Environmental Assessment
Southern Black Hills Water System Argyle Road Service Area
Special Use Permit

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ACRONYMS

AMSL	Above Mean Sea Level
ARSD	Administrative Rules of South Dakota
BLM	Bureau of Land Management
CEQ	Council of Environmental Quality
cfs	Cubic Feet per Second
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
ft^2/d	Square Foot per Day
gpd	Gallons per Day
gpm	Gallons per Minute
GHG	Greenhouse Gas
MAs	Management Areas
MIS	Management Indicator Species
MUSYA	Multiple-Use Sustained Yield Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
OAA	Organic Administration Act
psi	Pounds per Square Inch
R2	Rocky Mountain Region
RD	Rural Development
RESPEC	RESPEC Consulting & Services
RPA	Forest and Rangeland Renewable Resources Act
SARC	State Archeological Research Center
SBHWS	Southern Black Hills Water System
SDCL	South Dakota Codified Law
SD DENR	South Dakota Department of Environment and Natural Resources
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office
SOLC	Species of Local Concern
SWRMS	State Water Resource Management System
THPO	Tribal Historic Preservation Office
USDA	United States Department of Agriculture
USGS	United States Geological Survey

GLOSSARY OF TERMS

Adequate well – A well that has been constructed to allow the inlet to the pump to be placed not less than 20 feet into the saturated aquifer or to allow the pump to be placed as near to the bottom of the aquifer as is practical if the aquifer thickness is less than 20 feet. (ARSD 74:02:04:20)

Adversely impacted domestic well – A domestic well that has been constructed according to the definition of an adequate well and the water level of the aquifer has declined to a level that the well's pump no longer delivers sufficient water for the well owner's needs.

Anisotropy – The property of being directionally dependent, as opposed to isotropy, which implies identical properties in all directions. A difference, when measured along different axes, in a material's physical or mechanical properties.

Aquifer –A geologic formation, or part of a group of formations, that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Aquifer pumping test (pump test) – A field test by which a well is pumped for a period of time and data are collected for use in assessing characteristics of subsurface water-bearing zones (aquifers).

Artesian spring – A free-flowing spring. A spring whose water is under pressure, generally through some opening in a confining layer over an aquifer.

Artesian well – A well in which pressurized water naturally rises to above the top of the aquifer.

Batholith – A large body of igneous rock formed beneath the Earth's surface by the intrusion and solidification of magma.

Confined aquifer – An aquifer that contains water that would rise above the top of the aquifer in a penetrating well. Also known as an artesian aquifer.

Confining layer – An impermeable layer underground composed of geologic material through which water does not move, or moves very slowly and in small quantities.

Direct effects – Results of an action occurring when and where that action takes place.

Discharge – The volume rate of water flow. Rate of fluid flow passing a given point at a given moment in time, expressed as volume of water per unit of time, such as cubic feet per second (cfs) or gallons per minute (gpm).

Floodplain – Flat or nearly flat land adjacent to a stream that stretches from the banks of the stream channel to the base of the enclosing valley and experiences flooding during periods of high discharge.

Groundwater – Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled, and where the upper surface level forms the water table.

Groundwater elevation – The elevation above mean sea level of the water table within an aquifer.

Groundwater elevation contours – Lines of equal water table elevation for an aquifer. When mapped, groundwater elevation contours can be used to derive the generalized direction of groundwater flow within an aquifer. Also known as potentiometric surface contours.

Groundwater flow path – An underground route for groundwater movement, extending from a recharge zone (such as a rock outcrop) to a discharge zone (such as a stream or a spring).

Heterogeneity – Lack of uniformity in the composition or character of a substance. In the context of an aquifer, heterogeneity indicates that aquifer properties such as transmissivity and storage coefficient vary considerably within the aquifer.

Homogeneity – Uniformity in the composition or character of a substance.

Hydraulic gradient – A vector gradient between two or more hydraulic head measurements over the length of the flow path. The difference in hydraulic head at two locations within an aquifer.

Hydraulic head – In an aquifer, the elevation to which water will rise in a properly constructed well. The distribution of hydraulic head through an aquifer determines where groundwater will flow.

Hydraulic pressure (head) – A measurement of water pressure, typically measured as a water surface elevation, expressed in units of length.

Hydrogeology – A branch of geology concerned with the occurrence, use, and functions of surface water and groundwater.

Indirect effects – Results of an action occurring at a location other than where the action takes place and/or later in time but in the reasonably foreseeable future.

Intermittent stream – An intermittent stream is one that flows from groundwater discharge seasonally, at least over certain stretches of the stream channel. A stream that does not flow continuously, as when water losses from evaporation or seepage exceed the available streamflow.

Isotropy – Exhibiting identical properties or uniformity in all directions. When measured along different axes, no differences in a material's physical or mechanical properties are observed.

Isotope – A variant of an atom of a particular chemical element which has a different number of neutrons.

Karst – A geologic condition that is developed in/over limestone, dolomite, or gypsum by dissolution. It is characterized by sinkholes, caves, and underground drainage.

Karst aquifer – A body of soluble rock (such as limestone, dolomite, or gypsum) that conducts water primarily through a connected network of fractures formed by dissolution of the rock. A karst aquifer may have both primary (intergranular) and secondary (dissolution fracture) porosity.

Karst topography – A landscape that is characterized by numerous caves, sinkholes, fissures, and underground streams. Karst topography forms where bedrock consists of carbonate-rich rock, such as limestone, dolomite, or gypsum, and water is available for dissolution of the rock material over time.

Karstic – Characterized by features of karst topography.

Laminar flow – Horizontal flow of water. Occurs when a fluid flows in parallel layers, with no disruption between the layers.

Madison Aquifer – That part of the Madison Limestone that is saturated with groundwater.

Madison Limestone – A thick sequence of mostly carbonate rocks of Mississippian age in the Rocky Mountain and Great Plains areas of the western United States. The rocks serve as an important aquifer.

Outcrop – That part of a geologic formation that is exposed at the land surface.

Paleosol – A layer of fossilized soil, usually buried beneath layers of rock or more recent soil horizons.

Perennial stream – A stream which contains water at all times except during extreme drought. A stream with base flow.

Permeability – The quality or state of being permeable (having pores or openings that permit liquids or gases to pass through).

Porosity – The quality or state of being porous (having pores). A measure of the void (empty) spaces in a material.

Primary porosity – The main or original porosity in a rock or alluvial deposit.

Recharge – Process by which water moves downward from surface water to groundwater. Groundwater is recharged naturally by rain and snow-melt that soaks into the ground and rock formations, and can eventually reach an aquifer (aquifer recharge).

Sandstone – A sedimentary rock composed of abundant rounded or angular fragments of sand set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material.

Secondary porosity – The porosity developed in a rock after its formation, through such processes as dissolution or fracturing. Secondary porosity often enhances the overall porosity of a rock material, and can coexist with or replace primary porosity. Dual porosity is a term used when primary and secondary porosity exist together.

Sedimentary rock – Rocks resulting from the consolidation of loose sediment that has accumulated in layers. Examples of sedimentary rocks are sandstone, siltstone, limestone, and shale.

Storage coefficient (S) – The volume of water released from an aquifer per one foot surface area per one foot change in head. Measures the ability of an aquifer to store water.

Theis equation – An equation for two-dimensional radial flow of groundwater to a point source in an infinite, homogeneous aquifer.

Transmissivity (T) – The volume of water flowing through a cross-sectional area of an aquifer that is one foot wide times the aquifer thickness, under a hydraulic gradient of one foot by one foot in a given amount of time (usually a day). A measure of how much water can be transmitted horizontally in an aquifer.

Water allocation – Determining the quantity of water from a given source that can or should be ascribed to various instream or out-of-stream uses.

Water budget – The method for measuring the amount of water entering, stored within, and leaving a watershed.

Watershed - The area of land bounded by a divide that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel or to a lake, reservoir, or other body of water. Also called a drainage basin.

Well casing – The tubular lining of a well. Also a steel or plastic pipe installed during construction of a well to prevent collapse of the well hole.

Well log – A detailed record of the geologic formations penetrated by a well borehole and their thicknesses.

Water table – The depth at which rock or soil pore spaces or fractures and voids in rock are completely saturated with water. The upper surface of the groundwater or that level below which the soil is saturated with water.

CHAPTER 1 INTRODUCTION

1.1 Document Structure

RESPEC Consulting & Services (RESPEC) under the direction of the United States Department of Agriculture (USDA) Forest Service Hell Canyon Ranger District has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) of 1970 and other relevant laws and regulations. This EA discloses the direct, indirect, and cumulative environmental effects that would result from the No Action and Modified Proposed Action alternatives. The document is organized into five parts:

Chapter 1 – Introduction: This section includes information on the background of the project, the Purpose and Need for the project, and the decisions to be made. This section also details how the Forest Service informed the public of the proposal, how the public responded, and how issues were developed and analyzed. Key issues are identified and described.

Chapter 2 – Alternatives, Including the Proposed Action: This section provides a detailed description of the Modified Proposed Action and its alternatives. This section also describes alternatives considered but eliminated from detailed analysis. Finally, this section provides a summary table comparing the alternatives with respect to the key issues identified and resources affected.

Chapter 3 – Existing Environment and Environmental Consequences: This section describes the current state of environmental conditions and environmental effects of implementing the No Action alternative and Modified Proposed Action alternative by resource. For each resource, the existing conditions are described, followed by the analysis of the direct, indirect, and cumulative effects of each alternative on the resource. The effects of the No Action alternative are described to provide a baseline for evaluating effects of the Modified Proposed Action alternative.

Chapter 4 – Consultation and Coordination: This section provides a list of the interdisciplinary team members who participated in preparation of this EA.

Chapter 5 – Monitoring Plan: This section describes recommended monitoring plans for water resources and invasive species.

Additional documentation, including more detailed description and analyses of project-area resources, including resource specialist's reports, may be found in the project planning record located at the Hell Canyon Ranger District Office, 330 Mt. Rushmore Rd., Custer, South Dakota.

1.2 Background

The Southern Black Hills Water System (SBHWS) is a non-profit organization incorporated in 2005 with the goal of providing a water system to rural residents of the southern Black Hills area of South Dakota.

The SBHWS has a six-member board that meets monthly. In 2006 the South Dakota State Legislature approved SBHWS for placement on the State Water Resources Management System (SWRMS). The SWRMS identifies large, costly water projects that require specific state or federal authorization and financing, and projects are placed on the SWRMS list when recommended by the State Water Board and approved by the State Legislature and Governor. Figure 1-1 shows the proposed project location and surrounding area. The proposed project is located in Section 24, Township 6 South, Range 4 East, and in and Sections 19, 20, and 29, Township 6 South, Range 5 East, Custer County, South Dakota.

The SBHWS has applied for federal funds and loan guarantees through USDA Rural Development (RD) for the construction of about 80 miles of water pipeline and associated facilities in southern Custer County and northern Fall River County. The proposed project includes two construction phases – Phase I, located in the area east of the project area (Figure 1-1) along Argyle Road, US Highway 385, and 7-11 Road, and Phase II, located in the area west of the project area around Argyle Road and in the area around South Dakota Highway 89. An EA titled "Southern Black Hills Water System North Hot Springs/Argyle Road Service Areas Water Distribution and Storage Project – Environmental Assessment/Report" was written in 2006 for RD and RD issued a Finding of No Significant Impact (FONSI) on July 2, 2008.

Phase II of the water pipeline project crosses National Forest System (NFS) land at two locations, for a total distance of approximately 2.7 miles. The USDA Forest Service must approve the issuance of a special use permit for construction on NFS land. As a component of the permitting process, compliance with NEPA and other relevant laws and regulations is required, and is the reason for this EA.

1.3 Purpose and Need for Action

The purpose and need for action of the Argyle Road Water Pipeline project is to provide potable water to customers along Argyle Road in a manner consistent with Forest Plan direction, and mitigating all resource concerns. A limited number of residents along Argyle Road have access to private wells while many must purchase and/or haul water to fulfill domestic, livestock, and fire protection needs. This water pipeline will provide water for current and future users.

The purpose and need for this project are supported by Goal 8 of the Forest Plan (USDA-Forest Service, 2006a), which is to promote rural development opportunities. Under the Forest Plan, the USDA Forest Service recognizes the importance of promoting sustainable development in cooperation with local, county, state, and Tribal partners and recognizes the nature and extent of local economic dependencies on National Forest activities. The Forest Service will give special attention to resource programs that help diversify rural economies, coordinate with local communities to recognize local goals to maintain desired life styles and social values, and provide appropriate assistance to development groups.

1.4 Modified Proposed Action

During the scoping period for the initial proposed action (October 2009), a pumping rate of 100 to 400 gallons per minute (gpm) was proposed. Comments from scoping identified concerns that the quantity of water proposed for pumping under the Proposed Action could result in adverse effects to

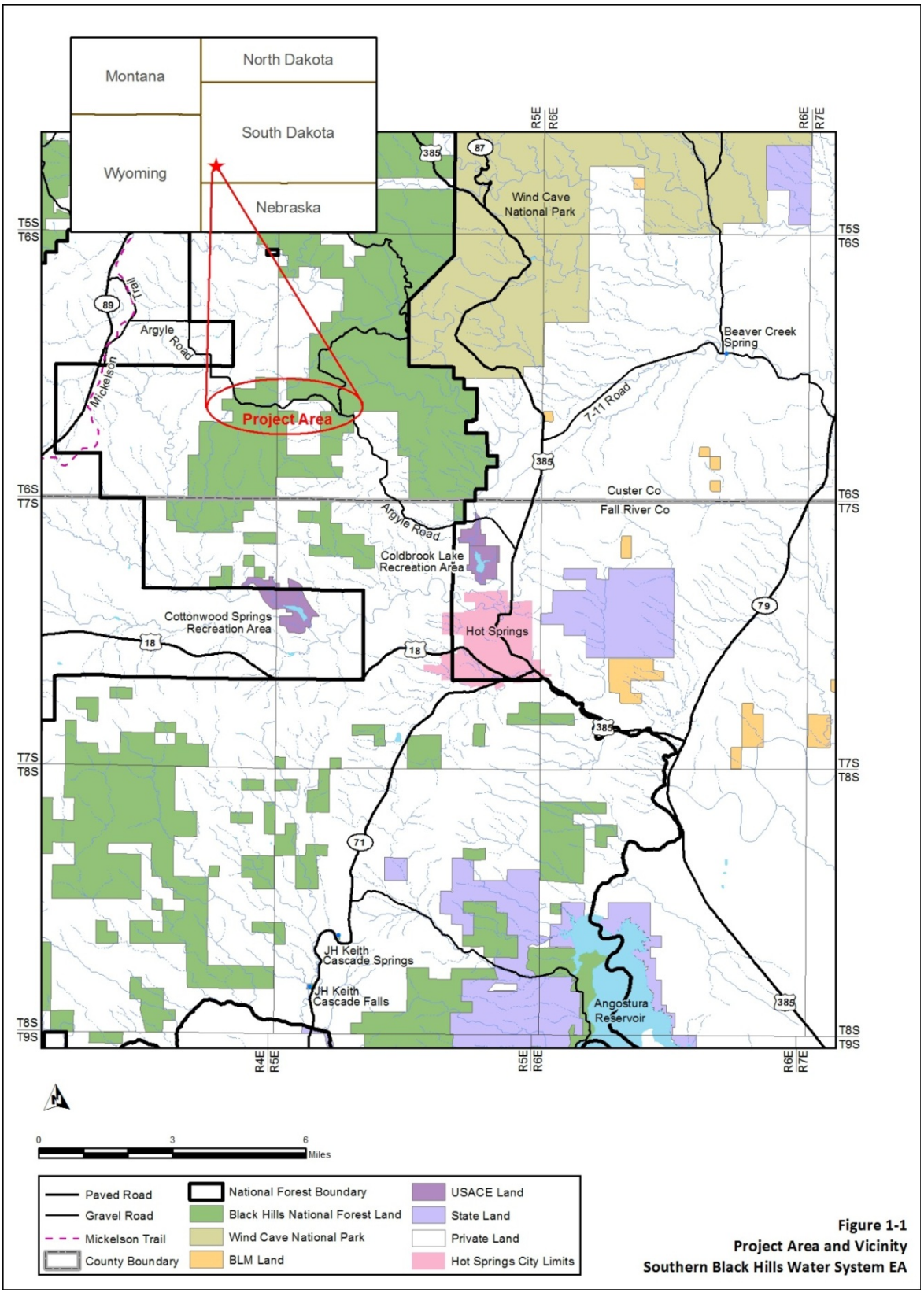

Figure 1-1. Project Area and Vicinity Southern Black Hills Water System EA.

groundwater. The Modified Proposed Action, which limits the pumping capacity to 109 gpm, was requested by the SBHWS.

The Modified Proposed Action is to approve the issuance of a special use construction permit for a 40-foot corridor (approximately 13 acres of disturbance) and maintenance and operations permit for a 20-foot corridor (approximately 6.5 acres of disturbance) to SBHWS for a water transmission pipeline across NFS land. This project is located along Argyle Road, in Custer and Fall River Counties, with approximately 2.7 miles located on NFS land in two segments. The source of water for the pipeline is a Madison Aquifer well and pumping capacity is limited to 109 gpm by state permit. Table 3-5 summarizes design features that would be implemented to monitor and reduce effects to each resource described in Chapter 3 by the Modified Proposed Action.

1.5 Decision Framework

1.5.1 Decisions to be made by Responsible Officials/Authority

After reviewing the Modified Proposed Action, all alternatives and the environmental analysis, and after considering additional public comments, the responsible official, the Black Hills National Forest, Forest Supervisor (Forest Supervisor), will reach a decision that is in accordance with the purpose and need for this project. Based on this EA and information contained in the Project Record, the Forest Supervisor will decide whether to implement the modified action as proposed, including any design features.

The decision to be made is whether to approve installation, operations, and maintenance of a water transmission pipeline across 2.7 miles of NFS lands. This decision is documented in a Decision Notice. A FONSI is used to document that potential impacts are not significant and that preparation of an environmental impact statement (EIS) is not required.

1.5.2 Legal Framework of Decision

The Organic Administration Act of 1897 provides authority for the Forest Service to regulate the occupancy and use of NFS lands. The Multiple-Use Sustained-Yield Act of 1960 (MUSYA) and the National Forest Management Act of 1976 (NFMA) expand the purpose and uses of the NFS lands. The Federal Land Policy and Management Act (FLPMA) provides permitting authority for water pipelines across NFS lands.

NEPA requires that all federal agencies use a systematic interdisciplinary approach in planning and decision making. The NEPA process used by the Forest Service is set forth in the Council of Environmental Quality (CEQ) regulations at 40 CFR 1500-1508, Forest Service Manual (FSM) 1950, and Forest Service Handbook (FSH) 1909.15. Preparation of this EA has been completed in accordance with the referenced laws, regulations, and direction.

1.5.3 Requirements of the Forest Plan

The REVISED Forest Plan, as amended, supported by the final environmental impact statement (FEIS) for the revision and the Phase II Amendment (USDA-Forest Service 1996a, 2005a, 2006a), is the forest

programmatic document required by the rules implementing the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) as amended by the NFMA. The purpose of the amended Forest Plan is to provide direction for the multiple use of and sustained yield of goods and services from NFS lands in an environmentally sound manner.

The Forest Plan establishes Goals, Objectives, Standards, and Guidelines for forest management. Goals are broad general terms that define the desired end results of forest management. Objectives are tied to each Goal and represent measurable desired results and desired resource conditions. Objectives provide a means to evaluate forest management performance. Standards are mandatory limitations on Forest Service management actions. The Forest Service may not deviate from Standards unless the Forest Plan is amended. Guidelines are similar to Standards; however, the Forest Service may depart from Guidelines provided the action meets the overall Goals and Objectives established in the Forest Plan, and rationale for deviation is documented by the decision maker.

The Forest Plan identifies 11 Goals, each with associated Objectives, for multiple-use management of the Black Hills National Forest. Goals 1, 2, and 8 provide management emphasis and direction applicable to the issuance of a special use permit to the SBHWS, as follows:

Goal 1. Protect basic soil, air, water, and cave resources.
Goal 2. Provide for a variety of life though management of biologically diverse ecosystems.
Goal 8. Promote rural development opportunities.

Goals 1, 2, and 8 are described below. Forest Plan Objectives, Standards, and Guidelines designed to protect or manage specific resources are detailed in Chapter 3 under each resource.

Goal 1. Protect basic soil, air, water and cave resources.
Soil, water, and air provide the framework for health of the forest and regional watershed areas. Caves are unique resources that provide habitat for species not found elsewhere and provide conduits for groundwater flowing from one surface watershed to another. Congress has recognized the importance of these resources to long-term national well-being and, in keeping with the direction from Congress, the Black Hills National Forest will be managed so that the rivers, streams, wetlands, lakes, riparian areas, and caves of the Forest reflect healthy, functioning ecosystems. Water conditions on the Forest will be of a quality and quantity to enable them to contribute to municipal water supplies for citizens surrounding the Black Hills, including those using the Madison Aquifer. Caves classified as “significant” under the provisions of the Federal Cave Resources Protection Act of 1988 will be protected (USDA-Forest Service 2006a). Lacking any “significant cave” determination, all caves on the National Forest will be managed as significant.

Goal 2. Provide for a variety of life through management of biologically diverse ecosystems.
There is a diverse array of plants and animals in the Black Hills. Congress has recognized the importance of biological diversity and, in keeping with the direction from Congress, the Black Hills National Forest will be managed to retain or expand important and/or limited forest components. Habitat for the existing winter bald eagle population will be conserved and potential nesting habitat will be available

should their breeding range expand. Potential habitat for sensitive species is identified and ample habitat will be conserved to minimize the potential for federal listing (USDA-Forest Service 2006a).

