



United States
Department of
Agriculture

Forest
Service



October 2006

**Environmental
Assessment**

Ballard Petroleum Holdings, LLC Wildhorse Creek Oil Field Development

**Douglas Ranger District, Medicine Bow-Routt National Forests and
Thunder Basin National Grassland, Campbell County, Wyoming**

**WYW Lease No's. WYW139626, WYW141187,
WYW141188**

Douglas Ranger District, Medicine Bow-Routt National Forests and
Thunder Basin National Grassland,
Campbell County, Wyoming

For Information Contact:
Mike Sierz, Minerals Management Specialist
Douglas Ranger District
U.S. Forest Service
2250 E. Richards, Douglas, WY 82633
(307) 358-1612

e

"The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer."

SUMMARY

The Douglas Ranger District of the Medicine Bow-Routt National Forests and Thunder Basin National Grassland proposes to authorize Ballard Petroleum Holdings, LLC (Ballard) to develop (access, drill, test and complete) five (5) conventional oil wells on National Forest System (NFS) Lands in the Spring Creek Geographic Area of the Thunder Basin National Grassland in Sections 17, 18, 19 and 20, Township 54 North, Range 69 West, of Campbell County, Wyoming during 2006 and 2007.

Through this environmental effects analysis process, the District Ranger will determine where and under what terms and conditions Ballard may occupy the surface to develop their oil and gas leases while protecting natural resources and providing for public access and safety. In addition, the BLM Buffalo Field Office Manager will utilize this environmental analysis (EA) to determine the conditions under which Ballard may exercise their federal mineral leases. This decision implements the *Revised Land and Resource Management Plan for the Thunder Basin National Grassland* (herein referred to as the Grassland Plan or LRMP) (USFS 2001a). The analysis documented in this EA tiers to the analyses and findings documented in the *Final Environmental Impact Statement for the Northern Great Plains Management Plans Revisions* (USFS 2001b) and Thunder Basin Land and Resource Management Plan (USFS 2001a) and *Record of Decision* (USFS 2002) and adopts and incorporates by reference portions of the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project, herein referred to the PRB FEIS (BLM 2003a) and incorporates by reference other applicable laws and regulations. Surface developments are required to be consistent with direction contained in the Grassland Plan and existing leases.

Alternative A, the Proposed Action, involves activities necessary to drill, complete, operate, and reclaim five (5) conventional oil wells within the administrative boundaries of Thunder Basin National Grassland. Wildhorse Creek Federal 4-18 would be located in the SWSE, Section 18, T54N R69W, and Wildhorse Creek Federal 44-18 would be drilled in the SESE, Section 18, T54N R69W. Wildhorse Creek Federal 31-19 would be drilled in the NWNE, Section 19, T54N R69W and Wildhorse Creek Federal 42-19 would be drilled in the SENE Section 19, T54N, R69W. Wildhorse Creek Federal 21-20 would be drilled in the NENW Section 20, T54N, R69W. These are proposed infield wells to be drilled in a known field to determine actual underground circumstances at new depths and rock formations to determine if there are amounts of oil or gas that would be economically viable to develop. The roads being used are existing graded roads and trail. A level drill pad for each well, not to exceed approximately 300 feet x 250 feet, would be constructed. The wellhead and associated tanks and ancillary buildings would be located on each pad. Wells would be drilled to a maximum depth of 5700 feet. Under this Alternative, approximately 4.65 miles of new roads would be constructed to BLM Resource Road standards, assuming each well proves a commercial discovery. Construction of the route to Wildhorse Creek Federal 44-18 would require the removal of +/- 10 trees.

If production is obtained, portions of the location not needed for production facilities will be re-vegetated. There will be no pits utilized for production. At the end of production, or if the well is plugged and abandoned without going into production, the location and access road will be restored to a condition approximating pre-use. The site and all disturbed areas will be reclaimed and reseeded in accordance with Forest Service requirements.

If viable amounts of minerals are found to exist, additional development on the leasehold may be anticipated. If a new source of oil is discovered additional NEPA analysis may be conducted to determine impacts and base decisions about how the future redevelopment of this field would take place.

In addition to the Proposed Action, this Environmental Assessment also evaluates Alternative B, the No Action Alternative.

Under the No Action Alternative, Ballard would not develop the oil and gas minerals in their Thunder Basin leases. Oil and gas minerals from the Project Area would continue to be drained from un-drilled federal mineral acreage, resulting in a loss of revenues for the public estate. The habitat proposed for disturbance under the Proposed Action would remain undisturbed by oil field development.

This Environmental Assessment (EA) complies with the requirements of the National Environmental Policy Act of 1969 as amended (NEPA), and the Office of the Presidents Council on Environmental Quality regulations for implementing the Act. This EA documents the environmental effects analysis of Ballard’s proposal to develop oil and gas wells on NFS Lands in the Thunder Basin National Grassland. The EA includes a description of the proposal, the purpose and need for the action, the public issues identified regarding the actions, and the Alternative to the Proposed Action that was considered, the affected environment and the environmental consequences of implementing the proposal or the Alternative to it.

This EA is not a decision document. It is a document disclosing environmental consequences of implementing the Proposed Action and No Action Alternative. The consideration of the No Action Alternative is required by CEQ regulation, however Ballard’s mineral leases in the Project Area grants the company the “right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits” in the leased lands, subject to the terms and conditions incorporated in the federal leases. Leases involved are WYW139626, WYW141187, and WYW141188. Descriptions of the leases can be found in Lease Summary Table below.

LEASE SUMMARY TABLE						
Lease Number	Township	Range	Section	Q/Q	Lot	Total Acres in Lease
WYW141187	54N	69W	5	SE/4	13, 14, 19, 20	645.640
			7	W/2 NW, SWSE	8, 9, 19	
			8	NWNE, NENW	1, 2	
			17	SWNW	5	
			18	S/2SW, S/2SE, NWSE, SWNE	11, 14, 17-20	
WYW141188	54N	69W	19	N/2 NW, N/2 NE	5-8	234.340
			20	W/2 NW	4, 5	
WYW139626	54N	69W	19	SWNW, SENE, E/2 SE	9, 12, 13, 20	1336.96
			20	SW, E/2 NW	3, 6, 11-14	
			21	W/2 SW	2, 3	
			29	NW	3-6	
			30	W/2 NW, NENW, S/2 SW	5, 5-9, 12, 16, 17	
			31	N/2 NW, SWNW, W/2 NE, W/2 SE, S/2 SW, SESW	6-9, 11, 14, 16-19	
			32	W/2 SW	12, 13	

TABLE OF CONTENTS

Summary	i
1.0 Introduction	1-1
1.1 Document Structure	1-1
1.2 Background	1-2
Area Description	1-2
Wellsites	1-2
1.3 Purpose & Need for Action	1-3
1.4 Decision Framework	1-3
1.5 Public Involvement	1-4
1.5.1 Public Issues And Concerns Raised	1-4
2.0 Comparison of Alternatives	2-1
2.1 Alternative A – Proposed Action	2-1
Well Sites	2-2
2.1.1 Disturbance Summary	2-4
2.2 Alternative B – No Action	2-5
2.3 Comparison of Alternatives	2-5
2.4 Forest Service Requirements and National Grassland Plan Standards and Guidelines That Apply	2-5
2.5 Design Criteria for Proposed Project	2-6
2.6 Grassland Plan Consistency and Compliance	2-11
3.0 Affected Environment	3-1
3.1 Geology, Minerals, and Paleontology	3-3
3.1.1 General Geology	3-3
3.1.2 Minerals	3-4
3.1.3 Paleontological Resources	3-6
3.1.4 Geologic Hazards	3-6
3.2 Air Quality	3-7
3.3 Water Resources	3-8
3.3.1 Water Quality Standards	3-8
3.3.2 Wyoming Storm Water Regulations	3-10
3.3.3 Surface Water	3-10
3.3.4 Ground Water	3-11
3.4 Soils	3-15
3.5 Vegetation Resources	3-19
3.5.1 Vegetation Cover Types	3-19
3.5.2 Wetlands and Riparian Areas	3-19
3.5.3 Non-native Invasive and Noxious Weeds	3-19
3.6 Wildlife Resources and Fisheries	3-20
3.6.1 Big Game Animals	3-20
3.6.2 Other Mammals	3-21
3.6.3 Raptors and Owl	3-23
3.6.4 Upland Game Birds	3-25
3.6.5 Other Birds	3-25
3.6.6 Amphibians and Reptiles	3-26
3.6.7 Fisheries and Rare Native Fish	3-27
3.7 Threatened, Endangered, Sensitive Species, and Management Indicator Species	3-28
3.7.1 USFWS Federally Listed Species	3-28
3.7.2 USFS R2 Regional Forester’s Sensitive Species	3-30

3.7.3	USFS Management Indicator Species (MIS).....	3-33
	greater sage-grouse (<i>Centrocercus urophasianus</i>).....	3-35
	sharp-tailed grouse (<i>Tympanuchus phasianellus</i>).....	3-37
3.8	Access	3-39
3.9	Land Use	3-39
3.9.1	Oil and Gas Development	3-39
3.9.2	Recreation	3-39
3.9.3	Domestic Livestock Grazing.....	3-40
3.10	Cultural (Heritage) Resources.....	3-41
	Survey Results.....	3-41
3.11	Socio-Economics Resources	3-41
3.11.1	Demographics.....	3-41
3.11.2	Economic Activity.....	3-43
3.11.3	Employment and Income	3-45
3.11.4	Environmental Justice	3-46
3.12	Visual Resources.....	3-46
	Regulatory Environment, Policy, and Guidelines	3-47
3.13	Noise	3-47
	Noise Guidelines and Standards.....	3-48
4.0	Environmental Consequences	4-1
4.1	Geology, Minerals, and Paleontology.....	4-2
4.1.1	Alternative A – Proposed Action	4-2
4.1.2	Alternative B – No Action	4-3
4.1.3	Cumulative Effects for Action Alternative	4-4
4.2	Air Quality	4-4
4.2.1	Alternative A - Proposed Action.....	4-4
4.2.2	Alternative B – No Action	4-7
4.2.3	Cumulative Effects for Action Alternative	4-7
4.3	Water Resources	4-8
4.3.1	Alternative A – Proposed Action	4-8
4.3.2	Alternative B – No Action	4-9
4.3.3	Cumulative Effects for Action Alternative	4-10
4.4	Soil.....	4-11
4.4.1	Alternative A – Proposed Action	4-11
4.4.2	Alternative B – No Action	4-12
4.4.3	Cumulative Effects for Action Alternative	4-12
4.5	Vegetation Resources.....	4-13
4.5.1	Alternative A - Proposed Action.....	4-13
4.5.2	Alternative B – No Action	4-13
4.5.3	Cumulative Effects for Action Alternative	4-13
4.6	Wildlife Resources.....	4-14
4.6.1	Alternative A - Proposed Action.....	4-14
4.6.2	Alternative B – No Action	4-15
4.6.3	Cumulative Effects for Action Alternative	4-15
4.7	Threatened, Endangered, Sensitive, and Management Indicator Species,.....	4-16
4.7.1	Alternative A - Proposed Action.....	4-16
4.7.2	Alternative B – No Action	4-20
4.7.3	Cumulative Effects for the Proposed Action Alternative.....	4-21
4.8	Access	4-22
4.8.1	Alternative A - Proposed Action.....	4-22
4.8.2	Alternative B - No Action.....	4-23

4.8.3	Cumulative Effects for Action Alternative	4-23
4.9	Land Uses.....	4-23
4.9.1	Alternative A - Proposed Action.....	4-23
4.9.2	Alternative B – No Action	4-24
4.9.3	Cumulative Effects for Action Alternative	4-24
4.10	Cultural Resources	4-25
4.10.1	Alternative A - Proposed Action	4-25
4.10.2	Alternative B – No Action.....	4-25
4.10.3	Cumulative Effects for Action Alternative.....	4-25
4.11	Socio-Economics	4-26
4.11.1	Alternative A - Proposed Action	4-26
4.11.2	Alternative B – No Action.....	4-26
4.11.3	Cumulative Effects for Action Alternative.....	4-26
4.12	Visual Resources.....	4-27
4.12.1	Alternative A – Proposed Action.....	4-27
4.12.2	Alternative B – No Action.....	4-27
4.12.3	Cumulative Effects for Action Alternative.....	4-27
4.13	Noise	4-28
4.13.1	Alternative A – Proposed Action.....	4-28
4.13.2	Alternative A – No Action	4-29
4.13.3	Cumulative Effects for Action Alternative.....	4-29
4.14	Summary of Cumulative Effects.....	4-30
5.0	Consultation and Coordination.....	5-1
5.1	InterDisciplinary Team Members	5-1
5.2	Federal, State, and Local Agencies Consulted.....	5-1
5.3	Ballard Petroleum Holdings LLC	5-1
5.4	Third-Party Contractors	5-2
6.0	References	6-1

TABLES

Lease summary Table	ii
Table 2-1. Lease Descriptions.....	2-4
Table 2.2. Surface Disturbance under the Proposed Action (Alternative A).....	2-5
Table 2.3. Summary of Alternatives and Long-Term Surface Disturbances	2-5
Table 3-1. Wyoming REgional Air Quality Data:	3-8
Assumed Background Air Pollutant Concentrations,	3-8
Applicable Ambient Air Quality STandards,.....	3-8
and PSD Increment Values.	3-8
Table 3-2 Water Quality for the Wasatch and Fort Union Coal Aquifers	3-13
Table 3-3 Wildhorse Project Area Soil Series Characteristics.....	3-17
Table 3-4 Wildlife Species that could Potentially Occur in the Project Area.....	3-21
Table 3-5. Occurrence of suitable habitat for Endangered, Threatened, Proposed, or Candidate species..3-28	
Table 3-6 USFS Region 2 Special Status Birds and their Habitat and Potential Occurrence in the Vicinity of the Project Area.....	3-30
Table 3-7 USFS Region 2 Special Status Mammals and their Habitat and Potential Occurrence in the Vicinity of the Project Area	3-31
Table 3-8 USFS Region 2 Special Status Amphibians and fish, their Habitat and Potential Occurrence in the Project Area.....	3-32
Table 3-9. Percentage of Desired Seral Stages and Structural Classes in Spring Creek Geographic Area.3-	

Table 3-10. Peak Male Sharptailed Grouse Observations for SCGA	3-38
Table 3-11. Summary of Allotments in Project Area	3-40
Table 3-12 State of Wyoming, Campbell County and City Population Statistics 1990-2000	3-43
Table 3-13 Economic Activity for Wyoming and Campbell County	3-43
Table 3-14 Wyoming Mineral Income - Fiscal Years 1997 – 2001	3-44
Table 3-15 Campbell County Employment and Personal Income Fourth Quarter 2003	3-45
Table 3-16 Typical Sound Levels from Common Noise Sources.....	3-48
Table 3-17 Typical Sound Levels from PRB Temporary Generators.....	3-48
Table 3-18 TBNG Standards, Guidelines, and Stipulations that Affect Noise Levels Perceived by Wildlife	3-49
Table 4-1 Comparison of Proposed Action to Cumulative Projected Oil and Gas Development, Powder River Basin	4-2
Table 4.2. Summary of Direct and Indirect Effects on Air Quality by Alternative	4-8
Table 4-3 Disturbance of Sensitive Soil Types, Proposed Action	4-11
Table 4.4 Summary of Cumulative Effects Actions and Analyses	4-30
Table 5-1 Forest Service ID Team Members.....	5-1

FIGURES

Figure 1. Vegetation Monitoring Points in Spring Creek Geographic Area	3-34
Figure 2. Comparison of Sage-Grouse Minimum Population Estimate (1995-2005).....	3-36
Figure 3. State of Wyoming sage-grouse population estimates from 1990-2005.....	3-36

APPENDICES

- Appendix A - Project Maps
- Appendix B - Standard and Site Specific Conditions of Approval for Ballard’s Wildhorse Development
- Appendix C - Glossary
- Appendix D - Information Regarding Directional Drilling and Clustering

1.0 INTRODUCTION

1.1 DOCUMENT STRUCTURE

The USDA Forest Service (USFS), Douglas Ranger District has prepared this EA in compliance with NEPA and other relevant federal and state laws and regulations. The Forest Service and USDI Bureau of Land Management (BLM) work together through an Interagency Agreement dated 11/19/1991 to coordinate administration of oil and gas operations on Federal leases within the National Forest System. This EA discloses the direct, indirect, and cumulative environmental impacts that could result from the Proposed Action and Alternative. The document is organized into five (5) parts:

1. Introduction: The section includes information on the history of the project proposal, the purpose of and need for the project, and Ballard's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

2. Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's Proposed Action as well as alternative methods for achieving the stated purpose. These Alternatives were developed based on an on-site review of the Project Area by the USFS, and on issues raised by the public and other agencies. This discussion also includes possible impact avoidance and mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative. Maps of each Alternative are provided in Appendix A, Project Maps.

3. Affected Environment and Environmental Consequences: This section describes the affected environment and the environmental consequences of implementing Alternative A or B. This analysis is organized by a brief description of the resource issue followed by an analysis of potential impacts under each alternative. This section describes the management area prescription and desired conditions for the Project Area under the Grassland Plan (USFS 2001a).

4. Consultation and Coordination: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

5. Appendices: Appendices A, B, and D provide more detailed information to support the analyses presented in the environmental assessment. Appendix C is a glossary of terms and acronyms used throughout the document.

The Project Area is located within the environmental impact Analysis Areas of the Northern Great Plains Management Plans Revisions (USFS 2001b) and the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project, herein referred to the PRB FEIS (BLM 2003a). Additional documentation of analyses specific to the Proposed Action and/or the Project or Analysis Areas may be found in the project planning record for this EA. This documentation includes the Paleontology Report, Cultural Resources Report, Road Analysis, Rangeland Specialist Report, wildlife and plant survey reports, bat echolocation studies, the Biological Assessment, Biological Evaluation and Appraisal of Management Indicator Species for wildlife and botany. The project planning record is located at the Douglas Ranger District Office in Douglas, Wyoming.

1.2 BACKGROUND

Area Description

The area of the proposed project is approximately 37 miles northeast of Gillette, Wyoming, within the administrative boundary of the Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger District. It is in the Spring Creek Geographic Area (SCGA) (USFS 2001a, page(s) 2-26 to 2-32) and within the Wildhorse Creek watershed. Please refer to Figures 2-1 and 2-2 in Appendix A, Project Maps.

The access to the lease location is north of Gillette, Wyoming State Highway 59 for approximately 30 miles to the Weston/Soda Butte turn off. Turn east onto Heald County Road and travel approximately 5 miles east to York Road. Turn south onto York Road and travel 2.4 miles south to Forest Service (USFS) System Road # 1015C and turn east into the general location of the proposed wells (see maps in Appendix A, Project Maps).

The terrain in the Project Area is gently rolling with defined ephemeral (seasonal) drainages. These drainages may have several hundred feet of elevation change from the bottom to the surrounding hilltops. The landscape includes draws and short grass prairie communities on primarily sandstone substrates. Some mid-grass community type exists.

The Grassland Plan management direction for the Project Area is 5.12 General Forests and Rangelands which emphasizes Range Vegetation.

Scenic integrity objectives is low.

Recreation Opportunity Spectrum class for the Project Area is roaded natural.

Livestock grazing is the dominant land use. Recreational use, moderate through summer and increases during the hunting season. Management emphasis is on a balance of resource use and opportunities.

Sagebrush, grassland community wildlife species such as prairie dogs, mule deer, antelope, mountain plover, sage grouse and raptors inhabit the area.

Wellsites

An interdisciplinary team consisting of Company Representatives, Forest Service Mineral Specialist, Range Specialist, Archeologist, and Wildlife Biologist conducted an onsite inspection of the proposed location on July 28, 2003. Additionally, prior consultation was conducted with Forest Service Engineering staff. The location of the proposed well site pads are consistent with lease terms including special lease stipulations.

A level drill pad for each well, not to exceed approximately 300 feet x 250 feet of disturbed area, would be constructed. The wellhead, tanks and ancillary buildings would be located on this pad. The amount of ground disturbance is anticipated to be consistent with estimates provided in the Thunder Basin Oil and Gas Leasing Final Environmental Impact Statement (USFS 1994). **Total disturbance associated with road and well site area on Forest Service System Lands is expected to be less than two (2) acres for each well site and less than four (4) acres for access roads.**

Facilities will meet color and tone visual requirements.

If production is obtained, portions of the location not needed for production facilities will be re-vegetated. There will be no pits utilized for production. At the end of production or if the well is plugged and abandoned without going into production, the location and access roads will be restored to a condition approximating pre-use. The site and all disturbed areas will be reclaimed and reseeded in accordance with Forest Service requirements.

1.3 PURPOSE & NEED FOR ACTION

The current condition does not meet the objective to honor valid existing mineral leases. The current condition includes a current active lease with no oil and gas wells drilled on this lease.

The purpose of this project is to:

- in part, fulfill the Federal Government's policy to foster and encourage mineral development as expressed in the Mining and Minerals Policy Act of 1970.
- This project would also fulfill the goals of the 1920 Mineral Leasing Act, as amended, which promotes the development of oil and gas resources.
- Return mineral royalties to the federal Treasury.
- Honor all valid existing legal mineral rights and to ensure that reclamation provisions of operating plans are completed to standard.

This project would serve to meet the goal in the 2001 Land and Resource Management Plan for the Thunder Basin National Grassland (Grassland Plan) to improve the capability of the Nation's forests and grasslands providing a desired sustainable level of uses, values, products, and services.

The desired condition is to allow the legal lease holder to develop its lease. The need for action will be fulfilled by permitting Ballard to develop its valid Federal oil and gas leases, to help meet the public's need for oil and gas and to avoid the loss of Federal mineral resources. Potential oil from Ballard's lease would return royalty revenues to the Federal Treasury.

1.4 DECISION FRAMEWORK

Given the purpose and need, the deciding official (*USFS and BLM*) will review the Alternatives analyzed as described in this environmental document and will make the following decisions:

- 1) Approve the Surface Use Plan of Operation
- 2) Once the BLM has issued the permits to drill, the USFS implements the Surface Use Plan of Operations. The USFS will issue special use permits for off-lease activities and/or developments. The USFS may require that impact mitigation measures, design criteria and monitoring requirements be employed in order for the action to be fully consistent with Grassland plan standards and guidelines.

In order to approve the Surface Use Plan of Operations, the deciding official must decide whether or not to select the proposed action (Alternative A) or the other alternative action considered in detail. Ballard's mineral leases in the Wildhorse Creek Oil Field Development Project Area grants the company the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the federal leases.

No oil and gas operations involving surface disturbance on NFS lands can be permitted without approval by the Forest Service responsible official. The Forest Service has the lead for National Environmental

Policy Act (NEPA) analysis and documentation for this site specific proposed action. The BLM would be a cooperating agency. The NEPA document has been prepared to disclose the social and environmental effects of implementing the proposal or the Alternative which will permit the deciding official to make an informed decision. The BLM has responsibility for addressing down-hole issues, concerns and needs relating to the proposed action, and certain specific surface-related actions relating to the proponents' accountability and responsibilities related to production activities.

