



**SOUTH DAKOTA PUBLIC UTILITIES COMMISSION
APPLICATION FOR
GROTON GENERATION STATION UNIT 2 PROJECT**

Prepared for:



BASIN ELECTRIC POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58501
(701) 223-0441

Prepared by:



TETRA TECH, INC.

4900 Pearl E. Circle, Suite 300W
Boulder, CO 80301

JANUARY 2007



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January 2007

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APPENDICIES

<u>Title</u>	<u>Description</u>
A	South Dakota Environmental Impact Statement
B	Geologic Cross-Sections
C	Brown County Zoning Variance
D	Air Quality Operating Permit Application
E	Time Schedule
F	Noise Study
G	GE LMS100 Specifications
H	Efficiency Calculations

EXHIBITS

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ACRONYMS AND ABBREVIATIONS

Basin Electric	Basin Electric Power Cooperative
BOP	Balance of plant
Btu	British thermal unit
CEM	Continuous emission monitoring
CO	Carbon monoxide
CTG	Combustion turbine generator
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
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GE	General Electric
GGS2	Groton Generation Station Unit 2
gpm	Gallons per minute
HMI	Human machine interface
HPC	High-pressure compressor
Hwy	Highway
kV	Kilovolt
Kwh	Kilowatt-hour
LG	Lockwood Greene
LRFF	Long range financial forecast
LPC	Low-pressure compressor
$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter
msl	Mean sea level
MAPP	Mid-Continent Area Power Pool
mmscfd	Million standard cubic feet per day
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NESC	National Electrical Safety Code
NBPL	Northern Border Pipeline
NO ₂	Nitrogen Oxide
NOx	Nitrous Oxides
NRC	National Research Council
PLSS	Public Land Survey System
PM ₁₀	Particulate matter less than 10 microns
PSD	Prevention of significant deterioration
PUC	Public Utilities Commission
ROW	Right-of-way
SD	South Dakota
SDAR	South Dakota Administrative Rule
SDCL	South Dakota Codified Law
SDEIS	South Dakota Environmental Impact Statement
SDGS	South Dakota Geological Survey
Section line	Public Land Survey System section line
SHPO	State Historic Preservation Office

ACRONYMS AND ABBREVIATIONS (Cont.)

T&E	Threatened and endangered
Tetra Tech	Tetra Tech, Inc.
TIC	The Industrial Company
tpy	Tons per year
TSM	Transmission System Maintenance
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
Western	Western Area Power Administration

1.0 APPLICATION PREFACE

Basin Electric Power Cooperative (Basin Electric) is proposing the construction of a second combustion turbine generator (CTG) at the existing Groton Generation Station near Groton, South Dakota, to serve projected member load growth. A second 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 Groton Generation Station Unit 2 (GGS2) Project.

The proposed GGS2 Project will include a new 80 to 100 MW simple cycle 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.

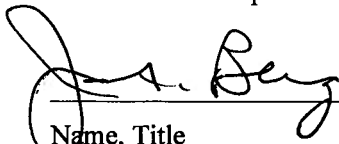
This application meets the requirements set forth in South Dakota Codified Law (SDCL) 49-41B and South Dakota Administrative Rule (SDAR) 20:10:22. The balance of this document provides the application, supporting exhibits, and supporting documents. In accordance with SDCL 49-41B-22, Basin Electric affirms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

- The proposed facility complies with all applicable laws and rules;
- The facility 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;
- The facility will not substantially impair the health, safety, or welfare of the inhabitants; and
- The facility 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 facility on such terms, conditions, or modification of construction and operation or maintenance as the PUC may deem appropriate.

Basin Electric Power Cooperative

By:


Name, Title
NEPA/Water/Waste
Management Coordinator

Date:

1-3-2007

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 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 58503-0564
(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 58503-0564
(701) 223-0441

Dick Shaffer
Project Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58503-0564
(701) 223-0441

2.2 Name of Owner and Manager (SDAR 20:10:22:07)

The proposed generation facility is to be owned by Basin Electric. The project manager is:

Dick Shaffer
Project Coordinator
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, North Dakota 58503-0564
(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 GGS2 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 an additional 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 \$81.0 million. The major components of this estimate are as follows:

Simple cycle gas turbine-generator	\$72.5 million
115 kV transmission line (less than 0.5 miles) and substation upgrades	\$1.0 million
Engineering, overhead, interest during construction, contingency	\$7.5 million

2.5 Demand for Facility (SDAR 20:10:22:10)

Construction of the GGS2 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 an additional 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 eastern system (including the anticipated transfers across the Rapid City DC Tie within Firm & Participation Sales) and the resulting surplus/(deficit). Numbers enclosed in parenthesis indicate a deficit.

EXHIBIT 1
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
BASIN ELECTRIC EASTERN SYSTEM PROJECTED SUMMER LOADS AND RESOURCES

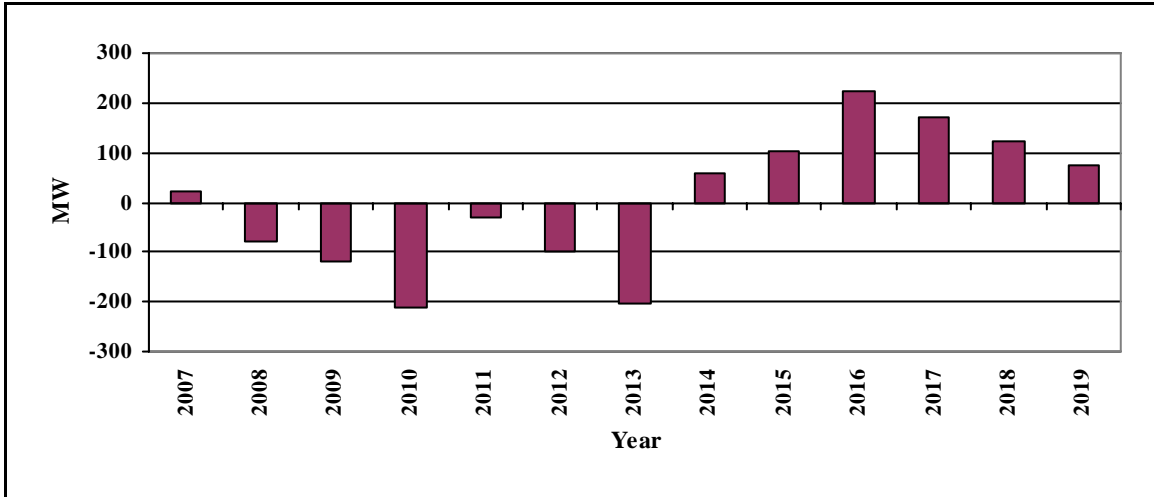
Year	Summer Season Demand	Net Generation Owned	Firm & Participation Purchases	Firm & Participation Sales	Net Reserve Capacity	Surplus / (Deficit)
2007	1,650	1,882	157	164	233	(8)
2008	1,717	1,890	157	194	243	(107)
2009	1,747	1,898	157	164	248	(104)
2010	1,832	1,892	157	165	261	(208)
2011	1,874	1,889	157	36	267	(131)
2012	1,914	1,889	157	38	273	(179)
2013	1,944	1,889	157	65	278	(241)
2014	1,981	2,239	127	81	283	21
2015	2,014	2,339	127	100	288	63
2016	2,054	2,339	127	37	294	82
2017	2,093	2,339	127	37	300	35
2018	2,130	2,339	127	38	305	(7)
2019	2,165	2,339	127	38	311	(48)

Note: Units are MW

Even though 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 July 2006.

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 summer load and capability surplus/(deficit) calculation for the Basin Electric total system. The calculation includes projects currently under construction, as well as projects Basin Electric has committed to building and thus included in Basin Electric's current Board approved Long Range Financial Forecast (LRFF). Some of the main projects include the Dry Fork Station in 2011 and an east side coal plant in 2014.