The Forest Plan also defines Management Areas (MAs) within the Black Hills National Forest. These are areas where differing types of resource and use opportunities are available. The Forest Plan defines additional direction on desired conditions for each MA. The project area for the special use permit is located in two MAs (Figure 1-2):

MA 5.1A	Southern Hills Forest and Grassland Areas
MA 5.4	Big Game Winter Range Emphasis

MA 5.1A is managed for sustainability of the physical, biological, and visual values associated with areas of woody vegetation and open grassland. Habitat and vegetation are managed to achieve and maintain the desired conditions for wildlife, livestock, and vegetation. MA 5.4 is managed to provide high-quality winter and transitional habitat for deer and elk, high-quality turkey habitat, habitat for other species, and a variety of multiple uses.

Goal 8. Promote rural development opportunities.

Rural communities are rising to the challenge of diversifying their economies. In the Forest Service, contributions to rural development are accomplished through partnerships. Under the Forest Plan, the Forest Service recognizes the importance of promoting sustainable development in cooperation with local, county, state, and Tribal partners and recognizes the nature and extent of local economic dependencies on National Forest activities. The Forest Service will give special attention to resource programs that help diversify rural economies, coordinate with local communities to recognize local goals to maintain desired life styles and social values, and provide appropriate assistance to development groups.

1.5.4 Requirements of State Water Right Permits

Water laws and rules in South Dakota are governed by South Dakota Codified Law (SDCL) and the Administrative Rules of South Dakota (ARSD). Water right permits are issued by the South Dakota Department of Natural Resources Water Rights Program. The Water Rights Program manages water rights in the state by monitoring groundwater levels in over 1,600 observation wells, monitoring stream flows using 52 gauging stations, and by collecting annual water use data. This information is used to determine whether water is available to meet existing and proposed water uses and to manage water resources during drought conditions.

The source of water for the proposed water pipeline is a Madison Aquifer well. Three water permits have been issued to the well owner, Mr. Eben W. Streeter. When issued, a water permit may list qualifications to maintain the permit. Water Permit No. 2634-2, authorized on February 18, 2009, authorized the connection of the SBHWS to a pre-existing water system that distributes water from an existing well. The well is authorized to appropriate 109 gpm. The permit specifies under the

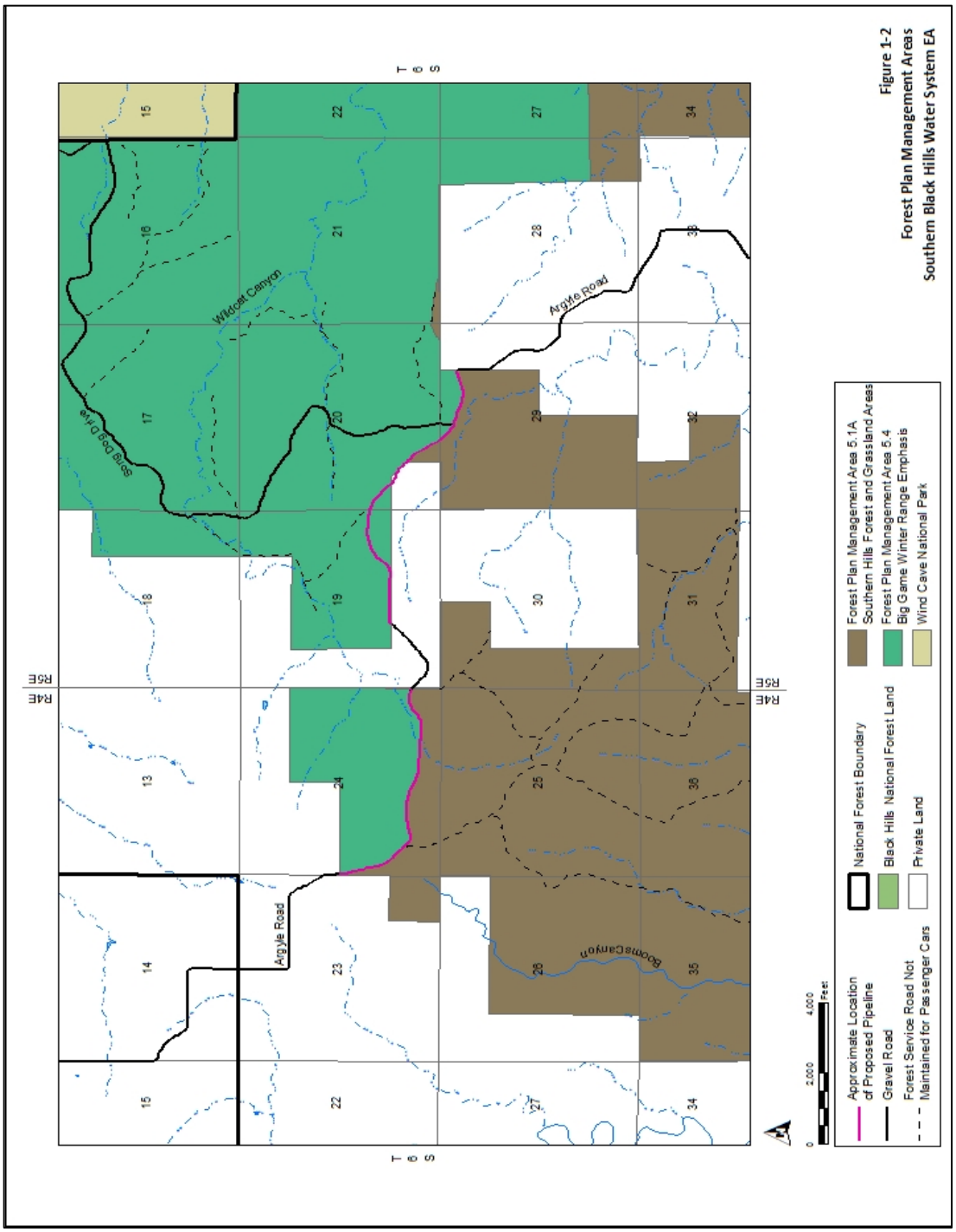

Figure 1-2. Forest Plan Management Areas, Southern Black Hills Waster System EA.

qualifications that the well owner will control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

As defined by the State of South Dakota, an adequate well is a well that has been constructed to allow the inlet to the pump to be placed not less than 20 feet into the saturated aquifer or to allow the pump to be placed as near to the bottom of the aquifer as is practical if the aquifer thickness is less than 20 feet (ARSD 74:02:04:20). A domestic well is defined as adversely impacted if it has been constructed according to the definition of an adequate well and the water level of the aquifer has declined to a level that the well's pump no longer delivers sufficient water for the well owner's needs.

Water Permit No. 2634-2 also specifies that the permit holder will report annually, to the State of South Dakota, the amount of water withdrawn. In addition, the permit specifies that the SBHWS cannot begin construction beyond Phase I and II until an alternative water source is obtained and developed, at which point the well's use must be restricted to use as a standby water source for SBHWS.

1.6 Public Involvement

Public involvement is an integral part of the Forest Service decision-making process and an important component of scoping, a process used to narrow the focus of the EA. The purpose of scoping is to identify public concerns, agency concerns, and information sources to be used in developing alternatives and conducting effects analysis. The scoping process is defined by the Council on Environmental Quality (CEQ, Regulation 1501.7) as "… an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action."

Public scoping of the SBHWS Argyle Road service area special use permit EA was initiated with the development of a written description of the Proposed Action. A scoping package was then prepared consisting of a cover letter from the District Ranger of the Hell Canyon District of the Black Hills National Forest, a description of the proposal, a location map, and a site map. The description of the proposal contained explicit instructions on how to submit comments or identify issues.

The scoping package was mailed by the Forest Service to 116 individuals and organizations on October 6, 2009. The scoping mailing list (Appendix I) was developed from the Hell Canyon Ranger District scoping list and included individuals and organizations who have expressed an interest in commenting on projects within the District, area government representatives and agencies, Tribal organizations, adjacent landowners, and organizations representing various environmental and industrial interests. In addition, the Forest Service discussed the project internally to identify resource issues that needed to be analyzed based on laws, regulations, and existing information on resources within the project area.

The Forest Service requested comments to be submitted by November 6, 2009. The Forest Service published a "Scoping Request: Southern Black Hills Water System – Argyle Road Water Pipeline" notice in the Rapid City Journal on October 7, 2009, in the Custer County Chronicle on October 14, 2009, and the Hot Springs Star on October 13, 2009. A notice for public scoping comments was also placed on the Black Hills National Forest website. Seventeen written comment letters or forms were received. Public scoping comments received from the scoping request are provided in Appendix II.

1.7 Issues

Issues identified and considered included issues raised during the public scoping process and issues developed by Forest Service resource specialists and their contractors. CEQ regulations at 40 CFR Sec. 1500.4 and 1501.7 require that the EA emphasize issues that are directly applicable and relevant to each of the alternatives presented in the assessment, including the No Action alternative. By focusing the analysis on issues that may affect resources, the pertinent differences between alternatives can be effectively identified.

Measurement indicators and corresponding threshold values are presented in the following section for each issue. Measurement indicators are developed as a means to compare and quantify potential effects on the various resource areas and how well each alternative addresses the issues.

Issue #1: The volume of water involved with this project and the potential effects on water quantity available to other uses.

Comments from scoping identified concern that the Proposed Action could result in adverse effects to groundwater, specifically private water wells, the cave lakes of Wind Cave National Park, and as contributions to water flow in Beaver Creek. The USDA Forest Service also identified as a concern the effect of pumping on water features on National Forest land. In response to these concerns, a Modified Proposed Action was developed. The analysis completed in this EA is based on a withdrawal of 109 gpm from the Madison Aquifer. Withdrawals exceeding 109 gpm are outside the scope of this analysis.

The first measurement indicator for this issue is flow from the well into the water pipeline in gpm. The threshold for this measurement indicator is 109 gpm, the maximum pumping capacity of the water source for the pipeline as specified in the Modified Proposed Action. The second measurement indicator is water fluctuations in the Madison Aquifer. The threshold for this measurement indicator is whether there are adverse impacts to domestic wells from the withdrawal of water from the Madison Aquifer for the pipeline. The third measurement indicator is leakage from the water pipeline on NFS lands. The threshold for this measurement indicator is loss of water from the pipeline as is crosses NFS lands. Establishing a monitoring plan to measure flow from the well into the water pipeline, water fluctuations in the Madison Aquifer, and potential leakage from the water pipeline on NFS lands, is the method used to accomplish the three measurement indicators.

Issue #2: Pipeline construction activities and the effects to wildlife and wildlife habitat.

Comments identified a concern that the project could disturb wildlife and wildlife habitats. Big game species, species of local concern (SOLC), sensitive species and management indicator species were specifically mentioned for the possibility of effect from ground disturbing activities. The measurement indicator developed for this issue is the acres of wildlife habitat disturbed in the project area. The threshold for this measurement indicator is 65.5 acres, the maximum area of land that would be allowed to be disturbed during pipeline construction.

Issue #3: Pipeline construction activities and the effects to Sensitive Plants.

The potential effect to state or federally listed plant species was raised as a concern. The measurement indicator for this issue is the acres of vegetation disturbed in the project area. The threshold for this measurement indicator is 65.5 acres, the maximum area of land that would be allowed to be disturbed during pipeline construction.

Issue #4: Potential for the establishment and spread of invasive plants as a result of the pipeline construction activities.

Concern was expressed for the establishment and spread of invasive plants as a result of the ground disturbing activities during the construction of the proposed pipeline. The measurement indicator developed for this issue is the increase of invasive species following construction, operation, or maintenance of the water pipeline over the baseline level that exists presently. The threshold for this measurement indicator is no increase in invasive plants over existing levels. Establishing a monitoring plan to monitor and mitigate for invasive species, is the method used to accomplish the measurement indicator.

Issue #5: Pipeline construction activities and the effects to archeological and cultural resources.

Comments identified a concern for the project to affect archeological and cultural sites during the pipeline construction activities. The measurement indicator developed for this issue is the number of cultural sites disturbed. The threshold for this measurement indicator is no cultural sites disturbed.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This section provides a description of the No Action and Modified Proposed Action alternatives. This section also describes alternatives considered but eliminated from detailed analysis.

A summary table comparing the alternatives with respect to the issues and affected resources is provided in Table 2-1, located at the end of Chapter 2.

2.1 Alternative 1 – No Action

NEPA, 40 CFR 1502.14, requires the study of the No Action Alternative as a basis for comparing effects of the proposed action and other alternatives. The No Action alternative assumes no implementation of any elements of the proposed action. This alternative represents no attempt to actively respond to the purpose and need for action or the issues identified during scoping. The Forest Service would not issue a water pipeline special use permit for occupancy of NFS land in the Argyle Road area.

Under the No Action alternative, the water pipeline planned for installation by SBHWS under the Argyle Road service area special use permit would not be installed. No ground would be disturbed within a 200-foot survey corridor during construction or during maintenance of the water pipeline. Existing homes would continue to acquire drinking water from other sources.

2.2 Alternative 2 – Modified Proposed Action

The Modified Proposed Action (Figure 2-1) is to approve the issuance of a special use construction permit for a 40-foot corridor (approximately 13 acres of disturbance) and a maintenance and operations permit for a 20-foot corridor (approximately 6.5 acres of disturbance) to SBHWS for a water transmission pipeline across NFS land. This project is located along Argyle Road, in Custer and Fall River Counties, with approximately 2.7 miles located on NFS land in two parcels.

The source of water for the pipeline is a Madison Aquifer well owned by Mr. Eben W. Streeter, who holds three water permits (Water Permit Numbers 2302-2, 2546-2, and 2634-2). The maximum pipe diameter is 12 inches and pumping capacity is limited by state permit to 109 gpm. The South Dakota Department of Environment and Natural Resources monitors water levels in the Madison Aquifer using state-owned observation wells. The well owner under Water Permit No. 2634-2 will control water withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights. The analysis completed in this EA is based on a withdrawal of 109 gpm from the Madison Aquifer. Withdrawals exceeding 109 gpm are outside the scope of this analysis.

The water transmission pipeline will be buried and no above ground facilities or distribution lines will be authorized on NFS land. Location of the water pipeline within a 200-foot survey corridor will avoid conflict with wildlife and wildlife habitat, sensitive plants, and archeological/cultural resources.

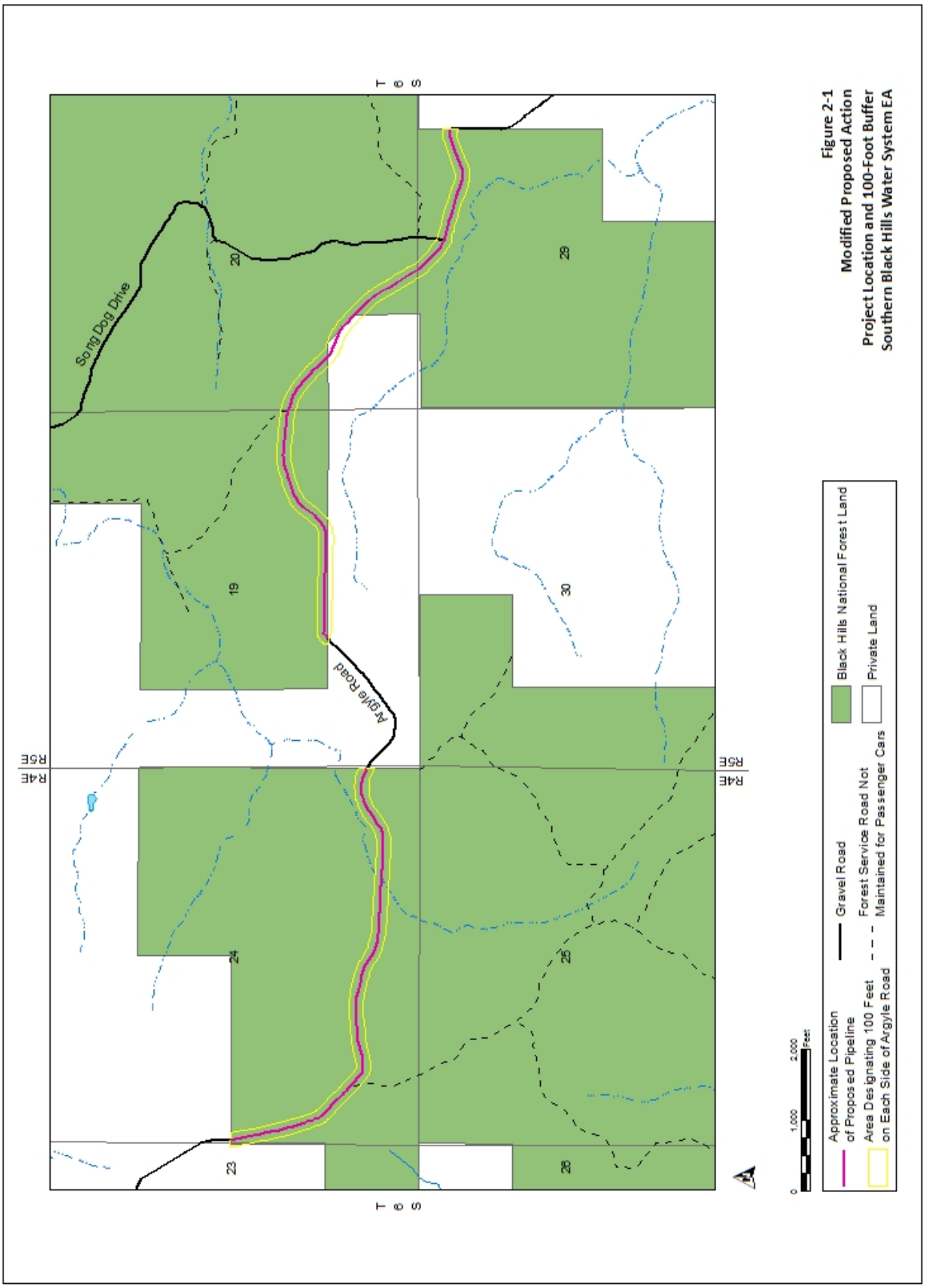

Figure 2-1. Modified Proposed Action, Project Location and 100-Foot Buffer.

2.3 Alternatives Not Considered in Detail

Two alternatives were considered but eliminated from detailed analysis in the EA. These alternatives were either suggested by the public through the scoping process or were developed during Forest Service interdisciplinary analyses. The rationale for why these alternatives were eliminated from detailed analysis is provided in the following sections.

2.3.1 Original Proposed Action – Argyle Road Water Pipeline Project

The original proposed action, scoped with the public as the Argyle Road Water Pipeline Project, was consistent in location to Segment 1, Phase 2 of the North Hot Springs/Argyle Road Project evaluated for USDA RD. The original special use permit application request from SBHWS to USDA Forest Service proposed a pumping rate of 700 gpm. The pumping rate was reduced to 100 to 400 gpm for the original proposed action to be more consistent with the USDA RD evaluation. The original proposed action included three parcels of NFS lands was then made available for public comment. After receiving comments indicating concern with the quantity of water proposed for pumping, and discussion with other agencies having jurisdiction related to this project including USDA RD and the South Dakota Department of Natural Resources (SD DENR) Water Rights Program, the Modified Proposed Action, at the request of SBHWS, was developed. The modified proposed action identified the limit of the pumping capacity of the well to 109 gpm, which is the amount authorized by the water permits. The easement request on public land was reduced from three to two parcels. This reduced the distance of pipeline crossing NFS lands from 2.8 to 2.7 miles.

2.3.2 Reduced Mileage of Pipeline

Reduced mileage of pipeline construction on public land due to private land opportunities is currently not available to SBHWS without easements. Those opportunities that became available since the initial public scoping have been recognized in the Modified Proposed Action. There are no additional opportunities to reduce the mileage of the pipeline on public land and meet the objectives of the project. The overall project length will remain basically the same whether located on private land or NFS lands.

2.4 Comparison of Alternatives

Table 2-1 compares alternatives by effect on resources, based on the issues identified in Section 1.7. Chapter 3 provides a detailed discussion of the resources and effects from the No Action and Modified Proposed Action alternatives.

Table 2-1. Summary of Alternatives and Measurement Indicators for Each Issue.

Measurement Indicators	Alternative 1 No Action	Alternative 2 Modified Proposed Action
Issue #1 (Water Resources) The volume of water involved with this project and the potential effects on water quantity available to other uses.		
• Flow from the well into the water pipeline in gpm. • Water fluctuations in the Madison Aquifer • Leakage from the water pipeline on NFS lands.	No direct, indirect, or cumulative effects on Madison Aquifer groundwater levels for area private wells, Wind Cave underground lakes, or Beaver Creek Springs.	No direct, indirect, or cumulative effects on Madison Aquifer groundwater levels for area private wells, Wind Cave underground lakes, or Beaver Creek Springs. As an indirect effect, more water will be taken from the Madison Aquifer and will be available for wildlife and firefighting than available under the No Action Alternative.
Issue #2 (Wildlife and Wildlife Habitat) Pipeline construction activities and the effects to wildlife and wildlife habitat.		
• Acres of wildlife habitat disturbed.	No change from current condition	There would be no effect on threatened or endangered species or species proposed for listing. Potential effects on sensitive species from temporary ground disturbance and loss of habitat (snags) are minimal. Potential for increase in invasive plants and subsequent loss of native grassland habitat in project area and surrounding area due to ground disturbance.
Issue #3 (Vegetation – Sensitive Plants) Pipeline construction activities and the effects to Sensitive Plants.		
• Acres of vegetation disturbed.	No change from current condition	No sensitive plants were identified in the project area. Negative effects to the two sensitive plants for which there is the potential for unknown occurrences in the project area would be limited and there is the potential that ground disturbance would assist in the establishment of these plants.
Issue #4 (Vegetation – Invasive Plants) Potential for the establishment and spread of invasive plants as a result of the pipeline construction activities.		
• Increase of invasive species following construction, operation, or maintenance of pipeline.	No change from current condition	The ground disturbance and loss of vegetation associated with this project could result in an increase of invasive plants in the project area and surrounding area and a subsequent loss of native grassland habitat.
Issue #5 (Archeological and Cultural Resources) Pipeline construction activities and the effects to archeological and cultural resources.		
• Number of cultural sites disturbed.	No change from current condition	No direct or indirect effects on archeological site located in the project area. Known archeological site will be avoided.