1.5 PUBLIC INVOLVEMENT

The President's Council on Environmental Quality (CEQ) regulations require an "early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a Proposed Action" (40 CFR 1501.7). In order to satisfy this CEQ requirement, the Responsible Official selected an Interdisciplinary (ID) Team and "charged" that team to scope with the public to determine their concerns and issues with this proposal, develop Alternatives to the proposal that respond to those issues, to analyze the environmental effects of the proposed land exchange and to prepare the environmental document.

The project was first entered in the MBRNF and TBNG Quarterly Schedule of Proposed Actions on December 3, 2004. The public Scoping Statement describing the Proposed Action was mailed to ninety-three (93) organizations, agencies and individuals known to be interested in proposed activities on the Thunder Basin National Grassland, as well as to parties that could be affected by the Proposed Action, including adjacent landowners, tribal governments, the Campbell County Commissioners, the Wyoming Governor's Office and the State and Federal Congressional delegations on December 23, 2004 and was published in the *Casper Star Tribune* on December 28, 2004.

Eight comment letters were received as a result of the scoping effort. The list of respondents include: Wyoming Game and Fish Department, Wendell Funk, Biodiversity Conservation Alliance, Wyoming State Historic Preservation Office, US Fish and Wildlife Service, Wyoming Dept. of Environmental Quality, Donny York, and Wyoming Geological Survey.

1.5.1 PUBLIC ISSUES AND CONCERNS RAISED

Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues and concerns to address and responses to each of these issues. The USFS separated the issues into three categories: 1) key issues that may drive alternative development; 2) key issues carried forward in analysis; 3) other issues outside the scope of the Proposed Action, and 4) design criteria, mitigations and monitoring.

Issues That May Drive Alternative Development

1. Whether or not directional drilling or clustering is technically feasible for the Ballard Wildhorse Creek Oil Field Development and if this option will be analyzed. Commenter # 3

Response # 1: *The Forest Service through its NEPA analysis process considered if there is a reason or need to directional drill versus straight vertical drilling, and for clustering. After reviewing information from Ballard Petroleum (letter to Mike Sierz from M Perius/Ballard Petroleum, August 26, 2005) regarding the technological aspects of directional drilling in this project, and information from the BLM (R Nordsvan to M Sierz Jan 20, 2006), the USFS decided this project does not lend itself to directional drilling. This Alternative was considered but not carried forward in analysis. These supporting documents can be found in Appendix D.*

Issues Carried Forward in Analysis

Wildlife

2. Whether or not the Forest Service will analyze specific wildlife activities to include: Sage Grouse (Grouse Habitats, Breeding and Nesting Habitats, Early and Late Brood Rearing Habitats, Wintering Habitats, Road Development, Gas and Oil Development, and Lek Buffers), Rare Native Fishes, and Raptors. Commenter #3

Response # 2: *A Biological Assessment/Biological Evaluation has been prepared by a qualified Wildlife Biologist and certified by the Douglas District wildlife Biologist that all wildlife restrictions and laws are complied with and or mitigated to have no effect on wildlife within the proposed Project Area. This BA/BE is site specific. The Forest Service will use the Thunder Basin Land and Resource Plan Standards and Guides to determine if all requirements are complied with.*

The baseline descriptions and existing conditions of wildlife resources can be found in Section 3.6, pages 3-20 through 3-27 and in Section 3.7, pages 3-28 through 3-39. Analysis can be found in Section 4.6, pages 4-14 through 4-15 and in Section 4.7 pages 4-16 and 4-20.

3. Whether or not the proposed action will have an adverse impact on any wildlife or plant species threatened or endangered or sensitive species or migratory bird species. Commenter # 3 and # 6.

Response # 3: *A Biological Assessment/Biological Evaluation has been prepared by a qualified Wildlife Biologist and certified by the Douglas District Wildlife Biologist that all wildlife restrictions and laws are complied with and/or mitigated to have no effect on wildlife within the proposed Project Area. A qualified Botanist has prepared a Biological Evaluation for Botany resources and certified by a Douglas District range specialist. The Forest Service will use the Thunder Basin Land and Resource Plan Standards and Guides to determine if all requirements are complied with. All No Surface Occupancy and Timing Limitations will be adhered to according to the Forest Plan and Lease Stipulations.*

The status of non-special status vegetation resources is described in Section 3.5, page 3-19 and the effects analysis can be found in Section 4.5, pages 4-12 and 4-13. The status of non-special status wildlife resources is described in Section 3.6, pages 3-20 through 3-27 and the effects analysis can be found in Section 4.7, pages 4-13 through 4-15. The status of special status plant and wildlife species can be found in Section 3.7 pages 3-28 through 3-39. The effects analysis is in Section 4.7, pages 4-15 through 4-21.

The status and analysis of effects on migratory birds is described in wildlife sections listed in the above paragraph.

Water Quality and Aquatics

4. Whether or not aquatics were considered for potential produced water flowing into Wildhorse Creek and Spring Creek. Commenter # 1.

Response #4. *All wells will use a closed system of tanks to hold any produced water. All water produced will be hauled to an approved State of Wyoming disposal site.*

A discussion of the plans for water containment and disposal can be found in the Applications for Permit to Drill which are summarized in Chapter 2, Section 2.5. The nature of the water environment is described in Section 3.3 pages 3-8 through 3-15. No fisheries are established in Wild Horse Creek watershed. Fisheries are not analysed in this Assessment. See Section 3.6.7, page 3-27. The status of other potentially occurring aquatic species can be found in Section 3.6.6 and analysis of effects is found in

Section 4.6.1, pages 4-13 and 4-14.

5. Whether or not this oil well field will further effect the water table level in the area. The flowing well on Wildhorse Creek may have stopped flowing at the advent of drilling two previous wells in the Wildhorse Creek drainage in the same area. Commenter # 7.

Response #5. *The analysis of this issue will be included in the EA.*

The resource descriptions and existing conditions, including interactions with surface waters, can be found in Section 3.3.3 pages 3-10 through 3-11 and Section 3.3.4 pages 3-11 through 3-15. The analysis of potential effects can be found in Section 4.3.1 pages 4-8 through 4-10.

6. Whether or not water quality will be analyzed in the Project Area to include: drill pad sites, road building, and discharge into area drainages. Commenter # 3.

Response #6. *There will be no discharge of water into any Project Area drainages. All water used in the drilling of the well will go into a drilling pit and will be evaporated with the pit being reclaimed after the water has evaporated. All production water will be contained in a large tank and hauled off to an approved State of Wyoming disposal site. Further analysis will be included in the EA.*

The analysis can be found in Section 3.3 pages 3-8 through 3-14 and Section 4.3 pages 4-8 through 4-10.

Cumulative Impacts

7. Whether or not the NEPA analysis will disclose the full extent of the proposed development as well as the direct and indirect effects of all aspects of the project and the cumulative impacts of past, present and reasonably foreseeable future actions regardless of who is responsible for those actions. Commenter # 5.

Response #7. *This was undertaken by the analysis in the PRB FEIS. However, cumulative effects of these wells will be discussed more specifically in the appropriate chapters of the EA document.*

The analysis can be found in Section 4, each subsection 4.X.3 various pages. Please refer to Table of Contents for Chapter and see subsections titled “Cumulative Effects for Action Alternatives”.

8. Whether or not a previous fairly intense oil field north and east of this project will have any effect on this proposed project. Commenter # 8

Response #8. *The cumulative effects will be analyzed in the EA that considers other well fields in the proximity to the proposal.*

The analysis can be found in Section 4, each subsection 4.X.3 various pages. Please refer to Table of Contents for Chapter and see subsections titled “Cumulative Effects for Action Alternatives”.

9. Whether or not a Cumulative Impact analysis will be completed beyond the scope of the PRB FEIS. Commenter # 3.

Response #9. *The analysis in the EA for this project will address cumulative impacts and impacts from existing and reasonably foreseeable development under resource-specific sections of the EA. It will adopt those parts of more extensive analyses of Past, Present and Reasonable Foreseeable actions in the PRB FEIS that are relevant to this proposed action.*

The analysis can be found in Section 4, each subsection 4.X.3 various pages. Please refer to Table of Contents for Chapter and see subsections titled “Cumulative Effects for Action Alternatives”.

Weed Control and Air Quality

10. Whether or not weed control and air quality will be analyzed. Commenter # 3.

Response #10 *The Forest Service uses weed control language that is included in the Conditions of Approval (COAs) that is similar to the language in the Powder River Basin Oil and Gas EIS (PRB-FEIS) (BLM 2003a). The Forest Service uses a process of having the operator prepare a weed control and pesticide plan of operation. The Forest Service then approves the proposed plan when it meets Forest Service Standards and Guidelines. The air quality of the given location is reviewed to determine if any air quality questions beyond the air quality studied and forecast in the PRB-FEIS. Further studies and specific analysis is dependent on the location, size and type of activities that are part or the proposed project.*

The existing conditions of weed populations and control can be found in Section 3.5.3 pages 3-19 and 3-20 and the analysis is found in Section 4.5.3 page 4-13. The existing conditions of air quality can be found in Section 3.2, pages 3-7 and 3-8 and the analysis is found in Section 4.2 pages 4-4 through 4-7.

Other Issues Outside the Scope of the Proposed Action

11. Whether or not the Forest Service will make sure all other necessary permits are obtained to include: National Pollutant Discharge (NPDES) permit, Storm Water Associated with Construction Activities Permit (if applicable), Injection Control Permit and Section 404 permit. Commenter # 6.

Response #11. *The Applicant is responsible for obtaining all applicable and required Federal and State permits . These permits are under the regulatory oversight of other state and federal agencies.*

12. Whether or not the exploration and exhaustion of natural (finite) resources protect the natural resources. Commenter # 2.

Response #12. *Statement or question is beyond the scope of this project and analysis.*

13. Whether or not the publics alleged need for petroleum will ever be met by extraction? Commenter # 2.

Response #13. *Statement or question is beyond the scope of this project and analysis.*

14. Whether or not the proposal requires that above-ground utilities leading to well and other facilities use construction techniques that prevent raptor electrocution. Commenter # 5

Response #14: *Outside scope of analysis. There are no above ground electric lines planned for this project. A Biological Assessment/Biological Evaluation has been prepared by a qualified Wildlife Biologist and Certified by the Douglas District Wildlife Biologist that the proposed action is in compliance with all wildlife restrictions and laws and/or any remaining effects are mitigated to have no effect on wildlife within the proposed Project Area.*

The baseline descriptions and existing conditions of wildlife resources can be found in Section 3.6, pages 3-20 through 3-27 and in Section 3.7, pages 3-28 through 3-39. Analysis can be found in Section 4.6, pages 4-13 through 4-14 and in Section 4.7 pages 4-15 and 4-21.

2.0 COMPARISON OF ALTERNATIVES

This chapter describes in detail and compares the Alternatives considered during the environmental effects analysis of the Wildhorse Creek Oil Field Development project. It includes a description of each alternative considered. Maps of each alternative are provide in Appendix A. The comparison table helps to sharply define the differences between each alternative. This section also presents the Alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

2.1 ALTERNATIVE A – PROPOSED ACTION

The Douglas Ranger District of the Medicine Bow-Routt National Forests and Thunder Basin National Grassland is conducting an environmental analysis of a proposal to authorize Ballard Petroleum Holdings, LLC to drill, complete, operate, and reclaim five (5) conventional oil wells within the administrative boundaries of Thunder Basin National Grassland. Wildhorse Creek Federal 4-18 will be located in the SWSE, Section 18, T54N R69W, and Wildhorse Creek Federal 44-18 will be drilled in the SESE, Section 18, T54N R69W. Wildhorse Creek Federal 31-19 will be drilled in the NWNE, Section 19, T54N R69W and Wildhorse Creek Federal 42-19 will be drilled in the SENE Section 19, T54N, R69W. Wildhorse Creek Federal 21-20 will be drilled in the NENW Section 20, T54N, R69W. See Figure 2.1 in **Appendix A**, Project Maps, for the location of the wells within the Project Area.

Under the terms of its federal oil and gas lease where the wells are proposed, Ballard Petroleum Holdings, LLC (Ballard) has a legal right to explore, develop, and produce oil and/or natural gas from the area defined in the lease. For operations on a lease on National Forest System lands (NFS), the Forest Service has the authority and responsibility to regulate all surface-disturbing activities conducted pursuant to the lease. The BLM has the authority and responsibility to regulate drilling, downhole operations, production activities, and certain surface activities directly associated with drilling, downhole operations, and production of oil and/or natural gas. A summary of the leases is found in **Table 2.1**.

The actions described in this Alternative are consistent with the oil and gas lease stipulations described in each of the three lease documents.

WYW139626 (issued 1996), WYW141187 (issued 1997) and WYW141188 (issued 1997) each provide for the following stipulations:

- Controlled Surface Use Stipulation – No activities allowed within one-quarter mile of a sage grouse or sharp-tailed grouse lek if activity would cause abandonment of the lek, unless practices are implemented to maintain or increase the existing habitat.
- Timing Limitation Stipulation – No activities shall be allowed within one-quarter mile of any rookery from March 1 to July 31, if they would cause abandonment of the rookery, unless practices are implemented to maintain or increase the opportunities at other rookery sites.

The Proposed Action will meet Grassland Plan standards and guidelines as well as the lease stipulations.

Two Alternatives have been analyzed within this document, the Proposed Action Alternative and the No Action Alternative. Under the No Action Alternative the proposed project would be rejected and no oil development associated with this project would be approved at this time. Existing activities, including conventional oil and gas development, livestock grazing, hunting and dispersed recreation, would

continue on and around the area proposed for development.

Through the environmental analysis process, the Douglas District Ranger and Buffalo Field Office Manager will determine where and under what terms and conditions the proponent may develop its oil and gas leases while protecting the natural resources and providing for public safety. Surface developments are required to be consistent with the 2001 Thunder Basin Grassland Plan direction, the 1994 Record of Decision for Oil and Gas Leasing on the Thunder Basin National Grassland, and other applicable laws and regulations. The purpose of the environmental analysis is to evaluate the site-specific means by which Ballard may develop the proposed wells on National Forest System Lands.

These are proposed infield wells to be drilled in a known field to determine actual underground circumstances at new depths and rock formations to determine if there are amounts of oil or gas that would be economically viable to develop.

If viable amounts of oil and/or gas are found to exist, additional development on the leasehold may be anticipated. If a new source of oil is discovered additional NEPA analysis may be conducted to determine impacts and base decisions about how the future redevelopment of this field would take place.

Facilities will meet color and tone visual requirements. The roads being used are existing graded roads and trail.

If production is obtained, portions of the location not needed for production facilities will be re-vegetated. There will be no pits utilized for production. At the end of production, or if the well is plugged and abandoned without going into production, the location and access road will be restored to a condition approximating pre-use. The site and all disturbed areas will be reclaimed and reseeded in accordance with Forest Service requirements.

Well Sites

An interdisciplinary team consisting of a Company Representative, Forest Service Mineral Specialist, Range Specialist and Wildlife biologist conducted an onsite inspection of the proposed location on September 9, 2003. Additionally, prior consultation was conducted with Forest Service Engineering and Cultural Resources staff. The locations of the proposed well site pads are consistent with lease terms including special lease stipulations.

A level drill pad covering an area not to exceed 300 feet x 250 feet would be constructed for each well. The wellhead, tanks and ancillary buildings would be located on this pad. Power for each well's facilities will be provided by a generator, also located on the pad. Power will be generated for at least a year until the viability of the wells is evaluated. Should the wells prove viable, Ballard will likely consider running underground electric lines to the wells from existing overhead power. Such an action would be considered under a separate analysis.

The amount of ground disturbance is anticipated to be consistent with estimates provided in the Thunder Basin Oil and Gas Leasing Final Environmental Impact Statement (USFS 1994). Total disturbance associated with road and well site areas is expected to be approximately two and half (2.5) acres for each well site.

Wildhorse Creek Federal 4-18

A new well would be drilled in the SWSE, Section 18, T54N R69W. Minimal improvements are planned for an existing upgraded road which would provide access to within approximately 0.25 mile of the proposed location. The 0.25 mile of new road would be a minimally improved travelway. Such improvements would include a 2 foot (internal diameter) culvert would be emplaced. Should a discovery

be made with this well, a permanent access road would be constructed to BLM ‘Resource Roads’ classification. The well pad would be built for a single well and would be approximately 240 feet by 200 feet. The top 12 inches of soil would be removed from the location including areas of cut, fill, and/or subsoil storage areas and stockpiled at the site.

Wildhorse Creek Federal 44-18

A new well would be drilled in the SESE, Section 18, T54N R69W. An existing road provides access to within approximately one mile of the proposed location. This road section would have only minimal improvements placed on it, in compliance with the landowners’ request. Upgrades would be made on the final +/- 1.5 miles of the access route. For further details, refer to plats and diagrams submitted with the 13 Point Plan for this well. The route would require removal of +/- 10 trees, installation of three culverts and leveling and shaping of a road bed suitable for BLM “Temporary Roads” classification with capabilities of handling drilling equipment traffic. In the event that a discovery is made, a permanent access road would be constructed to meet BLM “Resource Roads” classification as well as the landowners’ standards. For further details, refer to Plats and diagrams submitted with the 13 Point Plan for this well. The well pad would be built for a single well and would be approximately 240 feet by 200 feet. The top 12 inches of soil would be removed from the location including areas of cut, fill, and/or subsoil storage areas and stockpiled at the site. Per the agreement at the on-site meeting with the Forest Service representatives on 7-28-03 and with the BLM on 11-6-03 a cut would be required in the NESWSW of Sec.17 that would allow for a smooth transition off of the top of the ridge, east of the windmill. A second cut would be required to initiate the new trail near the windmill. The three fill areas would traverse three draws which would be encountered over the last 0.5 mile of new access road.

Wildhorse Creek Federal 31-19

A new well would be drilled in the NWNE, Section 19, T54N R69W. The planned route would traverse an upgraded oilfield road to within 0.4 miles of the new well-pad. Only minimal improvements would be made to this road section in the exploration phase, as agreed to at the on-site meeting with USFS and BLM representatives. The remaining 0.4 mile long access would be a graded trail during the exploration phase. A few 2-foot diameter culverts would potentially be built in to this road to allow drainage. In the event that a discovery is made, a permanent access road would be constructed to meet the BLM Resource Roads classification as detailed in the 13 Point Plan submission for this well. The well pad would be built for a single well and would be approximately 240 feet by 200 feet. The top 12 inches of soil would be removed from the location including areas of cut, fill, and/or subsoil storage areas and stockpiled at the site.

Wildhorse Creek Federal 42-19

A new well would be drilled in the SENE Section 19, T54N, R69W. The well pad would be built for a single well and would be approximately 240 feet by 200 feet. An existing vehicle access road covers approximately 1.5 mile from the Bergreen County Road to the NWSW Section 17 of T54N, R69W at the top of a draw. This section of road would have only minimal improvements placed on it for the drilling phase, in compliance with the landowner’s request. Planned construction activities would be minimal over the course of the access road from this point to a windmill, approximately 0.5 mile of private access. However, the planned upgrades would bring the access route to a standard meeting BLM “Temporary Roads” classification and would handle 18-wheel truck traffic. The final +/- 0.5 miles of the access route per agreement at the on-site meetings, would only be improved if the well is a producer. For further details, refer to Plats and diagrams in the APD package.

Wildhorse Creek Federal 21-20

A new well would be drilled in the NENW Section 20, T54N, R69W. The well pad would be built for a single well and would be approximately 240 feet by 200 feet. An existing road provides access to within

approximately one mile of the proposed location. The top 12 inches of soil would be removed from the location including areas of cut, fill, and/or subsoil storage areas and stockpiled at the site. This road section would have only minimal improvements placed on it, in compliance with the landowners’ request. Upgrades would be made on the final +/- 1.5 miles of the access route. For further details, refer to Plats and diagrams submitted with the 13 Point Plan for this well. A two-track trail exists to the well location. This +/- 1.25 mile of road would be modified to accommodate drilling equipment traffic. These modifications would include leveling small erosion spots and hillside traces. This would make the route suitable for BLM “Temporary Roads” classification. Further upgrading would be done only if the well is a producer.

TABLE 2-1. LEASE DESCRIPTIONS						
Lease Number	Township	Range	Section	Q/Q	Lot	Total Acres in Lease
WYW141187	54N	69W	5	SE/4	13, 14, 19, 20	645.640
			7	W/2 NW, SWSE	8, 9, 19	
			8	NWNE, NENW	1, 2	
			17	SWNW	5	
			18	S/2SW, S/2SE, NWSE, SWNE	11, 14, 17-20	
WYW141188	54N	69W	19	N/2 NW, N/2 NE	5-8	234.340
			20	W/2 NW	4, 5	
WYW139626	54N	69W	19	SWNW, SENE, E/2 SE	9, 12, 13, 20	1336.96
			20	SW, E/2 NW	3, 6, 11-14	
			21	W/2 SW	2, 3	
			29	NW	3-6	
			30	W/2 NW, NENW, S/2 SW	5, 5-9, 12, 16, 17	
			31	N/2 NW, SWNW, W/2 NE, W/2 SE, S/2 SW, SESW	6-9, 11, 14, 16-19	
			32	W/2 SW	12, 13	

Approximately 2216.94 total lease acres comprise the three leases. The five (5) wells in the Proposed Action, on 40 acre spacing, comprise 200 of the total Lease Acres within the three leases on Forest Service System Lands. Access roads will occupy additional acreage, which are for the most part on lease.

2.1.1 Disturbance Summary

The amount of surface disturbance is expected to be similar to estimates provided in the PRB FEIS (BLM 2003a). Short-term and long-term disturbances resulting from the construction of wells, utility corridors, access roads, and other facilities under Alternative A are summarized in **Table 2.2**. As stated in the well site descriptions, initial road construction will be consistent with a BLM “Temporary Road”. Only in the event of a viable discovery would the proposed roads be upgraded to meet a BLM “Resource Road” classification. Disturbance summaries in **Table 2.2** assume that each well will result in a viable discovery. No pipelines are planned for this project at this time. Any pipelines planned in the future would have to meet the Standards and Guidelines of the Thunder Basin Grassland Plan (USFS 2001a).

TABLE 2.2. SURFACE DISTURBANCE UNDER THE PROPOSED ACTION (ALTERNATIVE A).		
Disturbance Source	Short-Term (2-3 Years) Disturbance (acres)	Long-Term (10-20 Years) Disturbance (acres)
Well pads	8.6	8.6
Proposed new roads	15.08	10.28
TOTAL SURFACE DISTURBANCE	23.68	18.88

2.2 ALTERNATIVE B – NO ACTION

Although Ballard has a legal right to develop oil and gas minerals somewhere on their lease, analysis of the No Action Alternative is required by CEQ regulation. Under the No Action Alternative, current management plans would continue to guide management of the Project Area. No well development, access road construction or pipeline construction would be implemented to accomplish project goals. Existing two-track roads within the Project Area would continue to be used for access by ranching, hunting and other land use activities. The No Action Alternative is illustrated in **Figure 2-2**, Alternative B in **Appendix A**.

2.3 COMPARISON OF ALTERNATIVES

Information in **Table 2.3** is focused on activities and effects where different levels of effects can be distinguished quantitatively among Alternatives.