EXHIBIT 2
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
BASIN ELECTRIC'S TOTAL SYSTEM SUMMER SURPLUS/(DEFICIT)



Based on the analysis of loads and resources, Basin Electric in total will face a capacity deficit in 2008 and requires a peaking-type resource to fill the capacity. Exhibit 3 presents the load and capability surplus/(deficit) calculation for the Basin Electric total system with the addition of a second 80 to 100 MW turbine.

EXHIBIT 3
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
BASIN ELECTRIC'S TOTAL SYSTEM SUMMER SURPLUS/(DEFICIT) WITH THE
ADDITION OF A SECOND 80 to 100 MW TURBINE

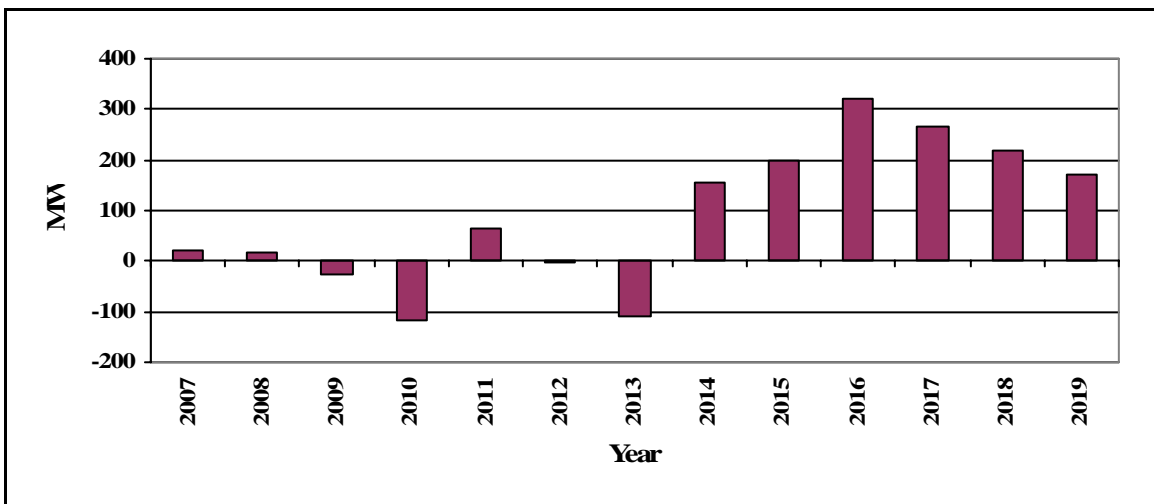


Exhibit 4 below, shows Basin Electric's forecasted 2008 hourly energy situation on the West (with no transfers to the west across Rapid City), Exhibit 5 shows Basin Electric's forecasted 2008 hourly energy situation on the East (with no transfers to the west across Rapid City) and Exhibit 6 shows Basin Electric's forecasted 2008 hourly energy situation in total.

As can be seen from the three exhibits (4, 5, and 6), Basin Electric needs base load energy on the west which can be transferred from the east to solve the west side short fall. By transferring power to the west all hours of the year, it pushes the east into additional peaking during the summer months.

**EXHIBIT 4
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2008 WEST HOURLY ENERGY (NO RAPID CITY DC TIE TRANSFERS)**

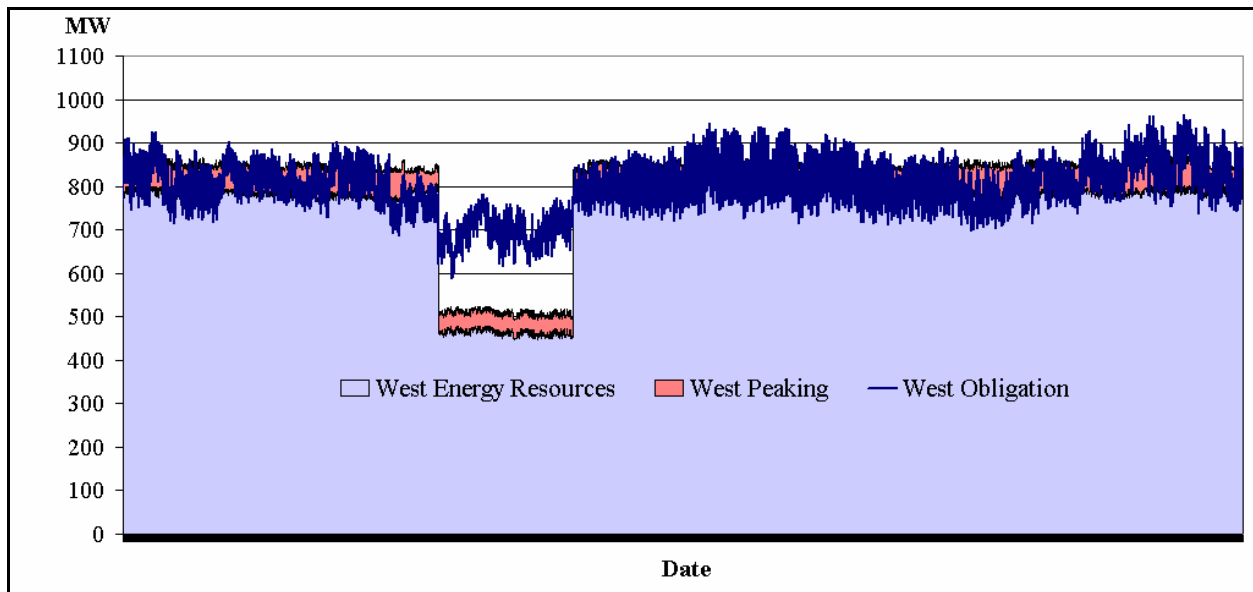


EXHIBIT 5
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2008 EAST HOURLY ENERGY (NO RAPID CITY DC TIE TRANSFERS)

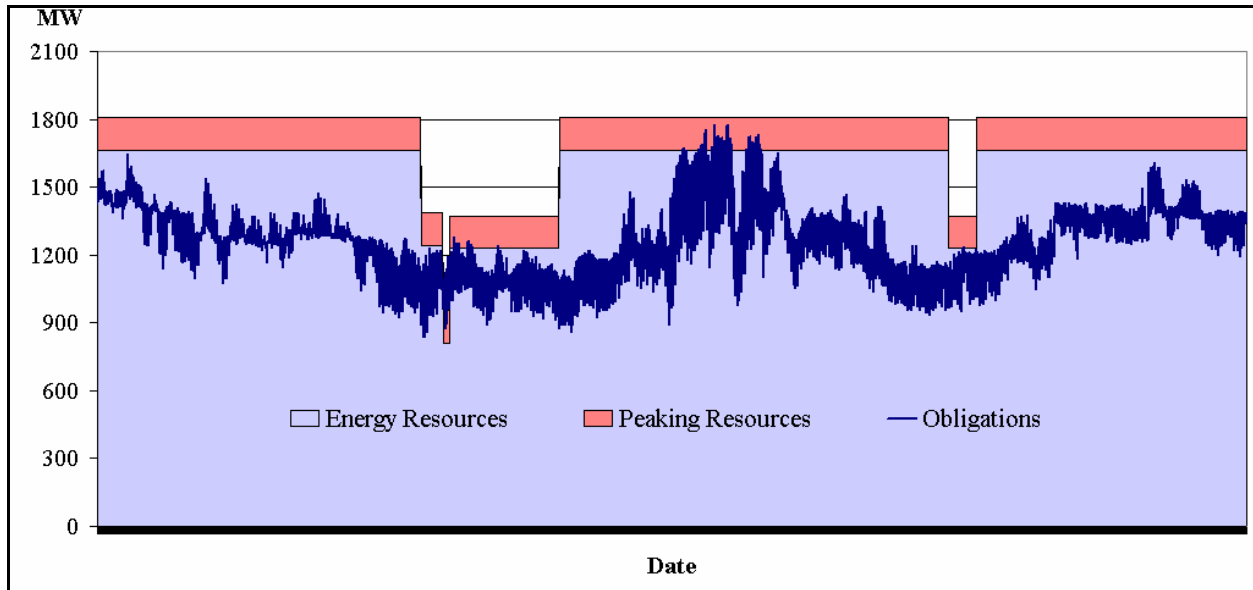


EXHIBIT 6
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2008 TOTAL SYSTEM HOURLY ENERGY