CHAPTER 3 EXISTING ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the current state of environmental conditions and the environmental effects of implementing the No Action and Modified Proposed Action alternatives by resource. For each resource, the analysis area and methods are defined and the affected environment (existing condition) is described. This is followed by an analysis of the effects (direct, indirect, and cumulative) that would result from implementing the alternatives (environmental consequences). Together, these descriptions form the scientific and analytical basis for comparison of alternatives presented in Chapter 2. Table 3-7, at the end of Chapter 3, summarizes design features that would be implemented to monitor and reduce effects by the Modified Proposed Action to each resource described below.

Direct effects are those effects that result from an action at the same time and place that the action occurs. Indirect effects are effects that result from an action but occur at a different time or place. Cumulative effects are the additive effects of the action and other ongoing and reasonably foreseeable activities in the vicinity of the project area. For purposes of this analysis, short-term effects are those expected in the next year (throughout the course of project implementation) and long-term effects are those expected between 1 and 20 years unless specifically defined in individual resource sections below.

3.1 Past, Present, and Reasonably Foreseeable Future Actions

The actions listed in Table 3-1 are activities of the Forest Service and other entities that have occurred within or around the SBHWS project area in the past, are currently being implemented, or may be implemented in the reasonably foreseeable future. All or only some of these actions may contribute cumulatively to the effects of this project, depending on the resource affected. The actions listed in Table 3-1 were determined using a time boundary of 10 years into the past for past actions and a time boundary of 10 years into the future for reasonably foreseeable future actions.

No large capacity (i.e. 1,000 or more gpm) Madison Aquifer wells are currently located in the project area. Beaver Creek Springs represent the largest discharge of groundwater in the project area (approximately 4,490 to 6,735 gpm).

In the future, additional land development and disturbances may occur (e.g. timber harvests, road and driveway construction, livestock grazing, and wildfires). However, specific plans or the extent of such activities is not known. On NFS lands, such future activities would be preceded by environmental analysis.

The construction of a new Madison Aquifer well by SBHWS under State Water Permit Number 2633-2 is a reasonably foreseeable future action. The permit authorizes the withdrawal of 300 gpm of groundwater at a location about three miles north of the Streeter well, in Section 35, Township 5 South, Range 6 East. The permit has a qualification requiring that groundwater withdrawals be controlled so that there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights. The permit also has a qualification requiring that withdrawals from the well be

controlled so that there are no significant adverse effects on the water flow or water quality of Beaver Creek Springs. A third qualification of the permit requires that SBHWS reduce the use of the Streeter well from a primary water source to a standby water source after an alternative water source is developed by SBHWS. Construction of a new well by SBHWS that withdraws more than 109 gpm as a replacement for the Streeter well will require additional environmental analysis for its use as part of the water system pipeline that crosses NFS lands.

Table 3-1. Past, Present, and Reasonably Foreseeable Future Actions Within or Around the SBHWS Project Area.

Action	Past	Present	Reasonably Foreseeable
Wildfires	X	X	X
Timber harvest/Livestock grazing	X	X	X
Road maintenance	X	X	X
Motorized recreation	X	X	X
Non-motorized recreation, such as hunting	X	X	X
Pipeline construction will create a temporary barrier for some wildlife species.		X	
Subdivision and development of residential areas in Custer County and Fall River County within and around the SBHWS project area.	X	X	X
Subdivision and development of residential areas within and around the SBHWS project area will introduce pets and create additional disturbance from road traffic and driveways, which will present a disturbance to wildlife and will degrade wildlife habitat.			X
Subdivision and development of residential areas within and around the SBHWS project area will disturb sensitive plant habitat and contribute to the spread of invasive plants.			X
Issuance of State Water Permit Numbers 419-2 (Wind Cave National Park) and 2302-2, 2546-2, and 2634-2 (Eben W. Streeter).	X		
Withdrawal of water from the Madison Aquifer by permitted and unpermitted well owners.	X	X	X
Withdrawal of water from Beaver Creek by landowners with water rights.	X	X	X
Construction of a new Madison Aquifer well by SBHWS under State Water Permit Number 2633-2, located within the SBHWS Phase I service area.			X

3.2 Water Resources

The following is an outline of the regulatory framework designed to protect or manage water resources that includes Federal laws, Federal Executive Orders, South Dakota Codified Law, and Forest Plan Objectives, Standards, and Guidelines.

Safe Drinking Water Act (SDWA) (42 U.S.C. 300f et seq.)

The SDWA is the main federal law that ensures the quality of drinking water. The SDWA authorizes the Environmental Protection Agency (EPA) to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. The SDWA also protects surface and groundwater supplies from contamination.

Clean Water Act (CWA) (33 U.S.C. 1251 et seq.)

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act. The goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States by reducing pollution.

Federal Cave Resources Protection Act (16 U.S.C. 4301-4309)

The purpose of the Federal Cave Resources Protection Act of 1988 is to secure, protect, and preserve significant caves on federal lands for the perpetual use, enjoyment, and benefit of all people, and to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on federal lands for scientific, education, or recreational purposes. Section 10 of the Federal Cave Resources Protection Act addresses water rights law.

Federal Land Policy and Management Act (FLPMA) (43 U.S.C. 1701 et seq.)

The FLPMA authorizes issuance of rights-of-way for water diversions, including wells, on NFS lands. It requires terms and conditions in authorizations for these rights-of-way to minimize damage to scenic and aesthetic values and fish and wildlife habitat and otherwise protect the environment, federal property, and the public interest.

Organic Administration Act (OAA) (16 U.S.C. 473-475, 477-482, 551)

The OAA contains the basic authority for watershed management on NFS lands. It provides for improvement and protection of the National Forests and securing favorable conditions of water flows. It also authorizes use of water within National Forests for domestic, mining, milling, and irrigation purposes under applicable state or federal law.

National Forest Management Act (NFMA) (U.S.C. 1600 et seq.)

The NFMA amends the Renewable Resource Planning Act and sets forth the requirements for plans for the NFS. The NFMA requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the NFS. It is the primary statute governing the administration of National Forests.

Multiple-Use Sustained-Yield Act (MUSYA) (16 U.S.C. 528-531)

The MUSYA authorizes and directs that the National Forests be managed under principles of multiple uses and to produce a sustained yield of products and services, and for other purposes. It provides that watershed protection is one of the five co-equal purposes for which NFS System lands were established and are to be administered.

Domestic Water Supply Act (16 U.S.C. 552a-552d)

The Domestic Water Supply Act provides for special management of watersheds on NFS lands to protect municipal water supplies.

Executive Order 11988 – Floodplain Management

Executive Order 11988 seeks to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development where there is a practicable alternative. Executive Order 11988 directs agencies to consider alternatives to siting in a floodplain, and applies to development of the 100-year floodplain as well as critical actions in the 500-year floodplain (Executive Order 11988).

Executive Order 11990 – Protection of Wetlands

Executive Order 11990 directs all Federal agencies to avoid destruction or modification of wetlands where there is a practicable alternative. Executive Order 11990 directs each Federal agency to avoid undertaking or aiding new construction in wetlands unless the head of the agency finds there is no practicable alternative to construction in the wetland and the proposed construction incorporates all possible measures to limit harm to the wetland and mitigates for lost wetland areas.

South Dakota Codified Law (SDCL)

Water allocation in South Dakota is based on the Doctrine of Prior Appropriation. In South Dakota, the state considers all water (surface and groundwater) to be the property of the people of the State. Domestic water use is the highest use of water and takes precedence over other appropriative uses. Domestic water use below 18 gpm does not require a water permit. The criteria for granting a water right permit are set forth in SDCL 46-2A-9. Criteria set for in SDCL 46-2A-9 include:

- Water must be available for the proposed use.
- The proposed diversion can be developed without unlawful impairment of existing rights; specifically the proposed diversion cannot cause a reduction in needed water supplies for adequate domestic wells or other adequate wells having prior water rights.
- The proposed use of water must be a beneficial use.
- The proposed use must be in the public interest.

The SD DENR Water Rights Program makes recommendations regarding water rights to the South Dakota Water Management Board. The Water Management Board, a citizen's board comprised of seven members appointed by the Governor, approves or denies water permit applications.

Forest Plan Direction

The following Forest Plan Objectives, Standards, and Guidelines are applicable to water resources for the SBHWS Argyle Road service area special use permit:

- Objective 108: Manage for sustained or improved water flows.
- Standard 1106: Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.
- Standard 1109: Reclaim roads and other disturbed sites when use ends, as needed, to prevent resource damage.
- Standard 1203: Design and construct all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.
- Standard 1210: Maintain enough water in perennial streams to sustain existing stream health. Return some water to dewatered perennial streams when needed. Comply with Section 505 of the FLPMA and 36 CFR 251.56 when issuing and re-issuing authorizations for water storage and diversion facilities.
- Guideline 1401b: Take measures to prevent human-caused changes in cave ecosystem, water, sediment, nutrient, chemical, airflow, humidity, or temperature regimes.

The analysis area for water resources (Figure 3-1) extends east to west from about US Highway 79 to SD Highway 89 and from north to south from about five miles north of Wind Cave to about 1.6 miles south of the Custer/Fall River County boundary. The source of water for the SBHWS proposed water pipeline is a 939-foot deep, four-inch diameter well called the Streeter well and its location is shown on Figure 3-1.

Overland drainage of the analysis area is by intermittent streams. Artesian springs are located in the analysis area. Beaver Creek Springs, artesian springs with a constant discharge of about 4,490 to 6,735 gpm (Driscoll et al., 2002) are located 0.95 miles from the Streeter well (Figures 1-1 and 3-1). There are currently no municipal water supplies or public sanitary sewer systems in the unincorporated areas of Custer and Fall River Counties. County residents have private wells or haul water and have on-site septic wastewater disposal systems.

The Streeter well draws water from the Madison Aquifer and is owned by Mr. Eben W. Streeter, who holds three water permits on the well (Water Permit Numbers 2302-2, 2546-2, and 2634-2). The well was constructed in 1949 and has been used for domestic purposes since 1979. The well was relined from top to bottom with four-inch diameter steel casing in the late 1980's or early 1990's. The water permits limit the pumping capacity of the well to 109 gpm and requires that the well owner control withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights. The well opening to the land surface is at an elevation of 3,518

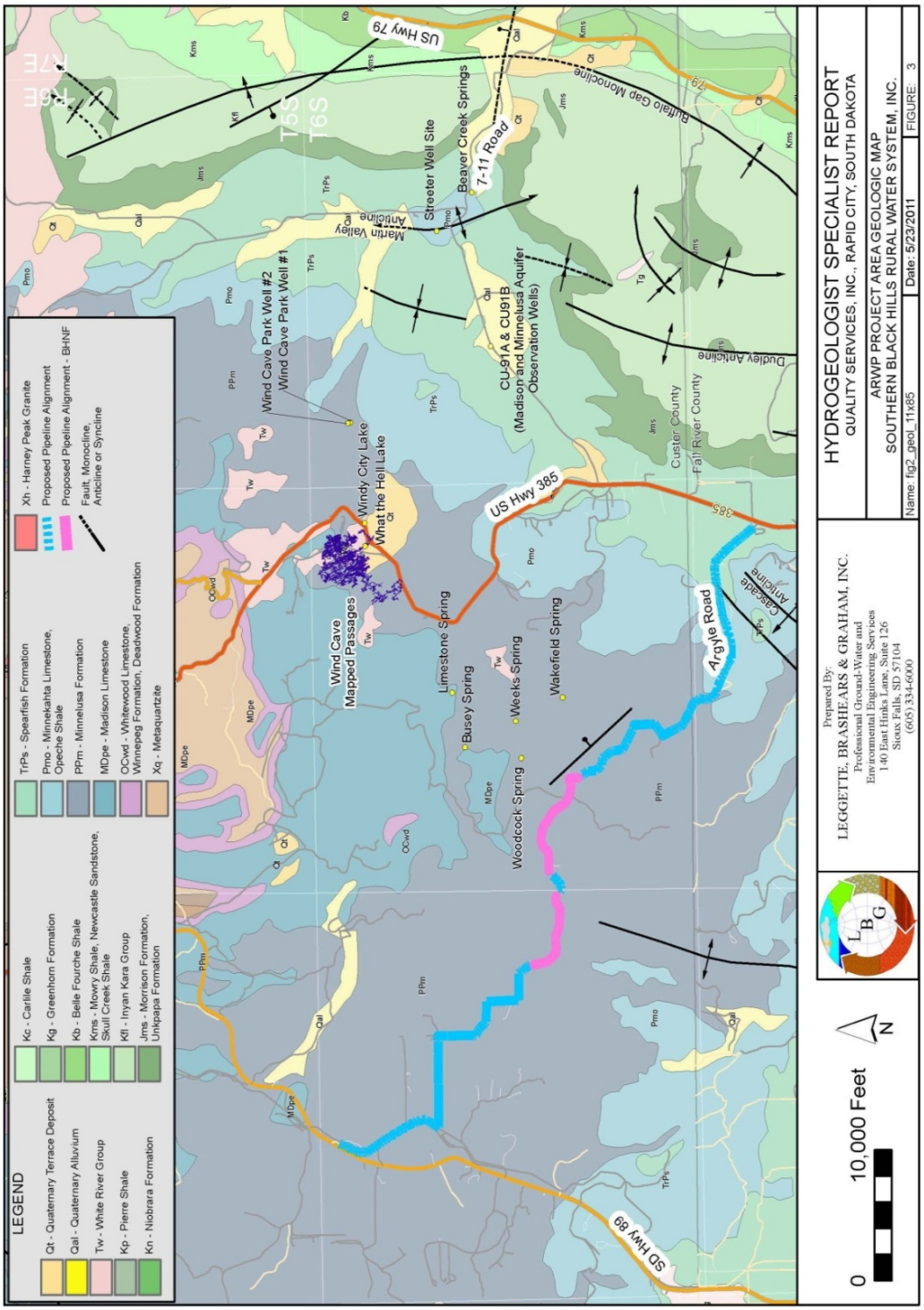

Figure 3-1. Water Resources Analysis Area.

feet above mean sea level (AMSL) and it has a shut-in pressure of about 27 to 32 pounds per square inch (psi).

A hydrogeology specialist's report was prepared for the water resources analysis area (Kannenberg and Kenyon, 2011a) that reviewed groundwater resources in the area associated with the Madison Aquifer and discussed potential effects of the water pipeline project on groundwater and surface water resources. This report is the primary source for information presented in Section 3.2. Past, present, and reasonably foreseeable future actions for water resources are presented in Section 3.1 and Table 3-1 of this report.

Geology of the Project Area

The Black Hills of South Dakota are an uplifted area that is approximately 110 miles long and 60 miles wide, with the long axis trending north to northwest. The distinguishing feature of the southern Black Hills is the Precambrian Harney Peak Granite. The Harney Peak Granite is a batholith (a solidified large intrusion of magma or molten rock) that forms some of the major Black Hills landmarks, including Harney Peak, Mount Rushmore, Thunderhead Mountain (Crazy Horse Monument) and the Needles. There are also large areas of Precambrian metamorphosed phyllites, schists and graywackes in the southern Black Hills.

The Precambrian rocks form the crystalline core of the Black Hills. Draped along the flanks of the Black Hills are numerous sedimentary formations deposited in the Paleozoic and Mesozoic eras. These units were originally flat-lying and covered the Precambrian rocks. The Black Hills were uplifted during a mountain building event approximately 60 to 65 million years ago (Driscoll et al., 2002) and the sedimentary rocks have been eroded at the highest points of the uplift, exposing the Precambrian crystalline core.

The geologic formations and associated aquifers in the project area are summarized below, in order from oldest to youngest. Figure 3-1 shows the geologic formations exposed at the land surface and major structural features including various types of geologic folds (monoclines, synclines, and anticlines) and faults.

Crystalline Core (Precambrian)

The crystalline core is comprised of granite, slate, phyllite and schists that, where fractured, are utilized as groundwater sources in the central Black Hills. The City of Custer, South Dakota, obtains its water source from Precambrian fractured rock.

Deadwood Formation (Cambrian)

The Deadwood Formation is comprised of sandstone with shale, limestone, and a basal conglomerate. It is an aquifer. Thickness ranges from 5 to 400 feet, with thinning occurring from north to south through the Black Hills (Gries and Martin, 1985). The thickness of the Deadwood Formation is about 25 feet at Wind Cave National Park, based on the well log for Wind Cave Well #1.

Englewood Formation (Ordovician-Devonian-Mississippian)

The Englewood Formation is a pink to purple slabby limestone that is from 30 to 60 feet thick. It has been suggested by some geologic researchers that the Englewood Formation be considered a member of the Madison Limestone in the southern Black Hills (Gries and Martin, 1985).

Madison Limestone (Mississippian)

Also called the Pahasapa Limestone, the Madison Limestone is a massive and cavernous limestone and dolomite that varies in thickness from 300 to 600 feet (Gries & Martin, 1985). Karstic features, caused by dissolution of the rock, are found at the top of the formation, and the formation is characterized by sinkholes, caves, and underground drainage. Many caves are present in the Madison Limestone, including Wind Cave and Jewell Cave.

The Madison Aquifer is recharged by infiltration of precipitation at outcrop areas and by streams that lose some or all of their flow to sinkholes or streamflow loss zones when crossing the Madison Limestone outcrop.

The Madison Limestone forms a major physiographic feature along the western flanks of the Black Hills called the Limestone Plateau. The Limestone Plateau is a large outcrop of the Madison Limestone located at a high elevation relative to the elevation of the Madison Limestone outcrop along the eastern flanks of the Black Hills.

The Madison Aquifer is the most important aquifer in the Black Hills. Wells that intersect portions of the aquifer containing large solution openings (caves and passages) can produce significant amounts of groundwater flow (over 1,000 gpm). The SD DENR monitors the groundwater level of the Madison Aquifer with a network of observation wells. The Madison Aquifer, especially in areas near the outcrop, also provides some of the highest quality groundwater available in the Black Hills. Lower-yield wells and dry wells are possible in the Madison Aquifer where the primary porosity is low and not enhanced by secondary porosity.

Because of the cavernous and karstic nature of the Madison Aquifer, groundwater flowpaths vary with location and local geologic structure. Geologic folding and faulting from the Black Hills Uplift have produced fractures or zones of weakness in the Madison Limestone. Over time, groundwater migrating preferentially along these fractures in the rock can create zones of increased permeability and porosity. Anisotropy in the Madison Aquifer (different transmissivity values in different directions) has been documented by Greene (1993). Wind Cave is an example of anisotropy in the Madison Limestone. The mapped passages of Wind Cave (Figure 3-1) trend northwest-southeast and indicate the primary alignment of cave dissolution over time by groundwater.

A residual red claystone, developed by weathering, is often observed at the top of the Madison Limestone (Gries and Martin, 1985). This paleosol may act as a confining layer or semi-confining layer separating the Madison Aquifer from the overlying Minnelusa Aquifer. Based on well logs from Madison

Aquifer wells drilled in the project area, the thickness of the paleosol at the top of the Madison Limestone in the project area is approximately 50 feet.

Minnelusa Formation (Permian/Pennsylvanian)

The Minnelusa Formation has three major units, including upper sandstone, a middle dolomite, sandstone, shale and anhydrite unit, and lower sandstones and dolomites. The Minnelusa Formation is up to 800 feet thick in the southern Black Hills.

The Minnelusa Formation is an important aquifer in the Black Hills, and there are many domestic wells completed in the Minnelusa Aquifer. The aquifer is recharged by infiltration of precipitation at the outcrop areas of the formation and by streams that lose some or all of their flow to sinkholes or stream-flow loss zones when crossing the Minnelusa Formation.

Folding and faulting has produced fractures or zones of weakness in the upper portions of the Minnelusa Formation. Groundwater percolation can migrate preferentially through these areas and create zones of increased permeability and porosity.

The water quality of the Minnelusa Aquifer is generally not as good as the water quality of the Madison Aquifer. Areas of the Minnelusa Formation containing large amounts of anhydrite or other evaporitic rocks contain sulfate and other dissolved constituents that can degrade the groundwater quality. The degree of hydraulic interconnectedness between the Minnelusa and Madison Aquifers varies with location. The Minnelusa Formation is exposed at the surface where the water pipeline project crosses NFS land along Argyle Road (Figure 3-1).

Opeche Shale (Permian)

The Opeche Shale is composed of red shale that varies in thickness from 85 to 130 feet (Gries and Martin, 1985). It can act as a confining layer between the underlying Minnelusa Aquifer and overlying Minnekahta Limestone, although there are areas where it does not appear to impede upward groundwater flow from the Minnelusa Formation.

Minnekahta Limestone (Permian)

The Minnekahta Limestone is a massive, purple limestone that is approximately 40 feet thick. It is an aquifer, but due to its relatively low saturated thickness, it is generally not considered a likely source for high-yield wells. The Streeter well site, the source of water for the proposed water pipeline, is located in an isolated area of Minnekahta Limestone outcrop located at the apex of an anticline.

Spearfish Formation (Permian/Triassic) and Sundance Formation (Jurassic)

The Spearfish Formation is composed of red, sandy shale that contains anhydrite and gypsum lenses. It is soft, easily eroded, and forms what is known locally as the “red valley” encircling the Black Hills. The thickness of the formation along the eastern side of the Black Hills is 375 to 450 feet (Gries and Martin,

1985). The Spearfish Formation is a minor aquifer in areas where the gypsum and anhydrite are dissolved, increasing the porosity and permeability (Driscoll, et. al., 2002).

The Sundance Formation overlies the Spearfish Formation and is composed of glauconitic sandstone and shales that vary in thickness from 250 to 350 feet (Gries and Martin, 1985). There are local aquifers in the sandstone units of the formation. In general, the Spearfish and Sundance Formations form a confining layer above the Minnekahta Limestone and/or the Minnelusa Formation (in those areas where the Opeche Shale does not act as a confining layer for the Minnelusa Formation).