TABLE 2.3. SUMMARY OF ALTERNATIVES AND LONG-TERM SURFACE DISTURBANCES		
Proposal Element	Alternative A Proposed Action	Alternative B No Action
Oil and Gas Wells	5 wells (8.6 acres total)	0 (0 acres)
Access Roads Proposed roads to be constructed and/or reconstructed	4.65 miles (10.28 acres) total 2.21 miles on USFS land	0 miles (0 acres)
TOTAL LONG-TERM SURFACE DISTURBANCE	18.88 acres	0 acres

*Acreage calculations provided in parentheses represent new, long-term surface disturbance that would occur under the proposed alternative. Disturbance calculations are not included for existing disturbances such as existing two-track roads and BLM Resource class roads.

2.4 FOREST SERVICE REQUIREMENTS AND NATIONAL GRASSLAND PLAN STANDARDS AND GUIDELINES THAT APPLY

In response to public comments on this proposal and USFS Resource Specialist recommendations, impact avoidance and design criteria were developed to reduce potential adverse impacts of the Proposed Action Alternative. The measures described below are consistent with those measures required in the 2001 Grassland Plan (USFS 2001a) and provided in the PRB FEIS Record of Decision and Resource Management Plan Amendments (BLM 2003a, pages A-5 through A-18). Other measures available for review are in the PRB FEIS, pages 4-392 through 4-405. They will be site specifically implemented either

as APD requirements or as Conditions of Approval (COA) attached to and made part of the APD.

In addition, representatives of the USFS and Ballard conducted onsite inspections of the proposed development action on USFS surface. These inspections resulted in site-specific design criteria which have been incorporated into the Proposed Action.

In response to public comments on the proposed project and USFS resource requirements and Grassland Plan Standards and Guidelines (USFS 2001a), design criteria and effects monitoring requirements were developed to reduce potential adverse impacts of the Proposed Action Alternative and to monitor for the effectiveness of these measures. The design criteria described in Section 2.5 are consistent with those measures required in the Grassland Plan (USFS 2001a) and 2002 ROD (USFS 2002); the 1994 ROD for Oil and Gas Leasing on the TBNG; the PRB FEIS (BLM 2003a) and April 2003 ROD and LRMP Amendments for the PRB O&G Project (BLM 2003b). The measures will be implemented either as APD requirements, or as COA attached to and made a part of the APD.

Approval of the Proposed Action is subject to adherence to all of the operating plans, including the Surface Use Plans, Drilling Plans, and APDs, and compliance with all design criteria and requirements applied by the USFS and BLM COAs, and USFS Surface Protection, Rehabilitation and Operation Requirements.

2.5 DESIGN CRITERIA FOR PROPOSED PROJECT

Design criteria include the following measures which will apply to all aspects of the Proposed Action. These design criteria include: standard Conditions of Approval and stipulations that apply to oil and gas development in general on the Grassland, and that apply to this lease in particular; measures or methods known to be effective controls for various conditions that apply to this specific site; standards and guidelines from the Grassland Plan applicable to the activity and Area, and; general best practices.

Geology and Minerals

- Gas or oil migration will be moderated by well control, isolation of permeable formations by proper placement of cement in the casing annulus, casing ventilation to low-pressure regimes, and plugging procedures.

Surface Water

- Watershed conservation practices implemented as project design criteria will minimize and control runoff and sediment movement from construction areas. These practices are detailed in the Surface Use Plans submitted with the APDs and in other supporting documentation on file in the project record, which includes the specific details of the Drilling Program (8-Point Plan) for each well. Conditions of Approval that will apply to this project include the use of graveled travel surfaces, water diversion structures, and sediment traps and/or fences. Sediment movement will also be inhibited by the use of protective materials, such as riprap and/or brush, and/or the retention of native vegetation between construction areas and streams. Brush-hogging, rather than blading, will be used wherever possible to minimize ground disturbance. Protection of water chemistry will be enhanced by these measures as well as the measures intended to prevent or mitigate spills and to prohibit the migration of oil or gas from the well bore. Potential for impacts to surface water will be reduced or prohibited by the use of a closed system of tanks to hold any water produced. All produced water will be hauled away to an approved State of Wyoming disposal site.

- No monitoring or mitigation will be required for surface water. The design criteria for the proposed action and the standard conditions of approval for oil and gas development which apply to this project are adequate measures for protection of surface waters.

Groundwater

- Adherence to Ballard's drilling plan and the BLM and USFS COAs regarding the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and utilizing proper cementing procedures, will protect any potential fresh water aquifers above the target zone. This will ensure that ground water will not be adversely impacted by well drilling and completion operations. The design criteria included in the drilling plan will ensure that no significant impacts will occur to down-hole resources from the Proposed Action.
- No groundwater monitor wells or water well agreements will be required.

Air Quality

- As needed or required by the USFS, Ballard shall water roads during the construction phase in order to minimize fugitive dust emissions with at least 50 percent control efficiency.
- Speed limits set for the Project Area will be adhered to. This will reduce emissions of fugitive dust.

Soils

- Accelerated soil loss will be minimized by limiting the following: the removal of vegetation, the leveling of work areas, and the location of wells on slopes that require cuts and fills for well pad construction.
- All available topsoil (four to 12 inches) from constructed well locations including areas of cut and fill, and stockpile at the site. Topsoil will also be salvaged for use in reclamation on all other areas of surface disturbance. Topsoil will be clearly segregated from excess spoil material. Topsoil stockpiled for 10 months or longer will be signed and stabilized with annual ryegrass or other suitable cover crop.
- Areas of highly erosive soils shall be avoided when drill sites, two-track routes, and pipeline routes are surveyed and staked, in order to substantially reduce the amount of soil loss.
- Road construction that requires cuts-and-fills shall be minimized. Pipeline construction also shall avoid steeper slopes where possible. Where necessary, erosion control features, such as water bars or other means of diverting flows off sloping pipeline rights-of-way, shall be constructed to control increased runoff and erosion.
- Construction and drilling activity will not be conducted using frozen or saturated soil material during periods with watershed damage or excessive rutting is likely to occur
- Timely initiation of reclamation and re-vegetation efforts shall be required to effectively and immediately control accelerated soil loss due to either wind or water erosion.

Reclamation

- A plan for reclaiming sites will be submitted for USFS approval. USFS approval is required before reclamation may begin. All concentrated use areas, such as well sites, will be restored to native vegetation.
- All areas disturbed by earthwork associated with this Proposed Action will be re-contoured to a natural appearance as near the original contour as possible, as soon as practical after the conclusion of operations or placement of lines in trenches.

- All disturbed areas over 0.25 acres in size must be mulched at the rate of two tons/acre with certified weed-free mulch such as hay, straw, wood chips, etc. The mulch will be crimped into the surface with a disk. Depressions will not be left to trap water or form ponds. Re-contoured areas will be outsloped to avoid concentrating surface waters and producing gullies.
- Reclamation of roads may include water bars. The Gold Book - Surface Operating Standards for Oil and Gas Exploration and Development (BLM and USFS 2005) will be used as guidance. They would be constructed on the contour at intervals beginning at the top of disturbed slopes. They should be at least one foot deep, with approximately two feet of drop per on 100 feet of length, with the berm on the downhill side.
- All disturbed areas, which have been compacted, will be scarified. Disturbed areas over 0.25 acre in size will be landscaped to approximate original contours, seeded and fenced with a fence design USFS approved by the District Ranger to exclude livestock.
- Roads abandoned at the end of production will be ripped to depth of 18 inches before they are disked, seeded, and mulched.
- Any topsoil conserved during excavation will be distributed evenly over these re-contoured areas. The land surface will be left “rough” after re-contouring to ensure that the maximum surface area will be available to support the reestablishment of vegetative cover. USFS goals for vegetative cover will guide re-vegetation efforts. Goals are erosion control, palatable and nutritious forage for livestock and wildlife, and visual esthetics.
- The reclamation work, including seeding and mulching shall be completed by six months of completion of drilling.

Vegetation Resources

- Vegetation will be kept a minimum of 15 feet from all wellheads.
- Re-vegetation efforts will comply with all instructions and specifications provided by the USFS. Seeding is expected to occur in the fall after September 1, prior to ground frost, or in the spring after frost has left the ground, prior to May 15.
- The seed mixture, including fertilizer and mulching requirements, seeding depth, and seed drilling specifications will be approved by the USFS. Seed will be drilled on the contour using a seed drill equipped with a depth regulator to ensure even depths of planting. Seed will be planted 0.5-inch deep. The anticipated seed mix and rates of application on USFS-administered lands are listed below.
- Ballard will be responsible for prevention and control of noxious weeds and weeds of concern on all areas of surface disturbance associated with this Project (well locations, roads, water management facilities, etc.). Use of pesticides shall comply with the applicable Federal and State laws. Pesticides shall be used only in accordance with their registered uses and within limitations imposed by the Secretary of Interior. Prior to the use of pesticides on public land, the holder shall obtain from the USFS authorized officer written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed necessary by the Authorized Officer to such use.
- Weed monitoring and weed control measures shall be conducted annually for the life of the project.

- Soil material stockpiled for 10 months or longer will be seeded according to instructions and specifications provided by the USFS.

Species	Rate of Application
western wheatgrass	7 lbs./Acre
slender wheatgrass	5 lbs./Acre
prairie clover	2 lb./Acre
green needlegrass	1 lbs./Acre
western yarrow	7 lbs./Acre

Wildlife Resources

- To reduce the risk of nest failure, construction activities (drilling, testing, new construction, workovers) shall not be conducted within the line-of-sight (up to 0.5 mile) of known raptor nest site between 1 March and 31 July. The USFS may waive these stipulations if a nest is documented to be inactive for a consecutive period of seven years.
- Construction shall be prohibited within 0.25 mile of greater sage grouse leks within the Project Area between 1 March and 15 June. Furthermore, noise from generation sources will not exceed 49 decibels (10 dBA above background noise) at any nearby sage grouse or sharp-tailed grouse display grounds.
- Roads shall be constructed to the minimum standard needed to accomplish the Purpose and Need for the Project while minimizing disturbance to soil and vegetation, as well as the potential for wildlife-vehicle collisions.
- Annual monitoring of raptor nest sites within the Project Area shall be completed by a qualified wildlife biologist during the life of the project.
- Annual surveys for greater sage grouse leks shall be completed by a qualified wildlife biologist during the life of the project.

Visual Resources

- Weed monitoring and weed control measures shall be conducted annually for the life of the Project.
- All above ground production facilities would be a “Standard Environmental Color” as shown on the Munsell Soil Color Charts of the Wyoming BLM. Approved colors are Sand Beige (5Y6/3) and /or Desert Brown (10Y 6/3) or Shale Green (5Y4/2). This requirement does not apply where special colors are required by safety regulations. All above ground facilities will be painted within six months of installation.
- Night lighting will be designed to reduce impacts to the nighttime viewshed. Continuous dusk to dawn lighting at facilities will be limited. If continuous lighting is necessary, the light will be obstructed such that only the facility is directly lighted. Whenever the facilities are not actively being worked the lights will be at a minimum.

Cultural Resources

- If historic or archaeological materials are uncovered during construction, the Applicant will immediately suspend all operations that might further disturb such materials and contact the Authorized Officer at the Douglas Ranger District.
- Ballard will be responsible for informing all persons in the area who are associated with the Project that they will be subject to prosecution for knowingly disturbing historic or archaeological

sites or for collecting artifacts.

- If historic or archaeological materials are uncovered during construction, Ballard will immediately suspend all operations that might further disturb such materials and contact the Authorized Officer at the Douglas Ranger District.

Paleontological Resources

- A USFS approved paleontologist has completed a vertebrate fossil survey and prepared a survey report.
- In the event that significant fossil remains are identified during Project construction, and subject to stipulation contained in and rights granted by lease terms, construction at that location shall be halted and the Authorizing Officer shall be notified. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by an approved professional paleontologist with five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant Paleontological values. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorizing Officer. The applicant will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.

Land Use and Transportation

- Equipment and vehicles will be confined to access roads, well pads, and other approved access areas specified in the approved APDs or Surface Use Plans.

Hazardous Waste Management

- Hazardous substance, as defined by Comprehensive Environmental Response Liability Act, will not be used in the construction or drilling operations associated with these wells. Commercial preparations, which may contain hazardous substances, may be used in production operations and will be transported within the Project Area. Any materials containing hazardous substances will be handled in an appropriate manner to minimize the potential for leaks and spills to the environment. The only fluids/waste materials that are authorized to go into the drilling fluid pit are Resource Conservation and Recovery Act exempt oil and gas exploration and production waste.
- Spills of oil, gas, or any other potentially hazardous substances will be reported immediately to the USFS, BLM, and other responsible parties. Mitigation will begin immediately, as appropriate, through cleanup or removal to an approved disposal site.
- Project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts.
- Either a portable, self-contained or chemical toilet will be provided on location during drilling and completion operations. Upon completion of operations, or as necessary, the contents of toilet holding tanks will be disposed of at an authorized sewage disposal facility. Disposal will be in accordance with WDEQ rules and regulations regarding sewage treatment and disposal.
- Neither trash nor empty barrels will be placed in any temporary mud pit. Refuse (trash and other solid waste, including cans, paper, cable, etc.) generated during construction, drilling, and production testing activities will be contained in an enclosed receptacle, removed from the drill locations promptly, and hauled to an authorized disposal site.
- Immediately after removal of the drilling rig, debris and other waste materials not contained within trash barrels will be cleaned up and removed from each well location. Used motor oil will

be placed in closed containers and disposed of at an authorized disposal site.

- Chemicals, sewage, garbage and other solid wastes will be removed from the site after drilling and completion operations.

Fire and Explosives

- Ballard shall institute all necessary precautions to ensure that fire hazard is minimized and keep fire-fighting equipment readily available when drilling.
- During all road building, pad construction, drilling, well completion, producing and abandonment activities, all gasoline, diesel-powered equipment used must be equipped with approved spark arresters or mufflers. Fire suppression materials will be kept on-site at all times. Ballard is responsible for all fires and must notify the Authorizing Officer.
- Should the use of explosives be required during construction, the operator shall comply with all applicable local, state, and Federal laws, regulations and requirements involving the storage handling, preparation, and use thereof. Prior to any blasting, the District Ranger will be notified and an approved blasting plan submitted to the USFS.

2.6 GRASSLAND PLAN CONSISTENCY AND COMPLIANCE

The analyses documented in this EA are tiered to the *Final Environmental Impact Statement for the Northern Great Plains Management Plans Revisions and Record of Decision* (USFS 2002b) and the Grassland Plan (USFS 2001a). The Grassland Plan has replaced the 1985 *Medicine Bow National Forest Land and Resource Management Plan* as it relates to the Thunder Basin National Grassland. The Grassland Plan establishes the management direction for the grassland for the next 15 years, and offers guidance for the implementation of all resource management activities on the Thunder Basin National Grassland. Information about the analysis and Project Area described in the Grassland Plan are contained in or referenced in this document. The Grassland Plan includes grassland-wide and site-specific standards and guidelines that can assist the land manager to achieve the goals and objectives, and desired conditions on the grassland that are consistent with the Plan. The Project Area within the Thunder Basin National Grassland contains lands that will be managed under a single Grassland Plan Management Area Prescription, MAP 5.12 (page 2-24 USFS 2001a).

The factors that were considered in determining whether or not the proposed well field development is consistent with the standards and guidelines described in the Grassland Plan include:

The Purpose and Need for the project;

The Grassland Plan Management Area Prescription(s) and Management Emphasis Theme(s) relevant to the Project Area;

The current conditions in the proposed Project Area compared to the desired conditions for minerals development and other resources protection and enhancement, as described in the Grassland Plan;

The necessity to continue the development of mineral resources in an area where significant resource potential exists, where progress toward that goal has already been made, and where the Grassland Plan goal is to encourage and allow this development to occur;

Whether or not the action could meet intended Management Area Prescription goals and objectives for providing energy to the nation that is needed, while at the same time meeting the

goals for the protection of wildlife and threatened, endangered and sensitive plant and/or animal species habitats, and rangeland uses and other resource needs.

The ID Team, District Ranger and Forest Supervisor have determined that the Proposed Action Alternative is consistent and would be in compliance with the Grassland Plan. The No Action Alternative is not consistent with the Grassland plan because it does not honor valid existing operating rights associated with the leases.

The Record of Decision for the 2001 Thunder Basin National Grassland Land and Resource Management Plan acknowledges on pages 18 and 43 the existing lease rights held by Ballard Petroleum Holdings, LLC (USFS 2001a). Grassland Plan standards and guidelines would not apply to the Ballard leases if they would be inconsistent with the rights granted under those leases, because they were issued before the date of the decision that implements the current plan.

3.0 AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the existing condition of resources (physical, biological, social, and economic environments) in the Project Area. Where the resource being affected could not be limited to the Project Area, the scope of analysis is expanded to describe the affected environment for that resource. If the Analysis Area is expanded, additional information will be given as to why and how the expansion could affect or otherwise impact other resources or values. If resources are present in the Project Area but are determined to be unaffected in any way by either of the Alternatives, they will be mentioned briefly with a description of why they are not affected.

Analysis Areas of previous environmental analyses, surveys and assessments related to non-coalbed methane (CBM) oil and gas development overlap the Project Area. This EA adopts and incorporates by reference a number of these, in part to describe the existing environment. Documentation of these analyses and assessments include the PRB FEIS (BLM 2003a), the Environmental Impact Statements for the Northern Great Plains Management Plans Revision (USFS 2001b) and the Final Environmental Impact Statement for Oil and Gas Leasing on the Thunder Basin National Grassland (USFS 1994). The Spring Creek Assessment (USFS 2002b) provides an interdisciplinary analysis of the condition of the SCGA. These analyses were supplemented with current information specific to the project's Analysis Areas, where available, and by site-specific surveys and/or assessments.

Management Plan Conformance

The USFS contributes to the nation's demand for minerals by encouraging responsible mineral development. The USFS and BLM administer the mineral laws and regulations to minimize surface resource impacts while supporting sound energy and minerals exploration and development. Programmatic environmental concerns are addressed during the development of the USFS and BLM LRMP. The objective of a LRMP is to guide all natural resource management activities and establish management Standards and Guidelines.

The Northern Great Plains Management Plans Revision was developed to be an ecosystem approach to revising grassland management plans in Wyoming, North Dakota, and South Dakota. Each planning unit then used the analysis and participated in developing a management plan specific to that unit. Resource management in the TBNG was updated with the 2002 issuance of the ROD for the 2001 FEIS for the Northern Great Plains Management Plans Revision (USFS 2001b) and the Grassland Plan (USFS 2001a).

The Grassland Plan describes, in general terms, the desired condition of the TBNG and includes grassland-wide and site-specific Standards and Guidelines that can assist land managers in achieving the goals, objectives, and desired conditions on the grassland. The Grassland Plan allocates land into Geographic and Management Areas. Geographic Areas include management direction that is too specific to apply across an entire grassland or several grasslands. Management Areas are defined by the resources and are administered to achieve a particular emphasis or theme. Each Geographic and Management Area has desired conditions. The desired conditions describe what is expected in a particular area of the National Grassland. Conceptually, the desired condition is a goal towards which the USFS works to achieve and/or maintain such condition in a management area. When reviewing a proposed project on NFS land, the decision maker takes into consideration whether the proposed project will result in a move toward the desired condition, a move away from the desired condition, or would have no effect on the

desired condition.

The implementation of the Proposed Action in the Project Area is subject to the rights granted by and stipulations and other lease terms contained in the leases held by Ballard that were issued prior to the implementation of the 2001 Grassland Plan. The Proposed Action is consistent with the Standards and Guidelines described in the Grassland Plan (USFS 2001a) as well as the Geographic and Management Area Prescriptions outlined in the Grassland Plan. The Project Area is entirely within the SCGA. The Management Area Prescription for the Project Area is Category 5.12, General Forest and Rangeland: Rangeland Vegetation Emphasis.

Spring Creek Geographic Area Direction (USFS 2001a)

The TBNG encompasses approximately 572,000 acres of NFS lands in northeastern Wyoming and is divided into six geographic areas. The Geographic Area direction applies to area management as does the Grassland-wide direction and Management Area direction. The proposed Project Area is within the SCGA, which encompasses approximately 48,740 acres.

Desired Conditions

Insects, diseases, wildfire, and grazing patterns will create plant communities with diverse composition and structure. This area will have a healthy and diverse mix of grasses, including the following species: western wheatgrass, needle and thread grass, green needlegrass, little bluestem, blue grama, and prairie junegrass. Management activities will maintain or enhance hardwood and coniferous trees, woody shrub inclusions and other beneficial plant communities and increase vegetative diversity. Tree densities within stands will vary to create landscape-scale diversity. Fire will be used in some areas to promote open park-like timber stands. Late successional-stage vegetation may be found in the area.

Riparian areas/woody draws will be managed to maintain or enhance different age classes of herbaceous plants, shrubs, and trees. Some areas will be managed to achieve rapid development of cottonwood and willow riparian habitats. Desired riparian species include sedges, rushes, snowberry, rose, willow, cottonwood, and other woody plants.

Areas with heavy recreation use will have picnicking and camping facilities available. Motorized and nonmotorized trails will have signs to distinguish different uses.

Primitive conditions with minimal facility development will be emphasized. Mineral developments such as oil and gas wells and pipelines will be present but visually subordinate in the mid and background. Pastures will remain large.

Management Area Prescription (USFS 2001a, page(s) 3-24)

Each Management Area is characterized by a prescription that facilitates the achievement of the desired conditions consistent with the theme. Resource goals, objectives, Standards and Guidelines provide land managers with a set of parameters that guide implementation of projects on the surface. The mix of MAP in the Grassland Plan provides for continued coal mining, oil and gas development, livestock grazing, and other managed activities.

The MAP for each area describes the management theme, the desired conditions, and the Standards and Guidelines, including those that are Grassland-wide, that apply. The MAP that

applies to the Project Area is 5.12, General Forest and Rangeland: Rangeland Vegetation Emphasis. This MAP encompasses about 34,481 acres in the SCGA. The Grassland Plan describes the theme for the MAP 5.12 as primarily “managed for the sustainability of physical, biological, and scenic values associated with woody vegetation and open grassland” (USFS 2001a, page(s) 3-24).

Desired Conditions

“These areas are dominated by open meadows, grasslands, shrublands, and areas of woody vegetation. Diversity is achieved by maintaining or enhancing hardwood and coniferous trees, shrub inclusions and other beneficial plant communities and openings. Tree densities vary within stands to create landscape-scale diversity. Fire is used to promote open, park-like timber stands. Late-successional vegetation may be found in the area.

Management emphasis is on a balance of resource uses and opportunities, such as livestock grazing, wildlife habitat, dispersed recreation, minerals management and timber harvest. Some areas produce substantial forage for livestock and wildlife. Though some areas are forested, they usually do not produce commercial wood fiber because of poor site potential.

Recreation facilities may be present. Range and other management activities are coordinated with recreation so they do not conflict with the managed use season. Signs of motorized travel, hunting, hiking, timber harvest, mining and livestock grazing may be evident. Recreation use is moderate throughout the summer and increases during hunting seasons (USFS 2001a, page(s) 3-24).