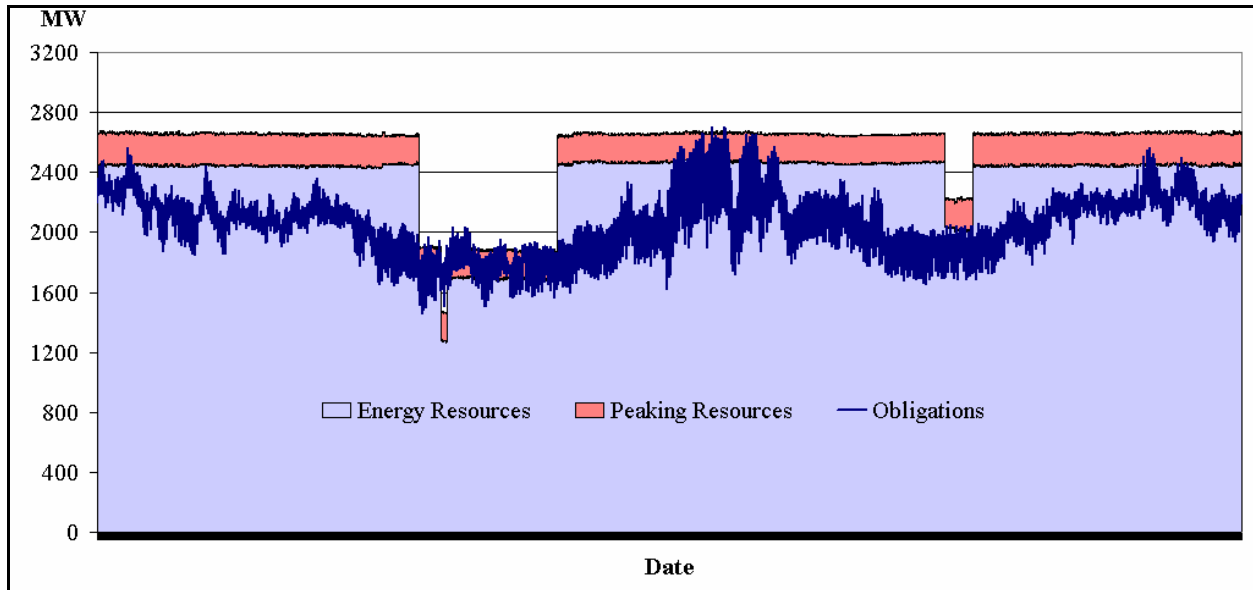
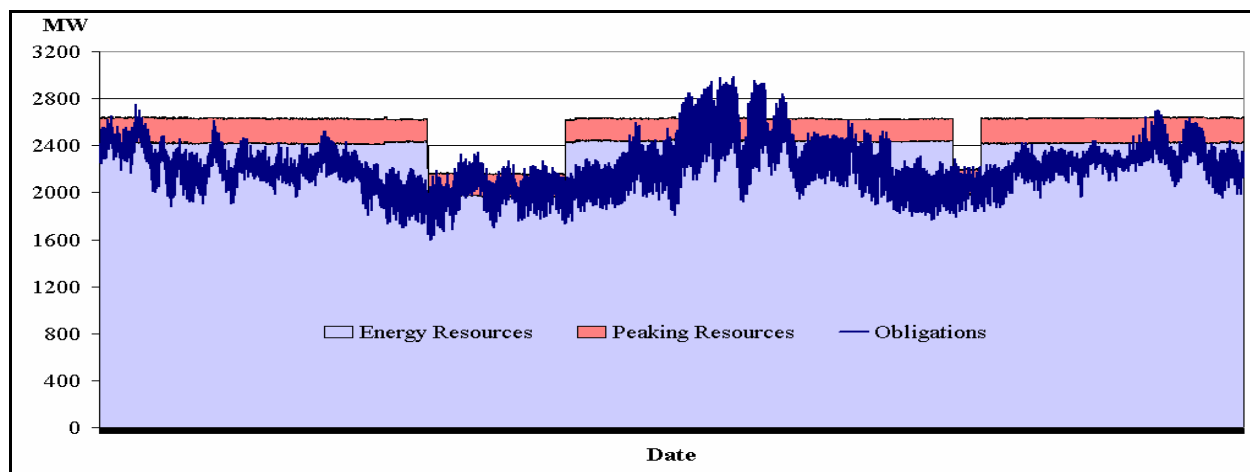


Exhibit 7 below, shows Basin Electric's forecasted 2012 hourly energy situation in total. The load profile is based on actual 2005 loads. The available energy is based on Basin Electric's existing resources,

scheduled maintenance outages for existing resources, and contract purchases. The load pattern is the Basin Electric member load, diversity, losses and contracted non-member sales.