Unkpapa Sandstone (Jurassic) and Morrison Formation (Jurassic)

The Unkpapa Sandstone is a fine-grained sandstone of limited areal extent. The thickest known exposure of the Unkpapa Formation is in Fuson Canyon (Gries and Martin, 1985), where it forms colorful banded layers due to weathering of iron-bearing minerals. Fuson Canyon is located approximately 2.75 miles northeast of the Streeter well.

The Morrison Formation consists of easily erodible claystone, siltstone and shale, with minor, interbedded quartz sandstone. Like the Spearfish Formation, the Morrison Formation is continuously exposed around the entire Black Hills (Gries and Martin, 1985). Both the Unkpapa Sandstone and the Morrison Formation are minor aquifers occasionally utilized for domestic or livestock watering purposes.

Inyan Kara Group (Lower Cretaceous)

The Inyan Kara Group is comprised of the Lakota Formation and the Fall River Formation. Both formations are composed of sandstone, with interbedded shales, limestone, and claystones. The Inyan Kara Group forms what is known locally as the "hogback," a ridge on the outer edge of the concentric red valley encircling the Black Hills. The Inyan Kara Group is a regionally important aquifer, and has the largest storage volume of all the aquifers in the Black Hills (Driscoll, et. al, 2002).

Groundwater Levels in the Madison Aquifer

The SD DENR Water Rights Program monitors water levels in 26 observation wells completed in the Madison Aquifer. The SD DENR Madison Aquifer observation well closest to the Streeter well is CU-91A, a five-inch well installed in 1991 that penetrates 115 feet of the Madison Aquifer and is under artesian pressure.

Water level data for CU-91A, provided by the SD DENR and measured relative to the top of the well casing, were converted to groundwater elevation data (SD DENR, 2011a). The land surface elevation at CU-91A is 3,640 feet AMSL and the elevation of the top of the Madison Limestone at CU-91A is 2,590 feet AMSL. The initial (and lowest) groundwater elevation was measured in CU-91A in November 1991 and was 3,636 feet AMSL (approximately four feet below ground surface). The water level in CU-91A, for approximately four years after the well's installation, remained below the ground surface. In the summer of 1995, the water level in the well rose above the ground surface and has since remained above the ground surface (indicating that the well water would flow onto the surface due to artesian

pressure if the well was not capped). The groundwater elevation at CU-91 was 3,656 feet AMSL in November 2010.

The groundwater elevation contours (also called potentiometric surface contours) for the Madison Aquifer in the project area are shown in Figure 3-2 (Long et al., 2011), and suggest a generalized groundwater flow direction extending outward from the crystalline core of the Black Hills.

Flowpath of the Madison Aquifer in the Project Area

A flowpath in the Madison Aquifer extending from the area of the City of Hot Springs to Beaver Creek Springs has been postulated, based on evidence from the three following factors (Naus, et al., 2001, Driscoll, et al., 2002):

1. Analysis of recharge origin based on stable isotopes of oxygen and hydrogen (deuterium).
2. Age-dating utilizing a second stable isotope of hydrogen (tritium).
3. Water budget considerations

In general, the stable isotope data suggest that at least some of the groundwater discharging from Beaver Creek Springs originated on the Limestone Plateau on the western slope of the Black Hills. The water has migrated from the west, around the southern end of the Black Hills near the City of Hot Springs, and northward to Beaver Creek Springs. The tritium data from Beaver Creek Springs also suggest that a component of the groundwater originates from the Limestone Plateau due to longer travel times. A water budget calculated by Carter et al. (2001) estimated the amount of recharge in the area near Beaver Creek Springs and compared that amount to the measured discharge at the spring. Based on the calculated water budget, it was concluded that there is more groundwater being discharged by Beaver Creek Springs than can be accounted for by local recharge.

Additional investigation into the flowpath of the Madison Aquifer in the project area was proposed by SBHWS in 2006. SBHWS, the National Park Service (NPS) and the United States Geological Survey (USGS) jointly conducted a geochemical sampling and analysis project designed to provide information regarding the flowpath of the Madison Aquifer in the Southern Black Hills. Geochemical analysis of the collected samples included the stable isotopes of oxygen and hydrogen (deuterium) for recharge origin analysis, age dating including tritium and chlorofluorocarbons (CFCs) analysis, and major ion and trace element analysis. Included in the sampling was the Streeter well, Beaver Creek Springs, What the Hell Lake and Windy City Lake in Wind Cave, and SD DENR Madison Aquifer observation well CU-91A.

The results were reported by Back and Long (2007), Back (2011), and Kannenberg and Kenyon (2008). The age dating and stable isotope recharge origin data for Beaver Creek Springs indicate that water discharging from the springs contains a significant component of groundwater originating from the western flank of the Black Hills. Groundwater from the Streeter well is primarily modern water derived from local recharge. The estimated age of water from the Streeter well is dated to be from the early 1970's (Back and Long, 2007; Back, 2011). The geochemical characteristics of groundwater from the Streeter well and groundwater in Wind Cave are similar (Kannenberg and Kenyon, 2008).

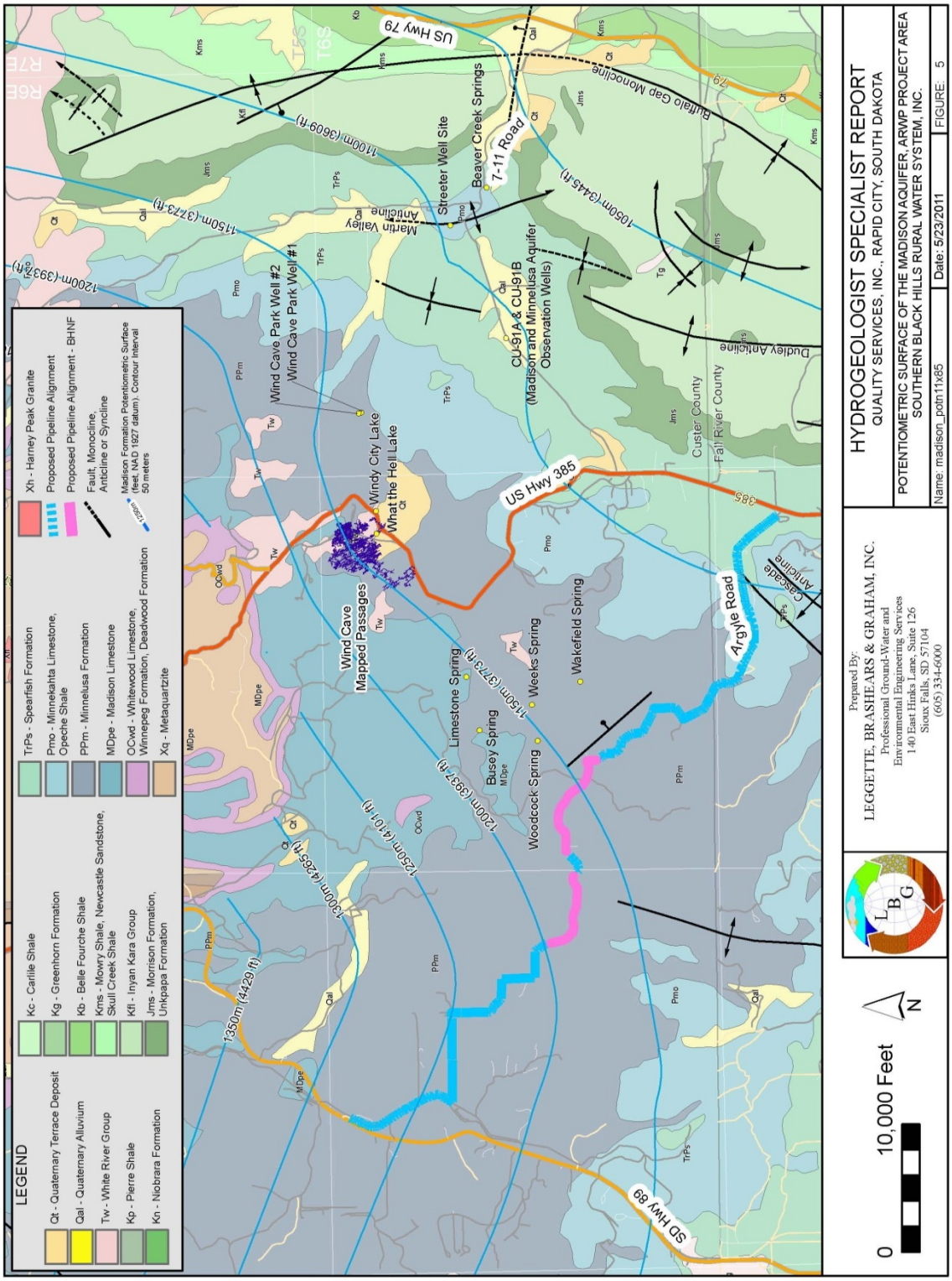

Figure 3-2. A Generalized Map of Groundwater Elevation Contours of the Madison Aquifer (Based on Long et al., 2011).

The youngest groundwater identified in the geochemical sampling and analysis project was from the underground lakes in Wind Cave (Back and Long, 2007; Back, 2011). The lakes in Wind Cave are comprised of relatively young water (mid-to-late 1980's) originating primarily from local recharge into outcrops of Madison Limestone and the Madison Limestone sinkhole loss zone along Beaver Creek. This observation is consistent with the relatively recent increases in the amount of water observed in Wind Cave lakes.

SD DENR Madison Aquifer observation well CU-91A was found to have the oldest water, dated to be from the mid-to-late 1940's (Back and Long, 2007; Back, 2011). The stable oxygen and hydrogen isotope recharge origin data for CU-91A, however, suggest local recharge.

Aquifer Characteristics of the Madison Limestone

Two parameters used in calculations to estimate groundwater level changes in an aquifer due to pumping from a well are discussed in this report: transmissivity and storage coefficient. Transmissivity is a measure of how much water can be transmitted horizontally in an aquifer. Storage coefficient measures the ability of an aquifer to store water.

The transmissivity of the Madison Aquifer varies greatly, with estimates of transmissivity ranging from less than one square foot per day (ft^2/d) to 56,000 ft^2/d (Carter et al., 2001). The Madison Limestone and the Minnelusa Formation have extensive fractures, solution-enhanced openings, and collapse features that result in large and variable secondary porosities and large heterogeneity in associated aquifer properties (Putnam and Long, 2007). Determining the aquifer characteristics for a karst aquifer by traditional methods using an aquifer pumping test must take into consideration that karst aquifers typically have both primary and secondary porosities (Taylor and Greene, 2001).

Greene (1993) determined transmissivity and storage coefficient for the Madison Aquifer in two wells (RC-5 and RC-6) near Rapid City from aquifer pumping tests. Based on the information from drill logs and geophysical logs, both wells were completed in portions of the Madison Aquifer that contained significant large fractures and solution openings, such as voids or small caves. RC-5 penetrated 380 feet of the Madison Limestone, RC-6 penetrated 450 feet of the Madison Limestone, and both wells were assumed to be fully penetrating (Greene, 1993). For RC-6, the results of the aquifer pumping test and analysis indicated a transmissivity of 17,000 ft^2/d and a storage coefficient of 2×10^{-3} (Greene, 1993). For RC-5, there were significant differences in the transmissivity with direction, with a value for the major axis of transmissivity (the dominant direction of orientation of the enlarged solution openings) of 56,000 ft^2/d, and a value of 1,300 ft^2/d in the minor transmissivity direction (perpendicular to the major transmissivity axis). The storage coefficient for RC-5 was 3.5×10^{-4}.

The direction of aquifer anisotropy is site specific, and the actual directions of the major and minor transmissivity axes determined by Greene (1993) for the Rapid City wells will not likely be the same for the Madison Aquifer in the project area. However, based on the observed pattern of the Wind Cave passages and on the presence of the folds and faults in the project area, the presence of major and minor transmissivity axes in the project area is likely.

Wind Cave National Park has two wells that penetrate the Madison Aquifer. Both wells are located in Wind Cave Canyon and are separated by a distance of approximately 550 feet. Wind Cave Well #1 is the main water source for Wind Cave National Park. According to the well log for Wind Cave Well #1, the wellbore is uncased (open-hole completion) in four formations (Madison Limestone, Englewood Limestone, Deadwood Formation, and the Pre-Cambrian Formation) as well as having perforated casing in the Minnelusa Formation. Wind Cave Well #1 fully penetrates 258 feet of the Madison Aquifer. According to the well log for Wind Cave Well #2, the perforated casing is installed only within the Madison Aquifer. The well penetrates 256 feet of the Madison Aquifer.

In October 2007, the NPS performed an aquifer pumping test on Wind Cave Well #1 (Hughes, 2011). There were equipment difficulties that resulted in some interruption of pumping. In general, the average pumping rate for Wind Cave Well #1 over the 72-hour pumping test was approximately 38 gpm. NPS personnel monitored water levels in Wind Cave Well #2 over the course of the 72-hour pumping test. There was no change in water level in Wind Cave Well #2 attributable to the pumping of Wind Cave Well #1. Two potential reasons for the lack of observed response in Well #2 to pumping from Well #1 are a transmissivity for the Madison Aquifer on the order of 40,000 ft^2/day, or that the transmissivity of the Deadwood Aquifer at Wind Cave Well #1 is greater than the transmissivity of the Madison Aquifer at the well. Due to the completion of Wind Cave Well #1 in multiple aquifers, it is not possible to quantify the transmissivity of the Madison Aquifer based on the Wind Cave Well #1 aquifer pumping test.

In September 2008, the NPS performed an aquifer pumping test on Wind Cave Well #2. The average pumping rate maintained by Well #2 during the approximately 24-hour constant-rate pumping test was approximately 115 gpm. No changes in the water levels in Well #1 due to pumping of Well #2 were noted during the aquifer pumping test. The transmissivity estimated for the Madison Aquifer from the aquifer pumping test was 3,200 ft^2/day. No estimate of storage coefficient was possible from the aquifer pumping test. Lohman (1972) indicates that for a confined aquifer, the storage coefficient can be estimated by multiplying the thickness of the aquifer by 10^{-6} per foot of aquifer thickness. Utilizing this method, the storage coefficient in the Madison Aquifer in the vicinity of the two Wind Cave wells is estimated to be approximately 2.6×10^{-4}.

Application of the Theis Equation to Calculate Declines in Madison Aquifer Groundwater Levels Based on Pumping of the Streeter Well

Estimated theoretical declines in the elevation of groundwater for the Madison Aquifer from pumping at the Streeter well were calculated in the hydrogeology specialist's report for thirteen wells within the project area, the Wind Cave underground lakes, and Beaver Creek Springs (Kannenberg and Kenyon, 2011a). Calculations were estimated using analytical solution methods based on the Theis equation (Theis, 1935). The information needed to estimate the decline in groundwater elevation at any distance from a discharging well completed in a confined aquifer includes the aquifer characteristics of transmissivity and storage coefficient and the pumping duration and rate.

Inputs utilized in the Theis analytical solution for this analysis include the following:

- A range of estimated transmissivity and storage coefficient values for the Madison Aquifer in or near the project area.
- A pumping duration of one year at the Streeter well to examine indirect effects and a pumping duration of twenty years to examine cumulative effects.
- A continuous pumping rate of 109 gpm at the Streeter well.

The Theis equation incorporates the following nine assumptions (Theis, 1935):

1. The aquifer has infinite areal extent and receives no recharge.

This assumption is reasonable for the scale of the project area and the distance of the Streeter well from the aquifer recharge areas. The closest aquifer recharge areas in the project area are Madison Limestone outcrops and Beaver Creek and Highland Creek streamflow loss zones, which are located about 5.5 to seven miles from the Streeter well. Additional Madison Limestone outcrop recharge areas are located at an even greater distance from the project area.

2. The aquifer is homogeneous and isotropic.

This assumption is not true in the Madison Aquifer, as the aquifer is neither homogeneous nor isotropic. In recognition of this deviation from this assumption, three of the transmissivity and storage coefficient values used to calculate declines in groundwater elevation levels and evaluate the direct effects and cumulative effects are taken from pumping tests performed on two Madison Aquifer wells owned by the City of Rapid City and known to be completed in an area of enhanced secondary porosity. Based on information from well logs, the presence of Wind Cave, and the presence of large geologic folds in the project area, the Madison Aquifer in the project area likely contains a significant amount of secondary porosity features. The fourth set of transmissivity and storage coefficient values used in the theoretical head decline estimates is based on a single-well aquifer pumping test performed on a well located in the project area (Wind Cave Well #2).

Because the karstic Madison Aquifer is neither homogenous nor isotropic, the calculated declines in groundwater elevation levels utilized in the effects analysis will likely differ from actual values, particularly in areas where transmissivity varies with direction due to aquifer anisotropy. The Madison Aquifer in the project area is dominated by secondary porosity in which fracture flow is the primary conduit of water. Aquifers with significant secondary porosity, such as the Madison Aquifer, over the scale of the project area can behave as equivalent porous media due to the interconnection of the fractures and conduits. The Theis solution-derived estimates are a reasonable, and likely conservative, approximation of declines in groundwater levels for a project of this magnitude and scale.

3. The pumping well fully penetrates the thickness of the aquifer.
4. The flow to the pumping well is laminar (i.e. horizontal) when the pumping well fully penetrates the thickness of the aquifer.

The Streeter well does not fully penetrate the Madison Aquifer and therefore flow to the Streeter well will not likely be completely horizontal. The effect of a partially penetrating well on non-laminar flow decreases with distance from the pumping well and with longer durations of pumping. At the scale of this analysis for the project area, the effects of partial penetration are not likely significant.

5. The aquifer is confined.

This assumption is valid. The Madison Aquifer is confined in the area of the Streeter well.

6. Water is released instantaneously from aquifer storage and groundwater levels are lowered.

This assumption is likely not valid for the karstic Madison Aquifer, but according to Lohman (1972), the assumption is entirely empirical and has been applied with some success for decades.

7. The diameter of the pumping well is very small and consequently storage in the well can be neglected.

This assumption is valid, particularly at the scale of this analysis of groundwater in the project area.

8. The pumping well is 100 percent efficient.

This assumption is not valid, and is rarely valid for any pumping well. Well efficiency is only a factor at the pumping well itself and does not affect drawdown in the aquifer at a distance from the pumping well.

9. The groundwater surface in a confined aquifer has no slope.

This assumption is not valid since the groundwater surface in the confined aquifer is likely sloped, resulting in a defined groundwater flow direction. The presence of a sloping groundwater surface will change the shape of the pumping well's groundwater capture zone from circular to elliptical.

Madison Aquifer Water Levels in Wind Cave

Approximately 330 million years ago, an erosional karst topography developed at the surface of the Madison Limestone, forming sinkholes, fissures, and other openings that were buried and then later exposed by erosion during the Black Hills Uplift. The Black Hills Uplift created preferentially aligned cracks and fissures in the Madison Limestone and the Minnelusa Formation. Subsequent dissolution of the limestone by water originating from up to three different sources (surface water streams and diffuse recharge through the formation and overlying formations, regional groundwater migration in the confined aquifer, and rising thermal water or hot springs) enlarged existing solution openings (Palmer et al., 2000). Uranium-series isotope research indicates that Wind Cave is still draining (Bakalowicz et al., 1987).

Some of the passages in the cave are completely filled with groundwater, such as Windy City Lake, while others are partially filled with groundwater, such as What the Hell Lake and Calcite Lake. There are also streams, such as Rebel River, and drips in the cave. Staff gauges are installed in the passages between

the water-filled caverns and Wind Cave National Park personnel manually read the lake water levels from the staff gauges.

Water levels in the underground caverns vary over time. In general, water levels in the lakes increased from 1986 to 2004, decreased from September 2004 until May 2008, and have been increasing since May 2008. In the late 1990's, water levels rose significantly. For example, What the Hell Lake got its name because in 1996 it was discovered that a passageway that had been dry for 20 years contained water. The passage nearly filled with water in 1999 (National Park Service, 2011a). Elevated water levels in What the Hell Lake from 1999 to 2004 prevented access to Calcite Lake. Calcite Lake and Windy City Lake are interconnected and, due to continuing high water levels, Windy City Lake has not been accessible since June 1996 (Hughes, 2011).

The groundwater elevation of the Madison Aquifer at SD DENR observation well CU-91A has generally been equal to or greater than the groundwater elevation of the Madison Aquifer at Calcite Lake for the available period of record.

Beaver Creek Springs

Black Hills springs have been classified into six types based on the hydrogeologic position of the spring (Rahn and Gries, 1973). Beaver Creek Springs (Figure 3-2), located about 4,000 feet southeast of the Streeter well, is classified as a Type 2 spring. Type 2 springs occur near the contact between the Minnekahta Limestone and the Spearfish Formation, do not dry up, and serve as permanent discharge points from the carbonate aquifers (Madison Limestone, Minnelusa Formation, and Englewood Limestone). The approximate discharge rate for Beaver Creek Springs is 4,490 to 6,735 gpm (Driscoll et al., 2002).

Type 2 springs, like the Beaver Creek Springs which is a large artesian spring zone, are thought to be pressure-relief mechanisms for the Madison and Minnelusa Aquifers (Huntoon, 1985). As groundwater, under hydraulic pressure, migrates to areas of decreased porosity, springs develop in zones of weakness, resulting in groundwater discharge and a reduction in aquifer hydraulic pressure. The source water for Beaver Creek Springs is primarily groundwater from the Madison Aquifer with some potential contribution from the Minnelusa Aquifer (Driscoll, et al., 2002).

Upstream of Beaver Creek Springs, Beaver Creek is an intermittent stream, often losing its flow to sinkholes where it crosses the Madison Limestone, Minnelusa Formation, and Minnekahta Limestone (Hortness and Driscoll, 1998). Downstream of Beaver Creek Springs, Beaver Creek is a perennial stream.