3.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

3.1.1 General Geology

The PRB occupies 22,000 square miles of northeastern Wyoming and southeastern Montana. It is a northwest-southeast trending asymmetric structural basin filled with Cenozoic sediments of continental origin that were derived from surrounding uplifted areas (BLM 2003a). The basin was formed during the Laramide Orogeny about 60 million years ago. Basin sediments were derived from the Bighorn Mountains to the west, the Laramie Mountains and Hartville Uplift to the south, and the Black Hills to the east (BLM 2003a). The early Tertiary basin fill sediments (Wasatch and Fort Union formations) attain a maximum thickness of more than 6,500 feet along the basin axis. Along drainages, a thin veneer of Quaternary alluvial deposits overlies the Tertiary geologic formations (BLM 2003a).

Thunder Basin National Grassland covers a portion of the broad, shallow west-dipping east flank of the northeastern Wyoming Powder River Basin, which is both a geologic basin and a physiographic basin. Present basin configuration resulted from Laramide orogenic events (Late Cretaceous to Early Tertiary, 50-75 mya). The basin is surrounded by uplifts: the Bighorn Mountains and Casper Arch to the west, the Laramie and Hartville uplifts to the south, the Black Hills uplift to the east, and the Miles City Arch to the north in Montana. The basin is about 125 miles long in a north-south direction and about 100 miles wide, with a deep structural axis close to its western margin, directly east of and parallel to the Bighorn Mountains. A thick, almost continuous, sequence of Cambrian- to Quaternary-age sediments fills the basin. Continental sediments (sandstone, siltstone, mudstone, and shale) of Late Jurassic to Early Tertiary age crop out in the northeastern part of the Grassland on the west flank of the Black Hills uplift.

Succeedingly younger (Cretaceous-Tertiary) sedimentary units of marine and continental origin (conglomerate, sandstone, siltstone, mudstone, shale, and coal) crop out from northeast to southwest across the Grassland. Some of the Cretaceous units in this sequence serve as source and/or reservoirs for hydrocarbons in the subsurface (Holm 2001).

The geologic structural grain controls drainage development, particularly in the northeastern part of the Grassland where drainages are aligned along the strike of the sedimentary units. This includes the SCGA. A regional fracture system, generally comprising two fractures sets exert local control on surface drainage and topography (Holm 2001). Differential erosion of soft Tertiary sandstones and shales and more resistant clinker (baked shales resulting from burning of coals seams) create an irregular topography of rolling to steep hills and badlands. Local variations in geology and soils affect ecosystem character, though the semi-arid climate with pronounced seasonal variation in temperature and precipitation has the greatest influence on vegetation types (Holm 2001).

Exposed at the surface throughout most of the grassland are young, soft sediments of the Tertiary Ft. Union and Wasatch formations. Successively older units from Upper Cretaceous Lance to Jurassic Morrison crop out from southwest to northeast over the eastern third of the grassland. Jurassic sediments are present at the surface only in the northeast part of the Grassland (Holm 2001). Detailed descriptions of the geologic and mineral resources of the PRB are found in the PRB FEIS (BLM 2003a) and in the Oil and Gas Resources of Thunder Basin National Grassland (Holm 2001).

The Project Area and Analysis Area, here described as the Project Area, is situated in “haystack” topography formed by the numerous tributaries to the Powder River. Rolling hills are dissected by ephemeral drainages throughout the Project Area, forming gentle ridges and steep-sided draws. Large outcrops with significant relief are found to the north and to the west of the Project Area. Moderately exposed outcrops are present within the Project Area. Sedimentary outcrop exposure of the Tullock Member of the Fort Union Formation is primarily limited to cutbanks within ephemeral drainages. For the most part, these outcrops are less than 5 meters and show signs of extensive weathering.

In the Project Area the primary bedrock Formations encountered include the Pierre, Niobrara, Mowry, Muddy and Skull Creek. The target zone, the top of the Muddy Formation, is approximately 5500 below surface and is approximately 65 feet thick.

3.1.2 Minerals

Mineral resources extracted near the Project Area are conventional oil and gas.

Oil and Gas

The Powder River Basin is one of the richest petroleum provinces in the Rocky Mountains with more than 2.7 billion barrels of recoverable oil and over 2.3 trillion cubic feet of gas discovered in about 700 fields between 1908 and 1995 (Holm 2001). All or parts of approximately 74 fields occur within the boundaries of Thunder Basin National Grassland. Reservoirs in the area produce mostly oil with associated gas. The oil is sweet, with gravities ranging from about 20° API to 50° API. Lower gravity oils occur in the eastern or shallower reservoirs, with increasing gravities west at greater depths (Holm 2001).

Some of the Cretaceous units in the Powder River Basin serve as source and/or reservoirs for

hydrocarbons in the subsurface (Holm 2001). Primary reservoirs in the Powder River Basin have depositional characteristics favorable for the occurrence of stratigraphic traps. Stratigraphic traps generally are porosity "pinch-outs", such as restricted bodies of sandstone encased in shale by sequential depositional events. Stratigraphic traps are not necessarily directly associated with any kind of structural deformation, though a combination of structural-stratigraphic trapping mechanisms controls some oil and/or gas accumulations. Most of the fields in the basin are stratigraphic in nature, and future discoveries are also expected to be in stratigraphic traps (Holm 2001).

The shallow Muddy, Minnelusa and Dakota Formations occur in the SCGA. The major producers in this area are the Muddy and Minnelusa. The entire potentially productive geologic section from Tertiary and Upper Cretaceous down through Pennsylvanian age rocks occurs in the North Area (Muddy/Minnelusa trend; SCGA). Production in the area is from two reservoirs, Cretaceous Muddy and Pennsylvanian Minnelusa, at depths ranging from about 5,000 ft to 8,000 feet. It is the only part of the Grassland in which the Minnelusa produces. Production from both Minnelusa and Muddy reservoirs occurs only in the southwest half of the North Oil and Gas Area. A low and variable rate of drilling occurred continuously through the 1990's, with averages of four wells drilled per year and less than one new producer completed per year. Success rate over the 1989- 1997 time period was about 20%.

Currently in the SCGA there are 21 producing oil wells and 23 oil fields in or adjacent to the Area. The oil fields are older. Some of these are abandoned. Others are marginal producers or stripper fields producing less than 10 barrels per day. Production in these wells will likely decline and eventually be plugged and abandoned. There are three ongoing exploratory efforts in SCGA seeking discovery of a new field, including the proposed action. In the SCGA oil and gas development has included recent staking and filing of approximately nine wells.

Coal Resources

The Powder River Basin contains some of the largest accumulations of low sulfur sub-bituminous coal in the world. Coal mining is prevalent in and near the Thunder Basin National Grassland. These mines are found in the southern area of TBNG. The Wyoming State Geological Society (WSGS) records reveal that coals underlie SCGA and the Project Area, however no mines or pits are found in SCGA or the Project Area or Analysis Area (WSGS 1990). Coal resources are not discussed further in this EA.

Salable Minerals

Federal minerals such as sand, gravel, and rock are governed by the Materials Act of 1947, as amended (30 *United States Code* [U.S.C.] 601 et seq.) and promulgating regulations found in 43 CFR 3610 and 36 CFR 228.40. These regulations authorize the BLM to sell federal mineral materials at fair market value. No salable minerals are found in the Project Area or Analysis Area (WSGS 1989). Salable minerals are not discussed further in this EA.

Locatable Minerals

The *General Mining Law of 1872* makes federal minerals available by location except for those minerals specifically available through lease or sale (such as coal, oil & gas, and oil shale). No locatable minerals (such as iron, copper, asbestos, gold, and jade) are known to occur within the Project Area or Analysis Area (Hausel 1990); therefore, locatable minerals are not discussed further in this EA.

3.1.3 Paleontological Resources

Surface geology in the Project Area is mapped as the Tullock Member of the Fort Union Formation (Kent et al. 1980). In the PRB, The Paleocene Fort Union Formation, which consists of sandstone, conglomerate siltstone, and coal beds, was deposited by alluvial fans, lacustrine and fluvial systems, and raised bogs (BLM 2003a). Fort Union sediments were deposited by north-flowing braided, meandering streams, and swamps in the basin center, and by alluvial fans at the basin margin (BLM 2003a). The eastern edge of the PRB in Campbell County, Wyoming, adjacent to the Little Powder River, is uplifted. Bedrock exposures of the Tullock Member of Fort Union Formation in the Project Area allow erosive processes to create outcrops that are potentially fossiliferous. The Tullock Member of the Fort Union Formation consists of light-gray and yellowish-gray fine-grained sandstone, gray sandy or silty shale, dusky-red carbonaceous shale, and thin beds of coal (Kent and Berlage, 1980). The Tullock Member represents river systems that formed elongate high constructive deltas.

The USFS Rocky Mountain Region is cooperating with the BLM and University of Wyoming in an experimental program to classify geological formations according to their probability of containing vertebrate fossil resources. The paleontological classification system is designed to provide USFS management with a way to prioritize protection of paleontological resources. Under this system, surficial formations are classified on a scale of one to five (with five as the highest) to reflect the likelihood of containing vertebrate fossils. The exposed formation in the Project Area has a Fossil Yield Potential Classification of three which is described as “being fossiliferous geologic units whose fossil content varies in significance, abundance, and predictable occurrence.” This category also includes sedimentary units of unknown fossil potential (Appendix J, p. J-2 in USFS 2001a). For formations ranked as levels three to five, a pedestrian survey of the potentially productive portions of a Project Area is required.

The Analysis Area for this resource is the areas of proposed construction activity associated with the Proposed Action. A site-specific paleontological resource evaluation of the proposed Project construction areas and immediately surrounding areas with bedrock outcrop was conducted by the Forest Service on January 18, 2006 (USFS 2006). The field survey focused on areas where potentially fossiliferous outcrops may be impacted by proposed construction sites. These areas included rights-of-way (ROWs) for roads, pipelines, and well pads. The surveys found that none of the proposed construction disturbed significant outcrops of bedrock that might yield fossil specimens.

3.1.4 Geologic Hazards

Earthquake Damage

No known or suspected active faults with a surficial expression occur in Campbell County. Without an exposed, active fault, it is difficult to estimate seismic hazard based on limited historic records. The seismic risk of earthquake damage in Campbell County is classified as Seismic Zone 0 (Case et al. 2002) though seven magnitude 2.5 and greater earthquakes have been recorded in or near Campbell County between 1967 and 1993. The most recent earthquake on February 24, 1993, magnitude 3.6, occurred approximately 10 miles east-southeast of Reno Junction, approximately 15 miles from the center of the Project Area. Earthquake probability maps modeling seismic hazard based on a 2500-year event indicate that the worse case scenario would result in intensity VII earthquakes with slight to moderate damage in well-built ordinary structures in the area near the Project Area (Case et al. 2002). Earthquake hazards are not discussed further in this EA.

Landslides

No landslide hazards have been documented in the Project Area. Slope gradients in the Project Area are mild to moderate thereby reducing the likelihood that unstable soils may move. The nearest landslide hazard areas are located approximately ten and a half miles west of the Project Area in Section 35, T54N/R71W (WSGS 2005b). Within the Project Area, the following natural and human caused processes can contribute to the susceptibility to landslides: precipitation; erosion; weathering; intense storms; rain-on-snow events; loss of vegetation or soil damage; construction on slopes; overloading and destabilizing a slope. Landslide hazards are not discussed further in this EA.

Flood Hazards

Surface water flows in response to storm events or snowmelt, Potential flood hazards can be associated with weather conditions such as intense local storm events or rapid snowmelt. The proposed Project Area occurs within the upper reaches of Wildhorse Creek. The drainage area has a moderate to steep gradient basin within and above the Project Area. Planned stream and drainage crossings are located on tributaries of the mainstem. Watersheds above these crossings are small, ranging in area from approximately 40 to 80 acres. These tributaries are ephemeral to intermittent with scattered small potholes which may retain water during part of the year. Any flow is primarily in response to storm events and runoff.

Wind Blown Deposits

Unless stabilized by a good vegetative cover, wind blown deposits present a potential hazard because they are subject to continuing resettlement. Active wind blown deposits are not known to occur within the Project Area (Case et al. 1998).

3.2 AIR QUALITY

The Analysis Area for air quality is SCGA. Impacts from oil and gas development on air quality were analyzed in the PRB FEIS (BLM 2003a), and in the FEIS for the Northern Great Plains Management Plans Revision (USFS 2001b). Prevailing winds in the area occur from the southwest, but local conditions, including terrain and temperature changes throughout a 24-hour cycle, can drive channeling (air flows between highlands and valleys) in complex terrain. Air quality in Campbell County, Wyoming is designated attainment with Environmental Protection Agency's (EPA's) National Ambient Air Quality Standards (NAAQS). These standards address criteria pollutants for which the EPA has established state and national ambient air quality standards. Site-specific air quality monitoring data applicable to the Project Area are limited for these criteria pollutants. However, Wyoming regional air quality data (**Table 3-1**) are representative of conditions in Campbell County and the Project and Analysis Areas.

TABLE 3-1. WYOMING REGIONAL AIR QUALITY DATA: ASSUMED BACKGROUND AIR POLLUTANT CONCENTRATIONS, APPLICABLE AMBIENT AIR QUALITY STANDARDS, AND PSD INCREMENT VALUES.						
Pollutant/ Averaging Period	Background Concentration (µg/m³)	Primary National Ambient Air Quality Standard (µg/m³)	Secondary National Ambient Air Quality Standard (µg/m³)	Wyoming Standards	PSD Class I Increments (µg/m³)	PSD Class II Increments (µg/m³)
CO						
1-hour	3,500	40,000	40,000	40,000	----	----
8- hour	1,500	10,000	10,000	10,000	----	----
NO₂						
Annual	16.5	100 (0.053 PPM)	100	100	2.5	25
PM₁₀						
24 – hour	42	150	150	150	8	30
Annual	17	50	50	50	4	17
PM_{2.5}						
24 – hour	19	65	65	65	----	----
Annual	7.6	15	15	15	----	----

Source: PRB FEIS (2003a, Table 3-93, page(s) 3-294)

In the vicinity of the Project Area, the primary sources of air pollutant emissions include fugitive dust from roadways, natural windblown dust and, more rarely, smoke from natural or human-caused fires and emissions from temporary generators. The primary pollutants of concern associated with these existing sources are particulate matter with an aerodynamic diameter less than 10 microns, referred to as PM₁₀, and 2.5 microns, referred to as PM_{2.5}. Vehicle traffic and wind erosion contribute to these emissions. The state of Wyoming has a network of visibility monitoring stations across the state. One of these stations, EPA monitor ID No. 560050123-1, is located in SCGA. Site sensing equipment includes a camera to provide relative evidence of visibility and equipment to detect levels of nitrogen dioxide (NO₂) and ozone (O₃). Data from this relatively new site reveal no exceedences for these two parameters in 2005 (USEPA 2005).

Data from areas comparable to the Project Area, that is areas remote from active mines and urban areas within Campbell County, but with oil and gas activity, show no exceedences for PM₁₀ or PM_{2.5} (USEPA 2005).

3.3 WATER RESOURCES

3.3.1 Water Quality Standards

Regulations, guidelines, and procedures affecting management and protection of water resources include:

- The **Clean Water Act (CWA)** of 1948 (33 U.S.C. 1251 et seq.) specifies permitting requirements for discharges of wastewater and storm water to waters of the United States under the National Pollutant Discharge Elimination System (NPDES) and for the protection of ambient water quality. The State of Wyoming has primacy over the administration of the CWA.
- **Section 404 of the CWA** regulates the discharge of dredged or fill material into the navigable waters at specified sites, including wetlands, and all work or structures in, or affecting, the course, condition, or capacity of navigable waters of the United States. The federal program is administered by the U.S. Army Corps of Engineers with EPA oversight.
- **Section 402(p) of the CWA** requires states to issue permits for storm water discharges associated with industrial activity, including construction activities that could disturb one or more acres; however, the EPA has postponed storm water permit requirements for storm water discharges associated with small construction activities from oil and gas exploration, production, processing and treatment operations or transmission facilities until June 12, 2006. The postponement is effective in Wyoming; however, oil and gas construction activities that are part of a larger common plan of development that would disturb five or more acres are considered a large construction activity and do not qualify for the postponement.
- **40 CFR 122.26(a), 122.26(c), 122.26(d), 122.26(g)(1) and 122.41(a)** regulate storm water discharges.
- The **Federal Water Pollution Control Act (33 U.S.C. 1323)** of 2001 requires federal land managers to comply with all federal, state, and local requirements, administrative authorities, process, and sanctions regarding the control and abatement of water pollution in the same manner and to the same extent as any nongovernmental entity.
- The **Safe Drinking Water Act (SWDA, 42 U.S.C. 300f et seq.)** classifies ground water used for potable water supply and specifies requirements for the quality of ground water that can be used for water supply. Wyoming has not assumed primacy over the SWDA. The state drinking water quality program follows the EPA drinking water regulations. All enforcement for Wyoming is done by the Regional EPA office from Denver, Colorado.
- The **Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1009)** requires consultation and coordination with other federal, state, and local agencies.
- **USFS Region 2 (R2) Handbook 2509.25** establishes policies and requires the USFS to install measures to reduce erosion, stabilize land mass movement, mitigate adverse soil chemistry, and provide favorable conditions for water flow. Its goal is to protect the physical, chemical, biological and aesthetic quality of the water resource, and assure compliance with established state or national water quality goals.
- **EO 11988, Floodplain Management** requires federal agencies to avoid, when possible, adversely affecting floodplains with their actions and to avoid supporting floodplain development whenever there is a practicable alternative.

- **EO 11990, Protection of Wetlands** established a policy of no net loss of wetland for any federal action that may affect wetlands and to avoid activities in wetlands whenever there is a practicable alternative.

Wyoming Statutes (W.S.) 35-11-103, 35-11-301 et seq., Wyoming Department of Environmental Quality (WDEQ) Program, Chapters 1, 2, 7, 8, 18 provide state guidance with respect to the administration of water quality regulations. The WDEQ, Water Quality Division (WQD), and the Wyoming State Engineer Office (WSEO) are responsible for regulating wells other than those drilled to produce hydrocarbons. The Wyoming Oil and Gas Conservation Commission (WOGCC) is responsible for regulating wells that are drilled to produce hydrocarbons.

3.3.2 Wyoming Storm Water Regulations

The State of Wyoming has primacy over the administration of the Clean Water Act (CWA) and storm water regulations within the state. The CWA requires agencies to comply with requirements regarding the discharge of pollutants into surface water bodies through the Wyoming Pollution Discharge and Elimination System (WYPDES) permits. Section 402(p) requires WDEQ WQD to issue permits for storm water discharges associated with industrial activity, which includes oil and gas construction activities that would disturb five or more acres.

3.3.3 Surface Water

Surface Water Hydrology

The proposed Project is located entirely within the Wild Horse Creek watershed, The Analysis Area for this resource is the Wild Horse Creek watershed. Wild Horse Creek is a tributary of Spring Creek, which is a tributary of the Little Powder River. The only perennial water in SCGA is the Little Powder River. Isolated potholes in Spring Creek and Duck Creek drainages, and dammed stock water ponds, offer the only other year-round water catchments (USFS 2002b). Drainages are largely ephemeral with some intermittent reaches interspersed in the lower areas of larger watersheds. Climatic conditions characterized by hot summers and low annual precipitation drive this hydrology. Springs and artesian wells are rare and many are intermittent sources of water input in dry years. In recent years these normally dry conditions have been even drier due to a drought that began in 2000, as reported by the Office of the Wyoming State Climatologist (WSCO 2006).

Data characterizing the Little Powder River Basin is limited but available. USGS station 06324970 is located on the Little Powder River above Dry Creek, near Weston, Wyoming, west of the Project Area (USGS 2006a). Data from this station consists of discharge volumes, gage height, and precipitation volumes. The discharge data illustrates the importance of storm driven flow in the area. Thirty three years of records show April median flow of roughly 9 cubic feet per second. In April 2006 the median flow measured at this station was approximately 3.5 cubic feet per second with a peak flow reaching 100.0 cubic feet per second.

Precipitation

Regional climatic conditions for the Project Area can be classified as semi-arid. Climatic data are available from a station at Weston, located several miles west of the Project Area, for the period 1971 to 2000 (WRDS 2006c, page(s) 40-42). The recorded annual average precipitation for the area is 13.3 inches. On average, the seasonal high occurs in the late spring/early summer with

over 38 percent of the annual precipitation falling from May through July while only 7 percent of the precipitation occurs from November through January. The average annual temperature is approximately 46 degrees F. July is typically the warmest month with an average temperature of 88 degrees F. January is typically the coldest month with an average temperature of 24 degrees F. Recorded temperature extremes range from 7 degrees F to 89 degrees F.

Water Quality

The very eastern portion of SCGA is within the Upper Little Missouri River watershed. Information regarding this watershed and the Little Powder River Basin watershed, which encompasses most of SCGA, is available through the EPA (USEPA 2006a, USEPA 2006b). The EPA does not report any hazardous or toxic releases in the area of SCGA in either of the watersheds.

The Project Area lies within the watershed of the Little Powder River. Tributaries to the Little Powder River, including the Wildhorse watershed, are designated 3B by the WDEQ (WDEQ WQD 2001b, page(s) 1-11). Class 3B waters are “tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies and where those uses are not attainable”. These are intermittent and ephemeral streams with hydrology to support and sustain aquatic life include amphibians (WDEQ WQD 2001b, page(s) 1-11). Water quality indicates an alkaline nature typical of streams and rivers in the area, with constituents including bicarbonate, sulfates, chloride and boron (USGS 2006b).

3.3.4 Ground Water

Wyoming Ground Water Standards. Ground water regulations, Chapter 8, were promulgated pursuant to Wyoming Statutes (W.S.) 35-11-101 through 1104. Protection is afforded to all underground water bodies, including water in the vadose (root-growth) zone. Water used for a purpose identified in W.S. 35-11-102 and 103(c)(i) must be protected for its intended uses for which it is suitable. Water not being put to use must be protected for all uses for which it is suitable.

Alluvial Aquifers. Alluvial aquifers consist of very permeable unconsolidated coarse-grained sand and gravels that underlie floodplains and the adjacent stream terraces. Thicknesses are usually less than 50 feet. Local ground water movement dominates these systems in a downstream direction. The ground water resources contained in alluvial aquifers are unconfined. Water yields of about five to 1,000 gpm have been reported from PRB alluvial aquifers (BLM 2000). Recharge results from surface infiltration and discharge from underlying strata. The ground water system in these shallower aquifers exhibits a localized flow pattern, controlled by topography (BLM 2003a).

Descriptions of groundwater flow systems in the PRB by Rankl and Lowry were presented in the PRB FEIS (BLM 2003a). Northward regional groundwater flow is expected in the PRB from potentiometric data that relate the position of the underground aquifers with respect to the topography of the land surface and streams. Groundwater (potentiometric surface) data suggest most streams in the PRB should receive base flow (groundwater discharge) from a regional groundwater system. However, streamflow records do not support this conclusion. The locations of streams having base flows and the period of time that base flows occur indicate base flows are discharged to surface waters from local groundwater systems rather than a regional system. Additionally, groundwater discharge areas have not been identified in the northern part of the Project Area on the basis of chemistry of springs and shallow wells. The chemical quality of

shallow groundwater in the northern part of the PRB is affected more by local conditions than by regional flow (BLM 2003a).