**EXHIBIT 7
GROTON GENERATION STATION UNIT 2 PROJECT
BASIN ELECTRIC POWER COOPERATIVE
2012 TOTAL SYSTEM HOURLY ENERGY**

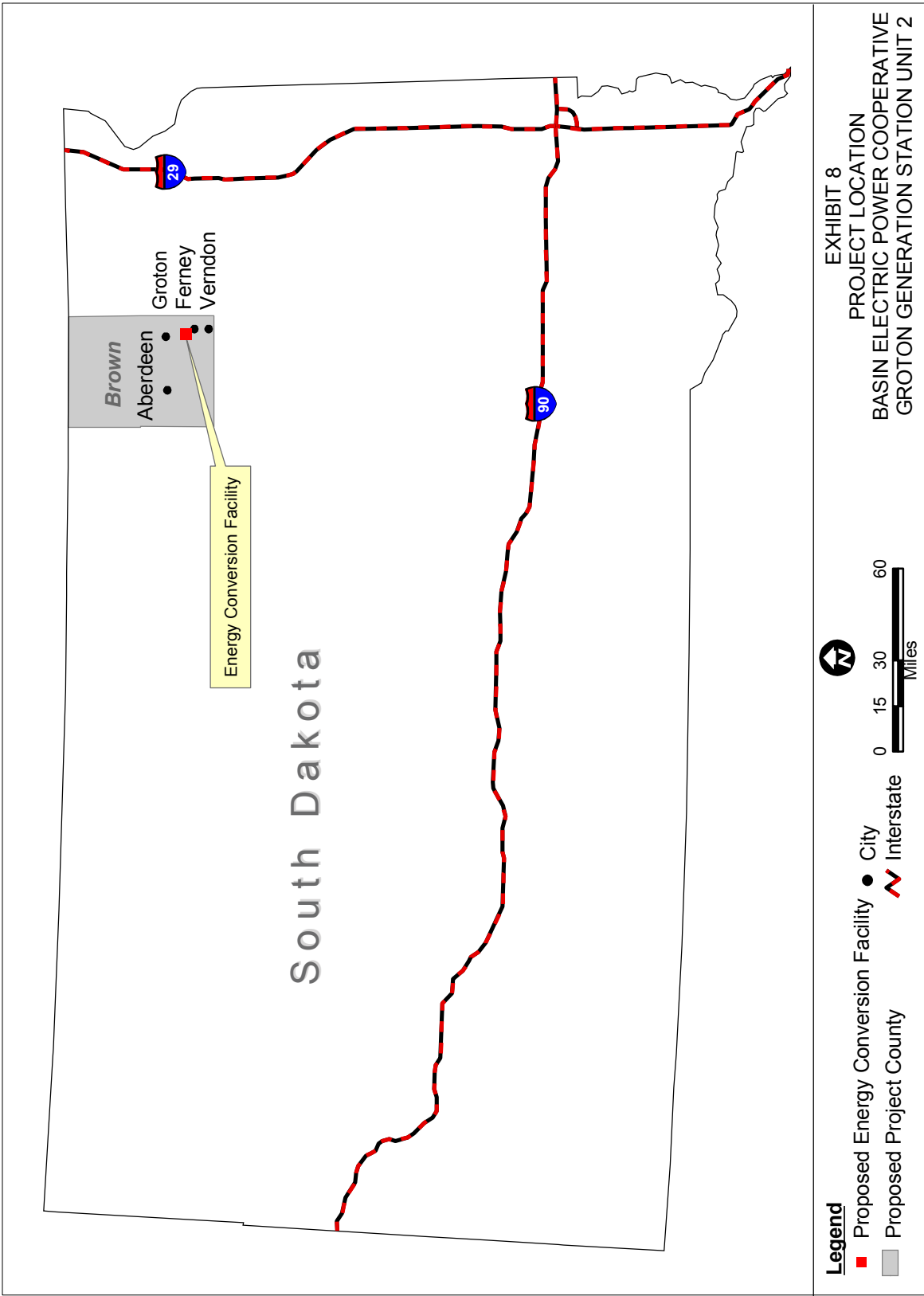


2.6 General Site Description (SDAR 20:10:22:11)

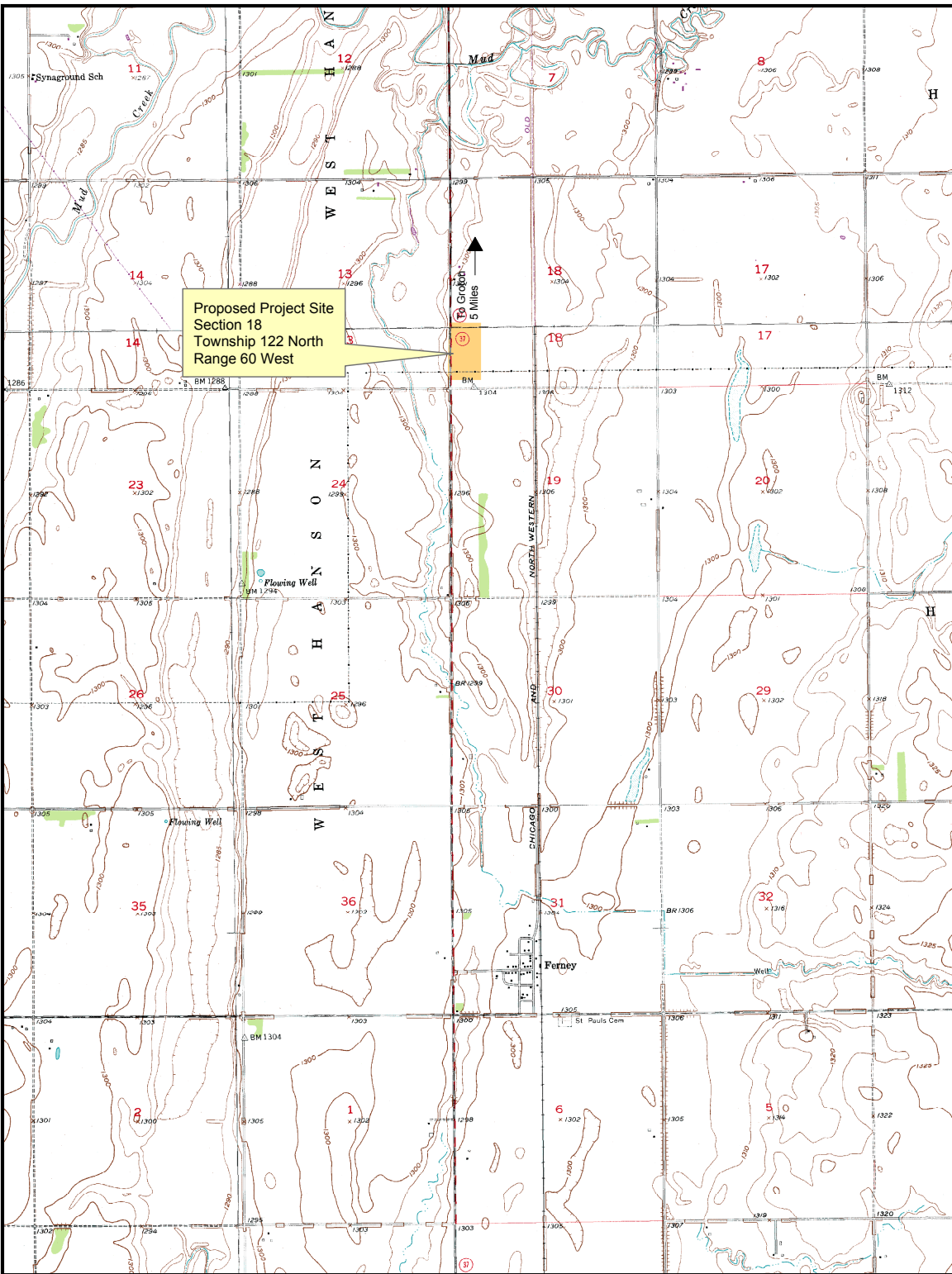
This section describes the site, including the proposed CTG and the general topographic features of the proposed site.

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

The site for the proposed GGS2 Project is located in a predominantly agricultural area, adjacent to the existing CTG at the Groton Generation Station site. The proposed CTG site is 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 8). 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 9, and an aerial photograph, Exhibit 10, show the project area.



26-OCT-2006 N:\ARCP\2010\321\PROJECT\BASIN_GIS\PROJECT\SPICUC061000\EX9_TOPO.MXD



Legend

- Proposed Project Site
- Road
- Stream
- Water
- Railroad

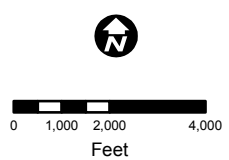



EXHIBIT 9
TOPOGRAPHIC MAP
BASIN ELECTRIC
POWER COOPERATIVE
GROTON GENERATION STATION UNIT 2

26-OCT-2008 N:\ARCP\2010\321\PROJECT\BASIN_GIS\PROJECTS\PUC\PU08\1000\EX10_AIR_PHOTO.MXD



Legend

 Proposed Project Site



2,000 1,000 0 2,000
Feet

EXHIBIT 10
AERIAL PHOTOGRAPH
BASIN ELECTRIC
POWER COOPERATIVE
GROTON GENERATION STATION UNIT 2

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.