Wind Cave National Park has monitored discharge from Beaver Creek Springs since 2009 and data collected from July 2009 to March 2011 was reviewed for this report (National Park Service, 2011b). Measurements are taken about every month. The lowest rate of discharge collected in that time was 4,248 gpm, measured in January 2010, and the highest rate of discharge was 7,269 gpm, measured in July 2010.

3.2.1 No Action Alternative

Under the No Action alternative, the special use permit would not be issued by the Forest Service and the water pipeline would not be installed across approximately 2.7 miles of NFS lands. Existing homes would continue to acquire drinking water from other sources. When construction of Phase I is completed, which does not require a special use permit from the Forest Service, SBHWS will provide water in the Phase I service area. Phase II would not be completed. Future distribution lines across public lands would require future authorizations and are not part of this analysis.

Direct and Indirect Effects

The water pipeline will not be constructed across approximately 2.7 miles of NFS lands along Argyle Road. There will be no direct effect on the Madison Aquifer.

Under Phase I of the SBHWS, water will be withdrawn from the Streeter well at a maximum pumping rate of 109 gpm. There is a potential for an indirect effect on the elevation of groundwater in the Madison Aquifer. Specifically, there is the potential to lower the elevation of the groundwater surface through continuous pumping of the Streeter well at a maximum rate of 109 gpm under Phase I of the SBHWS. Without construction of Phase II of the water pipeline, initial withdrawals may be less than the maximum of 109 gpm due to reduced need. The indirect effect from pumping for the No Action alternative was evaluated based on the drawdown of Madison Aquifer groundwater levels after one year of continuous pumping of the Streeter well at 109 gpm. Indirect effects to groundwater elevations were evaluated at area private wells, Wind Cave underground lakes, and Beaver Creek Springs in the hydrogeology specialist's report (Kannenberg and Kenyon, 2011a).

Thirteen wells in the project area (not including the Streeter well) are either completed in the Madison Aquifer or in multiple aquifers including the Madison Aquifer. An indirect effect to the thirteen wells is defined as a lowering of the groundwater level in any of the wells that is attributable to the withdrawal of 109 gpm of water from the Streeter well for one year to the point where one or more wells are adversely impacted (as defined by the SD DENR). The estimated decline in the elevation of the groundwater surface for each of the thirteen wells due to one year of pumping the Streeter well at 109 gpm was calculated using analytical solution methods based on the Theis equation over a range of transmissivity and storage coefficient values (Kannenberg and Kenyon, 2011a). The estimates show that the groundwater elevation declines vary from less than 0.1 foot in one year using a high transmissivity value in the Theis equation for the well located furthest from the Streeter well (about 14 miles away) to about three feet in one year using a low transmissivity value in the Theis equation for Wind Cave Well #1, the well closest to the Streeter well (about three miles away). Based on these calculated estimates, pumping the Streeter well continuously for one year at 109 gpm would not have an indirect effect on the ability of each of the thirteen wells to withdraw water from the Madison Aquifer because the effect to the groundwater levels in these wells would not reduce the ability of each of the wells to pump water. None of these wells would be adversely impacted, as defined by the SD DENR.

An indirect effect to Wind Cave underground lakes is defined as an observable lowering of the water level in the lakes that is attributable to the withdrawal of 109 gpm of water from the Streeter well for

one year. The groundwater elevation decline estimates vary from 0.2 feet to 2.25 feet at Calcite Lake and Windy City Lake (about 4.5 miles from the Streeter well), depending on the values of transmissivity and storage coefficient used with the Theis equation analysis (Kannenberg and Kenyon, 2011a). Historically observed elevation changes in the underground lakes have varied over time by tens of feet due to natural conditions. Given the conservative assumptions in the transmissivity and storage coefficient values applied, and the natural variation that is already observed in the underground lakes, pumping the Streeter well continuously for one year at 109 gpm would not have an indirect effect on the water levels in the Wind Cave underground lakes.

An indirect effect to Beaver Creek Springs is defined as an observable reduction in the flow of the springs that is attributable to the withdrawal of 109 gpm of water from the Streeter well for one year. The groundwater elevation decline estimates for the Madison Aquifer at Beaver Creek Springs from the withdrawal of 109 gpm for one year from the Streeter well vary from 0.3 foot to 6.75 feet, depending on the values of transmissivity and storage coefficient used with the Theis equation analysis. The estimated groundwater surface elevation of the Madison Aquifer at Beaver Creek Springs is about 80 feet above land surface, which is about equal to the groundwater elevation of the Madison Aquifer at the Streeter well. Lowering the elevation of the groundwater surface of the Madison Aquifer at Beaver Creek Springs by up to 6.75 feet would leave about 73 feet of Madison Aquifer hydraulic head above the land surface. The pumping therefore would not interrupt the discharge of Beaver Creek Springs (Kannenberg and Kenyon, 2011a) because the springs would continue to be under artesian pressure and flow due to this pressure. Even under the worst-case assumption that all water withdrawn from the Streeter well at 109 gpm would be subtracted from the discharge of Beaver Creek Springs, there would be no observable change from the natural variations observed in the discharge of the springs (Kannenberg and Kenyon, 2011a), estimated to vary from about 4,490 to 6,735 gpm by Driscoll et al. (2002). Therefore, there would be no indirect effect to Beaver Creek Springs from the withdrawal of 109 gpm of water from the Streeter well for one year.

One beneficial indirect effect of Phase I construction of the water pipeline is that there will be more water available for fire protection at structures that will have access to a continuous water source. Phase I is under construction and water will be made available whether or not the special use permit is issued. Water will be available to fight both structural fires and to protect homes during wildfires. Where water from the water pipeline is made available to livestock using stock tanks, there will also be a positive indirect effect on wildlife, which will have increased access to water sources.

Cumulative Effects

There is a potential for a cumulative effect on the elevation of groundwater in the Madison Aquifer. Specifically, there is the potential to lower the elevation of the groundwater surface through continuous pumping of the Streeter well at a maximum of 109 gpm over an extended period of time under Phase I of the SBHWS. Without construction of Phase II of the water pipeline, initial withdrawals may be less than the maximum of 109 gpm due to reduced need. The cumulative effect from pumping for the No Action alternative was evaluated based on the drawdown of Madison Aquifer groundwater levels after 20 years of continuous pumping of the Streeter well at 109 gpm. Twenty years pumping duration was chosen because this is the term limit for the Streeter well permit. Cumulative effects to groundwater

elevations were evaluated at area private wells, Wind Cave underground lakes, and Beaver Creek Springs in the hydrogeology specialist's report (Kannenberg and Kenyon, 2011a). The estimates of groundwater drawdown at these locations take into account existing pumping conditions within the Madison Aquifer in the project area and surrounding area, including ongoing withdrawals from the Madison Aquifer by the municipal well of the city of Hot Springs.

A cumulative effect to the thirteen Madison Aquifer wells located within the project area is defined as a lowering of the groundwater level in any of the wells that is attributable to the withdrawal of 109 gpm of water from the Streeter well for 20 years to the point where one or more wells are adversely impacted (as defined by the SD DENR). As previously discussed, thirteen wells located within the project area, in addition to the Streeter well, are either completed in the Madison Aquifer or multiple aquifers including the Madison Aquifer. The estimated decline in the elevation of the groundwater surface for each of the thirteen wells due to 20 years of pumping the Streeter well at 109 gpm shows that the declines vary from less than 0.2 foot over 20 years using a high transmissivity value in the Theis equation for the well located furthest from the Streeter well (about 14 miles away) to about seven feet over 20 years using a low transmissivity value in the Theis equation for Wind Cave Well #1, the well closest to the Streeter well (about three miles away) (Kannenberg and Kenyon, 2011a). Based on these calculated estimates, pumping the Streeter well continuously for 20 years at 109 gpm would not have a cumulative effect on the ability of each of the thirteen wells to withdraw water from the Madison Aquifer because the effect to the groundwater levels in these wells would not reduce the ability of each of the wells to pump water. None of these wells would be adversely impacted, as defined by the SD DENR.

A cumulative effect to Wind Cave underground lakes is defined as an observable lowering of the water level in the lakes that is attributable to the combined withdrawal of 109 gpm of water from the Streeter well and six gpm from Wind Cave Well #1 for 20 years. The groundwater elevation decline estimates vary from 0.25 feet to 6.5 feet at Calcite Lake and Windy Lake (about 4.5 miles from the Streeter well), depending on the values of transmissivity and storage coefficient used (Kannenberg and Kenyon, 2011a). Historical observed elevation changes in the underground lakes have varied over time by tens of feet due to natural conditions. Given the conservative assumptions in the transmissivity and storage coefficient values applied, and the natural variation in water levels that is already observed in the underground lakes, pumping the Streeter well continuously for 20 years at 109 gpm would not have a cumulative effect on the water levels in the Wind Cave underground lakes.

A cumulative effect to Beaver Creek Springs is defined as an observable reduction in the flow of the springs that is attributable to the withdrawal of 109 gpm of water from the Streeter well for 20 years. The groundwater elevation decline estimates for the Madison Aquifer at Beaver Creek Springs from the withdrawal of 109 gpm for 20 years from the Streeter well vary from 0.4 foot to 10.5 feet, depending on the values of transmissivity and storage coefficient used. The estimated groundwater surface elevation of the Madison Aquifer at Beaver Creek Springs is about 80 feet above land surface. Lowering the elevation of the groundwater surface of the Madison Aquifer at Beaver Creek Springs by up to 10.5 feet would leave about 70 feet of Madison Aquifer hydraulic head above the land surface. The pumping, therefore would not interrupt the discharge of Beaver Creek Springs because the springs would continue to be under artesian pressure and flow due to this pressure (Kannenberg and Kenyon, 2011a). Even

under the worst-case assumption that all water withdrawn from the Streeter well at 109 gpm would be subtracted from the discharge of Beaver Creek Springs, there would be no observable change from the natural variations observed in the discharge of the springs (Kannenberg and Kenyon, 2011a), estimated to vary from about 4,490 to 6,735 gpm by Driscoll et al. (2002). Therefore, there would be no cumulative effect to Beaver Creek Springs from the withdrawal of 109 gpm of water from the Streeter well for 20 years.

A 2008 unpublished SD DENR report prepared for Water Permit Number 2634-2, held by Mr. Eben Streeter, concluded that due to the distance of the Streeter well from the underground lakes of Wind Cave National Park and from Beaver Creek Springs, and due to the relatively low discharge rate of 109 gpm, measureable effects to water levels in the underground lakes and at Beaver Creek Springs were unlikely. The SD DENR also indicated in the report that the Water Rights Program had no record of domestic wells in the Madison Aquifer near the Streeter well and that wells in other aquifers were not expected to be affected by withdrawals from the Streeter well.

There are no other projects in the project area contributing to the cumulative effects on the elevation of Madison Aquifer groundwater.

3.2.2 Modified Proposed Action Alternative

Under the Modified Proposed Action alternative, the special use permit would be issued by the Forest Service and the water pipeline would be installed across approximately 2.7 miles of NFS lands. Both Phase I and Phase II of the SBHWS would be constructed. Once Phase I and II of the water pipeline are completed, SBHWS would provide rural water service to private properties along the service lines. Future distribution lines across public lands would require future authorizations and are not part of this analysis.

Direct and Indirect Effects

The proposed project would follow all Forest Plan Objectives, Standards, and Guidelines applicable to water resources. Specifically, the project would: manage for sustained or improved water flows, design and construct appropriate stream crossings and other instream structures, maintain enough water in perennial streams to sustain existing stream health, and take measures to prevent human-caused changes in cave ecosystem, water, sediment, nutrient, chemical, airflow, humidity, or temperature regimes.

The installation of the water pipeline across approximately 2.7 miles of NFS lands along Argyle Road will have no direct effect on the Madison Aquifer.

Under either alternative, there is no difference in the amount of maximum water withdrawal allowed under state permit for the Streeter well, which is the source of water for both Phase I and Phase II of the SBHWS. Because there is no difference in permitted water withdrawal for the No Action alternative and the Modified Proposed Action alternative, the effects on groundwater resources are essentially the same for both alternatives.

There is a potential for an indirect effect on the elevation of groundwater in the Madison Aquifer. Specifically, there is the potential to lower the elevation of the groundwater surface through continuous pumping of the Streeter well at a maximum rate of 109 gpm. The indirect effect from pumping for the Modified Proposed Action alternative was evaluated based on the drawdown of Madison Aquifer groundwater levels after one year of continuous pumping of the Streeter well at 109 gpm. The indirect effects analysis is identical to that described for the No Action alternative because no change in the maximum pumping rate at the Streeter well would occur for the Modified Proposed Action.

There is the potential for an additional indirect effect if the water pipeline ruptures where it crosses the 2.7 miles of NFS lands. The result would be accidental discharge of water from the pipeline and subsequent drainage into the watershed. Localized erosion and flooding could occur, with the amount of erosion and flooding of land related to the amount of water released.

Construction of the water pipeline by SBHWS in Phase II would have the positive indirect effect of making even more water available for fire protection at structures that will have access to a continuous water source than under the No Action alternative (Phase I construction only). Water will be available to fight both structural fires and to protect homes during forest fires. Where water from the water pipeline is made available to livestock using stock tanks, there will also be a positive indirect effect on wildlife, which will have increased access to water sources.

Cumulative Effects

There is a potential for a cumulative effect on the elevation of Madison Aquifer groundwater. Specifically, there is the potential to lower the elevation of the groundwater surface of the Madison Aquifer through continuous pumping of the Streeter well at a maximum of 109 gpm over an extended period of time. The cumulative effect from pumping for the Modified Proposed Action alternative was evaluated based on the drawdown of Madison Aquifer groundwater levels after 20 years of continuous pumping of the Streeter well at 109 gpm. The cumulative effects analysis for the Modified Proposed Action is identical to that described for the No Action alternative because no change in the maximum pumping rate (109 gpm) at the Streeter well would occur.

The three measurement indicators and their threshold values are described in Section 1.7 of this report for Issue #1 – the volume of water involved with this project and the potential effects on water quantity available to other uses. To monitor for potential effects to groundwater from withdrawals from the Streeter well for Phase II of the SBHWS and to document that the measurement indicator thresholds for Issue #1 are not exceeded during the project, a monitoring plan would be established to measure flow from the well into the water pipeline, water fluctuations in the Madison Aquifer, and potential leakage from the water pipeline on NFS lands. The water resources monitoring plan is described in Section 5.1 of this report.

3.3 Wildlife and Wildlife Habitat

Assessment and evaluation of wildlife within the project area was prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act of 1973 (19 U.S.C. 1536 (c)) and followed standards established in the Forest Service Manual direction (2672.42) and the Code of Federal

Regulations (50 CFR 402). Also, Forest Plan Objectives and Standards designed to protect or manage wildlife and wildlife habitat include:

- Objective 221: Conserve or enhance habitat for Rocky Mountain Region (R2) sensitive species and species of local concern (SOLC). Monitoring will be conducted at a Forest-wide level, not at a project level, and will be done for habitats or populations.
- Objective 238: The following are objectives for management indicator species (MIS). MIS will be monitored using trends in habitat; however, when available, population trends may be used as a strong indicator of management response. Monitoring will be conducted at a Forest scale and not at the project level. Population monitoring will be discretionary as provided by 219.14.f.
    - Maintain or enhance habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer and brown creeper; as outlined in specific direction pertaining to aspen, other hardwoods, riparian areas, grasslands, spruce and ponderosa pine (e.g., Objectives 201, 205, 211, 239-LVD, 5.1-204).
    - Maintain habitat opportunities for black-backed woodpeckers across the Forest, as outlined in specific direction pertaining to conifer habitat, snags and recently burned habitat (e.g., Objectives 211, 11-03, 5.1-204, Standard 2301).
    - Maintain habitat for golden-crowned kinglets, as outlined in specific direction pertaining to spruce habitat (e.g., Objective 239-LVD).
    - Maintain or enhance habitat quality and connectivity for mountain suckers, as outlined in specific direction pertaining to aquatic resources (e.g., Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).
- Standard 3115: A R2 sensitive species or SOLC located after contract or permit issuance will be appropriately managed by active coordination between permittee, contractor or purchaser, Forest Service line officer, project administrator, and biologist and/or botanist. Solutions need to be based on the circumstances of each new discovery and must consider the species need, contractual obligations and costs, and mitigation measures available at the time of discovery.

The analysis area for wildlife and wildlife habitat resources (Figure 2-1) is defined as the immediate 100-foot area on either side of the centerline of Argyle Road (FS# 333) along approximately 2.7 miles of project corridor. The analysis area is located on two separate parcels of the Black Hills National Forest and covers about 65.5 acres. The analysis area and adjacent surrounding area consists of three major habitats based on vegetative cover. These include Ponderosa pine forest, mid-elevation mixed grass prairie, and disturbed areas. The disturbed areas make up a large portion of the analysis area and include roadway, cut and fill of roadway ditches, a disturbed road-affiliated borrow pit, and an area affected by historic wildfire. A biological assessment and biological evaluation (Phillips, 2011), threatened, endangered, and sensitive species specialist's report (Hays, 2009a), and fauna survey (Hays, 2009c) of the project area have been completed. Past, present, and reasonably foreseeable future actions for wildlife and wildlife habitat are presented in Section 3.1 and Table 3-1 of this report.

Management Indicator Species (MIS)

There are nine MIS designated in the Black Hills National Forest. Of these nine, three have suitable habitat in the wildlife and wildlife habitat resources analysis area: white-tailed deer, grasshopper sparrow, and black-backed woodpecker. A review and discuss of MIS in the analysis area was completed by Hays (2009a).

White-Tailed Deer

The white-tailed deer is a very common species in the Black Hills National Forest. It is a very adaptable species that can live in many habitats, including grasslands, wetlands, and woodlands. The keys to effective white-tailed deer management are maintaining quality habitat and controlled hunting.

White-tailed deer were found to be common immediately adjacent to the analysis area, although they were not observed within the analysis area (Hays, 2009a). This project may affect white-tailed deer in and around the analysis area but the project will have no adverse effect on the species because the project will not contribute to the greatest potential threats to the species: habitat loss or habitat degradation.

Grasshopper Sparrow

The grasshopper sparrow prefers large grassland patches and avoids smaller patches with low area to edge ratios. Within the analysis area, the greatest threats to grasshopper sparrows are habitat loss, habitat fragmentation, and habitat degradation from grazing and current fire regimes. Habitat loss occurs primarily through urban development and conversion of grasslands to croplands. The grasshopper sparrow is locally common in the analysis area (Hays, 2009a).

This project may affect grasshopper sparrows in and around the analysis area but the project will have no adverse effect on the species because the project will not contribute to the greatest potential threats to the species: habitat loss, habitat fragmentation, and habitat degradation (Hays, 2009a).

Black-Backed Woodpecker

The black-backed woodpecker uses mature and old-successional stages of the forest. In burned forest areas, the black-backed woodpecker selects nest sites in areas with high tree densities, small tree diameters, and snag trees that have limited decay. Fire suppression, salvage logging, and the practice of replacing overmature stands with young stands are detrimental for black-backed woodpecker populations (Hays, 2009a).

No individuals of this species were located during surveys of the project area, although potential habitat does exist within or adjacent to the project area. This project may affect black-backed woodpeckers in and around the analysis area but the project will have no adverse effect on the species because the project will not contribute to the greatest potential threats to the species: replacement of a mature forest with young stands, salvage logging, fire suppression, or insecticide use (Hays, 2009a).

Threatened and Endangered Species

A list by county of threatened or endangered species and species proposed for listing was provided by the U.S. Fish and Wildlife Service and used to determine species listed for Custer County. Three wildlife species are listed for Custer County – the whooping crane, black-footed ferret, and Sprague's Pipet.

Whooping Crane

The whooping crane breeds and nests along lake margins or among rushes and sedges in marshes and meadows. The water in these wetlands is anywhere from 8 to 10 inches (20 – 25 cm) to as much as 18 inches (46 cm) deep. This wetland habitat does not exist in the project area. There would be no effect on whooping cranes from activities associated with this project.

Black-Footed Ferret

The black-footed ferret is associated with mixed and shortgrass prairies but any prairie dog town of suitable size may be potential ferret habitat. There are no prairie dog towns on the Black Hills National Forest affected by the proposed project. There would be no effect on black-footed ferrets.

Sprague's Pipit

The U.S. Fish and Wildlife Service reviewed the conservation status of Sprague's Pipet to determine whether the species warrants protection under the Endangered Species Act. The status review found that listing the Sprague's Pipet as threatened or endangered is warranted, but that listing the species at this time is precluded by the need to complete other listing actions of higher priority. The Sprague's Pipit uses grassland habitat almost exclusively throughout the year. During the breeding season, the Sprague's Pipit favors relatively large grassland patches. The grassland habitat associated with the project consists of relatively smaller grassland patches mixed with areas of Ponderosa pine forest. At most, this species would be expected to migrate through the project area. This project would not reduce habitat for this species and therefore would have no effect on the Sprague's Pipet.

Sensitive Species

The current R2 sensitive species list was last updated on June 9, 2009 and there are 24 wildlife species on the list that could be present in the Black Hills. A risk assessment was conducted on the potential for adverse effects from the Modified Proposed Action on R2 sensitive species that are known to occur in the Black Hills. The risk assessment was based on the potential for the Modified Proposed Action to affect a species or alter suitable habitat. Results from the pre-field review and field reconnaissance (Hays, 2009c) indicate that two R2 sensitive bird species were observed during field surveys – the Lewis's Woodpecker and the grasshopper sparrow. All other R2 species assessed were given a no determination of effect for this project.

Lewis's Woodpecker

The Lewis's Woodpecker nests in old trees and snags, forages from perch sites, and hawks insects out of the air. The species was observed in the burned habitat on the west end of the project area. There is less than three acres of burned habitat in the project area. This project may adversely affect individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or in a loss of species viability range wide. This is a conservative determination since there is only a small

likelihood of potential harm to any individuals or breeding season disturbance to this species as a result of the proposed activities.