Groundwater discharge area of aquifers less than 200 feet deep primarily coincide with the valleys of perennial and intermittent streams (BLM 2003a). Recharge areas for deeper aquifers generally coincide with major drainages. Vertical movement between aquifers is known to exist by the exchange rate is unknown. Subsurface flow in the Little Powder River is to the north. These conditions of reduced recharge and ongoing flow to the north out of the aquifers would contribute to losses in hydraulic head (BLM 2003a). Springs likewise would be reduced in flow during times of drought. Outflow is affected by evapotranspiration where the aquifers are exposed. Springs in this area are often seasonal in flow and are known to change in response to yearly conditions.

Water quality in alluvium within the PRB is variable. Concentrations of TDS in alluvial aquifers ranged from 106 to 6,610 mg/L and averaged 2,128 mg/L for 38 samples taken from the PRB (BLM 2003a). The alluvial and colluvial deposits associated with drainages associated with the ephemeral streams present in the Project Area are generally thin and very fine grained, exhibiting limited permeability. They are not laterally extensive enough to be considered aquifers.

Wasatch Formation. The Wasatch Formation consists of interbedded sandstones, siltstones, and shales with occasional discontinuous coal stringers and clinker deposits. The yield of wells completed in the Wasatch aquifer is directly related to the number and thickness of sandstone lenses or beds penetrated by the well. Wells can yield as much as 500 gpm, although smaller rates are more typical (BLM 1999). Where the sandstone and coal stringers are saturated, wells yield water that is used primarily for stock watering. Saturated strata are limited in areal extent and are typically thin, lenticular sandstones. Intervening shale layers effectively limit the hydraulic connection between sandstone lenses, restricting water movement. Because the water producing units are not continuous, the Wasatch is not considered to be a regional aquifer.

Recharge of the Wasatch aquifer is through surface infiltration of precipitation and lateral movement of water from adjacent clinker, spoil, and alluvium. Ground water is discharged from the Wasatch by evaporation and transpiration where the formation outcrops, by pumping wells, and by seepage into the alluvium along stream drainages. The discontinuous nature of the water bearing strata results in low overall hydraulic conductivity and low ground water flow rates. Ground water flow in the Wasatch aquifer is suspected to be primarily local and related to topography (see the discussion of recharge in the alluvial aquifers above). The varied characteristics of the aquifer units within the Wasatch result in variable hydraulic properties.

A 2002 study analyzed samples from several sources of Wasatch and Fort Union waters in order to determine water quality with respect to state standards (BLM 2003a). The study indicated that for public supply and domestic use, Wasatch waters can sometimes exceed State of Wyoming standards for TDS; however, exceedences are more likely to occur north of the Belle Fourche River. Wasatch waters can frequently exceed state irrigation standards for sulfate and, to a lesser extent, dissolved solids. Some samples of Wasatch waters exceed the state livestock standard for pH. Wasatch waters can be characterized as ranging from soft to very hard (BLM 2003a). The electrical conductivity (EC) and sodium adsorption ratio (SAR) values for the Wasatch Formation water indicate that a slight to moderate reduction in infiltration may result if this water is used for irrigation. The median SAR and median sodium concentration place this water in the category of medium sodium hazard (BLM 2003a). After the water is discharged, however, its EC would tend to rise as soil particles become entrained in the flow. The increase in EC would tend to allow the

water to demonstrate no reduction in infiltration. Water quality data from the Wasatch aquifer are summarized in **Table 3-2**.

TABLE 3-2 WATER QUALITY FOR THE WASATCH AND FORT UNION COAL AQUIFERS					
Parameter	Wyoming Water Quality Standard			Wasatch Aquifer¹ (median of 7-8 samples)	Fort Union Coal Aquifer¹ (median of 13 samples)
	Chapter VII Ground Water				
	DOM	AG	LS		
pH	6.5-9.0	4.5-9.0	6.5-8.5	7.8	7.2
EC (micromhos/cm)				1,382	1,070
SAR	--	8.0	--	9	7
Sodium (mg/L)				225	210
Calcium (mg/L)				15.5	36
Chloride (mg/L)	250	100	2,000	9.6	9.1
Sulfate (mg/L)	250	100	2,000	130	<0.3 – 1.8
Bicarbonate (mg/L)	250	200	3,000	461	712
Total dissolved solids (mg/L)	500	2,000	5,000	1,010	644
<small>¹Source: Barros and Ogle, 2003, page(s) 28-29) DOM = Domestic AG = Agriculture (Irrigation) -- No standard established LS = Livestock</small>					

Fort Union Aquifers. The Fort Union Formation consists of three hydrologic units: the Tongue River Member (which includes the Wyodak Coal), the Lebo Shale Member, and the Tullock Member. Water yields from the Fort Union aquifers range from three to 160 gpm (BLM 2003a, page(s) 3-29).

The Tongue River Member contains as many as 11 coal beds and many discontinuous, lenticular sandstone layers. The Wyodak coal occurs at the top of the Fort Union sequence and is considered a regional aquifer in the PRB. The Wyodak aquifer consists of multiple coal seams, interbedded sandstones, and clinker beds that form a sequence that ranges from 50 to 70 feet thick, dipping to the west at less than one percent. Hydraulic conductivity varies and reflects the amount of fracturing present in the coal seam (BLM 2003a).

Recharge occurs primarily along clinker outcrop areas with a small amount of leakage from the overlying Wasatch aquifer. Recharge into the coal could also come from spoil and alluvial aquifers and from localities where coal underlies valley fill deposits. Clinker aquifers consist of highly fractured rocks formed by the natural burning of coal beds. Clinker aquifers can store large amounts of water from rainfall and snowmelt. Clinker deposits may yield as much as 500 gpm water (BLM 2000). Recharge of the clinker occurs from precipitation, surface water infiltration, and lateral inflow from clinker deposits updip. Although recharge rates to the clinker are relatively high, the rate of recharge from the clinker units to coal seams is often limited by a relatively low-permeability, clay-rich zone that typically occurs at the contact between the clinker and the coal. Ground water stored in clinker is slowly discharged to springs, streams and coal

aquifers downdip, helping to maintain perennial streams during dry periods. The Project Area is updip from exposed clinker and is not in the area where such springs and stream inputs are possible.

The Lebo Member consists of sandstones grading to mudstone with depth. Wells in the Lebo unit may yield as much as 10 gpm of water for domestic and livestock use if a sufficient thickness of saturated sandstone is penetrated. As with other Fort Union aquifers, recharge is primarily from inflow at outcrop areas. Ground water generally flows north (BLM 1999). The Lebo Member is sometimes referred to as the “Lebo Confining Layer” as its fine-grained composition generally retards the movement of water. Many mines in Campbell County use the Lebo Member for water supply wells (BLM 2001).

The Tullock Member aquifer consists of fine to medium-grained sandstone layers and thin coal seams interbedded with siltstone, shale, and carbonaceous shale. The Tullock was deposited in river systems that flowed to the east and varies from 500 to 1,500 feet thick. Fine-grained sandstones and jointed coal beds may yield as much as 40 gpm, but yields of 15 gpm are more common. Where the aquifer is confined, wells generally flow less than 10 gpm. Recharge to the Tullock results from leakage through overlying strata and infiltration along the outcrop areas (BLM 1999). Like the Lebo, the Tullock Member is not directly disturbed by coal mining, but many mines use it for water supply wells (BLM 2001).

Analyses of Fort Union produced water indicate that concentrations of most constituents are generally less than the most restrictive Wyoming ground water quality standards (BLM 2003a). The domestic use standard for dissolved solids was the standard most frequently exceeded in the samples drawn for a 2002 study (BLM 2003a). The irrigation standards for sulfate and TDS were exceeded by the sample Fort Union waters in only eight percent of the samples. Hardness ranges from 74 to 446 mg/L, making the water typically hard (BLM 2003a). The EC and SAR values for the Fort Union Formation water indicate that a slight to moderate reduction in infiltration may result if this water is used for irrigation. The median SAR and median sodium concentration place this water in the category of medium sodium hazard (BLM 2003a). After the water is discharged, however, its EC would tend to rise as soil particles become entrained in the flow. The increase in EC would tend to allow the water to demonstrate no reduction in infiltration. A summary of water quality parameters is shown in **Table 3-2**.

Springs and seeps occur where ground water is discharged to the surface. They are most numerous where topographic relief is great and stratigraphic units are discontinuous. In addition, springs and seeps also emerge at the base of clinker deposits, along the contact between the permeable clinker and impermeable layers below. The primary source of recharge to springs and seeps is infiltration of precipitation and seepage from streams and rivers.

Ground water levels in the area depend on the aquifer in which the well is completed and well depth. The Wasatch and Fort Union aquifers are the most important local sources of ground water in the PRB (BLM 1999). These waters are developed extensively for shallow wells less than 1,000 feet below the surface.

Groundwater development in the SCGA includes 53 drilled wells and 11 developed springs. Groundwater quality is adequate for stock and domestic use. Wells permitted in and near the Project Area range in depth from 200 to 700 feet (WSEO 2006). Within the Analysis Area, the area within one mile of the project wells, are six permitted water wells, and two permitted developed springs. Four wells and the two springs were permitted and are administered by the Forest Service. The permit for one of the developed springs was cancelled. All were permitted

for the use of stock water. Well depths vary from 210 to 505 feet. Static water depths vary from 0 to 170 feet. Given the depths of the shallow wells and the geology of the area, the Tullock is the likely source for the shallow wells. A ‘flowing well’ or artesian well is identified on the mainstem of Wild Horse Creek on the Adon NW 7.5 minute quad and is also in the WSEO water rights database (WSEO 2006). This well was permitted in 1962 by the Forest Service for stock watering use and at the time was 505 feet deep. The watershed above this well is roughly 1560 acres. This represents the recharge area for this flowing well.

3.4 SOILS

The Analysis Area, which includes a two-mile buffer around the Project Area of the proposed wells, is characterized by haystack topography with ridges and escarpments formed by the numerous tributaries to the Little Powder River. Thirty-four percent of the Analysis Area has a slope of 0-3 percent; the remaining 66 percent has a slope of 3 to 45 percent (see **Table 3-3**). Soils in the Project Area support vegetation/forage for livestock grazing and wildlife habitat. Past soil disturbances include construction and operation of roads, oil and gas wells, water wells, pipelines, electrical power lines, and water-control impoundments. Current soil productivity varies depending on local factors such as soil depth, texture, slope, topographic aspect, and permeability in combination with grazing pressure and precipitation.

A soil survey for Campbell County (Northern Part) has been published by the United States Department of Agriculture-Natural Resources Conservation Service (NRCS). According to the NRCS data (Prink 2002), 22 soil units occur in the Analysis Area (**Table 3-3**). Of these 22 soil types, there are only three have areal extents greater than 10 percent each of the total extent of the Analysis Area. These are Ucross-Fairburn loams, Deekay-Oldwolf loams, and Oldwolf-Fairburn loams. Together these three soil types make up 54 percent of the Analysis Area. These are also the soils that would be affected by the proposed Project activities.

The dominant soil map unit of the upland plains in the Analysis Area is Ucross-Fairburn loams, comprising 25 percent of Project Area (**Table 3-3**). Ucross-Fairburn loam soils typically comprise ridge or hill landforms on moderately steep to steep slopes (15-45 percent) (Prink 2002). Ucross-Fairburn loams formed in alluvium derived from sandstone and shale, are moderately deep (20-40 inches to bedrock), have loam and clay loam subsurface textures and are well-drained (Prink 2002).

The second most common soil map unit in the Analysis Area is Deekay-Oldwolf Loams (17 percent) (**Table 3-3**). Deekay-Oldwolf Loam soils typically comprise the backslopes (0-6 percent) of ridge or hill landforms. Like the Ucross-Fairburn Loams, Deekay-Oldwolf Loams have deep (>60 inches to bedrock), well-drained, loam and clay loam surface textures formed in alluvium derived from sandstone and shale (Prink 2002).

The third soil type comprising more than 10 percent of the Analysis Area is Oldwolf-Fairburn Loams (12 percent). Oldwolf-Fairburn loams comprise the shoulders (3-15 percent slope) of ridge or hill landforms and have moderately deep (20-60 inches to bedrock), well-drained, loam and clay loam surface textures formed in alluvium derived from sandstone and shale (Prink 2002).

Conditions such as wind and water erosion hazards, saline and sodic soils, and clayey soils can prevent a disturbed soil from achieving a stable post-disturbance state. Factors contributing to high water erosion hazards are slope, soil erodibility factor (k-factor), and soil permeability (rate

of water infiltration) (BLM 2003ae). Wind erosion hazards are based on soil texture and how susceptible a soil is to wind erosion (BLM 2003a).

The soils within the Analysis Area have characteristics that are likely to be susceptible to severe water erosion hazards if disturbed and not stabilized with proper measures (Prink 2002; **Table 3-3**). The potential for severe wind erosion hazard is limited to 87.8 acres of a single soil type (Fairburn-Mittenbutte-Badland complex, Unit 277) that occurs in less than one percent of the Analysis Area (**Table 3-3**). None of the five proposed wells would be built in this soil type. The remaining 99 percent of the Analysis Area is characterized by slight to moderate potentials for accelerated water and wind erosion if disturbed.

Soils with salinity levels of 0 to 8 mmhos/centimeter are considered slightly saline (BLM 2003a). The Analysis Area has approximately 36.8 acres of deep, slightly saline soils in the western edge of the Project Area (see **Table 3-3**). This soil type represents less than 0.5 percent of the Analysis Area. None of the proposed wells or roads would disturb this soil type.

The Sodium Adsorption Ratio (SAR), or sodicity, of surface or ground water is the ratio of concentration of sodium ions relative to calcium and magnesium ions in water. Slightly elevated salinity and exchangeable sodium measured as Sodium Adsorption Ration (SAR) levels in subsoil horizons below the relatively thin (zero to eight inches) topsoil layers can affect the reclamation potential. None of the soil types in the Analysis Area have elevated SAR levels.

In addition to the soils with slightly high salinity content, approximately 1023.8 additional acres (see **Table 3-3**) are heavier, clayey soils. Clayey soils, particularly those whose clay fraction is comprised mostly of swelling, smectitic clay minerals, are more susceptible to shrink-swell action and compaction that can affect the soils' ability to support construction and the potential for long-term reclamation. None of the proposed wells or roads would disturb this soil type.

TABLE 3-3 WILDHORSE PROJECT AREA SOIL SERIES CHARACTERISTICS

Map Unit/ Well #	Map Unit Name	Acreage within Analysis Area	% of Analysis Area	Slope Range (%)	Depth Class	Water Erosion Hazard	Wind Erosion Hazard	Shrink- Swell Potential	Salinity (mmhos /cm)	SAR	Potential as a source of Reclamation Material
324 #44-18 #42-19	Ucross- Fairburn loams	2726.81	25.27%	15-45	Moderate (20- 40")	Moderate	Moderate	Moderate	2	5	Fair to Poor Organic matter content low, droughty, depth to bedrock
134 #31-19	Deekay- Oldwolf Loams	1838.88	17.04%	0-6	Deep (>60")	Moderate	Moderate	Moderate	2	5	Fair Organic matter content low
299 #4-18	Oldwolf- Fairburn loams	1340.42	12.42%	3-15	Moderate	Moderate	Moderate	Moderate	2	5	Fair to Poor Droughty, depth to bedrock
334	Vonalf-Xema- Mittenbutte fine sandy loams	957.99	8.88%	3-30	Deep	Moderate	Slight	Low	2	0	Fair to Poor Doughty, depth to bedrock
283	Gateson- Xema- Mittenbutte fine sandy loams, wooded	665.69	6.17%	3-30	Moderate	Moderate	Slight	Low	0	0	Fair to Poor Organic matter content low, droughty, depth to bedrock
225	Ucross-Iwait- Fairburn Loams	621.46	5.76%	3-30	Moderate	Moderate	Moderate	Moderate	2	5	Fair to Poor Organic matter content low, depth to bedrock
295	Lismas- Sabatka- Xema complex	524.49	4.86%	3-15	Shallow	Moderate	Moderate	High	0-2	0-5	Poor to Fair Too clayey, droughty, depth to bedrock, organic matter content low
131	Deekay loams	452.55	4.19%	0-6	Deep	Moderate	Moderate	Low	2	5	Fair Organic matter content low
224 #21-20	Ucross-Iwait Loams	413.17	3.83%	0-6	Moderate	Moderate	Moderate	Moderate	2	5	Fair Organic matter content low, depth to bedrock
105	Arwite-Elwop Fine Sandy Loams	292.05	2.71%	0-6	Deep	Moderate	Slight	Moderate	2	0	Fair Organic matter content low
168	Jaywest- Spottedhorse Loams	185.19	1.72%	0-6	Deep	Moderate	Moderate	High	2	5	Poor to Fair Too clayey, organic matter content low

TABLE 3-3 WILDHORSE PROJECT AREA SOIL SERIES CHARACTERISTICS

Map Unit/ Well #	Map Unit Name	Acreage within Analysis Area	% of Analysis Area	Slope Range (%)	Depth Class	Water Erosion Hazard	Wind Erosion Hazard	Shrink-Swell Potential	Salinity (mmhos /cm)	SAR	Potential as a source of Reclamation Material
303	Oshoto-Ziggy silt loams	148.04	1.37%	0-6	Deep	Moderate	Moderate	Low	2	5	Fair Organic matter content low
254	Badland-Lismas complex	136.87	1.27%	15-75	Shallow	Moderate	Moderate	High	2	5	Poor Too clayey, droughty, depth to bedrock
107	Arwite-Vonalf Fine Sandy Loams	115.69	1.07%	0-6	Deep	Moderate	Slight	Low	2	0	Fair Organic matter content low
132	Deekay-Moorhead Loams	92.39	0.86%	0-6	Deep	Moderate	Moderate	High	2	5	Fair Organic matter content low, too clayey
277	Fairburn-Mittenbutte-Badland complex	87.80	0.81%	3-60	Moderate	Moderate	Moderate to Severe	Low	2	0-5	Poor Droughty, depth to bedrock, organic matter low
103	Arwite Fine Sandy Loams	39.23	0.36%	0-6	Deep	Moderate	Slight	Low	2	0	Fair Organic matter content low
167	Jaywest-Moorhead Loams	37.67	0.35%	0-6	Deep	Moderate	Moderate	High	2	5	Poor to Fair Too clayey
312	Rockypoint Sodawells complex	36.87	0.34%	0-3	Deep	Moderate	Moderate	Low	2-8	0-5	Fair to Poor Organic matter content low
302	Oshoto Moorehead complex	34.92	0.32%	0-6	Deep	Moderate	Moderate	Moderate	2	5	Fair to Poor Organic matter content low, too clayey
135	Deekay-Oldwolf Loams	31.46	0.29%	6-15	Deep	Moderate	Moderate	Moderate	2	5	Fair Organic matter content low
183	Moorhead-Leiter Clay Loams	12.25	0.11%	0-6	Deep	Moderate	Moderate	High	2	5	Poor Too clayey, organic matter content low

Source: Prink 2002

3.5 VEGETATION RESOURCES

3.5.1 Vegetation Cover Types

The dominant vegetation in the SCGA includes Wyoming big sagebrush, needle-and-thread grass, blue grama and ponderosa pine. Bare ground and cushion plants are also present along the edges of draws. Woody shrubs including snowberry, cottonwoods, Russian olive, chokecherry and buckbrush (skunkbrush) are commonly found in the draws.

The Analysis Area is defined as the two-mile buffer zone surrounding each of the five wells. Gap Analysis Project data from the University of Wyoming delineated four vegetation types in the Analysis Area. General Habitat Types represented in the Analysis Area include mixed grass prairie (45%), Wyoming sagebrush (25%), ponderosa pine (16%), and dry land crop (fallow lands, non-irrigated lands; 14%) (Merrill 1996). While this data (USGS 1:100,000 mapping scale) is small-scale, it provides a coarse-filter screen for data analysis.

The majority of the Project Area is on upland sites. Upland vegetation is dominated by blue grama (*Bouteloua gracilis*) and western wheatgrass (*Pascopyrum smithii*). Big sagebrush (*Artemisia tridentata*). Lesser densities of junegrass (*Koeleria cristata*), bluegrasses (*Poa spp.*), cactus (*Opuntia polyacantha*), and needle and thread (*Stipa comata*) occupy the site. Areas with shallow clayey soils have sparse vegetation and have a prostrate growing phlox (*phlox spp.*) common to the site. Various annuals, including cheatgrass (*Bromus tectorum*) and Japanese brome and six weeks fescue (*Vulpia octoflora*) are present and generally increasing in the Project Area. Antelope and mule deer habitat exist in the area. Wildlife browsing is moderate to heavy on most *Artemisia tridentata* plants in the area.

The Project Area occurs within the Spring Creek Grazing Association (SCGA) of the Thunder Basin National Grassland. It involves NFS and private lands used for livestock grazing. The Analysis Area falls within two grazing allotments: 1) the Pickrel # 114 allotment and 2) the York #118 allotment. See Section 3.9.3 this document for more information regarding the grazing allotments and nature of use in the area. Refer to Sections 2.5 and 3.0 for management direction and desired conditions for this area.

The desired condition for the upland vegetation, as described in the Grassland Plan, is to maintain approximately 50% of the landscape for the SCGA in mid to late seral stages (pg 2-22). Plan objectives for the area are being met with the composition of both late and mid seral plant species providing a moderate to high vegetation structure.

3.5.2 Wetlands and Riparian Areas

No true riparian or wetland areas exist in the area. Horse Creek which runs through the area is an ephemeral stream; at the time of the survey the stream was dry.

3.5.3 Non-native Invasive and Noxious Weeds

Noxious weed infestations have been increasing in recent years on the Thunder Basin National Grasslands. Moderate amounts of Canada thistle are known to exist in the Project Area, found mostly in the drainages. Spotted knapweed is found in the surrounding area. Undesirable and introduced plant species have been increasing in occurrence and abundance in recent years; most noticeable are cheatgrass, Japanese brome, and white top. The timing of this survey was not well suited for plant identification of noxious and invasive plant species. Many noxious and other invasive plants are increasers in disturbed sites such as well locations, newly built roads and other ground disturbing activities.

3.6 WILDLIFE RESOURCES AND FISHERIES

The Analysis Area for this resource is defined as the Project Area and a surrounding 2-mile area. As discussed in Section 3.5, vegetative cover of the Project Area is comprised of Wyoming big sagebrush, needle-and-thread grass, blue grama and ponderosa pine. Bare ground and cushion plants are also present along the edges of draws. Woody shrubs including snowberry, cottonwoods, Russian olive, chokecherry and buckbrush (skunkbrush) are commonly found in the draws. Mammals, including populations of big game animals, occurring in the Project Area are discussed in Section 3.6.1 and 3.6.2. Raptors as well as upland game birds and other birds are discussed in Sections 3.6.3 through 3.6.5. Amphibians and Fisheries in the Project Area are addressed in Sections 3.6.6 and 3.6.7. Animals with special status (USFS, USFWS) are covered in Section 3.7. Birds protected under the Migratory Bird Treaty Act that are known or expected to occur in SCGA and the Analysis Area are addressed throughout these Sections, dependent upon the status of regulatory protection or conservation concern.