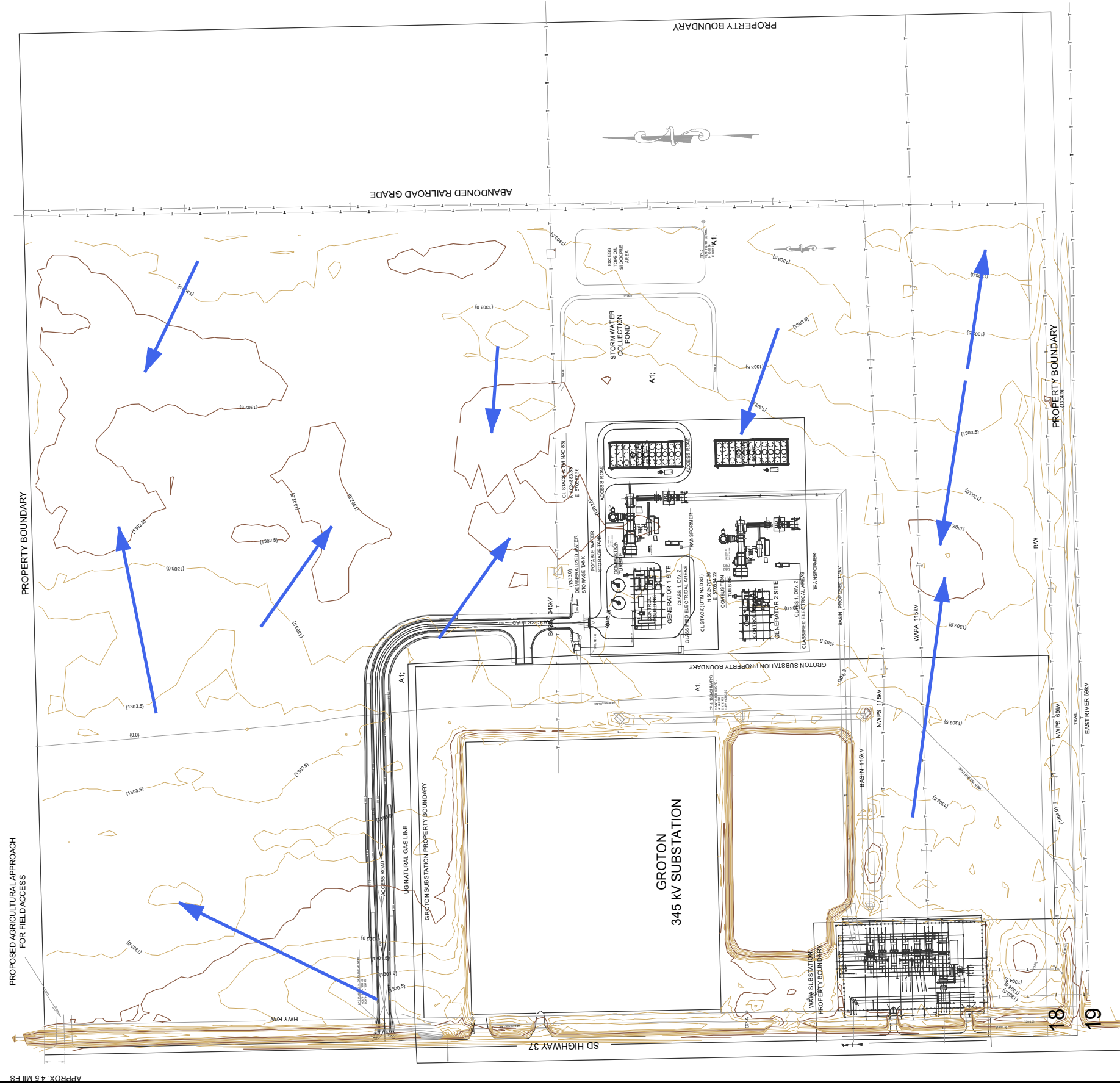
An existing 345 kV transmission line owned by Basin Electric and a 115 kV line owned and operated by Western currently pass within 0.5 mile of the site. The proposed CTG will be constructed on land already owned by Basin Electric, and will be located just east of the Groton 345-kV substation and just south of the existing CTG. The proposed site includes a storm water drainage pond sized to accommodate the two CTGs. 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. During the construction of the original CTG in 2005, approximately 11.5 miles of 10.75-inch diameter underground natural gas pipeline was constructed to supply the CTG. This pipeline will also supply the proposed CTG without modifications.

2.6.2 General Topographic Features of the Project

The elevation is approximately 1,300 feet (400 meters) above mean sea level (msl) at the Groton CTG. The topography of the proposed CTG site is relatively flat. Some rolling hills are in the area. Topographic maps of the proposed project area are provided as Exhibit 9, Exhibit 11, and Exhibit 11A.

2.7 Alternative Sites (SDAR 20:10:22:12)

This section presents the general criteria used to select the Groton site in 2004. The Groton site was also compared to alternative sites in this process and the advantages of the Groton site were clearly presented (Basin Electric 2004c). Based on these evaluations, it is recommended that the proposed GGS2 project be located within the Groton site.



Direction of Surface Drainage

BASIN ELECTRIC
POWER COOPERATIVE
GROTON GENERATION STATION UNIT 2

A vertical scale bar labeled "Feet" is positioned on the right side of the map. The scale has markings at 250, 125, 0, 125, and 250 feet, with the 0 mark in the center.

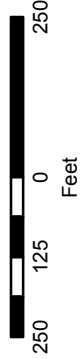


EXHIBIT 11a
SITE LAYOUT ON AERIAL PHOTO
BASIN ELECTRIC
POWER COOPERATIVE
GROTON GENERATION STATION UNIT 2

2.7.1 Evaluation Criteria

During the East Side Peaking Project, Basin Electric systematically evaluated alternatives to the Groton Generation Station site (Basin Electric 2004c). There were several objectives in considering an alternative: access to high voltage transmission system with available capacity, available gas and water supply, low cost, and minimal environmental and public impact:

- 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 CTG, although important, were not considered to be as critical as fuel supply and transmission capabilities.

During the East Side Peaking Project (2004c), an initial screening process followed by a field reconnaissance identified potential alternatives to the proposed Groton site. 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

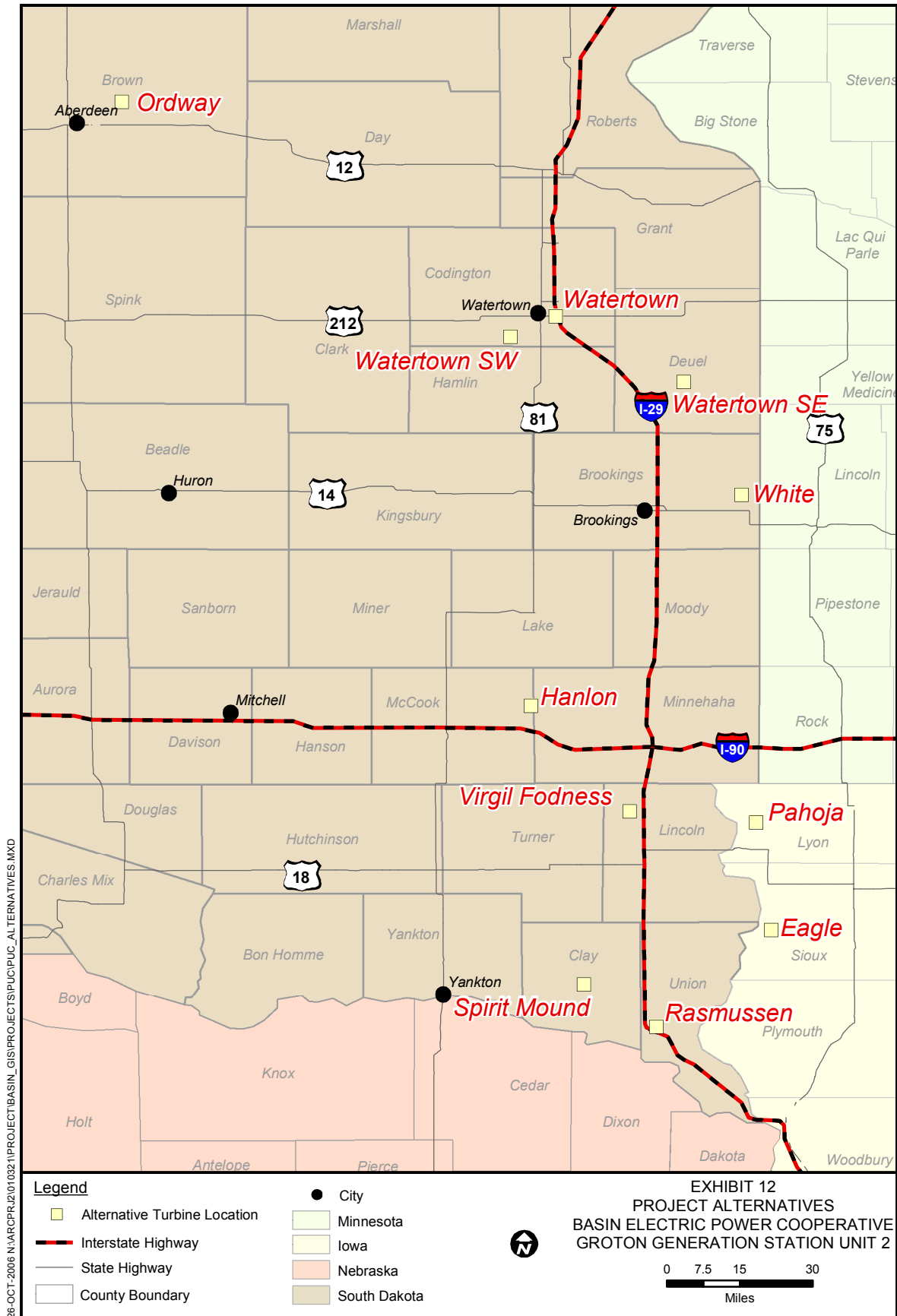
- Minimizing the number of landowners who would be affected
- Minimizing potential impacts to known wetlands, threatened and endangered (T&E) species, sensitive habitats, waters of the U.S., and other environmental resources
- Minimizing costs associated with acquisition, construction, and maintenance
- 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 in 2004

In 2004, 12 potential CTG locations were identified in Basin Electric's East Side, which includes eastern South Dakota and northwestern Iowa (Exhibit 12) (Basin Electric 2004c). 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.