Grasshopper Sparrow
The grasshopper sparrow nests and forages in prairie grassland habitat. This species was observed in the mixed-grass prairie habitat in the project area. There is less than eight acres of grassland habitat in the project area. This project may adversely affect individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or in a loss of species viability range wide. This is a conservative determination since there is only a small likelihood of potential harm to any individuals or breeding season disturbance to this species as a result of the proposed activities.

Species of Local Concern

Black Hills Supplement "r2_bh_2600-2005-1" to Forest Service Manual provides direction for the management of SOLC (USDA-Forest Service, 2005b). As defined by this supplement, a SOLC is a plant, fish, or wildlife species (including subspecies or varieties) that do not meet the criteria for sensitive status. These could include species with declining trends in only a portion of R2, or those that are important components of diversity in a local area. Table 3-2 lists all SOLC species for the Black Hills National Forest and identifies those pertinent to the project area. There is no habitat present or suspected in the project area for all of the SOLC species listed.

3.3.1 No Action Alternative

Direct and Indirect Effects
Under the No Action Alternative, no construction, operation, or maintenance activities would take place. Thus, there would be no ground disturbance or removal of dead trees. No direct or indirect effects to wildlife and wildlife habitat would occur. There would be no direct or indirect effects to whooping cranes, black-footed ferrets, Sprague's Pipets, Lewis's Woodpeckers, or grasshopper sparrows. There would be no direct or indirect effects to MIS or SOLC.

Cumulative Effects
Under the No Action Alternative, no cumulative effects would occur.

3.3.2 Modified Proposed Action Alternative

Direct and Indirect Effects
The proposed project would follow all Forest Plan Objectives, Standards, and Guidelines related to conserving or enhancing habitat for R2 sensitive species, SOLC, and MIS. Under the Modified Proposed Action Alternative, it is possible that some dead trees would be removed during pipeline construction. This would result in minimal potential for a direct effect loss of nesting and foraging habitat for the Lewis's Woodpecker. Temporary disturbance during construction could directly affect both the Lewis's Woodpecker and grasshopper sparrow if these species were present at the time. Since these species migrate out of the project area, disturbance would be possible during the late spring to early fall months (May – October). All other R2 species and MIS assessed were given a no determination of effect for this project.

Table 3-2. Evaluation of Species of Local Concern in the Project's Analysis Area for Wildlife and Wildlife Habitat.

Evaluation of Species of Local Concern in the Project's Analysis Area for Wildlife and Wildlife Habitat			
Species	**Species Presence Known in the Analysis Area?**	**Habitat Present or Suspected?**	**Rationale for Species Evaluation**
Atlantis fritillary (*Speyeria atlantis pahasapae*)	NO	NO	Surveys (Marrone, 2006) near the project area did not detect this species. Preferred habitat (spruce) not present in the project area.
Tawny crescent (*Phycoides batesii*)	NO	NO	Surveys (Marrone, 2006) near the project area did not detect this species. Preferred habitat (moist meadows) not present in the project area.
Callused vertigo (*Vertigo arthuri*)	NO	NO	Species not suspected to occur in the project area (Frest and Johannes, 2002).
Mystery vertigo (*Vertigo paradoxa*)	NO	NO	Species not suspected to occur in the project area (Frest and Johannes, 2002).
Frigid ambersnail (*Catinella gelida*)	NO	NO	Species not suspected to occur in the project area (Frest and Johannes, 2002).
Striate disc (*Discus shimekii*)	NO	NO	Species not suspected to occur in the project area (Frest and Johannes, 2002).
Sharp-shinned hawk (*Accipiter striatus*)	YES	NO	Suitable forest nesting habitat (if present) would not be affected by the project.
Cooper's hawk (*Accipiter cooperi*)	YES	NO	Suitable forest nesting habitat (if present) would not be affected by the project.
Broad-winged hawk (*Buteo platypterus*)	NO	NO	There is no preferred nesting habitat. Species not present.
Northern saw-whet owl (*Aegolius acadicus*)	YES	NO	This species is known to occur in the southern Black Hills, but suitable habitat is not expected to be affected by the project.
Pygmy nuthatch (*Sitta pygmaea*)	NO	NO	Not known to occur in the project area. Suitable habitat not likely to be affected by the project.
American dipper (*Cinclus mexicanus*)	NO	NO	There is no suitable habitat in the project area. Species not present.
Black and white warbler (*Mniotilta varia*)	NO	NO	There is no deciduous-riparian habitat. Species not present.
Northern long-eared myotis (*Myotis septentrionalis*)	YES	NO	This species is known to occur in the southern Black Hills, but suitable habitat is not expected to be affected by the project.
Small-footed myotis (*Myotis ciliolabrum*)	YES	NO	This species is known to occur in the southern Black Hills, but suitable habitat is not expected to be affected by the project.
Long-eared myotis (*Myotis evotis*)	YES	NO	This species is known to occur in the southern Black Hills, but suitable habitat is not expected to be affected by the project.
Long-legged myotis (*Myotis volans*)	YES	NO	This species is known to occur in the southern Black Hills, but suitable habitat is not expected to be affected by the project.
Northern flying squirrel (*Glaucomys sabrinus*)	NO	NO	This species is not known to occur in the project area.
Meadow jumping mouse (*Zapus hudsonius campestris*)	NO	NO	There is no suitable riparian habitat. Species not present.
Mountain goat (*Oreamnos americanus*)	NO	NO	Goats and goat habitat are not present in the project area.
Rocky Mountain bighorn sheep (*Ovis canadensis*)	NO	NO	Also a R2 sensitive species as of June 8, 2007. Bighorn sheep are not known to be present near the project area.

Direct and indirect effects to SOLC could include minimal displacement during the construction phase of the project. There would be no direct and indirect effects on whooping cranes and black-footed ferrets. The project would not reduce habitat for the Sprague's Pipet and would therefore have no direct or indirect effects on the species.

The ground disturbance and loss of vegetation associated with this project could result in the indirect effect of an increase of noxious weeds and subsequent loss of native grassland habitat. Re-vegetation (seeding all disturbed areas with certified weed-free native grass species) and erosion control devices (as needed) would be used to mitigate the ground disturbance effects of the project. Each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks. No more than 500 feet of open trench would be allowed in advance of pipe laying to minimize the amount of open trench. Construction would be located within a 200-foot planning corridor to best minimize effects to resources. Off-road motorized travel associated with construction would occur only after May 15 and before December 15, in accordance with Forest Plan Standard 5.4-9101.

Cumulative Effects

The measurement indicator and its threshold value are described in Section 1.7 of this report for Issue #2 – pipeline construction activities and the effects to wildlife and wildlife habitat. The threshold value of 65.5 acres of disturbed land would not be exceeded during pipeline construction, and the total acres of disturbance will not change wildlife viability.

The contribution of this project to the total effects from all projects would be small. All projects that disturb existing native vegetation have the potential to increase acres affected by noxious weed species. Re-vegetation (seeding all disturbed areas with certified weed-free native grass species) and erosion control devices (as needed) will be used to mitigate the ground disturbance effects of the project.

3.4 Vegetation – Sensitive Plants and Invasive Plants

A number of Forest Plan Objectives and Standards are in place to protect vegetation resources. Standard 1106 requires the stabilization and maintenance of roads and other disturbed sites during and after construction to control erosion. Standard 1109 requires that roads and other disturbed sites be reclaimed when use ends, as needed, to prevent resource damage.

Forest Plan Objectives and Standards that directly address R2 sensitive species and SOLC include:

- Objective 221: Conserve or enhance habitat for R2 sensitive species and SOLC. Monitoring will be conducted at a Forest-wide level, not at a project level, and will be done for habitats or populations.
- Standard 3115: A R2 sensitive species or SOLC located after contract or permit issuance will be appropriately managed by active coordination between permittee, contractor or purchaser, Forest Service line officer, project administrator, and biologist and/or botanist. Solutions need to be based on the circumstances of each new discovery and must consider the species need, contractual obligations and costs, and mitigation measures available at the time of discovery.

- Standard 4304: Treat individual noxious weed plants or groups of plants in areas where R2 sensitive or SOLC plants occur. Use a treatment method that is the least risk to the species being protected.
- Standard 4309: Monitor weed treatments used at R2 sensitive SOLC plant occurrences and re-treat as needed during the season.

Forest Plan Objectives and Standards that directly address invasive plants include:

- Objective 230: Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.
- Standard 1110. Initiate re-vegetation as soon as possible, not to exceed 6 months after termination of ground disturbing activities. Re-vegetate all disturbed soils with native species in seed/plant mixtures that are noxious-weed free. On areas needing immediate establishment of vegetation, non-native, non-aggressive annuals (e.g., wheat, oats, rye) or sterile species may be used while native perennials are becoming established, or when native species are not available (e.g., during drought years or years when wildfires burn large acreages in the United States). Other aggressive non-native perennials (e.g., smooth brome, timothy) will not be used. Seed will be tested for noxious weeds. If mulches are used they are to be noxious-weed free. Weed-free alfalfa seed may be used only when native legume seed is not available and only when there is extensive disturbance associated with road construction or mine reclamation where topsoil is no longer available.
- Standard 4301: For all proposed projects or activities, determine the risk of noxious-weed introduction or spread, and implement appropriate mitigation measures and treatment.
- Standard 4304: Treat individual noxious weed plants or groups of plants in areas where R2 sensitive or SOLC plants occur. Use a treatment method that is the least risk to the species being protected.
- Standard 4306: Use certified noxious-weed-free seed, feed and mulch. Seed will be tested for noxious weeds at the time of purchase.
- Standard 4309: Monitor weed treatments used at R2 sensitive SOLC plant occurrences and re-treat as needed during the season.

The analysis area for vegetation resources (Figure 2-1) is defined as the immediate 100-foot area on either side of the centerline of Argyle Road (FS# 333) along approximately 2.7 miles of project corridor. It is located on two separate parcels of the Black Hills National Forest and covers about 65.5 acres. The analysis area and adjacent surrounding area consists of three major habitats based on vegetative cover. These include Ponderosa pine forest, mid-elevation mixed grass prairie, and disturbed areas. The disturbed areas make up a large portion of the analysis area and include roadway, cut and fill of roadway ditches, a disturbed road-affiliated borrow pit, and an area affected by historic wildfire. A threatened, endangered, and sensitive species specialist's report (Hays, 2009a) and flora survey (Hays, 2009c) of the project area have been completed. Past, present, and reasonably foreseeable future actions for sensitive plants and invasive plants are presented in Section 3.1 and Table 3-1 of this report.

The Forest Service botanist prepared a botany biological evaluation report (Scott, M., 2011) that considered and evaluated federally listed plant species and R2 sensitive plant species in the analysis area and surrounding area. A list of federally endangered and threatened species and species proposed for listing was provided by the U.S. Fish and Wildlife Service and used to determine plant species listed for Custer County. No federally listed or proposed plant species occur on the Black Hills National Forest. The current R2 sensitive plant species list was last updated on June 9, 2009 and there are 13 plant species on the list that are known to occur in the Black Hills National Forest.

A pre-field review of R2 sensitive species and potential habitat was conducted to determine the potential for adverse effects from the Modified Proposed Action on R2 sensitive species (Scott, M., 2011). All R2 sensitive species potentially occurring in the Black Hills National Forest were considered in the evaluation. Areas adjacent to and within the project area have had limited plant surveys (Hays, 2009a). The analysis of effects was based on the potential for the Modified Proposed Action to affect a R2 sensitive species or alter suitable habitat.

There are no known occurrences of any R2 sensitive plant species in the project area or immediately adjacent to it. Most of the areas affected by the project are not considered suitable habitat for any rare plant species due to the disturbed areas from road development. There may be suitable habitat, however, for two species: *Botrychium campestre* and *Botrychium lineare*. *Botrychium campestre* (Iowa moonwort) and *Botrychium lineare* (narrowleaf grapefern) are often found within historically disturbed areas in the Black Hills on deep, loamy soils. These areas are very limited within the project area.

Botrychium campestre (Iowa Moonwort)

Botrychium campestre is considered a grassland species, associated with sandy grassland habitats in prairies, dunes, railroad sidings, and fields over limestone. The known Black Hills sites all occur on silt loam soils of limestone parent material. Soils similar to those of known sites exist within the project area, but the majority of the project area is located within a ponderosa pine forest community. While little is known about the exact habitat correlation of *Botrychium campestre*, it does not particularly seem to prefer this community type. However, there is a historic voucher record (1973) from a single occurrence in ponderosa pine forest in the Bearlodge Mountains in Crook County, Wyoming. Because of this historic voucher, Ponderosa pine forest cannot be eliminated as a habitat for *Botrychium campestre* until the species habitat preferences in the Black Hills are better understood. In addition, two sites that occurred beneath or immediately adjacent to Ponderosa pine were discovered in the spring of 2010. These vouchers are still awaiting confirmation.

No occurrences of *Botrychium campestre* are known to occur in the project area. Because of the uncertainty related to the species habitat preferences, there may be possible habitat for the species in the project area.

Botrychium lineare (Narrowleaf Grapefern)

Typical habitat descriptions for *Botrychium lineare* are problematic because there is considerable variation between habitat types in its currently known range. This species may be a habitat generalist since habitat across the range for *Botrychium lineare* is quite variable and its range stretches from sea level in Quebec, Canada, to about 10,000 feet in Colorado. *Botrychium* species are typically long-lived

(10 – 15 years) and colonizing plants may require disturbed sites to become established (Farrar, 2004). This is consistent with the *Botrychium lineare* occurrence conditions observed in the Black Hills.

No occurrences of *Botrychium lineare* are known to occur in the project area. Because of the uncertainty related to the species habitat preferences, there may be possible habitat for the species in the project area.

3.4.1 No Action Alternative

Direct and Indirect Effects
Under the No Action Alternative, no construction, operation, or maintenance activities would take place. Thus, there would be no ground disturbance and there would be no direct or indirect effects from the potential for the establishment or spread of invasive plants. No direct or indirect effects to sensitive plants would occur.

Cumulative Effects
Under the No Action Alternative, no cumulative effects would occur.

3.4.2 Modified Proposed Action Alternative

Direct and Indirect Effects
Direct effects of construction to vegetation in the project area would include a disturbance of a maximum of about 33 acres in the Argyle Road corridor. Overall, the direct effect to vegetation would be minor, short term, and site specific, since the disturbance area would be small and reseeding and natural revegetation are expected to occur after construction. Indirect effects of construction could include increased soil erosion or compaction and introduction or proliferation of invasive plant species, which would affect the viability of existing vegetation.

There are no known occurrences of *Botrychium campestre* in the project area although there is the potential for unknown occurrences to be directly affected under the Modified Proposed Action. The Modified Proposed Action may adversely affect individuals (if any unknown occurrences exist), but this would not likely result in a loss of viability on the planning area, or cause a trend toward federal listing or a loss of species viability range-wide.

Botrychium campestre has been known to persist with disturbances in other areas of its range and has been documented a number of times to colonize disturbed areas (Farrar, 2004) and the low-level disturbance associated with this project may create conditions suitable for colonization sites for *Botrychium campestre*.

There are no known occurrences of *Botrychium lineare* in the project area although there is the potential for unknown occurrences to be directly affected under the Modified Proposed Action. The Modified Proposed Action may adversely affect individuals (if any unknown occurrences exist), but this would not likely result in a loss of viability on the planning area, or cause a trend toward federal listing or a loss of species viability range-wide.

There is much uncertainty regarding risks to *Botrychium lineare*. Natural and human induced disturbances, including land management activities such as timber harvest, grazing, prescribed fire, and fire suppression may create and maintain suitable habitat for this species or may negatively affect existing populations, depending on the disturbance intensity and frequency (Beatty et al., 2003). Low-level disturbance associated with this project may create conditions suitable for colonization sites for *Botrychium lineare*. Although specific data is lacking on the Black Hills National Forest for *Botrychium lineare*, the earlier successional conditions that occur within the project area could produce conditions that would be beneficial to site colonization by this wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (Farrar, 2004).

Monitoring and surveying for sensitive species in the project area is ongoing by Forest Service personnel. Newly identified occurrences of these sensitive species in the project area would be managed by the Forest Service before and during construction of this project, with avoidance of known plant occurrences the goal. The proposed project would follow all Forest Plan Objectives, Standards, and Guidelines related to R2 sensitive species, weed control, erosion control, and re-vegetation.

All projects that disturb existing native vegetation have the potential to increase acres affected by noxious weed species. Noxious weeds are defined under the South Dakota Weed Act (SDCL 38-22) and the federal Noxious Weed Act of 1974 as any species of plant that is, or is likely to be, detrimental or destructive and is difficult to control or eradicate. Weeds can displace and fragment native plant communities, which in turn reduces forage for wildlife and livestock, reduces protective soil cover, and detracts from the aesthetics of an area. Not only are weeds considered an ecological threat, but also an economic burden due to the high cost of controlling them.

Invasion by noxious weeds and other exotic plants can be detrimental to an area's native vegetation habitat and to individual sensitive plant species as invasive species have the ability to out-compete desired plants. Consequently, the ground disturbance and loss of vegetation associated with this project could result in the indirect effect of an increase of noxious weeds and subsequent loss of native grassland habitat. Also, an indirect effect of the Modified Proposed Action could be increased competition with *Botrychium campestre* and *Botrychium lineare* by exotic species and noxious weeds. Each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks. No more than 500 feet of open trench would be allowed in advance of pipe laying to minimize the amount of open trench. Construction would be located within a 200-foot planning corridor to best minimize effects to resources.

Cumulative Effects

Overall, the cumulative effects of ground disturbance to vegetation from pipeline construction and ongoing maintenance would be minor, short term, and site specific. The disturbance area would be small and reseeding and natural re-vegetation are expected to occur after construction and ongoing maintenance of the pipeline.

The lack of information available on the optimal distribution, abundance, microhabitat needs, and disturbance regime for persistence of *Botrychium campestre* and *Botrychium lineare* in the Black Hills makes it difficult to predict what cumulative effects could be expected in the project area. It is reasonable to assume, based on what is understood about these two plant species, that there may be at least a few presently unknown scattered occurrences of these species in the Black Hills on private and public lands and that these occurrences may be comprised of relatively small numbers of individuals. Past, present, and foreseeable future actions (as well as natural disturbances) likely have and could be expected to continue to have both positive and/or negative effects on *Botrychium campestre* and *Botrychium lineare* occurrences in the Black Hills, depending on the disturbance intensity and frequency. Since *Botrychium campestre* and *Botrychium lineare* are not known to occur within the project area, no cumulative effects on these species are anticipated.

The measurement indicator and its threshold value are described in Section 1.7 of this report for Issue #3 – pipeline construction activities and effects to sensitive plants. The threshold value of 65.5 acres of disturbed land would not be exceeded during pipeline construction, and the total acres of disturbance will not change sensitive plants viability.

There exists a potential for a cumulative effect if noxious weeds were to become established in the project area as a result of project activities and were to spread to other areas not affected prior to this project. The measurement indicator threshold for invasive plants is no increase in invasive plants over existing levels. The Forest Service special use permit would address the need to monitor for invasive plants following ground disturbance so that no increase in invasive plants would occur due to the project. A monitoring plan for invasive plants is presented in Section 5.2 of this report. Re-vegetation (seeding all disturbed areas with certified weed-free native grass species), herbicide treatments before and after disturbance, and erosion control devices (as needed) would be used to mitigate the potential for an increase in noxious weeds. Each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks. No more than 500 feet of open trench would be allowed in advance of pipe laying to minimize the amount of open trench. Construction will be located within a 200-foot planning corridor to best minimize effects to resources.

3.5 Archeological and Cultural Resources

The National Historic Preservation Act of 1966 (16 U.S.C. 470f) (NHPA) creates a process under which federal agencies must consider the effect of a proposed project on any property listed or eligible for listing in the National Register of Historic Places (NRHP) before it authorizes or funds any undertaking. Section 106 of the NHPA requires federal agencies to take into account the effects of their actions on historic properties. The intent is to identify such properties, assess effects, and seek ways to avoid, minimize, or mitigate any adverse effects. The NHPA only applies to federal undertakings. If no action is chosen, then there is no undertaking (36 CFR Part 800.16(y)).

Also, two Forest Plan Guidelines are applicable to archeological and cultural resources:

- Guideline 6101: Consider long-term Forest management needs in determining appropriate use of mitigation effects to, or avoidance of, heritage resources during project planning.
- Guideline 6106: During all planning and implementation activities, incorporate information, data and ideas in the Black Hills Heritage Resources overview and the Forest Heritage Resources Database.

The analysis area of archeological resources is defined as the immediate area 100 feet on either side of the centerline of Argyle Road (FS# 333) along approximately 2.7 miles of project corridor. The analysis area is located on two separate parcels of the Black Hills National Forest, covers about 65.5 acres, and is shown on Figure 2-1. Landscape elements in the project area include a large burn area devoid of mature trees, grass meadow and pasture, exposed bedrock outcrops, and mature Ponderosa pine forest areas. There are no past, present, or reasonably foreseeable future actions for archeological and cultural resources.

Section 106 consultation was completed by the Forest Service with both South Dakota SHPO and Cheyenne River Sioux Tribe and Oglala Sioux Tribe Tribal Historic Preservation Offices (THPO). A determination of No Historic Properties Affected for this undertaking was made by SHPO on December 21, 2009. The SHPO concurrence number is R2010020300103. No responses were received from THPOs during the Section 106 consultation process.

A cultural resource records search was conducted on September 8, 2009 at the South Dakota State Archeological Research Center (SARC) and involved site, previous survey, and historic structure searches. During the records search it was found that no historic structures were on record within the analysis area. One archeological site was found to be located in the analysis area (Calhoun, 2009, p.15-16).