3.6.1 Big Game Animals

Big game species in SCGA include antelope and mule deer.

Pronghorn

Wyoming supports the largest pronghorn population in North America (BLM 2003a). The species is most abundant in short-and mixed-grass habitats common to the PRB (BLM 2003a). The Project Area is considered yearlong range for pronghorn by the Wyoming Game and Fish Department (WGFD) (WGFD 2003a). Yearlong range indicates that a population or portion of a population makes general use of the habitat on a year round basis, except occasionally under severe winter or drought conditions. All of the Project Area is considered WGFD pronghorn herd-unit 351, the Gillette herd (WGFD 2003a). In general the herd population trend has been stable.

White-tailed Deer

White-tailed deer are found throughout North America. In Wyoming they are concentrated in riparian woodlands, shrubby riparian and irrigated agricultural lands. They are generally absent from dry grasslands and coniferous forest (BLM 2003a). Although the Project Area is within Hunt Area 18, Campbell, for white-tailed deer, the Project Area does not contain enough animals to be considered important habitat for white-tailed deer (WGFD 2003b). As the Alternative would not have a direct, indirect or cumulative effect on white-tailed deer, the species is not discussed further in this document.

Mule Deer

Mule deer frequent habitats that include short-and mixed-grass prairies, sagebrush shrublands, and shrubby riparian areas. The Project Area is within Hunt Area 18 and is considered winter yearlong range. The overall population level has been stable.

Elk

In Wyoming elk are concentrated in mountains and wooded foothills. The Project Area does not contain enough animals to be considered important habitat for elk (WGFD 2003). The Project Area is in Hunt Area 129, which is found across the state and denotes areas where elk may be found, but are not known to have larger populations. As the Alternative would not have a direct, indirect or cumulative effect on elk, the species is not discussed further in this document.

3.6.2 Other Mammals

In addition to the big game species listed above, less common and smaller mammals of the short-and mixed-grass communities, sagebrush shrubland, and riparian shrublands that could potentially occur in the Analysis Area are included in **Table 3-4** (Cerovski et al. 2004). Of these species, the Townsend's big-eared bat (*Plecotus townsendii*), fringed myotis (*Myotis thysanodes*), swift fox (*Vulpes velox*), black-tailed prairie dog (*Cynomys ludovicianus*), and greater sage-grouse (*Centrocercus urophasianus*) are special status species discussed in Section 3.7.2.

TABLE 3-4 WILDLIFE SPECIES THAT COULD POTENTIALLY OCCUR IN THE PROJECT AREA		
Species Common Name	Species Latin Name	Habitat
Merriam's shrew	<i>Sorex merriami</i>	Basin-prairie and mountain-foothills shrublands, eastern great plains grasslands, rural developments, below 7500 feet.
desert cottontail	<i>Sylvilagus audubonii</i>	Cottonwood riparian/drylands, basin-prairie shrublands, sagebrush-grasslands, eastern great plains and great basin-foothills grassland.
mountain (Nuttall's) cottontail	<i>Sylvilagus nuttallii</i>	Heavy shrub cover in deciduous forests, juniper woodlands.
black-tailed jackrabbit	<i>Lepus californicus</i>	Eastern shortgrass prairies, open greasewood and sagebrush grasslands, moist meadow grasslands, agricultural areas, roadside/railroad banks, unreclaimed mine areas.
white-tailed jackrabbit	<i>Lepus townsendii</i>	Occurs in most open habitats from shrub grasslands, to openings in foothill conifer stands and montane coniferous forests, to alpine tundra. Sagebrush-grasslands are most commonly used.
least chipmunk	<i>Tamias minimus</i>	Occurs in most habitat types. Inhabits more biotic communities and has a greater altitudinal range than other chipmunk species whose range it overlaps.
thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>	Juniper, basin-prairie and mountain-foothills shrublands, grasslands, small grain agricultural areas, barren areas, roadsides/railroad banks, mined areas, overgrazed areas.
black-tailed prairie dog	<i>Cynomys ludovicianus</i>	Shortgrass and midgrass grasslands. Nests in burrow. Feeds on grasses, forbs, shrubs, and occasionally insects.
eastern fox squirrel	<i>Sciurus niger</i>	Deciduous forests, woodland chaparral, cottonwood-riparian, urban areas.
northern pocket gopher	<i>Thomomys talpoides</i>	Virtually all habitats with loose soil and relatively few rocks and stones.
olive-backed pocket mouse	<i>Perognathus fasciatus</i>	Basin-prairie shrublands, sagebrush-grasslands, eastern great plains, great-basin-foothills, and mountain-foothills grasslands. Prefers sandy soils.
Ord's kangaroo rat	<i>Dipodomys ordii</i>	Basin-prairie and mountain-foothills shrublands, grasslands, sand dunes, roadside/railroad banks.

TABLE 3-4 WILDLIFE SPECIES THAT COULD POTENTIALLY OCCUR IN THE PROJECT AREA		
Species Common Name	Species Latin Name	Habitat
beaver	<i>Castor canadensis</i>	Aquatic habitats adjacent to aspen, willow, or cottonwood stands.
western harvest mouse	<i>Reithrodontomys megalotis</i>	Basin-prairie and mountain-foothills shrublands, riparian shrublands, sagebrush grasslands, eastern great plains grasslands often associated with yucca.
white-footed mouse	<i>Peromyscus leucopus</i>	Deciduous woodlands, cottonwood riparian, occasionally grasslands, open areas near woodlands.
deer mouse	<i>Peromyscus maniculatus</i>	Virtually all habitats.
northern grasshopper mouse	<i>Onychomys leucogaster</i>	Basin-prairie and mountain-foothills shrublands, grasslands, fallow lands, rock outcrops, disturbed areas. Requires silty or sandy soils.
bushy-tailed woodrat	<i>Neotoma cinerea</i>	Most habitat types with rock outcrops, abandoned buildings, caves, mines
prairie vole	<i>Microtus ochrogaster</i>	Basin-prairie shrublands, grasslands, eastern great plains grasslands, small grain agricultural areas
meadow vole	<i>Microtus pennsylvanicus</i>	Moist to wet meadows and grasslands in or near coniferous forests, aspen, basin-prairie shrublands, sagebrush-grasslands, mixed shrublands, riparian shrub, and grasslands
sagebrush vole	<i>Lemmys curtatus</i>	Basin-prairie shrublands, sagebrush-grasslands, eastern great plains and great-basin-foothills grasslands, agricultural areas.
muskrat	<i>Ondatra zibethicus</i>	Marsh-swamp wetlands, aquatic habitats.
house mouse	<i>Mus musculus</i>	Agricultural areas, urban areas.
porcupine	<i>Erethizon dorsatum</i>	Most habitat types including coniferous and deciduous forests, vegetated riparian area, sagebrush-grasslands, grasslands.
coyote	<i>Canis latrans</i>	Most habitat types including plains, deserts, and mountains with grass and shrubs, dense forest.
red fox	<i>Vulpes vulpes</i>	Most habitat types. Prefers a mixture of streamside communities, rolling agricultural areas, brush, pastures, open areas.
raccoon	<i>Procyon lotor</i>	Abundant in cottonwood-riparian areas and along perennial streams, but found in most habitat types below 6,500 where water is available.
badger	<i>Taxidea taxus</i>	Most common in basin grasslands and basin sagebrush-grasslands.
striped skunk	<i>Mephitis mephitis</i>	Most habitats including mixed woodlands, brushy areas, open fields with broken wooded ravines, rock outcrops.
mountain lion	<i>Puma concolor</i>	Most habitat types where deer are present. Prefers remote areas with dense cover and rocky, rugged terrain.

TABLE 3-4 WILDLIFE SPECIES THAT COULD POTENTIALLY OCCUR IN THE PROJECT AREA		
Species Common Name	Species Latin Name	Habitat
bobcat	<i>Lynx rufus</i>	Most habitat types with broken, brushy country or mountains. Often found in rocky areas with cliffs or along rocky rims.
mink	<i>Mustela vison</i>	Most habitat types near open water, especially riparian zones adjacent to watercourses and ponds.
long-tailed weasel	<i>Mustela frenata</i>	Found in most habitat types including open fields, willows, desert shrubland, grasslands, riparian shrubland. Typically found in rock outcrops near water. Often occupies open habitats in or near coniferous zones.
western small-footed myotis	<i>Myotis ciliolabrum</i>	Pine-juniper, basin-prairie shrublands, sagebrush-grasslands, eastern great plains, great-basin-foothills, and mountain-foothills grasslands, cliffs, rock outcrops.
little brown myotis	<i>Myotis lucifugus</i>	Coniferous and deciduous forests, sagebrush-grasslands, riparian shrub, close to water.
hoary bat	<i>Lasiurus cinereus</i>	Coniferous and deciduous forests, aspen, basin-prairie shrublands, eastern great plains grasslands, sagebrush grasslands, mountain foothills shrublands, riparian shrub. Roosts in deciduous trees.

3.6.3 Raptors and Owl

The SCGA is known to support nesting raptors. Nests of bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), ferruginous hawk (*Buteo regalis*), and Swainson's hawk (*Buteo swainsoni*) are considered active by the USFS unless unoccupied for seven consecutive years. For the burrowing owl (*Athene cunicularia*) and other raptor species, a nest is no longer considered active if it has been unoccupied during the current or most recent nesting season (USFS 2001a).

Several raptor species have been assigned special status by agencies and organizations. Special status raptor species that occur in the area are described in Section 3.7. Other raptor species known or suspected to occur in the vicinity of the Project Area or Analysis Area, which is within a two-mile radius of the Project Area, are described below.

golden eagle

Golden eagles are common, widely distributed, year-round residents of Wyoming and the West in general. Prey consists mainly of rabbits and larger rodents, though they are known to scavenge on a variety of species. Golden eagles typically nest in trees or on cliff faces. Breeding Bird Survey (BBS) data indicates that on average 0.9 golden eagles have been observed per the Soda Well survey route (adjacent to Analysis Area) per year between 1979 and 2001 (Sauer et al. 2004). There are a limited number of trees and rock outcrops in the Analysis Area, but no individuals have been documented within that Area. Trends are indeterminate for SCGA. Nests of this species have not been recorded in the Project Area.

northern goshawk

Northern goshawks are most commonly associated with dense forest, a habitat type that is limited in the Analysis Area. However, given the proximity of the Black Hills of South Dakota, a known preferred habitat, the range of the species and its habit of short-distance migrations; it can be found in the Analysis Area. Nests of this species have not been recorded in the Analysis Area.

red-tailed hawk

Red-tailed hawks are common, widely distributed, year-round residents of Wyoming. They nest in trees and cliff faces and commonly perch atop fence posts and telephone poles. Dominant prey consists of primarily small mammals with lesser quantities of reptiles and small birds (Gough et al. 1998). Red-tailed hawk populations are generally increasing, in Wyoming; however, trends in SCGA indicate declining to stable population from 1979 to 2001. According to BBS data, on average 1.30 red-tailed hawks have been observed per bird survey route per year between 1979 and 2001 with a generally stable population (Sauer et al. 2004). A nesting red-tailed hawk was documented in the Analysis Area during the biology surveys.

Swainson's hawk

Swainson's hawk is a neotropical migrant that breeds throughout North America and inhabits grassland, shrubland and agricultural lands. Swainson's hawks are common, widely distributed, summer residents of Wyoming which nests in trees and occasionally on cliffs. Prey consists of small mammals, grasshoppers, and locusts. According to BBS data, only one Swainson's hawk has been observed on the Soda Well route between 1979 and 2001 (Sauer et al. 2004). Regional trends for Wyoming are indeterminate. This species has not been recorded in the Project Area. An active Swainson's hawk nest existed in the Analysis Area in a live cottonwood during 2003; however, by May 2004 the nest had fallen out of the tree and was no longer usable by raptors. No Swainson's hawks were observed during subsequent nesting seasons within the Analysis Area.

American kestrel

This small falcon lives throughout the western hemisphere. Those in northern latitudes of North America may migrate while other populations maintain a year round presence. They are generalist predators. They are primarily cavity nesters. American kestrels are known to nest in portion of Wyoming including SCGA. No nests of this species have been recorded in the Analysis Area.

prairie falcon

Prairie falcons are common residents of Wyoming and occupy cliffs in all habitats with open areas. Prairie falcons nest in a hole or on a ledge on a cliff or rock outcrop. They feed on birds, small mammals, insects, and lizards. Ongoing raptor surveys have not identified any prairie falcon nest sites within the Project Area.

merlin

Merlins are an uncommon resident of Wyoming and will occupy most habitats below 8,500 feet. Merlin will use nests built by other species, particularly black-billed magpies, in coniferous or deciduous trees. The species feeds mostly on birds, but also small mammals and insects. Ongoing raptor surveys have not identified any merlin nest sites with in the Project Area.

barn owl

Barn owls are common residents of Wyoming and will occupy most habitats below 9,000 feet, especially cottonwood-riparian. Great horned owls nest in abandoned tree nests of raptors, corvids, or squirrels in tree cavities, caves, or crevices. They feed on rabbits, rodents, pheasants, quail, and small birds. Ongoing raptor surveys have not identified any owl nest sites within the Project Area.

great horned owl

Great horned owls are common residents of Wyoming. Barn owls will nest in a building, cave or crevice. They feed on rodents, and sometimes small birds. Ongoing raptor surveys have not identified any owl nest sites within the Project Area.

3.6.4 Upland Game Birds

Greater sage-grouse (*Centrocercus urophasianus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) are common year-round or seasonally resident upland game birds known from within or near the Project Area. Sage-grouse is a special-status species discussed under Section 3.7.3. In Wyoming, sharp-tailed grouse are locally common where grasslands are intermixed with other shrublands, especially in wooded draws, shrubby riparian areas, and wet meadows (Cerovski et al. 2004). Sharp-tailed grouse are more commonly found within and near the Project Area in mixed grass environments. Both species are addressed in Section 3.7.3, USFS Management Indicator Species. Gray partridge, turkey and ring-necked pheasant are known in SCGA but do not occur in the Project Area.

3.6.5 Other Birds

The USFWS has established planning units, or regions, each with a list of birds of conservation concern for the unit. The Project Area is contained within Bird Conservation Region 17 (badlands and prairies). Those species of conservation concern with no special status on the TBNG are addressed below. Habitat and breeding information come from Cerovski et al. (2004). Species that may occur in SCGA include trumpeter swan (*Cygnus buccinator*), upland sandpiper (*Bartramia longicauda*), Wilson's phalarope (*Phalaropus tricolor*), black-billed cuckoo (*Coccyzus erythrophthalmus*), red-naped sapsucker (*Sphyrapicus nuchalis*) and dickcissel (*Spiza Americana*), (USFWS 2002, Table 17). Red-tailed hawk, though not a species identified as a priority species for conservation concerns, is protected under the Migratory Bird Treaty Act and is known to occur in the Analysis Area.

Partners in Flight (PIF) is a voluntary international coalition of government agencies, conservation groups, academic institutions, private businesses and concerned citizens dedicated to the conservation of common birds including migratory bird species protected under the Migratory Bird Treaty Act. PIF directs its resources to inventory and monitoring, research, management, education and international cooperation. Activities include the development of geographically based conservation plans. The Wyoming state working group of PIF developed the Wyoming Bird Conservation Plan (WBCP) (Nicholoff 2003). Level 1 Priority Bird Species were identified by the Wyoming Partners in Flight Wyoming Bird Conservation Plan Version 2.0 (Nicholoff 2003). These species and their habitats have been determined to be most in need of conservation in Wyoming. The efforts of PIF in gathering and interpreting data preparatory to the development of the WBCP were statewide and included the SCGA. The group's efforts represent the best overview of the area for these species.

There are a number of bird species of concern observed in Campbell and Crook Counties that show no evidence of nesting (Cerovski et al. 2004). These species are likely migrants moving through the area seasonally. These species and others that may occur on the TBNG but which are outside of any effects of

the proposed action (geographically or biologically) have been eliminated from further review. The table below lists the species known or suspected to breed in the SCGA, based on circumstantial evidence of breeding. These species are discussed below.

Trumpeter swans are uncommon Wyoming residents with no known distribution in Campbell County. Trumpeter swans inhabit marshes, lakes, and rivers. They nest on islands, muskrat houses, and pieces of floating bog. Trumpeter swans feed on aquatic vegetation as well as insects and aquatic invertebrates.

Upland sandpiper is an uncommon summer resident of Wyoming that inhabits eastern great plains grasslands and dryland grass pastures. This species is not known to breed in the Analysis Area.

Wilson's phalarope is a common summer resident of Wyoming marshes, lakes, and shorelines. Phalaropes nest in a lined scrape on damp ground near water and feed mainly on aquatic invertebrates and seeds of aquatic plants. This species is known to breed in SCGA but no habitat exists for this species in the Project Area.

Black-billed cuckoos prefer upland woodlands that provide a variety of trees, shrubs, vines, and other vegetation more commonly associated with riparian habitats. Though there are sporadic trees and shrubs along the dry creek bottom in the Analysis Area that could provide potential nesting habitat in the form of shrubby draws, Wild Horse Creek does not provide the type of riparian habitat preferred by this species.

Red-naped sapsuckers inhabit mountainous areas of Wyoming where coniferous forests and stands of aspen dominate. There is a limited amount of ponderosa pine in the Analysis Area, but no aspen habitat. This species is not known or expected to nest in the Analysis Area.

Dickcissel prefers grassland habitats having taller grasses, forbs, or shrubs as well as agricultural areas. Grassland habitat does occur in the Analysis Area. The height of the vegetation would depend on the species composition, moisture patterns, and grazing regime of particular areas.

Waterfowl

A number of common migratory or resident waterfowl could occur in the Analysis Area. The following species are known to breed in the SCGA: Canada goose (*Branta canadensis*), gadwall (*Anas strepera*), American widgeon (*Anas americana*), mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), cinnamon teal (*Anas cyanoptera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), green-winged teal (*Anas crecca*), canvasback (*Aythya valisineria*), ruddy duck (*Oxyura jamaicensis*), pied-billed grebe (*Podilymbus podiceps*), eared grebe (*Podiceps nigricollis*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), and American coot (*Fulica americana*) (Cerovski et al. 2004). These species would not be expected to utilize the Project Area as the area lacks habitat for these species.

3.6.6 Amphibians and Reptiles

Amphibians that have been observed in wetland or riparian communities in the SCGA include western spiny softshell (*Apalone spinifera hartegi*). Historic records include tiger salamander (*Ambystoma tigrinum*), Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousei*), northern leopard frog (*Rana pipiens*) and boreal chorus frog (*Pseudacris maculata*). The following reptiles may be found in the Analysis Area: western painted turtle (*Chrysemys picta bellii*) snapping turtle (*Chelydra serpentina*), greater short-horned lizard (*Phrynosoma hernandesi*), plains hog-nosed snake (*Heterodon nasicus*), eastern yellow-bellied racer (*Coluber constrictor flaviventris*), bullsnake (*Pituophis catenifer*

sayi), plains gartersnake (*Thamnophis radix*), and prairie rattlesnake (*Thamnophis radix*) (Cerovski et al. 2004)

3.6.7 Fisheries and Rare Native Fish

The Project Area is within the Wild Horse Creek watershed. Wild Horse Creek is a tributary to Spring Creek, which is a tributary to the Little Powder River, which is a tributary to the Little Missouri River. The majority of the Little Missouri River drainage basin area is sagebrush and grassland, with ponderosa pine along the ridges and breaks of low rolling hills (BLM 2003a). Livestock production is the primary land use within that drainage basin. Small stock water ponds and irrigation reservoirs provide the majority of fisheries habitat (BLM 2003a). WGF listed the majority of the waterbodies and watercourses in this drainage basin as unsuitable for sustaining a fishery (BLM 2003a). No fisheries are established in Wild Horse Creek. Fisheries are not discussed further in this document.

Spring Creek and Wild Horse Creek are both ephemeral and intermittent streams flowing mostly in response to runoff and storm events. Wild Horse Creek is supplemented by springs but does not maintain a quantifiable base flow. Under Chapter 1 of the Wyoming Water quality Regulations, WHC within the Project Area is classified as a 3B water by WDEQ. Class 3B waters are intermittent or ephemeral which because of natural habitat conditions, do not support nor have the ability to support fish populations or spawning. Class 3B streams do have sufficient hydrology to normally support and sustain communities of aquatic life including invertebrates, amphibians, or other flora and fauna which inhabit waters of the state at some stage in their cycles.

In the Project Area and Analysis Area, which is the Wild Horse Creek watershed, Wild Horse Creek and its tributaries are dry most of the year. A recent WGF study (WGF 2006) applied the Warmwater Stream Assessment method to assess native fish presence and stream habitat throughout eastern Wyoming. The Little Powder River watershed was included in that evaluation. The most abundant species found were fathead minnow, sand shiner and green sunfish.

Fish sampling was also conducted in late May 2002 in a sub-set of SCGA, with sampling in Spring Creek, Little Powder Reservoir and the Little Powder River. Species diversity was greatest in the Little Powder River, where nine species were found. The Reservoir appeared to contain only introduced sport fish, largemouth bass and yellow perch, but even potholes in intermittent streams contained small communities of game and non-game species. Both native and non-native species were present in those samples (USFS 2002b). Rare native fish, here defined as those with Heritage State Rank in Wyoming, were considered in this Analysis. Two with potential for occurrence in the area are USFS Region 2 Sensitive Species and are addressed in Section 3.7.2. One other species with Wyoming State Heritage Rank and potential for occurrence in the general geographic area in and surrounding SCGA is the western silvery minnow (Keinath, et al. 2003, WGF 2006b). The western silvery minnow prefers large to medium sized rivers. No habitat for this species occurs in the Project or Analysis Areas. This species is not discussed further in this document.

3.7 THREATENED, ENDANGERED, SENSITIVE SPECIES, AND MANAGEMENT INDICATOR SPECIES

3.7.1 USFWS Federally Listed Species

The potential for the Alternative to affect federally listed species (i.e., threatened, endangered, candidate, and proposed species) under the Endangered Species Act, USFS Sensitive Species, and selected Management Indicator Species (MIS) was addressed in-depth in a *Biological Assessment, Biological Evaluation, and Appraisal of Management Indicator Species (BA/BE/MIS)* prepared by Greystone, an ARCADIS Company (Russell 2006). The BA/BE/MIS analyzed wildlife resources on all lands (both federal and private) proposed for development by Ballard as well as within an Analysis Area specific to the species. This section of the EA summarizes the BA/BE/MIS. The certified document is available in the Project planning record at the Douglas Ranger District office. **Table 3-5** summarizes the federally-listed species potentially found within the Project Area, their habitat preference, and the potential for their habitat(s) within the Project Area.