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 the East Side Peaking Project PUC application (Basin Electric 2004c).

An alternative site 27 miles southeast of the city of Watertown, in Deuel County, South Dakota, (Exhibit 12) was evaluated in detail. The site is located in relatively level terrain near the intersection of the Northern Border Pipeline (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 would need to be constructed as part of the project if this alternative were implemented. The lack of a substation at this location was one of the primary reasons for not selecting this site in 2004.



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2.7.3 Advantages of the Groton Generation Station Facility

The evaluation of alternatives in 2004 revealed that the Groton Generation Station site was the only alternative that addressed the needs of Basin Electric and its consumers while minimizing impacts to the environment. Several generation technologies and alternative gas turbine locations were also considered. The Groton Generation Station site was selected because its accessibility, location, and scoring relative to the selection criteria chosen were comparable or superior to the other alternatives evaluated. The Groton site 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 Groton site 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 original CTG is located on land owned by Basin Electric. The majority of the pipeline was constructed in existing rights-of-way (ROW) reducing potential reliance on eminent domain powers. Based on all of these advantages, it is recommended that the proposed GGS2 project be located within the existing Groton site.

2.8 Environmental Information (SDAR 20:10:22:13)

Basin Electric has completed a South Dakota Environmental Impact Statement (SDEIS) for the proposed GGS2 Project that is located in Appendix A of this application. The existing environment is described in detail in Section 3.0 of the SDEIS. Estimates of the changes and impacts to the existing environment from activities associated with construction and maintenance of the proposed GGS2 unit are also discussed in detail in Section 3.0 of the SDEIS (Appendix A).

The proposed GGS2 site will be located on property owned by Basin Electric just east of the existing Groton 345 kV substation (Exhibit 11). A Western 115 kV substation is also adjacent to the proposed site. The proposed alignment for the underground gas pipeline minimized 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 SDEIS (Appendix A) demonstrates that the proposed GGS2 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 GGS2 facility on the physical environment.

2.9.1 Regional Land Forms

The proposed GGS2 project will use the existing level to nearly level terrain for the construction of the second CTG unit at the Groton site. The grading and earthmoving required is not significant because the site is nearly level and not located in an area susceptible to flooding (United States Department of Agriculture (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 9. Modifications to approximately 15 acres of cultivated farm fields were associated with grading an area for the generator pad and establishing drainage of storm water across and around the original site. A retention pond for site surface runoff water and non-contact cooling water was also constructed.

The original and proposed CTG sites within the Groton Generation Station site 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 was required. No direct, indirect, or cumulative impacts to topography were associated with the construction of the original project or are anticipated by the construction of the GGS2 project.

2.9.3 Geologic Features

The GGS2 and original 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 13).

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).

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 14).

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 County (USDA 1994, 1997). The proposed project is located in an area of poor probability of sand and gravel occurrence (Koch and Bradford 1976).

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 are 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).

2.9.6 Potential for Erosion and Sedimentation

Impacts to soils from the proposed GGS2 project would be insignificant. Direct impacts to soils within the CTG site 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 proposed CTG could be susceptible to erosion. The impacts from erosion are a function of the local soil type and the amount of clearing required. 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. Construction practices to minimize impacts to soil resources are provided in more detail in the SDEIS (Appendix A).

2.9.7 Seismic Risks, Subsidence Potential, and Slope Instability

Seismic hazards in the proposed GGS2 project area 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 CTG within the Groton site. As a result, no direct, indirect, or cumulative impacts to geological resources are anticipated by the proposed project.

Basin Electric's proposed GGS2 project 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 GGS2 project.

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 GGS2 project on surface water and groundwater.

2.10.1 Hydrologic Information and Map

The proposed site is relatively flat with only one foot of relief across the approximately 15 acre area to be occupied. To facilitate drainage around the proposed CTG as well as the existing CTG, an area of approximately five acres was built up and graded to drain storm water off the site to a shallow retention pond. The retention pond was 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 water is currently dissipated through a combination of evaporation and percolation. Water is routed to the pond by open drainage ditches, a collection of sump and pump or a combination of both. Exhibit 11 presents surface water drainage patterns near the proposed GGS2 site.

No mapped surface water bodies are within the area of the proposed GGS2 site (USDA 1994). 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 one mile north of the proposed GGS2 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 corridor may include impounded stock ponds in pastureland and ephemeral streams and drainages. 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 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 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 site is not located within a 100-year floodplain.

The proposed Groton 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 the proposed CTG 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 CTGs are 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 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 three feet and 17 feet, depending on the specific location. The water levels in most locations within the Lake Dakota Plain fluctuate less than six feet. The depth to ground water ranges from ground surface to 27 feet below ground 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 and Bradford 1976.)

No significant direct, indirect, or cumulative impacts to groundwater quality from the proposed GGS2 project are anticipated. Subsurface activities will be required to install the gas connection lines to sufficient depth. However, the existing gas pipeline penetrates only about four 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

The WEB Water Development Association in Aberdeen, South Dakota, provides all of the water for the Groton facility from an existing 12-inch rural water distribution pipeline that is adjacent to the site. Implementing the proposed GGS2 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

The WEB Water Development Association in Aberdeen, South Dakota, will provide the water for the proposed GGS2 CTG unit. The proposed GGS2 project 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 11.

2.10.4 Aquifer Use by Proposed Facility

Groundwater will not be used for the proposed GGS2 CTG project. The 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 GGS2 CTG unit.

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 GGS2 project. More detailed information from biological field surveys conducted to identify and quantify the terrestrial fauna and flora that may be affected by the proposed GGS2 project is discussed in Section 3 of the SDEIS in Appendix A of this PUC application. The impact of construction and operation of the proposed GGS2 project on the terrestrial biotic environment is also discussed in Section 3 of the SDEIS (Appendix A).

2.11.1 Effect on Terrestrial Fauna

No threatened, endangered, or candidate animal or plant species were observed in or around the proposed project area. Although the seasonal weather conditions precluded comprehensive direct observation of wildlife, the existing habitats in the project area is 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 area. Additionally, information provided through the South Dakota Natural Heritage Database does not indicate use of the proposed project area by any state or federally

listed species. Table 3-9 in the attached SDEIS (Appendix A) presents a list of rare, threatened, endangered, and candidate species in the study area, and Table 3-8 in the attached SDEIS presents a list of species observed in the proposed project area.

Construction of an additional CTG as part of the GGS2 project would not have significant direct and indirect impacts on wildlife in the proposed area. Short-term construction noise and activities could affect wildlife by temporarily frightening them from the area. However, nearby habitat in the area is suitable to support any wildlife temporarily displaced by construction of the proposed 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 the proposed project area are expected to be insignificant since the majority of the acreage for proposed GGS2 unit is within the existing substation industrial area. Cultivated cropland and farming are the principal land uses in the overall area surrounding the Groton Generation Station. Table 3-7 in the attached SDEIS (Appendix A) presents a list of plant species observed in the proposed project area.

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

- Staging areas for equipment and material near the proposed CTG site
- Performing geotechnical investigations

These short-term disturbances would be reclaimed soon after construction is completed.