During the Level III cultural resource inventory conducted on September 24, 2009, the archeological site was located, recorded, and evaluated for the NRHP. Cultural resources at the archeological site were evaluated using a combination of NRHP criteria, the South Dakota Statewide Preservation Plan contexts, and Black Hills National Forest eligibility guidelines. Based on this evaluation, the site was recommended not eligible for the NRHP. In addition, records show that the site has been reconstructed and lacks original integrity. No additional cultural resources were located in the analysis area during the linear pedestrian survey (Calhoun, 2009; p.17-19; 22).

3.5.1 No Action Alternative

Direct and Indirect Effects
Under the No Action Alternative, no construction, operation, or maintenance activities would take place. Thus, there would be no removal, displacement, or damage to artifacts, features, or deposits of cultural material. No direct or indirect effects to archeological and cultural resources would occur.

Cumulative Effects
Under the No Action Alternative, no cumulative effects would occur.

3.5.2 Modified Proposed Action Alternative

Direct and Indirect Effects

The proposed project would follow all Forest Plan Objectives, Standards, and Guidelines related to determining appropriate use of mitigation effects to, or avoidance of, cultural resources during project planning. The Modified Proposed Action would have no direct or indirect effects on the archeological site located in the project area. The South Dakota State Historic Preservation Office (SHPO) was contacted and concurs that this project will result in No Historic Properties Affected for this undertaking, which meets the measurement indicator threshold for this resource. SBHWS has been notified about the archeological site and the site would be avoided during pipeline construction. If during the course of any ground disturbance related to this project, any bones, artifacts, foundations, or other indications of past human occupation of the area were uncovered, the ground disturbing activity would be stopped immediately and the Hell Canyon Ranger District's Archeologist contacted.

Cumulative Effects

There are no past, present, or reasonably foreseeable future archeological and cultural resources actions in the analysis area and surrounding NFS lands to consider as part of the cumulative effects of the Modified Proposed Action. Under the Modified Proposed Action Alternative, no cumulative effects would occur.

3.6 Socioeconomic Resources

The local governments of Custer County and Fall River County establish county planning and zoning regulations within county boundaries and have jurisdiction over private land development. Custer County's Planning and Economic Development Department's most recent comprehensive plan became effective in 2009 (Custer County, 2009). Fall River County does not have a planning department or a county comprehensive plan at this time.

The socioeconomics analysis area (Figure 3-3) encompasses about 60,075 acres of land. The boundary for the socioeconomics analysis area incorporates the areas that would be served by the SBHWS when Phase I and Phase II of the rural water system's current project plans are constructed, minus the area south of Pringle that is within NFS lands and the northern part of the City of Hot Springs. The Phase I service area is the area within the socioeconomics analysis boundary east of the project area along Argyle Road, US Highway 385, and 7-11 Road. The Phase II service area is the area within the socioeconomics analysis boundary west of the project area along Argyle Road and in the area around South Dakota Highway 89. Past, present, and reasonably foreseeable future actions for socioeconomic resources are presented in Section 3.1 and Table 3-1 of this report.

About 86 percent of the socioeconomics analysis area (51,534 acres) is private land and about 12.5 percent (7,519 acres) is NFS lands. The remaining lands include NPS property (280 acres of Wind Cave National Park), Bureau of Land Management (BLM) lands (181 acres), and state lands (561 acres). The socioeconomics analysis area is located within both Custer County and Fall River County, with the majority of the area in Custer County. The area is served by US Highways 385 and 18, South Dakota State Highways 79, 87, and 89, as well as county roads and NFS roads and trails.

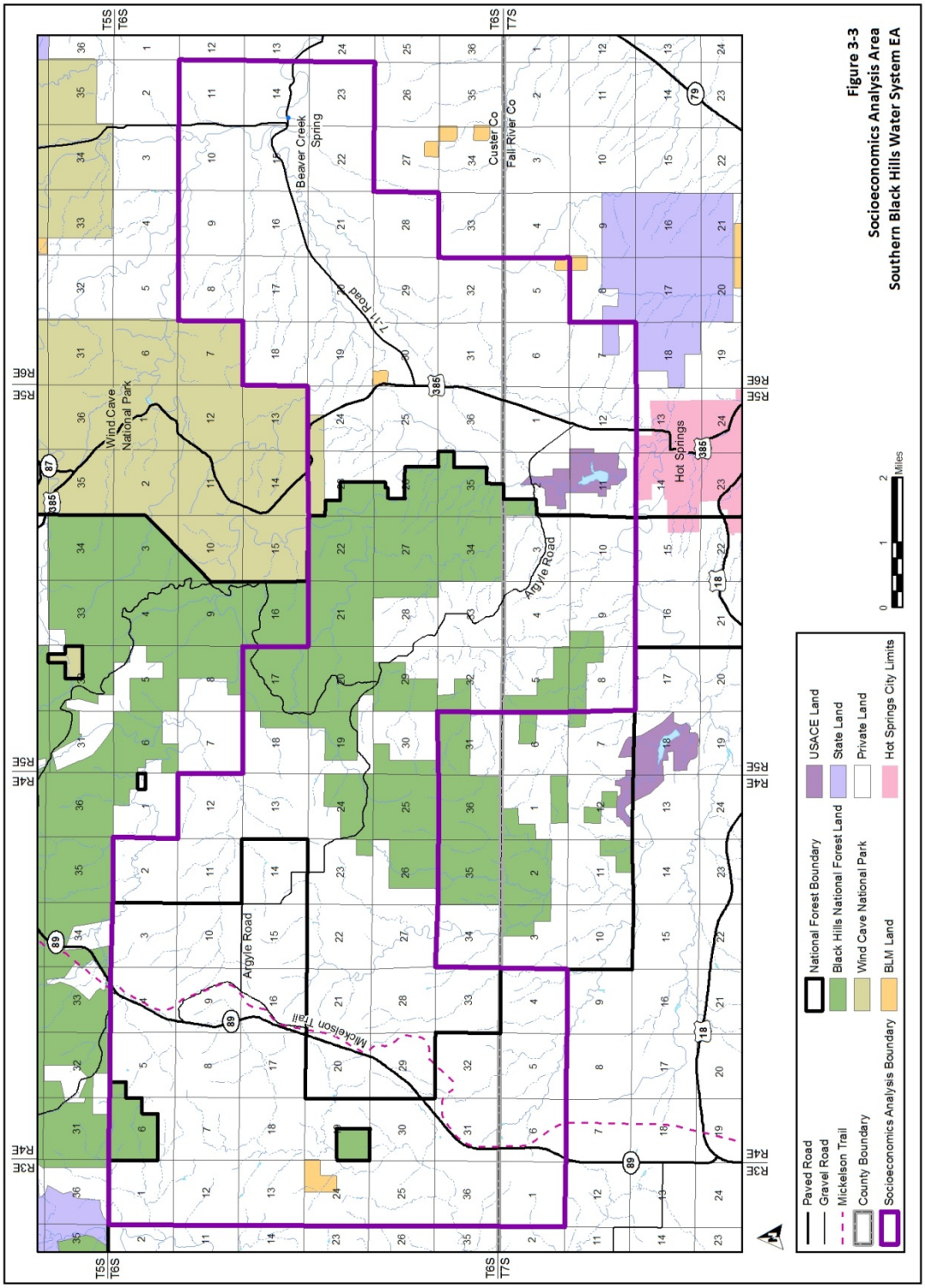

Figure 3-3. Socioeconomic Analysis Area, Southern Black Hills Water System EA.

There are a total of 388 users signed up with SBHWS at this time (Peterson, 2011). There are 100 users signed up for Phase I. The sale of the Casey Ranch, now owned by Wind Cave National Park, included 15 water taps. Of the remaining 85 sign-ups for Phase 1 rural water access, 38 plan to use rural water through SBHWS immediately, and 47 intend to maintain their monthly user fees but will not be using rural water through SBHWS at this time. These are lot owners where no home has been built yet. SBHWS has 288 users signed up for Phase II. Of these users, 220 are lot owners with homes planned for construction that presently have no drinking water source, 48 haul drinking water, and 20 have drinking water wells (Peterson, 2011). Most of the Phase II sign-ups are buying access to SBHWS but do not have plans for immediate construction and may not utilize water services for another five to 10 years. For this reason, the number of users signed up with SBHWS at this time does not reflect the number of actual households presently accessing the rural water service (Peterson, 2011).

The average person uses about 150 gallons per day (gpd) of water and the average household (with 3 to 4 residents) uses from about 450 to 600 gpd (Bastian, 2011). Based on this usage rate estimate and a maximum flow rate of the Streeter well of 109 gpm, SBHWS, under Phase I and II, would be able to support an estimated 260 to 350 sign-ups. This aligns reasonably with the number of total users currently signed up with SBHWS (388 users), taking into consideration that some of the SBHWS sign-ups may be for livestock use and that the average household water use estimates may be higher than what is typically found in the SBHWS service area.

SBHWS conducted an income study of residents within their proposed service area in 2006 and responses were obtained from 84 percent of the residents surveyed. The survey found that the median household income of the area surveyed was $25,000, significantly lower than the median household income reported in the US Census of $35,823 for Fall River County, $45,952 for Custer County, and $35,282 for the State of South Dakota.

Information for the analysis of population and demographics of Custer County and Fall River County are derived from US Census Bureau data and trends (http://factfinder.census.gov and http://quickfacts.census.gov), the Custer County Comprehensive Plan (2009), and the SBHWS Preliminary Engineering Report (Bartlett & West, 2006).

Custer County Population and Demographics

About 48 percent of Custer County is under state or federal management. Agriculture (farming and ranching) accounts for about 48 percent of the land use on privately held lands. The remaining four percent of land use in the county is comprised of local government properties, private residences, and businesses. Geographically, one-third of Custer County is located within the Black Hills National Forest boundary. Wind Cave National Park, Jewel Cave National Monument, and Custer State Park are also located within Custer County. Custer County has planning and zoning regulations in place, a County Planner, and a County Planning and Zoning Commission.

Custer County, with a year 2000 US Census population density of 4.7 persons per square mile, is considered a rural frontier county (National Center for Frontier Communities, 2011). A public opinion questionnaire of landowners was conducted by Custer County in 2008 and received a response from

about 20 percent of those surveyed. Survey results indicated that people live in Custer County because of the rural lifestyle and proximity to recreation and parks.

The median age of the county's population is 44 years. Inward migration consists primarily of retirees relocating to the area. Over time, there has been a net increase in the total number of households in the county but fewer people per household, resulting in a moderate population increase. From 1970 to 2005, population grew by 3,095 people, a 65% increase in population (1.4 percent annually). Population growth in Custer County over the last 35 years has outpaced that of both South Dakota and the United States. General demographic information for Custer County from the year 2000 US Census is provided in Table 3-3 and population trends for the county from 1960 through 2009 with percent change are shown in Table 3-4.

Table 3-3. Demographic Characteristics of Custer County, South Dakota (Source: 2000 US Census Data).

Demographic characteristics of Custer County, South Dakota (Source: 2000 US Census Data)	
Population (2009, estimate)	7,924
Population (% change 2000 to 2009)	8.9%
Households (2,000)	2,970
Persons per Household (2000)	2.35
Median household Income (2008)	$42,952
Persons below poverty level (2008)	10.3%
Persons per Square Mile (2000)	4.7
Building Permits Issued (2009)	46
Estimated median house value (2009)	$147,965
Mean price (2009 detached house)	$242,021

Table 3-4. Population Trends for Custer County, South Dakota, 1960-2009 (Source: 2000 US Census Data).

Population Trends for Custer County, South Dakota, 1960 – 2009 (Source: 2000 US Census Data)						
	Year					
	1960	**1970**	**1980**	**1990**	**2000**	**2009**
Population*	4,906	4,698 (-4.2%)	6,000 (+27.7%)	6,179 (+3.0%)	7,275 (+17.7)	7,924 (+8.9%)

*Percent change between years calculated as: $[(Value_{present} - Value_{past}) \div Value_{past}] \times 100$

Fall River County Population and Demographics

Agriculture and grazing of livestock are major industries in Fall River County, followed by tourism and recreation that support many local businesses. Fall River County is comprised of both publicly and privately held land. Fall River County does not have planning and zoning regulations in place and there is no County Planner or County Planning and Zoning Commission in Fall River County. In 2011, the Fall River County Commission adopted a Land Use Policy that addresses views of the County Commission on issues related to public lands in the county.

The median age of the county's population is 45.5 year. The overall population trend for Fall River County indicates that the county population is decreasing. Fall River County's population is expected to remain very close to its current level for at least the next decade and possibly longer into the future, similar to its historic trend of less than 1% growth per decade (Bartlett and West, 2006). General demographic information for Fall River County from the year 2000 US Census is provided in Table 3-5 and population trends for the county from 1960 through 2009 with percent change are shown in Table 3-6.

Table 3-5. Demographic Characteristics of Fall River County, South Dakota (Source: 2000 US Census Data).

Demographic Characteristics of Fall River County, South Dakota (Source: 2000 US Census Data)	
Population (2009, estimate)	7,241
Population (% change 2000 to 2009)	-2.8%
Households (2,000)	3,127
Persons per Household (2000)	2.23
Median household Income (2008)	35,823
Persons below poverty level (2008)	15.0%
Persons per Square Mile (2000)	4.3
Building Permits Issued (2009)	6
Estimated median house value	$91,041
Mean price (detached house 2009)	$143,608

Table 3-6. Population Trends for Fall River County, South Dakota, 1960-2009 (Source: 2000 US Census Data).

Population trends for Fall River County, South Dakota, 1960 – 2009 (Source: 2000 US Census Data)						
	Year					
	1960	**1970**	**1980**	**1990**	**2000**	**2009**
Population*	10,688	7,505 (-29.8%)	8,439 (+12.4%)	7,353 (-14.8%)	7,453 (+1.4%)	7,241 (-2.8%)

*Percent change between years calculated as: $[(Value_{present} - Value_{past}) \div Value_{past}] \times 100$

3.6.1 No Action Alternative

Under the No Action alternative, the special use permit would not be issued by the Forest Service and the water pipeline would not be installed across approximately 2.7 miles of NFS land. Existing homes would continue to acquire drinking water from other sources. When construction of Phase I is completed, which does not require a special use permit from the Forest Service, SBHWS would provide water in the Phase I service area. SBHWS could continue to pursue acquiring private land easements and reducing or eliminating pipeline construction on public land. SBHWS could develop additional groundwater supplies or enter into institutional water contract agreements with other communities or entities.

Direct and Indirect Effects

Under the No Action alternative, there would be no direct effects to the immediate project area, which is shown in Figure 2-1 as the approximate location of the proposed pipeline on NFS land. Many of the users that are signed up for water access under Phase I already live or plan to construct homes within the service area and would still purchase water services from SBHWS if the special use permit were not issued. Battle Mountain Subdivision, which is located on both sides of US Highway 385 just north of the Custer County – Fall River County boundary and has been in existence for more than 10 years, contains 65 lots. Some of the subdivision's residents have signed up for Phase I rural water access as a water source (Green, 2011).. At this time there are no additional subdivisions that have been platted or that are in the preliminary platting process in the Phase I service area. Upon completion of Phase I construction, water access from SBHWS would still be made available to existing and proposed residential lots and agricultural lots in the Phase I service area if the special permit were not issued.

Exposure to bacterial contamination could be an indirect effect to residents who do not receive access to a dependable and safe water supply and distribution system within the socioeconomics analysis area. Using water tanks in trucks involves handling and transferring drinking water between multiple containers and can introduce contaminants into the water or provide exposure to bacterial growth in storage tanks. The reliance on water tanks and water hauling also introduces a risk to the user relative to weather and road conditions.

Cumulative Effects

Under the No Action Alternative, no cumulative effects would occur.

3.6.2 Modified Proposed Action Alternative

Under the Modified Proposed Action alternative, the special use permit would be issued by the Forest Service and the water pipeline would be installed across approximately 2.7 miles of NFS land. Both Phase I and Phase II of the SBHWS would be constructed. Once Phase I and II of the water pipeline are completed, SBHWS would provide rural water service to private properties along the service lines. SBHWS could continue to pursue acquiring additional private and public land easements. SBHWS could develop additional groundwater supplies or enter into institutional water contract agreements with other communities or entities.

Direct and Indirect Effects

Under the Modified Proposed Action alternative, there would be limited direct effects to the immediate project area, which is shown in Figure 2-1 as the approximate location of the proposed pipeline on NFS land. Project construction could require some travel restrictions or traffic delays on Argyle Road. Restricted or delayed access for area residents and recreationists would be a short-term, temporary direct effect. To minimize impacts to travel and traffic along the road, each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks.

Upon completion of Phase I and Phase II construction, water access would be made available to existing and proposed residential lots and agricultural lots within the service area. According to the Custer County Planning Director (Green, 2011), there are several existing and planned developments in the Phase II service area. There are 197 existing lots in five subdivisions within the Phase II service area. These subdivisions are all located west of State Highway 89, in the far west portion of the socioeconomics analysis area (Figure 3-3). There are also 124 lots in the preliminary approval process in two subdivisions, and 50 lots likely to be developed in the future in one subdivision, all located in the far west portion of the socioeconomic analysis area. Within the Phase II service area, there are also about 700 acres in two locations (500 acres just west of State Highway 89 at the Custer County – Fall River County boundary and 200 acres at the west end of Argyle Road) that have the potential to be developed in the future (Green, 2011). Lots that are closer to State Highway 89 and other main roads have a greater potential for build-out than lots that are located further from paved roads (Green, 2011). Although growth in Custer County prior to 2008 was about 10 percent per year, growth has decreased since 2008 due to economic conditions and it is uncertain when these lots will be sold and when they will be developed (Green, 2011).

Indirect effects from Phase I and II construction are anticipated within the socioeconomics analysis area. Basic necessities such as site access, power, and water availability are vital components of how rapidly and to what extent rural lands are developed following construction of a rural water system (Lundeen and Janssen, 1981).County tax revenues could increase and public service needs (police, fire, and ambulance) could increase with increased development (Green, 2011). Effects to the county transportation network may result in the need for additional gravel and grading maintenance by Custer County(Green, 2011). Winter plowing is unlikely to increase on highways or county roads. Subdivision roads are not maintained by Custer County and there would be no increased maintenance and winter plowing for these roads.

Cumulative Effects

Cumulative effects from Phase I and II construction are anticipated within the socioeconomics analysis area. A potential cumulative effect is that the currently rural and agricultural nature of the land use in the service area will change as residential and other development occurs.

Potential population growth related to the construction of the water pipeline would occur within the Phase I and II service areas. Development of the water system could encourage people currently living adjacent to the service area to move into the service area, resulting in no net change in county

population. Access to water could also spur new development of existing residential lots and encourage subdivision of existing property over time, increasing population within the service area.

As a result of increased development, property values and property taxes could increase within the service area and surrounding area, the local economy could be affected, county tax revenues could increase, and public service needs within the service area could increase.

3.7 Other Resources

3.7.1 Range

A range assessment was completed for this project (Hays, 2009b). The project area includes disturbed area (roadway and associated ditches), some Ponderosa pine forest, and small areas of mid-elevation mixed grass prairie. There are three Forest Service grazing allotments in the project area. The Argyle and Shirttail allotments abut Argyle Road to the north and the Hot Brook allotment abuts Argyle Road to the south. The allotments are currently fenced and utilized as pastureland for livestock.

Under the No Action Alternative, there would be no construction, operation, or maintenance activities. Grazing activities would not be affected. The No Action Alternative would have no direct, indirect, or cumulative effects to livestock grazing.

During construction, the Modified Proposed Action Alternative could result in the temporary removal of fencing along the allotments to allow vehicles to maneuver. Fencing would be replaced or temporary fencing installed before the end of each work day to ensure cattle remained in the allotments. The ground disturbance and loss of vegetation associated with this project could result in the indirect effect of an increase of noxious weeds. There exists a potential for a cumulative effect if noxious weeds were to become established in the project area as a result of project activities and were to spread to other areas not affected prior to this project. Re-vegetation (seeding all disturbed areas with certified weed-free native grass species) and erosion control devices (as needed) would be used to mitigate the ground disturbance effects of the project. Construction would be located within a 200-foot planning corridor to best minimize effects to resources.

3.7.2 Air Quality

Goal 1 of the Forest Plan includes protection of air quality. Objective 101 of the Forest Plan is to maintain air quality standards in accordance with state implementation plans. Construction of the pipeline has the potential to result in short-term increases in fugitive dust and particulate matter in the project area from ground disturbing activities as well as construction vehicle traffic. Thus, minor, short-term, adverse effects on local air quality would result during construction. No other direct or indirect effects are anticipated. No cumulative effects are anticipated. Construction and operation would increase vehicular traffic to the area, but the effect would be minimal. Standard construction industry measures would be taken to minimize fugitive dust emissions created during construction activities.

3.7.3 Climate Change

Climate change, specifically increasing temperatures and atmospheric carbon dioxide (CO_2) levels, in addition to changes in levels of precipitation and the frequency and severity of extreme climatic events, can have notable effects on the world's forests and forest health. Similarly, human activities that modify the vegetation landscape can result in effects on climate change.

The health of the ecosystem is a function of water availability, temperature, CO_2, and many other factors. If vegetation cover and moisture exchanging properties of the land change, important local and regional climate characteristics such as humidity, wind, and temperature will also change. These changes have the potential to compound effects on vegetation. Climate change may cause a host of physical consequences to ecosystems, which may in turn affect the quality of plant and animal habitat.

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO_2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Forests, over time, absorb CO_2 (USDA-Forest Service, 2009b).

Under the No Action Alternative, no construction activities would take place, and there would be no change in vegetation cover, greenhouse gas (GHG) gas emissions, or the carbon cycle beyond current conditions. Thus, no direct, indirect, or cumulative effects on climate change are expected under this alternative.