TABLE 3-5. OCCURRENCE OF SUITABLE HABITAT FOR ENDANGERED, THREATENED, PROPOSED, OR CANDIDATE SPECIES				
Species	Potential for occurrence on Project Area	Occurrence in Northern Campbell County	Presence of habitat on Project Area	Rationale if not carried forward for analysis
Black-footed ferret ¹ <i>Mustela nigripes</i>	Very unlikely	Does not occur on TBNG	None	Species not present. Habitat has been block cleared by USFWS.
Bald eagle ² <i>Haliaeetus leucocephalus</i>	Possible	Observed but uncommon during winter; limited nesting potential	Limited ^F	Evaluated
Ute ladies'-tresses orchid ² <i>Spiranthes diluvialis</i>	Very unlikely	Does not occur on TBNG	None	Not known to occur on TBNG. Site visits confirmed no suitable habitat present in the Project Area.

- 1 – Endangered
- 2 – Threatened
- F – foraging habitat

No Candidate species are known to occur on TBNG.

black-footed ferret

The black-footed ferret is a secretive, nocturnal carnivore that is found almost exclusively in prairie dog colonies. Its primary prey is the prairie dog and prairie dog burrows are commonly used by the ferret for shelter. Once found throughout the Great Plains, the species is now considered to be one of the most endangered mammals in the United States.

Extensive surveys conducted throughout the state over the past 20 years for wild black-footed ferret have

resulted in the location of one population was discovered near Meeteetse, Wyoming, in 1981 (BLM 2003a). These surveys include USFWS approved clearances for coal mining and other developments in the PRB of Wyoming and USFS ferret surveys in areas of potential habitat completed on the TBNG. After ten consecutive years of black-footed ferret surveys, beginning in 1981, in accordance with USFWS protocol, no evidence was found to suggest that black-footed ferrets occur on the TBNG.

The USFWS has developed a list of habitat blocks that are not likely to be inhabited by black-footed ferrets. In these areas, take of individual ferrets and effects to a wild population are not an issue and surveys for ferrets are no longer recommended. Wyoming has statewide block clearance meaning that the USFWS no longer requires surveys for black-footed ferrets in the state.

Because the extensive ferret surveys conducted within the TBNG and northeastern Wyoming failed to document black-footed ferrets, it is believed that no black-footed ferrets are presently known to occur in within the Project Area. The species is not discussed further in this document.

bald eagle

Habitat for the bald eagle is generally found along lakes, large rivers, and coasts. The species feeds mostly on fish and waterfowl but also on carrion and mammals such as rabbits and prairie dogs. Bald eagles construct a platform nest of sticks and vegetation on cliff ledges or in tree forks. Species-wide populations are recovering from earlier declines and the species was down-listed from endangered to threatened in 1995. As of July 6, 1999, the bald eagle has been proposed for delisting (BLM 2003a).

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004). Eagles that migrate through or winter in Campbell County probably roost communally in isolated stands of large trees often associated with riparian areas. The birds likely forage widely for lagomorphs (rabbits and hares) or carrion. Most verified bald eagle nests within northeastern Wyoming are situated in significant cottonwood stands along larger creeks or rivers, the Tongue River, Powder River, and Clear Creek. Nesting attempts are rare on the TBNG (Beske 1994).

The Project Area is situated approximately six miles from the Little Powder River and more than two miles from the Dry Fork of Spring Creek. The valleys of these two water bodies support stands of cottonwood trees that could serve as roost habitat. Stands of conifers, predominantly ponderosa pine and juniper, surround and are within the Project Area. These stands also provide suitable sites for roosting, however, no fish-bearing water bodies, able to support a suitable prey base, are nearer than Spring Creek nor are any prairie dog towns, another suitable potential prey base, within the Project Area or a one-mile radius.

Surveys for raptor nests and potential roost habitat within the Project Area and a one-mile radius beyond the proposed Project Area revealed no bald eagle nests or potential roost sites. The Project and Analysis Areas, the Analysis Area being SCGA, contain suitable foraging habitat for bald eagle, however observation data indicate that any use of the SCGA by this species is rare or limited. There are no known bald eagle nests within the Project Area (Russell, 2006). Bald eagles do not appear on the Breeding Bird Survey record for the Soda Well route (#92046) (Sauer et al. 2005).

Ute ladies'-tresses orchid

The Ute ladies'-tresses orchid is a perennial, terrestrial plant that is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200-7000 feet. The orchid colonizes early successional riparian habitats (point bars, sand bars, and low lying gravelly, sandy,

or cobbled edges) persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. Only four occurrences are known in Wyoming. No populations of the orchid are known within the Analysis Area of SCGA. Surveys conducted in the Project Area did not find any Ute ladies'-tresses orchid habitat (Russell 2005). Therefore, occurrences of this plant are not expected within the Project Area. The species is not discussed further in this document.

3.7.2 USFS R2 Regional Forester's Sensitive Species

Sensitive species for Region 2 include mammals, birds, amphibians, reptiles, fishes, insects, mollusks, and plants. All of the species on the Region 2 sensitive species list have been reviewed and considered for potential occurrence. However, only those species known to occur within or have suitable or potential habitat in the Project Area or the respective Analysis Areas are included in the following discussion. The basis of that inclusion or exclusion is species' geographic distribution and habitat requirements.

Birds

Special status species within the TBNG, their habitat preference, presence of habitat in the Project Area, and potential for occurrence in the Project Area are discussed in **Table 3-6**. Species with no habitat in the Project Area are not discussed further in this document. Rationale for this decision can be found in the Project Biological Evaluation on file at the Douglas Ranger District (Russell 2006). The Analysis Area is defined as the Project Area for these species.

TABLE 3-6 USFS REGION 2 SPECIAL STATUS BIRDS AND THEIR HABITAT AND POTENTIAL OCCURRENCE IN THE VICINITY OF THE PROJECT AREA				
Species	Status¹	Habitat Preference²	Presence of Habitat(s) in the Project Area³	Potential for Occurrence in the Project Area²
ferruginous hawk <i>Buteo regalis</i>	K	Basin-prairie shrublands, eastern great plains, great basin-foothills grasslands, rock outcrop, cottonwood riparian.	Yes	Documented
northern harrier <i>Circus cyaneus</i>	K	Basin-prairie and mountain-foothills shrublands, grass and grass-like habitats, marshes.	Yes	Documented
short-eared owl <i>Asio flammeus</i>	K	Grasslands, basin-prairie shrublands, marshes, irrigated native meadows below 7000 ft.	Yes	Documented
greater sage grouse <i>Centrocercus urophasianus</i>	K	Sagebrush communities and associated habitat.	Yes	Documented
Lewis's Woodpecker <i>Melanerpes lewis</i>	U	Ponderosa pine savannah, pine-juniper, other coniferous forests, aspen, cottonwood-riparian, below 8500 feet.	Yes	Documented
loggerhead shrike <i>Lanius ludovicianus</i>	K	Pine-juniper, woodland-chaparral, basin-prairie and mountain-foothills shrublands.	Yes	Documented
Brewer's sparrow <i>Spizella breweri</i>	U	Basin-prairie and mountain-foothills shrublands, especially sagebrush, woodland-chaparral.	Yes	Documented

TABLE 3-6 USFS REGION 2 SPECIAL STATUS BIRDS AND THEIR HABITAT AND POTENTIAL OCCURRENCE IN THE VICINITY OF THE PROJECT AREA				
Species	Status¹	Habitat Preference²	Presence of Habitat(s) in the Project Area³	Potential for Occurrence in the Project Area²
grasshopper sparrow <i>Ammodramus savannarum</i>	U	Basin-prairie shrublands, eastern great plains grasslands, wet-moist meadow grasslands, agricultural areas.	Yes	Documented
sage sparrow <i>Amphispiza bellii</i>	U	Basin-prairie and mountain-foothills shrublands.	Yes	Documented
chestnut-collared longspur <i>Calcarius ornatus</i>	K	Eastern great plains and great basin-foothills grasslands, basin-prairie shrublands, agricultural areas.	Yes	Documented

¹USFS Region 2 Sensitive Species

K= Known occurrence in vicinity. Date of last observation indicates that species still occurs in the area.

S= Suspected occurrence. May be historic records but no recent observations. Suitable habitat likely.

U= Unknown occurrence, more surveys may be needed, may be historic records, potential habitat possible.

N=No documented occurrence in agency wildlife database, or Breeding Bird Survey records.

²Based on data from WGFD Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Cerovski et al. 2004)

³Based on data and evaluations made in Biological Evaluation for Ballard Petroleum Holdings LLC. Wildhorse Creek Oilfield Development (Russell 2006)

Mammals

Special status species within the TBNG, their habitat preference, presence of habitat in Project Area and Analysis Area, here described as the Project Area defined on the Project maps as found in this document, and potential for occurrence in or near the Project Area are discussed in **Table 3-7**.

TABLE 3-7 USFS REGION 2 SPECIAL STATUS MAMMALS AND THEIR HABITAT AND POTENTIAL OCCURRENCE IN THE VICINITY OF THE PROJECT AREA				
Species	Status¹	Habitat Preference²	Presence of Habitat(s) in the Project Area³	Potential for Occurrence in the Project Area³
fringe-tailed myotis bat, <i>Myotis thysanodes</i>	U	Coniferous forests, woodland-chaparrall, basin-prairie shrublands.	Yes	Not documented
Townsend's big-eared bat, <i>Plecotus townsendii</i>	U	Deciduous forests, dry coniferous forests, basin-prairie and mountain-foothills shrublands, desert grasslands, juniper.	Yes	Not documented
swift fox <i>Vulpes velox</i>	S	Eastern great plains grasslands, occasionally agricultural areas, irrigated native meadows, roadside/railroad banks.	Yes	Documented

¹USFS Region 2 Sensitive Species

K= Known occurrence in vicinity. Date of last observation indicates that species still occurs in the area.

S= Suspected occurrence. May be historic records but no recent observations. Suitable habitat likely.

U= Unknown occurrence, more surveys may be needed, may be historic records, potential habitat possible.

N=No documented occurrence in agency wildlife database, or Breeding Bird Survey records.

²Based on data from WGFD Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Cerovski et al. 2004)

³Based on data and evaluations made in Biological Evaluation for Ballard Petroleum Holdings LLC Wildhorse Creek Oilfield Development (Russell 2006)

Amphibians and Fish

The presence of suitable habitat in Project and Analysis Areas, and potential for occurrence of these species in the Project Area are discussed in Section 3.6.7. Existing conditions for the species are summarized in Table 3.8.

TABLE 3-8 USFS REGION 2 SPECIAL STATUS AMPHIBIANS AND FISH, THEIR HABITAT AND POTENTIAL OCCURRENCE IN THE PROJECT AREA				
Species	Status¹	Habitat Preference²	Presence of Habitat(s) in the Project Area³	Potential for Occurrence in the Project Area³
Northern leopard frog (<i>Rana pipiens</i>)	U	Swampy cattail marshes and beaver ponds in the plains, foothills, and montane zones up to 9,000 feet	Yes	Documented

¹USFS Region 2 Sensitive Species

K= Known occurrence in vicinity. Date of last observation indicates that species still occurs in the area.

S= Suspected occurrence. May be historic records but no recent observations. Suitable habitat likely.

U= Unknown occurrence, more surveys may be needed, may be historic records, potential habitat possible.

N=No documented occurrence in agency wildlife database, or Breeding Bird Survey records.

²Based on data from WGFD Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Cerovski et al. 2004)

³Based on data and evaluations made in Biological Evaluation for Ballard Petroleum Holdings LLC Wildhorse Creek Oilfield Development (Russell 2006)

In the Project Area and throughout the Wild Horse Creek watershed, Wild Horse Creek and its tributaries are dry most of the year. A recent WGF (WGF 2006) study applied the Warmwater Stream Assessment method to assess native fish presence and stream habitat throughout eastern Wyoming. The Little Powder River watershed was included in that evaluation. The most abundant species found were fathead minnow, sand shiner and green sunfish.

Fish sampling was also conducted in late May 2002 in a sub-set of SCGA, with sampling in Spring Creek, Little Powder Reservoir and the Little Powder River. Species diversity was greatest in the Little Powder River, where nine species were found. The Reservoir appeared to contain only introduced sport fish, largemouth bass and yellow perch, but even potholes in intermittent streams contained small communities of game and non-game species. Both native and non-native species were present in those samples (USFS 2002b). Neither finescale dace nor plains minnow, the two sensitive species with geographical potential of occurrence, were identified in these studies. No habitat for either of these species exists within the Project Area. These two species are not discussed further in this document.

Plants

Sensitive species, or their habitats, that are located on the Douglas Ranger District of the Medicine Bow-Routt National Forest, TBNG, or that are located adjacent to or downstream of the project and could potentially be affected were considered in this analysis. The 2003 Medicine Bow – Routt / Thunder Basin Sensitive Plant Species List identified the species listed in the table below as 2003 R2 List species of documented or suspected occurrence on the TBNG.

A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance was needed to complete the analysis for R2 List species with documented or suspected occurrence on the TBNG. The potential for occurrence for these species was evaluated. Sources of local and regional information included Forest Service records and files (provided by Kurt Staton, Rangeland Management Specialist, Douglas Ranger District), the Wyoming Natural Diversity Database (WYNDD), and scientific literature currently available. The 2003 U.S. Forest Service R2 Sensitive Species List (2672.11 \r2 FSM Supplement No. 2600-2003-1, Exhibit 01) and the PRB FEIS (2003) were reviewed.

No further analysis was required for species that are not known or suspected to occur in the Project Area, or for which no suitable habitat is present. A habitat survey was conducted for the eight species in the summer of 2004. Of the eight sensitive species requiring evaluation, seven of the species are not known to occur within the Project Area or within surrounding counties, and suitable habitat was absent within the Project Area. *Botrychium campestre* (prairie moonwort), *Carex alopecoidea* (foxtail sedge), *C. leptalea* (bristly-stalk sedge), *Eriogonum visherii* (Visher's buckwheat), *Penstemon laricifolius* var. *exilifolius* (larchleaf beardtongue), *Physaria didymoncarpa* var. *lanata* (woolly twinpod), and *Viburnum opulus* var. *americanum* (highbush cranberry) were excluded from further analysis based on a lack of habitat.

Barr's milkvetch (*Astragalus barrii*) is a stemless, mat-forming perennial forb which forms low cushions less than 15 cm in height and up to 30 cm across. Flowers are pink-purple to blue, occurring in late April-early June. The species is found primarily on dry, sparsely vegetated rocky prairie breaks, hillsides, and ridges underlain by calcareous shales and silty sandstones at elevations of 3600-5700 feet. It is often found in mid-slope positions on north- and east-facing topography. The plant is a regional endemic of northeastern Wyoming, southwestern South Dakota, northwestern Nebraska, and the Great Plains in southeastern Montana. In Wyoming, Barr's milkvetch occurs in Campbell, Converse, Johnson, Natrona, Niobrara, Sheridan, and Washakie counties. Surveys revealed no populations of this species in the Project Area.

3.7.3 USFS Management Indicator Species (MIS)

Under the National Forest Management Act (NFMA), the USFS is charged with preserving and enhancing the diversity of plants and animals consistent with overall multiple-use objectives stated in the LRMP. MIS are chosen to represent other species preferring similar habitat conditions. A Management Indicator Species (MIS) is defined as a “plant or animal species or habitat components selected in a planning process used to monitor the effects of planned management activities on populations of wildlife and fish, including those that are social or economically important” (USFS 2001a). The recently approved Grassland Plan was the result of a long and extensive research and planning effort addressing the inhabitant species, including plans for managing and monitoring wildlife populations. Management indicator species (MIS) are selected to serve as barometers for species diversity and viability. Management indicator species are monitored over time to assess the effects of management activities on their populations and habitat, and the populations of other species with similar habitat needs. MIS were selected to be specific indicators for each Geographic Area on the TBNG. In accordance with the Grassland Plan (USFS 2001a), the greater sage-grouse and sharp-tailed grouse were selected as the MIS for the SCGA (SCGA) and so will be evaluated for this proposed action. The Analysis Area for these species will be the Project Area and the surrounding area within two miles.

Greater sage-grouse is also a USFS Region 2 Sensitive Species. Sage-grouse is considered a “landscape species” by the Wyoming Sage Grouse Working Group as it utilizes a variety of sagebrush structural stages throughout the year. Sharp-tailed grouse requires habitat characterized by open grasslands and prairies. Sagebrush and other shrub and brush species provide critical winter shelter and food resources.

Existing Habitat Conditions

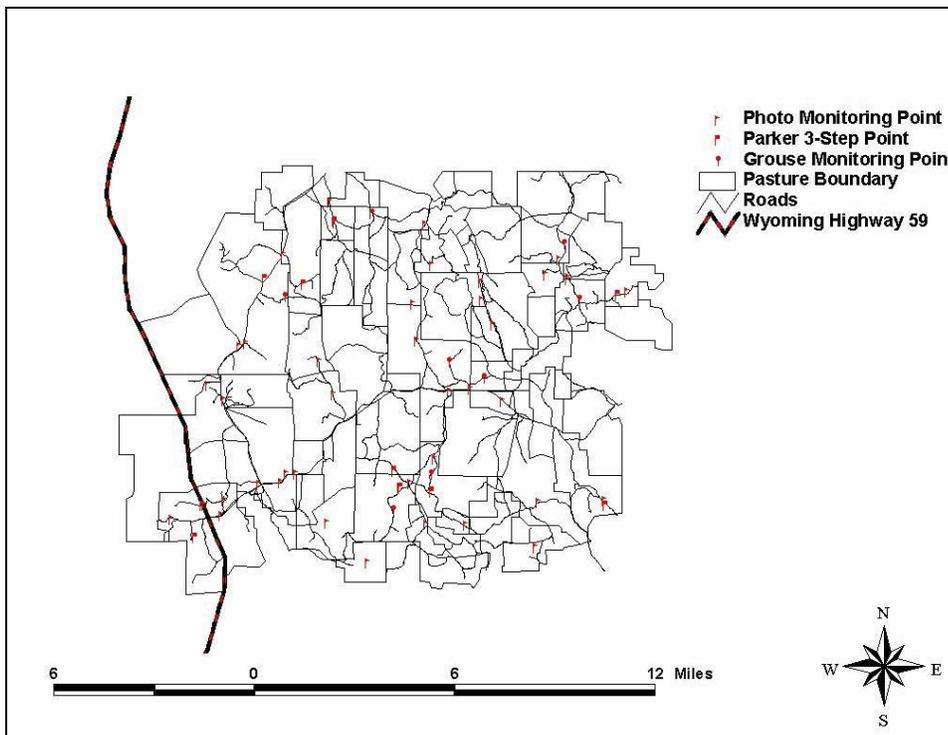
The Analysis Area provides suitable sharp-tailed grouse and sage-grouse habitat for all life phases. The General Habitat Types represented in the Analysis Area that would be important for grouse species includes mixed grass prairie and dryland crop (61%) and sagebrush habitat cover (25%) (Merrill et al. 1996).

Habitat data has been summarized in **Table 3-9** from vegetation monitoring throughout the SCGA (see Figure 1 below). These data indicated that structure class and seral stage of upland vegetation is close to meeting percentages prescribed for the SCGA and is consistent with the Thunder Basin National Grassland Land and Resource Management Plan (LRMP) (USFS 2001a).

TABLE 3-9. PERCENTAGE OF DESIRED SERAL STAGES AND STRUCTURAL CLASSES IN SPRING CREEK GEOGRAPHIC AREA.

Late Seral 10.7%	Late Intermediate Seral 30.4%	Early Intermediate Seral 39.4%	Early Seral 18.3%
High Structure 41.1%	Moderate Structure 39.4%	Low Structure 18.3%	

Figure 1. Vegetation Monitoring Points in Spring Creek Geographic Area



greater sage-grouse (*Centrocercus urophasianus*)

Sage-grouse are sagebrush obligates, requiring sagebrush as essential and necessary habitat during all seasons of the year. This relationship is perhaps closest in the late fall, winter, and early spring when sage-grouse are dependent on sagebrush for both food and cover. During the spring and summer, succulent forbs and insects become important additional food sources. Sage-grouse require an extensive mosaic dominated by sagebrush of varying densities and heights along with an associated diverse native plant community dominated by high levels of native grasses and forbs (WGF 2003a).

Sage-grouse congregate on strutting grounds called leks for spring breeding. Male sage-grouse appear to form leks opportunistically within or adjacent to potential nesting habitat (Connelly, et al., 2000). Lek habitat generally tends to be areas of low vegetation, with little or no sagebrush on the site. However, often there are areas of denser sagebrush nearby the lek that are used for foraging, loafing and hiding cover (WGF 2003a). Once formed, grouse (both male and female) tend to return to these leks habitually each year. Males will remain in attendance at the lek until all females have left the area.

Most sage-grouse nest within three miles of their breeding lek (WGF 2003a). Sage-grouse normally nest under tall sagebrush, but may use other plants as well. Nesting habitat in Wyoming is described as sagebrush stands with between 6% and 40% canopy cover, with higher quality nesting habitat found in the areas of higher canopy cover. Sagebrush stands used for nesting range in height from 8 to 18 inches tall, with individual nest plants reaching up to 32 inches tall (WGF 2003a). A dense understory of herbaceous plants (grasses and forbs) are needed in association with the nesting area. These plants need to be greater than 6" tall (Connelly, et al., 2000). Both new spring herbaceous growth and residual cover are important in the understory for nesting sage-grouse (WGF 2003a). Characteristics of sagebrush stands for nesting and wintering are very similar, but in winter, at least 12 inches of the sagebrush plant needs to remain above the snow.

Existing Species Conditions

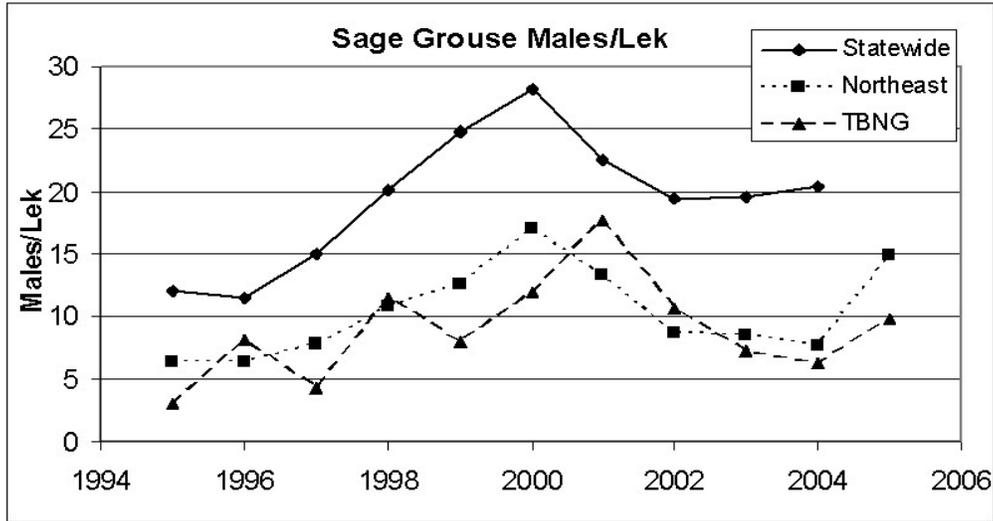
Indications of the most severe effects on recruitment and population trends of sage-grouse stem from weather conditions. Weather conditions influence populations, with the greatest stress resulting from winters with greater depths and longer duration of snow cover, drought conditions leading to decreased residual cover, and wet, cool spring weather which affects nesting and early brood rearing success. Drought conditions in the northeastern Wyoming during 2000, 2001, 2002 and 2004 may have contributed to the population declines in sage-grouse. During drought years, sage-grouse populations appear to do more poorly within areas of higher disturbance compared to populations in areas of lesser disturbance. The trends in lek attendance data for the area suggest that sage-grouse are more likely to do poorly in areas with higher disturbance (Oedekoven 2004). There is evidence to suggest that the grouse populations in the area are not necessarily declining, but are moving around to avoid disturbance, whether from natural or human-induced conditions.