Although unlikely for the GGS2 project, long-term direct impacts could be caused by:

- Clearing, grubbing, grading, and constructing the facilities that are associated with the proposed CTG
- Installing additional culverts and fill materials to improve access to the 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 site is, however, located on level to nearly level terrain that is not subject to flooding.

Cumulative impacts to vegetation are insignificant because the proposed CTG site has already been graded. The primary land use in the overall 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 GGS2 project. Existing information from biological surveys conducted to identify and quantify the aquatic fauna and flora that may be affected within the GGS2 site are discussed in more detail in Section 3 of the SDEIS in Appendix A of this PUC application. The impact of construction and operation of the proposed CTG on the aquatic biotic environment is also discussed in Section 3 of the SDEIS (Appendix A).

The proposed CTG is 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. Access to the proposed CTG will be from the existing roads, thus minimizing all impacts to any nearby wetland areas.

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 CTG site.

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

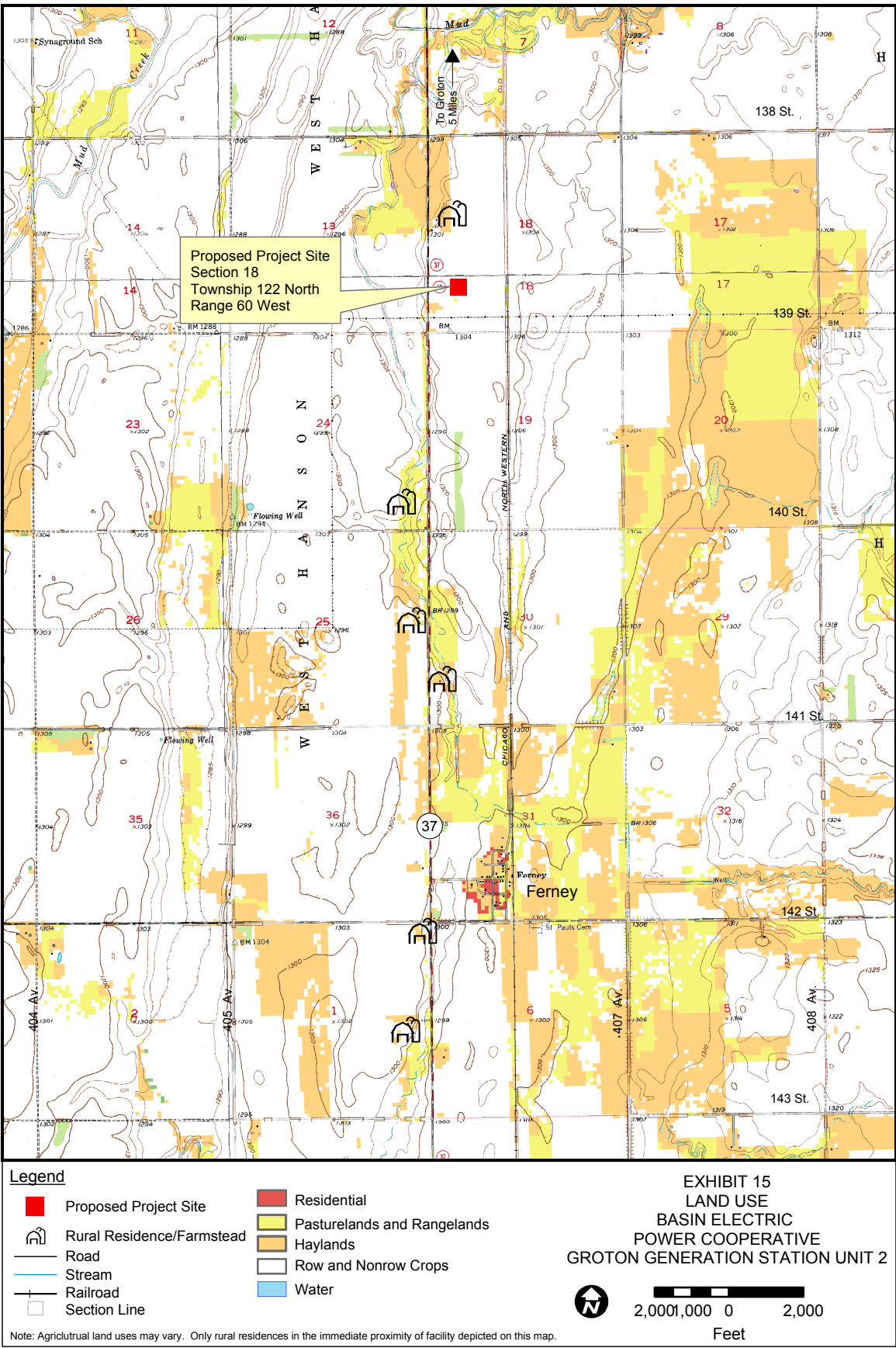
This section describes the land use in the affected environment and includes general and agricultural land use and formally classified lands. The land use study area is defined as the proposed GGS2 site within the Groton facility in Brown County. Exhibit 15 shows current land use in and around the proposed CTG.

The proposed CTG will encompass approximately five acres of land. The proposed GGS2 CTG site will occupy an existing industrial site; therefore, other land uses such as right-of-way, commercial transportation, or agricultural-related land uses are not directly affected by the proposed project. The proposed CTG 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 (Hwy) 37.

Farming is the principal enterprise near the Groton Generation Station in Brown County, South Dakota. 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 GGS2 facility does not contain any land that is formally classified or administered by federal or state governments. Prime farmland has been designated in Brown County; however, no prime farmland exists in the project area (USDA 1994).

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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 GGS2 facility.

2.13.3 Land Use Compatibility

The proposed CTG is compatible with the present land uses of the surrounding area. The proposed CTG will be constructed on land currently owned by Basin Electric and will be adjacent to an existing substation site. The addition of the second CTG to the area will 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 proposed CTG facility.

2.13.4 Effect on Land Use

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

Surface disturbance caused by construction of the proposed CTG facility would be minimal because the site has already been graded.

2.14 Local Land Use Controls (SDAR 20:10:22:19)

The proposed CTG occupies private land and is regulated under local land use plans and ordinances. The following are specific measures that will be adopted to protect land use in the area of the proposed 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.
- 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 County was 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 energy conversion facilities. The Application for Variance was approved by the Brown County Planning and Zoning Commission and is presented in Appendix C.

2.15 Water Quality (SDAR 20:10:22:20)

Construction of the GGS2 CTG site will comply with all applicable federal, state, and local permits required for alteration of wetlands, streams, or rivers from the project. Although some of the following may not be applicable to the proposed GGS2 site, these are specific measures that need to be adopted to protect water quality in a 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 second CTG will comply with all applicable federal, state, and local permits required to protect air quality. Basin Electric is proposing that the operation of two combustion turbines at the Groton Generating Facility will not produce higher annual emissions than those currently permitted for one turbine in permit number 28.0802-03. Dispersion modeling was used to estimate the air quality impact of potential emissions of NO_x and carbon monoxide (CO) from both CTGs at 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 2005). Modeling was conducted to demonstrate that potential air pollution impacts from the generators 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 both of the combustion turbines 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_x. The proposed CTG 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 and southeast of the site. Exhibit 16 compares the PSD significance levels and NAAQS with maximum-modeled concentrations.

Particulate emissions associated with construction of the second CTG 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 area, 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.

Particulate matter less than 10 microns (PM₁₀) 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)

Appendix E presents the proposed project schedule.