In terms of the effect of the proposed project on climate change, construction would include effects to existing vegetation and the operation of construction equipment and vehicles. Short-term disturbance to vegetation and soil during construction can have an effect on the local carbon cycle. Construction of the project would emit GHG gases in the short term (a direct effect). Neither of these effects to vegetation and equipment operation would measurably contribute to the global concentration of GHGs that affect climate in the short term (an indirect effect). The relatively minute quantities of pollutants released during construction, and afterwards during operation and maintenance of the pipeline, would have a negligible cumulative effect on climate change. The effects of this project would not be meaningfully measurable in terms of contributions to GHG emissions. Also, it would not affect the ability of the ecosystem to adapt to perturbations from climate change.

Table 3-7. Summary of Design Features for the Modified Proposed Action by Resource.

Summary of Design Features for the Modified Proposed Action by Resource	
Resource	**Alternative 2 Modified Proposed Action**
Water Resources	To monitor for potential adverse effects to groundwater, a monitoring plan would be established to measure flow from the well into the water pipeline, water fluctuations in the Madison Aquifer, and potential leakage from the water pipeline on NFS lands.
Socioeconomic Resources	To minimize travel and traffic effects, each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks.
Wildlife and Wildlife Habitat	Off-road motorized travel associated with construction would occur only after May 15 and before December 15, in accordance with Forest Plan Standard 5.4-9101. Special use permit would address monitoring invasive plants for five years in disturbed area. Re-vegetation with certified weed-free native grasses, herbicide treatments before and after disturbance, and erosion control as needed would be used to decrease the potential for increase in invasive plants and subsequent loss of native grassland habitat. Each one-quarter mile section of pipeline construction would be completed within 14 calendar days so that no single segment of corridor would be subject to construction disturbance for more than two full weeks. No more than 500 feet of open trench would be allowed in advance of pipe laying to minimize the amount of open trench. Construction would be located within a 200-foot planning corridor to best minimize effects to resources. Monitoring and treatment would continue throughout the life of the special use permit for areas that are disturbed during operations and maintenance of the pipeline.
Vegetation – Sensitive Plants and Invasive Plants	Monitoring and surveying for sensitive plants in the project area is ongoing by Forest Service personnel. See description under the Wildlife and Wildlife Habitat resource for how the special use permit would address monitoring and treatment of invasive plants.
Archeological and Cultural Resources	Known archeological sites would be avoided during construction. If archeological or cultural resources were found during construction, ground disturbing activity would be stopped and the Hell Canyon Ranger District's Archeologist contacted.
Range	If temporary fencing removal occurs for vehicle access during construction, fencing would be replaced or temporary fencing installed before the end of each work day to ensure cattle remain confined in allotment areas See description under the Wildlife and Wildlife Habitat resource for how the special use permit would address monitoring and treatment of invasive plants.
Air Quality	Standard construction industry measures would be taken to minimize fugitive dust emissions created during construction activities.

CHAPTER 4 CONSULTATION AND COORDINATION

A list of preparers is presented in Table 4-1.

Table 4-1. List of Preparers.

List of Preparers	
Resource Area/Title	**Preparer**
USDA Forest Service	
District Ranger	Lynn Kolund
Project Manager	Laura Burns
Natural Resource Law Specialist	Ed Fischer
NEPA Coordinator	Kelly Honors
Botany	Matt Scott
Wildlife	Brad Phillips
Range	Lucas Bindel
Water Resources	Chris Carlson
Water Resources	Les Gonyer
Cultural Resources	Matthew J. Padilla
RESPEC Consulting & Services	
Vice President	Cheryl Chapman
Project Engineer	Jenifer Sorensen
Project Analyst	Mary Kenner
Leggette, Brashears & Graham, Inc.	
Hydrogeology Specialist's Report	Mitch Kannenberg and Tim Kenyon
Accipiter Biological Consultants	
TE&S Specialist's Report, Range Assessment Report, Flora and Fauna Report	Tom Hays
Quality Services, Inc.	
Level III Cultural Resources Inventory Report	Emily Calhoun

CHAPTER 5 MONITORING PLANS

5.1 Water Resources

Due to uncertainties caused by the complexity of the hydrogeologic setting in the project area, a long-term monitoring and reporting plan designed to track the response of the Madison Aquifer to pumping of the Streeter well at 109 gpm, The Water Resources Monitoring and Reporting Plan, would be instituted under the Modified Proposed Action alternative.

Monitoring would be performed by several different entities, including SBHWS and state and federal agencies. Understanding the effects of the Modified Proposed Action will require cooperation and data sharing among these entities. Monitoring and reporting under this plan would consist of four parts, which are outlined below. The specific implementation provisions of the Water Resources Monitoring and Reporting Plan will be part of the special use permit.

1. Streeter Well

State Water Permit Number 2634-2, held by Mr. Eben Streeter, requires that SBHWS report annually to SD DENR the amount of water withdrawn from the Streeter well for use in the common distribution system. In addition to the state requirements, SBHWS will utilize a flow measuring device to monitor the Streeter well. The results will be recorded and reported monthly, or as required by the Forest Service.

The elevation of the groundwater in the Madison Aquifer at the Streeter well will be measured by a pressure gauge at the wellhead. The results will be recorded and reported monthly, or as required by the Forest Service.

2. Pipeline

The method of monitoring and reporting of results of leakage of water from the pipeline onto NFS lands will be part of the special use permit.

3. Beaver Creek Springs

Contingent on private landowner support of a monitoring plan for Beaver Creek Springs, the designated entity responsible for monitoring will record monthly discharges and report monthly, or as required by the Forest Service.

4. Other Water Resources

Other entities are currently monitoring water resources. Information would be shared with SBHWS for reporting purposes:

- Hydraulic head at SD DENR Madison Aquifer observation well CU-91A as currently being monitored by the SD DENR.
- Hydraulic head at SD DENR Minnelusa Aquifer observation well CU-91B as currently being monitored by the SD DENR.

- Water levels in Calcite Lake, What the Hell Lake, and Windy City Lake, as currently being monitored by Wind Cave National Park personnel.
- Madison Aquifer hydraulic head in Wind Cave Well #1 and Wind Cave Well #2, as currently being monitored by Wind Cave National Park personnel.

An Annual Monitoring Report will be prepared to summarize the previous year's data and provide an analysis of the effects on the identified key resources. SBHWS will incorporate its own monitoring results, as well as those reported by SD DENR, Wind Cave National Park, and any other relevant data. The monitoring data and analysis would be framed within the context of historical data when possible. For example, any increase or decrease in water levels at Wind Cave underground lakes would be reported along with current and historical trends and known seasonal changes in water levels. After three years, based upon the findings in the report, the Forest Service may require the report biannually.

5.2 Invasive Plants

The area of disturbance during the construction phase of the pipeline, under the Modified Proposed Action, will be monitored annually by a professional biologist for the first three years of the special use permit. The sampling plan for the monitoring will be submitted to the Forest Service. The findings will be reported as part of the Annual Monitoring Report. Any corrective action, which may be required, will be accomplished in accordance with the special use permit.

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APPENDIX I CONSULTATION AND SCOPING LIST

Public participation played a major role in the planning process and development of this environmental assessment. Scoping letters were mailed to the following list of agencies, adjacent landowners, interested groups and individuals. The Forest Service received a total of 17 responses as a result of initial scoping, from which issues and concerns were identified and alternatives were developed.

Stephanie Herseth-Sandlin, US House of Representatives
Tim Johnson, US Senate
John Thune, US Senate
Lance Russell, SD State Representative
Mike Verchio, SD State Representative
Gordon Howie, SD State Senator
Travis Bies, Custer County Commission
Joe Faulkenburg, Fall County Commission
John Culberson, Custer County Highway Department
James Margadant, Black Hills Chapter of the Sierra Club
Nancy Hielding, Prairie Hills Audubon Society
Shelly Deisch, SD Game, Fish & Parks
Ron Dahlinger, Black Hills Power and Light
Dan Hutt, Black Hills Electric Cooperative
Colin Paterson, The Norbeck Society
Jared McJunkin, National Wild Turkey Federation
Bob Paulson, The Nature Conservancy
Mike Mueller, Rocky Mountain Elk Foundation
Mark Mayer, SD Department of Natural Resources – Drinking Water
Vidal Davila, Wind Cave National Park
Steve Harper, Fall River Water Users District
Bureau of Reclamation
Fall River Water Users District
Angostura Irrigation District
Edgemont Chamber of Commerce
Biodiversity Conservation Alliance
Golden West Communications
Donna Rae Peterson, Cheyenne River Sioux Tribe
Joseph Brings Plenty, Cheyenne River Sioux Tribe
Darrell Flyingman, Cheyenne/Arapaho Tribes of Oklahoma
Gordon Yellowman, Cheyenne/Arapaho Tribes of Oklahoma
Brandon Sazue, Crow Creek Sioux Tribe
Ivan Posey, Eastern Shoshone Tribe
Joshua Weston, Flandreau Santee Sioux Tribe
Elaine Quiver, Grey Eagle Society
Dewey Tsonetokoy, Sr., Kiowa Ethnographic Endeavor for Preservation
Clair Green, Lower Brule Sioux Tribe
Michael Jandreau, Lower Brule Sioux Tribe
Elgin Crows Breast, Mandan, Hidatsa, and Arikara Nation
Marcus Levings, Mandan, Hidatsa, and Arikara Nation
Harvey Spoonhunter, Northern Arapaho Tribe
Darlene Conrad, Northern Arapaho Tribe
Leroy Spang, Northern Cheyenne Tribe
Conrad Fisher, Northern Cheyenne Tribe
Charlene Alden, Northern Cheyenne Tribe
Theresa Two Bulls, Oglala Sioux Tribe
Joyce Whiting, Oglala Sioux Tribe
Rodney Bordeaux, Rosebud Sioux Tribe
Russel Eagle Bear, Rosebud Sioux Tribe
Roger Trudell, Santee Sioux Nation
Sicangu Lakota Treaty Council Office
Mike Selvage Sr., Sisseton-Wahpeton Sioux Tribe
Myra Pearson, Spirit Lake Sioux Tribe
Ron His Horse Is Thunder, Standing Rock Sioux Tribe
Waste Win Young, Standing Rock Sioux Tribe
Adrienne Swallow, Standing Rock Sioux Tribe
Robert Cournoyer, Yankton Sioux Tribe
Brian Brademeyer
Nancy Hielding
Bill Curran

Leonard & Oonagh Wood, Wood Ranch, LP
James & Judith Hill
Dawayne & Barbara Nelson
Bennie & Shirley Barcroft
Frederic Stephan
Brian & Ann Powers
Allen Bolte
Emlon & Michele Stanton
Michael & Sheila Montgomer
Rex & Mildred Piper, Rex Piper Revocable Trust
Don & Sherry Oyler
Charles & Ruth Braddish
Robert & Norine Baird
James & Cynthia Benton
Courtesy Investments, LLC
Shirley McClure
Richard Meyer
Jon & Elizabeth Brechtel
Dan Dooley
Charles & Lois Greer
Richard Greer
Gerald & Darlene Thorndyke
Donald & Caren Howard
Sally Moore
A. Edward Claymore
Alvin & Sylvia Harris
Darlene Hahler
Gregory & Rose Wendall
Christopher Silva
Nancy Jean Dupont Revocable Trust
William & Judy Linder
Anthony & Jacqueline Van Ausdall
Adrian Ranch, LLC
Oscar, Inc.
Charles & Susan Trobee
Walmarth Tuthill

Raymond & Cheryl McClain
Bill Fraas
Arvid Iverson
Lee Broyles
Douglas Haynes
Phyllis Muhm
Jeffery Dross
Gary Palo
Gerald Galbraith
Priscilla Sieg
Harry Swain
Global Business Services, LLC
Harry Fraas
Stephen Collins
Knutson Bros.
Frank Schroth
Ken & Vivian Couch

APPENDIX II SUMMARY OF SCOPING COMMENTS

The following table is a summary of the specific comments received during scoping and how they were addressed during the Southern Black Hills Water System Argyle Road Service Area Special Use Permit Environmental Assessment (EA) process. The scoping letter was mailed out on October 6, 2009. The Forest Service received a total of 17 comments from individuals, groups, and state agencies. Each comment was assigned a number, and each issue or concern within a comment was also assigned an alphabetic letter. Each comment was evaluated against the four criteria for significant issues: 1) Outside the scope of the proposed action; 2) Already decided by law, regulation Forest Plan, or higher level decision; 3) Irrelevant to the decision to be made; and 4) Conjectural and not supported by scientific or factual evidence. A disposition for each issue was identified (S.I. = Significant Issue and N.S. = Non-Significant Issue).

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
1	Mark Mayer SD DENR	It appears, based on the information provided, that this project would not have adverse environmental effects to drinking water (quality) in this area.	Water Quality	N.S. - Information	Information
2	Rep Mike Verchio	The project...is a vital component to the viability of not only future development of this area, but improving the quality of life of its current residents. I urge you to give favorable consideration to this project. The impact is minimal and in the long run could even prove beneficial to wildlife habitat.	Support of Project	N.S. - Support	Noted
3.a	Harry and Marilyn Swain	We fully support the...project and are extremely interested in seeing it progress to completion as soon as possible.	Support of Project	N.S. - Support	Noted
3.b		We have had to rely on having water hauled since our well silted in. We have had to restrict our water usage. It would be impossible to fight even a grass fire at our home.	Support of Project	N.S. - Support	Noted
3.c		It is our opinion that the laying of the pipeline would have no adverse effect on Black Hills Forest Service lands as the pipeline as we understand it would follow the existing established route of the Argyle road.	Opinion	N.S. - Opinion	Noted

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
3.d		The Argyle road would have more impact to Forest Service lands due to dust, shoddy maintenance. It gets muddy and slippery in rain and snow and tends to wash out and gully.	Roads	N.S. – Outside the Scope of the Project	Maintenance of Argyle Road is outside the scope of this project.
4	Darlene Hahler	Inquiry on cost of water service.	Private Water Service	N.S – Outside the Scope of the Project	Cost of water service is outside the scope of this project.
5.a	Scott Johnson	Very supportive of project to provide dependable water to residents.	Support of project	N.S. - Support	Noted
5.b		Concerned about land speculation occurring with the expectation of water in this area.	Land Development	N.S. – Outside the Scope of the Project	Custer County planning department has jurisdiction over private land development.
5.c		Concerned that expected pipe size may be too small to provide water to all who sign up.	Pipe Size	N.S. – Outside the Scope of the Project	This analysis focuses on the project as presented within application from the SBHWS Board.
6.a	Bill Fraas	Concerned about potential for residential development and the level of water needed 50 years from now from the Madison Aquifer.	Water Quantity	S.I. – Water Pumping Rate and Effects to Madison Aquifer.	This issue will be used to modify the proposed action.
6.b		There is potential for the line to cross his property if the Forest Service does not approve the easement.	Alternative	Possible Alternative	The opportunity for the pipeline to cross landowner's property was made available and subsequently the National Forest modified the Proposed Action to reduce acreage on public land.
6.c		Believes the SBHWS Board is trying to provide a good thing.	Support of Project	N.S. - Support	Noted
7.a	Leonard and Oonagh Wood	The proposed pipeline is a good idea and we support it.	Support of Project	N.S. - Support	Noted

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
7.b		Pipeline would…open up a source of water to parts of County that are quite dry. Pipeline would provide…..safe and accessible water supply to residents, water for fire departments, and water for livestock.	Support of Project	N.S. - Support	Noted
8	Stuart Adrian	We support the proposed action.	Support of Project	N.S. - Support	Noted
9	Dawayne and Barb Nelson	Pipeline will provide dependable water for both man and wildlife.	Support of Project	N.S. - Support	Noted
10.a	Frank Schroth	Very much against the project.	Against Project	N.S. – Against Project	Noted
10.b		Concerned about the level of water to be removed from the Madison Aquifer and the resulting reduction in capacity and flow in Beaver Creek.	Water Quantity	S.I. - Effects to Madison Aquifer and Beaver Creek	This issue will be used to modify the proposed action. Effects to water levels will be discussed in the EA.
10.c		Concerned about the level of water to be removed from the Madison Aquifer and the resulting impact to cave lakes. Current monitoring shows impacts to cave lakes.	Water Quantity	S.I.- Effects to Madison Aquifer and Cave Lakes at Wind Cave	This issue will be used to modify the proposed action. Effects to water levels will be discussed in the EA.
11.a	Vidal Davila – Wind Cave National Park	The greatest concern that Wind Cave National Park has is the potential to draw down the water table of the Madison Aquifer thereby impacting the cave lakes within Wind Cave. …The impact could be seen immediately or could show up years in the future depending on water withdrawal rates. Based on our modeling, the subterranean lakes will be greatly impacted by pumping water from the aquifer and supplying hundreds or thousands of private water users.	Water Quantity	S.I.- Effects to Madison Aquifer and Cave Lakes at Wind Cave	This issue will be used to modify the proposed action. Effects to water levels and the cave lakes will be discussed in the EA.

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
11.b		Concern on potential impacts from digging the large trench to cultural resources. A complete archeology survey should be conducted and SHPO consulted.	Heritage	N.S. - Request	An inventory of cultural resources and consultation with recognized Tribes has been completed as required by Section 106 of NHPA.
11.c		Concern on potential impacts from digging the large trench on state or federally listed vegetation.	Sensitive Plants	S.I. – Effects to Sensitive Plants	Issue will be used to develop design criteria and the effects on state or federally listed vegetation will be discussed in the EA.
11.d		Concern on potential impacts from digging the large trench - potential for invasive weed species to occur and spread.	Invasive weeds	S.I. - Potential for Establishment and Spread of Invasive Weeds	Issue will be used to develop design criteria and the effects on weeds, will be discussed in the EA.
12.a	Dick Deutscher – Golden West Communications (GWT)	We have buried communication cables in and around the proposed pipeline location. We do not have construction prints and are therefore, unable to comment on direct effects to our facilities, at this time.	Existing Communication Lines	N.S. - Coordination	The need to coordinate with other easement holders in the area will be part of any permit issued on this project.
12.b		There may be areas on which SBHWS and GWT have overlapping easements. We would hope that any permit to SBHWS would be non-exclusive. We would like to have 6-10 feet of separation should either facility need to be excavated in an emergency.	Existing Communication Lines	N.S. - Coordination	The need to coordinate with other easement holders in the area will be part of any permit issued on this project.
12.c		We suggest that SBHWS bury a locate wire with their pipe to allow accurate location of the water pipe in the future.	Existing Communication Lines	N.S. - Coordination	The need to coordinate with other easement holders in the area, including providing location wire, will be addressed in any permit issued on this project.

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
12.d		All appropriate care should be taken when working around our facilities to avoid damage. We request to be contacted prior to any digging.	Existing Communication Lines	N.S. - Coordination	The need to coordinate with other easement holders in the area will be part of any permit issued on this project.
13.a	John Culberson – Custer County Highway Department	Custer County is very supportive of the project. The Custer County Commissioners approved their application to occupy right-of-way in areas that do not lie on Forest Service land.	Support of Project	N.S. - Support	Noted
13.b		It is my opinion that where county or state roads lie on Forest Service lands the local authority should be the arbiter of what is and is not acceptable practice in that right-of-way.	Road Right-of-Ways	N.S. - Opinion	Noted
14.a	Bob and Norine Baird	This referenced water line will be very beneficial to us for domestic use as well as livestock use.	Support of Project	N.S. - Support	Noted
14.b		Project will provide residents in this fire protection area, a reliable source of water.	Support of Project	N.S. - Support	Noted
15.a	Ken and Vivian Couch	Concerned about the adequacy of the water supply. Permits allow 742 million gallons of water per year to be pumped – is there adequate water available?	Water Quantity	S.I. - Effects to Madison Aquifer	This issue will be used to modify the proposed action. Effects to water levels will be discussed in the EA.
15.b		If the Streeter well is used, what assurances do we have that our wells, located nearby, will not be adversely affected?	Water Quantity	S.I. - Effects to Madison Aquifer and Private Wells	This issue will be used to modify the proposed action. Effects to water levels and private wells will be discussed in the EA.
15.c		There have been multiple grants of public monies to fund this project. How have monies been spent?	Funding	N.S. – Outside the Scope of the Project	Grants awarded to SBHWS have been administered by SD DENR and USDA Rural Development.

Comment #	Name	Summary of Comment	Focus Area	Disposition	Response
15.d		The Forest Service has spent a great deal of money to purchase Lady C ranch to restrict development. Is this consistent with the water line project?	Land development	N.S. – Outside the Scope of the Project	Custer County planning department has jurisdiction over private land development.
16.a	Jeffrey Vonk - SDGFP	Minimize habitat disturbance along the 40-foot construction easement, including impacts to nest trees, woody draws or sensitive plant communities. Items of concerns are road construction or relocation, pull-off or other ground disturbing activities.	Wildlife	S.I. – Effects to Wildlife and Wildlife Habitat	Issue will be used to develop design criteria for all alternatives and the effects to wildlife and wildlife habitat will be discussed in the EA.
16.b		Please address the amount of time projected to complete this project to minimize wildlife disturbance.	Wildlife	N.S. - Request	The estimated length of time to implement the project will be discussed in the EA.
16.c		Black Hills National Forest and counties should use the same native seed mix for rehab on disturbed areas. Standards for seedling establishment and keeping vehicles off planted areas should be agreed upon.	Seed Mix	N.S. - Request	Black Hills National Forest has an established native seed mix for the area. Seed mixes used by the county are outside the scope of this analysis.
16.d		Provide maps with known SOLC, R2 sensitive and MIS habitats and nesting sites.	Wildlife	N.S. - Request	Effects to SOLC, R2 Sensitive species and MIS will be addressed in the EA.
16.e		Provide maps with known riparian areas that may be impacted.	Riparian Areas	N.S. - Request	Effects to riparian areas will be addressed in the EA.
16.f		Provide maps with location and names of BHNF allotments and pastures that will be tying into the pipeline for federal land permittees.	Range Allotments	N.S. - Request	No water distribution lines are proposed on National Forest lands. The EA will discuss effects to range.
17	Oscar Peterson	Would like to continue to receive information on project.	Public involvement	N.S. - Request	Keep on mailing list.