182 %