EXHIBIT 16
GROTON GENERATION STATION PROJECT
BASIN ELECTRIC POWER COOPERATIVE
DISPERSION MODELING RESULTS

Scenario #	Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$)		
	Annual NO_x	1-Hour CO	8-Hour CO
Scenario 1	0.21	16.50	5.56
Scenario 2	0.22	16.25	5.57
Scenario 3	0.22	14.87	5.39
Scenario 4	0.21	16.36	5.54
Scenario 5	0.21	16.04	5.47
Scenario 6	0.22	14.70	5.30
Scenario 7	0.20	15.70	5.25
Scenario 8	0.21	15.81	5.34
Scenario 9	0.21	14.52	5.18
Scenario 10	0.19	15.41	5.14
Scenario 11	0.21	15.59	5.26
Scenario 12	0.21	14.32	5.11
Scenario 13	0.19	15.18	5.04
Scenario 14	0.20	15.19	5.14
Scenario 15	0.20	13.87	5.00
Scenario 16	0.19	14.81	4.89
Scenario 17	0.20	14.65	4.96
Scenario 18	0.19	13.18	4.81
Prevention of Significant Deterioration Significance Level	1	2,000	500
National Ambient Air Quality Standard	100	40,000	10,000

Notes:

$\mu\text{g}/\text{m}^3$ Micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

General Electric Engineer, Procure and Construct (EPC) Contract

The major contract for the work is an EPC contract with a consortium consisting of GE, The Industrial Company (TIC), and Lockwood Greene (LG). The contract requires General Electric (GE) to supply the CTG and balance of plant (BOP) equipment, including testing and startup. TIC will provide all construction labor and materials. LG will provide BOP engineering. This contract was issued in November 2006.

Transmission Engineering and Construction Contract

There is no contract associated with transmission lines to the substation since Basin will perform the work.

2.18 Community Impact (SDAR 20:10:22:23)

This section identifies and analyzes the effects of construction, operation, and maintenance of the proposed facility 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 3 of the SDEIS 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 GGS2 CTG facility. 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 second CTG 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 second CTG 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 facility. However, increased tax revenue would be realized without significant increase in the demand for county services.

2.18.3 Forecast of Agricultural Impacts

Short-term impacts to agriculture are expected to be minimal because the proposed GGS2 project site has already been graded and is not used for agriculture.

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 County in 2005 was estimated at 34,706 (Census 2006) 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 Brown 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 Hwy 37. Evergreen and deciduous trees are planted along the southern side of the residence (Exhibit 11A). 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 presented in Appendix F show that the late-night sound levels are below 50 A-weighted decibels (dBA) and that daytime values are typically between 50 and 79 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 50- to 55-dBA range during the day. 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. 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:

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

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 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.

$$\begin{aligned}\text{SPL2} &= 65 - 20\log(1700/400) \\ \text{SPL2} &= 65 - 12.57 \\ \text{SPL2} &= 52.43\end{aligned}$$

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 52 to 54 dBA at the nearest residence, some 1,700 feet away. The estimated noise level is dependent on the exact configuration of the equipment, weather, air absorption, ground attenuation effects, and barriers and reflections. 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. Given that the proposed GGS2 Project is even further away from the closest residence, the new CTG is not predicted to have noise impacts for this residence or any other residences in the area. 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 GGS2 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 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 et. al. 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. If needed, right-of-way surveying and staking, vegetation clearing, construction, and operation and maintenance of the proposed facility 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 project 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 (DOT) 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 3 of the SDEIS 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 the proposed

site. 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 3-12 in the SDEIS (Appendix A) lists employment by industry for Brown County (Census 2006). 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 three to five months
- Structural discipline — with iron workers, welders, apprentices and laborers, about 15 to 20 employees for a duration of three to four months
- Mechanical discipline — with millwrights, mechanics, apprentices and laborers, about 15 to 25 employees for a duration of three to five months
- Electrical discipline — with electricians, apprentices and laborers, about 25 to 35 employees for a duration of six to eight 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 four to five personnel. Local hires for all disciplines are estimated at 40 to 60 percent of total employment.
- Subcontractors from local firms will vary from civil testing, quality assurance/quality control for pipe and, painters, sheet rockers, and steel erection for building services, along will communications and data.
- Civil discipline: six employees for one month
- Iron workers: six employees for one month
- Electrical discipline with electricians, apprentices, and laborers: 10 employees for two months

Transmission Interconnection and Substation Modifications Employment Estimate

The transmission interconnection and substation modifications will be completed by Basin Electric Transmission System Maintenance (TSM) employees and Western employees so this work will have no impact on local employment. The anticipated workforce needed from Brown County 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 proposed 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, via the approximately 11.5 miles of existing branch pipeline. Basin Electric owns and operates this pipeline. Transmission interconnection will be with the Western 115 kV substation adjacent to the site, thus requiring minimal (less than ½ mile) of additional 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 five and 15 percent.

2.21.2 General Description

The proposed CTG is a GE Aero LMS100 dual fuel-capable gas turbine designed for outdoor installation. This is identical to the existing CTG that was installed in 2005. The LMS100 is a relatively new GE design, which is 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 LPC 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, and 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 second CTG, associated control building, and associated equipment will be built on site. The site includes 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 11 and 11A present a general description of the proposed facility.

2.21.3 Materials Flowing Into the Facility

The materials flowing into the second CTG 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 52 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 200 gallons per minute (GPM) of water. The water will be provided by WEB Water Development Association, located in Aberdeen, South Dakota. The CTG 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 for the proposed facility 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 proposed CTG facility along with the existing 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 proposed CTG 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 proposed 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 17 presents the chemical analysis of the proposed fuel for the proposed CTG.

EXHIBIT 17
GROTON GENERATION STATION 2 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)

The existing pipeline was 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 not only the existing CTG but also the proposed CTG with natural gas from the existing NBPL. The route for the existing gas pipeline begins at the NBPL Section 13, Township 120 North, Range 61 West, in Spink County, South Dakota and terminates at the Groton Generation Station in Section 18, Township 122 North, Range 60 West, in Brown County, South Dakota (Exhibits 9 and 10).

The proposed CTG 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 proposed 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 GGS2 Project is required to meet the growing needs for power of Basin Electric's membership in its service territory. The GGS2 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 proposed CTG 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 18:

EXHIBIT 18
GROTON GENERATION STATION 2 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 Decommissioning (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 disposed 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 \$2.5 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 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
GROTON GENERATION STATION 2 PROJECT
SOUTH DAKOTA PUC APPLICATION
BASIN ELECTRIC POWER COOPERATIVE
LIST OF PREPARERS FOR PUBLIC UTILITIES COMMISSION APPLICATION

Name	Education and Experience	Responsibility
<u>Tetra Tech</u>		
Robert Hammer	M.S, B.S., Meteorology 19 Years Experience	Project Manager
Bob Farnes	B.A. Geography 16 Years Experience	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
David Kane	Ph. D. Conservation Biology & Ecology B.S. Wildlife Ecology 20 Years Experience	SDEIS
Chad Lupp	B.A. Environmental Studies 7 Years Experience	Maps, Figures, Spatial Analysis
Sara Stonehill	B.A. Environmental Science 4 Years Experience	Air Quality
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
Dan Pastor	M.S. Environmental Engineering B.S. Civil Engineering 17 Years Experience	Technical Review
<u>ACR Consultants Inc.</u>		
Donna Stubbs	M.S. Interdisciplinary Archaeological Studies and Museum Studies 7 Years Experience	Cultural Resources

EXHIBIT 19
GROTON GENERATION STATION 2 PROJECT
SOUTH DAKOTA PUC APPLICATION
BASIN ELECTRIC POWER COOPERATIVE
LIST OF PREPARERS FOR PUBLIC UTILITIES COMMISSION APPLICATION
(Cont.)

Name	Education and Experience	Responsibility
<u>Basin Electric Power Cooperative</u>		
Jim Berg	Certified Professional Geologist B.S. Geology 22 Years Experience	Oversight, Project Description, Need for Project
Dick Shaffer	Registered P.E. B.S. Mechanical Engineering 36 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.
- Basin Electric. 2004c. South Dakota Public Utilities Commission Application for the East Side Peaking Project. Basin Electric Power Cooperative, Bismarck, North Dakota. December.
- Burns & McDonnell. 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.
- Koch, N. and W. Bradford. 1976. Major Geology and Water Resources in Brown County, South Dakota. Bulletin 25, Part II. 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.
- 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 Hwy 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. Census Bureau (Census). 2006. Population and other demographics for various years. Accessed on October 20, 2006. 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. 2005. "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>.