Population Data

Sage-grouse monitoring has occurred within the TBNG since 1967. Surveys in recent years indicate a fluctuating sage-grouse population from 1995 to 2004. A general upward trend that began in 1997 was reversed in 2000 for the Northeast and statewide sage-grouse populations (Oedekoven 2004) and in 2001 for the TBNG sage-grouse population (Lockman 2004). This trend is depicted in **Figure 2 Comparison of Sage-Grouse Minimum Population Estimate (1995-2005)**. The sharp decline in grouse populations after 2000 is attributed in part to drought conditions and the emergence of West Nile Virus.

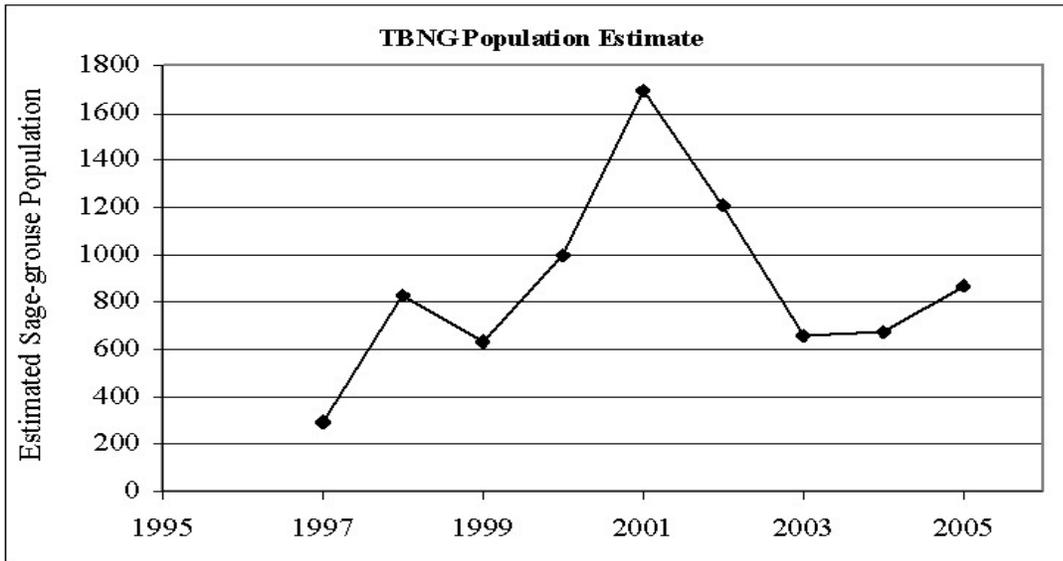
The following graphs indicated that the estimated population has increase from 2004 to 2005 in SCGA. State and NE Wyoming grouse working groups concluded that estimated populations show a decline starting in 2000 with some leveling out and some increase in 2005. All population estimates presented show some similarities.

Figure 2. Comparison of Sage-Grouse Minimum Population Estimate (1995-2005)



The minimum population estimate for the sage-grouse within the Sheridan Region for 2004 is about 5,000 +/- (80% CI) adult birds. The minimum population estimate for the sage-grouse within the TBNG for 2004 is approximately 500. Overall sage-grouse numbers in the State of Wyoming between 1990 and 2005 follow a similar population trend of increase as those of the Sheridan region and TBNG. The minimum population estimate for the sage-grouse in the State of Wyoming for 2003 is approximately 10,000. These population trends are summarized in Figure 3, State of Wyoming sage-grouse population estimates from 1994-2003.

Figure 3. State of Wyoming sage-grouse population estimates from 1990-2005.



Species Survey Information

Data obtained from the BLM Buffalo Field Office (BFO) indicated that three historic sage-grouse leks, Bergreen, Spring Creek, York, are located within the general area of the project. Two, the Spring Creek and York leks, are within two miles of the proposed Project Area. Greystone visited the Bergreen lek site three times on March 28, April 7 and 13, 2005 to verify activity status. No strutting grouse were observed at or near this location during surveys. In addition to checking the Bergreen lek, three surveys in search of previously unidentified leks were conducted on the same days, and the surveys failed to identify any new leks within two miles of the Project Area boundary.

The first Greystone survey was conducted before the protocol specified initiation date of April 1. L. Gerrard biologist with the BLM BFO, approved a survey for another well in the area at this time and therefore the first of the required three surveys was conducted prior to the established commencement date of April 1. Although adherence to protocol was not maintained, the initial survey was conducted when sage-grouse were known to be displaying on leks based on personal observations of strutting grouse within northeastern Wyoming prior to April 1, 2005.

The USFS surveyed the Spring Creek and York leks as part of their sage-grouse count route. Based on the USFS surveys, it was determined the York lek was active and Spring Creek was inactive, during 2005. However, both leks are considered active under the Grassland Plan (USFS 2001a). The entire proposed Project Area is within two miles of the Spring Creek sage grouse lek.

All of the proposed wells are located within or adjacent to suitable nesting and brood-rearing habitat for sage-grouse. In order to reduce disturbance to nesting sage-grouse within the Wildhorse area, surface disturbing activities will be conducted outside of March 1 to June 15. Delaying construction activities that disturb sagebrush after June 15 will most likely increase protection of nesting sage-grouse within this area.

sharp-tailed grouse (*Tympanuchus phasianellus*)

Habitat for the species consists of mixed grass prairie grasslands, mountain-foothills shrublands, willows, and irrigated native meadows (Cerovski et al. 2004). Sharp-tailed grouse leks are characterized by low, sparse vegetation allowing good visibility (Tesky 1994). Sharp-tailed grouse typically nest within one to two miles of display grounds (Tesky 1994). Quality nesting cover is where mid- and/or tall grass species are dominant and ungrazed or lightly grazed vegetation has accumulated over a few years (Tesky 1994).

Existing Species Conditions

Sharp-tailed grouse habitat consists of mixed grass prairie grasslands, mountain-foothills shrublands, willows, and irrigated native meadows (Cerovski et al. 2004). Quality nesting cover is where mid- and/or tall grass species are dominant and ungrazed or lightly grazed vegetation has accumulated over a few years (Tesky 1994).

There is suitable habitat within the Wildhorse development area for sharp-tailed grouse nesting and brood rearing. The availability of mid to tall residual grass for nest screening cover within lowland areas is currently somewhat limited. Some patches of residual grass occur within the area and could potentially be used by grouse for nesting and winter habitat. The ephemeral draws within the area did not contain dense covers of deciduous shrubs which would further reduce potential occurrence of sharp-tailed grouse within

the Project Area. Despite the apparent limitations of the habitat, sharp-tailed grouse, including broods, are frequently observed in the area.

Population Data

Sharp-tailed grouse are year-round residents of northeastern Wyoming. The WGFD collects incidental sharp-tailed grouse data in the area of TBNG and throughout the state. Surveys for this species have been conducted annually since the designation of sharp-tailed grouse as an MIS for the SCGA. This data will indicate trends as survey efforts continue. Currently there is no local, state, or regional data with which to compare. Lek observation information presented in **Table 3-10, Peak Male Sharptailed Grouse Observations...** indicate an increase in numbers of leks from 2002 to 2005.

TABLE 3-10. PEAK MALE SHARPTAILED GROUSE OBSERVATIONS FOR SCGA.			
Lek Name	2003	2004	2005
Duck Creek			9
York 1		2	0
York 2			3
York 3		4	
York 4			7
York 5	5	0	0
York 6		7	2
ZV Creek 1		15	
ZV Creek 2			3
Total males	5	28	27
Males per Lek	5	7	4.5

Species Survey Information

The protocol for conducting sharp-tailed grouse breeding surveys follows the same methodology as that for sage-grouse (BLM 2005). Surveys for this species were conducted simultaneously with sage-grouse lek surveys.

Data obtained from the BLM BFO indicated that two historic sharp-tailed grouse leks, Spring Creek and Prairie, are located within the general Project Area. Both of the leks were surveyed three times to determine 2005 breeding status. Based on these survey results, both leks were classified as inactive by TBNG Standards and Guidelines.

A previously unrecorded sharp-tailed grouse lek was discovered during 2005 surveys within the general SCGA. The Anderson Draw lek (Greystone name) is located in SESW Section 21, T54N-R69W. This lek is located outside of a one-mile buffer surrounding the proposed Wildhorse Project Area, and information on the dancing ground is being provided to the USFS and BLM BFO for inclusion into their databases. Only one survey/count was conducted for this lek as it was found later in the survey season. Inspection of the site indicated that droppings and feathers were present indicating the site was a lek.

3.8 ACCESS

Surface transportation in Campbell County is provided by a network of state, county, local, and primitive roads. Access to Project wells would be primarily by state highway and county roads that connect to a network of USFS and private ranch roads. The Project Area is roughly bounded by Heald Road to the north and State Highway 59 to the west.

Traffic in and around the Project Area is primarily associated with ranching and oil and gas activities. There are approximately 360 miles of existing roads in the Spring Creek watershed on private, state and federal lands. The USFS roads provide access for public use and surface lessees and are used intermittently by hunters and other recreational users. Approximately 1.7 miles of existing USFS roads would be utilized to develop the proposed wells within the Project Area.

Effects of the Alternative on transportation management in the Analysis Area, defined as the Project Area, are addressed in the Ballard Proposed Oil Well Field Development Roads Analysis. The Roads Analysis is available in the Project planning record for this EA at the Douglas Ranger District office.

3.9 LAND USE

The lands within SCGA were acquired through purchase and exchange in the late 1930s. Generally speaking most of these lands have been used for agricultural livestock grazing since they were first patented. Since the mid 1960s, the Project and Analysis Areas, here the same as the Project Area, have been characterized by a number of oil and gas explorations and developments.

Currently, the production of oil and gas, livestock grazing, dispersed recreation and hunting are the dominant human activities found within SCGA and the Analysis Area, including federal and non-federal lands. All are expected to continue.

3.9.1 Oil and Gas Development

Oil and gas activity is described in Section 3.1.2 Minerals. Please refer to this section for information regarding this issue.

3.9.2 Recreation

The USFS classifies NFS lands in terms of their Recreation Opportunity Spectrum (ROS). These classifications include: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Non-motorized, Roaded Natural, Roaded Modified, Rural, and Urban. Each ROS category, from Primitive to Urban, includes the provision for progressively more allowable development and evidence of human activity. The Project Area is classed as Roaded Natural. The existing condition of the area meets the desired condition discussed in Section 3.0.

The SCGA on Thunder Basin National Grassland is considered a dispersed recreation “hot spot” as it receives a relatively high level of use. Dispersed recreation is considered any activity outside of a developed site (e.g. campground, designated trail, etc.) Other than Soda Well picnic shelter, there are no developed recreational facilities in Spring Creek (Rose-Ritchie 2006). The east side of SCGA, east of Highway 50, where the Project Area is located, has a few dispersed camping spots.

SCGA is the nearest public land to the rapidly growing community of Gillette, Wyoming, and is used as a

recreation “back yard.” In a survey conducted in the summer of 2004, it was discovered that the primary uses by recreationists were off-road vehicle driving (with four-wheelers and dirt bikes), recreational shooting, mountain biking, horseback riding, hunting and some fishing. Over 90% of the users were from Gillette, Wyoming, 50% and under were under 30 years of age, and over 75% were male. The use was almost entirely day-use, for an average of two hours per visit. In addition, it was found that use occurs every day of the week at all times of day and nearly 365 days a year, as it rarely gets snowed out (Rose-Ritchie 2006).

The information gathered above was from the west side of Spring Creek; however, it can be extrapolated to the project proposal area, with some differences. Specifically, the proposed Project Area is used primarily for off-roading and mud-bogging, either with four-wheelers (OHVs) or full-sized vehicles. This has been a recent phenomena over the last two or three years. With this activity, usually comes recreational shooting, although there hasn’t been as much evidence of this activity as on the west side. Hunting is enormously popular in this area, with large numbers of hunters descending upon the public land during the brief hunting season (approx. two weeks) (Rose-Ritchie 2006).

3.9.3 Domestic Livestock Grazing

The Project Area and Analysis Area, here defined as the Grazing Allotments 114 and 118, occur within the administrative area of the Spring Creek Grazing Association (SCGA) of the Thunder Basin National Grassland. It involves NFS, state and private lands used for livestock grazing. The Analysis Area falls within two grazing allotments: 1) the Pickrel # 114 allotment and 2) the York #118 allotment. **Table 3-11** summarizes allotment information.

TABLE 3-11. SUMMARY OF ALLOTMENTS IN PROJECT AREA				
Allot.# & Name	N.G. Acres (Ac)	PVT & State Acres (Ac)	Livestock Class	Duration and AUMs (Animal Unit Months)
Allot.# & Name	N.G. Ac.	PVT & State Ac	Livestock Class and Animal Numbers	Duration
114 Pickrel	2703	8443	Cow/ Calf pair – 225 pairs and 10 bulls Horses - mare/colt pair – 50 pairs	2/28 to 12/02 1/01 to 12/031
118 York	3519	878	Cow/Calf pair - 160 pairs Bulls	4/01-12/31 6/01-7/31

The existing condition of grazing allotments in SCGA was assessed by the USFS in 2002 under the Spring Creek Assessment (USFS 2002b). A number of structural range improvements have been made to these allotments. The existing condition of the two affected allotments was addressed by the USFS in a project specific Rangeland Specialist Report (Gipson 2006). Stresses on the vegetation are dominated by impacts from undesirable plant species. The desired condition for upland vegetation, which is the dominant vegetation on the allotments, is to maintain approximately 50% of the landscape in mid to late seral stages. Plan objections for the Area are being met with the composition of both late and mid seral

plant species providing a moderate to high vegetation structure. The desired condition for the Area is to allow annual authorized livestock grazing on the allotments in the area. This condition is currently being met. Range improvement associated with these allotments are located on private lands.

3.10 CULTURAL (HERITAGE) RESOURCES

Under federal law, the U.S. Department of Agriculture (USDA) is mandated to protect significant archeological and historical sites, or cultural resources, located on NFS lands or affected by USFS actions (National Historic Preservation Act and the Archeological Resources Protection Act of 1979). A Class III Inventory cultural resource survey was conducted for each of the wells in the Proposed Action (Greer and Greer 2005a, b, c, d, e).

Known historic properties in the TBNG area range from prehistoric sites up to several thousand of years old to current day cattle and sheep ranching. Prehistoric sites that may be eligible would most likely be on ridge-tops where soil has accumulated or along stream courses where intact layers of cultural deposition may occur. Cultural resource properties recorded on TBNG reflect approximately 11,000 years of High Plains steppe environment human use. Approximately 3% of the SCGA has undergone some degree of archaeological surface examination since the mid-1970s with well over 100 sites found. There are prehistori and historic sites located and recorded. Few of the sites recorded on SCGA are eligible for the National Register of Historic Places. Site densitieis in SCGA area lower than would be expected throughout TBNG. The most common site type encountered are small, temporary prehisotirc hunting camps and historic pastoral camps. There is a larger ratio of historic to prehistoric sites records in SCGA than for TBNG as a whole (USFS 2002b).

Survey Results

Within the Proposed Action’s Area of Potential Effect (APE) to cultural and heritage resources, which is also the Analysis Area, no cultural resources were found, and no eligible properties are in the APE.

3.11 SOCIO-ECONOMICS RESOURCES

The Analysis Area for this resource is Campbell County, based on the project location and nearest population centers. The two incorporated towns in Campbell County are Gillette, approximately 30 miles south of the Project Area and Wright, 35 miles south of Gillette. Approximately 61 percent of the population of Campbell County are estimated to have been living in Gillette and Wright in the year 2005 (USCB 2006). Gillette is the county seat and is the largest incorporated city in Campbell County. Wright was founded in 1976 as a company town by Atlantic Richfield and developed by an agreement between a community development group and the corporation’s Black Thunder Mine. Campbell County is primarily rural and its economy is tied to traditional natural resource based industries. Agriculture provided the basis for community development during the nineteenth century; however, the mineral extraction industries of coal, oil, and gas are primarily responsible for the county’s current economic well-being.

3.11.1 Demographics

Campbell County’s population rose steeply in the late 1970’s , peaked in 1984, then dropped steeply in the late 1980’s, and increased slightly in the 1990’s. The reasons for the population changes are probably related to changes in the energy industry, particularly coal (University of Wyoming 2003). Population estimates and growth rates during 1960 to 2000 for city, county, and state populations are shown in **Table**

3-12. Annual growth rates in the last decade, approximately 10 percent, are similar for the state, county, and city populations (USCB 2005).

State, County, City	1980	1990	2000	Growth Rate 1960-2000 (percent)	Annual Change 1990-2000 (percent)
Wyoming	469,557	453,588	493,782	33.2	8.1
Campbell County	24,367	29,370	33,698	82.6	12.8
Gillette	12,134	17,635	19,646	81.8	10.2
Wright	0	1,236	1,347	100.0	8.2

Source: U.S. Census Bureau as

3.11.2 Economic Activity

The primary economic activities in Campbell County are coal mining, oil and gas production, mining service activities, and agriculture. **Table 3-13** indicates earnings for each sector in 2000 and 2001 for Wyoming and Campbell County. In 2000, gas and oil extraction in Campbell County accounted for 13.3 percent of the total mining earnings whereas oil and gas activity accounted for approximately 30 percent of mining earnings statewide.

		2000	2001
Wyoming	Mining total	\$1,446,519,000	\$1,471,127,000
	Mining (except oil and gas)	\$576,589,000	\$639,898,000
	Oil and gas extraction	\$446,191,000	\$428,400,000
	Support activities for mining	\$423,739,000	\$402,829,000
	Farm earnings	\$155,547,000	\$96,866,000
Campbell County	Mining Total	\$413,957,000	\$453,291,000
	Mining (except oil and gas)	\$252,739,000	\$306,057,000
	Oil and gas extraction	\$54,917,000	D
	Support activities for mining	\$106,301,000	D
	Farm earnings	\$5,509,000	\$1,411,000

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals. Source: WDAI2004b.

The mining industry, which includes oil and gas production, plays an important role in the state and county economy. The total mineral taxable value for the state of Wyoming was approximately \$5.6 billion in 2002. This value had grown to \$11.0 billion by the end of 2004. The total mineral taxable value for Campbell County was approximately \$2.2 billion in 2002, 39 percent of the statewide total (WDR 2003). By the end of 2004, the total mineral taxable value for Campbell County was approximately \$3.1 billion, 28.5 percent of the statewide total (WDR 2005). The 2002 assessed value of natural gas (conventional gas and CBM) for Campbell County was approximately 508 million and approximately \$2.5 billion for from 296 gas producers in the state (WDR 2004).

Following natural gas, coal is the second largest mineral revenue producer in the state. In 2003,

Campbell County coalmines produced 335.5 million tons of coal. Based on 2002 figures, the PRB (Campbell and Converse Counties) produced 96.4 percent of Wyoming's overall coal production, and Wyoming ranked as the number one producer of coal (37.3 percent of total) in the United States (CCEDC 2004). The state assessed value of coal in Campbell County in 2002 was approximately 1.5 billion dollars and 1.8 billion dollars in the state as a whole (WDR 2004).

Oil is the third largest mineral revenue producer in the state of Wyoming and the taxable valuation of oil production has increased since 1998 (WDR 2004). Oil production in Campbell County was approximately 10.5 million barrels in fiscal year 2003, a decrease of 7.6 percent from fiscal year 2002 (CCEDC 2004). The state assessed value of crude and stripper oil in Campbell County in 2002 was approximately 215 million dollars and 1.1 billion dollars in the state as a whole (WDR 2004).

Support activities for the mining sector provide services, on a contract or fee basis, required for the mining and quarrying of minerals and for the extraction of oil and gas. Often these support activities are performed in-house by mining operators. These activities include: taking core samples, making geological observations at prospective sites, excavating slush pits and cellars, and such oil and gas operations as spudding in, drilling in, re-drilling, directional drilling, well surveying; running, cutting, and pulling casings, tubes and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.

Agriculture in Campbell County consists mostly of livestock production (87.9 percent) and dryland farming (6.6 percent). Approximately 2.2 million acres in the county were classified as farms and ranches in 2003 and this land was valued at approximately 5.9 million dollars. In addition, ranchers utilized public lands, such as the TBNG, for grazing. In 2003, the county livestock sales accounted for \$32,693,000, while county crop sales accounted for \$425,000 (National Agriculture Statistic Service 2004).

Tax Revenue

The taxable valuation of mineral production provides a significant amount of capital to governing agencies (BLM 2003a). The total mineral income to Wyoming for fiscal years 1997 through 2001 is shown in **Table 3-14** (WDAI 2002).

TABLE 3-14 WYOMING MINERAL INCOME - FISCAL YEARS 1997 – 2001					
Source	1997	1998	1999	2000	2001
Ad Valorem Taxes	\$267,438,424	\$263,271,161	\$224,308,663	\$265,433,379	\$413,354,190
Severance Taxes	\$232,779,079	\$227,535,416	\$196,459,204	\$275,122,976	\$447,973,278
Federal Mineral Royalties	\$238,346,960	\$223,251,695	\$231,029,084	\$309,092,848	\$448,120,028
State Mineral Royalties	\$29,800,814	\$28,962,025	\$27,720,888	\$34,099,206	\$56,020,765
Sales & Use Taxes	\$35,515,973	\$34,824,144	\$28,800,218	\$29,491,611	\$44,024,305
State Rent & Fees	\$4,441,102	\$5,720,602	\$6,747,746	\$8,434,827	\$12,702,754
Total	\$808,322,352	\$783,565,043	\$715,065,803	\$921,674,847	\$1,422,195,320

Source: WDAI 2002

Revenues obtained from mineral development benefit the State of Wyoming and Campbell County through several taxes and royalty income. In the case of the Ballard Project, revenues from wells would be based on the value of the mineral produced, which depends upon the selling price and ownership of the mineral estate, which in this case is the federal Government. Revenues from Project wells would be

generated by: severance taxes for the value of all oil produced, supplying the State's General Fund (6.0 percent); county ad valorem, or property taxes (6.3 percent in Campbell County); half of federal lease bonuses; half of the royalty from gas produced from federal lands (half of the standard federal 12.5 percent royalty rate); and sales and use taxes from the purchase of equipment associated with development activities.

3.11.3 Employment and Income

Wyoming has experienced an average labor force growth of 15 percent since 1990. The State of Wyoming's average unemployment rate for 2005 was 3.6 percent, down by 0.8 percent from the average 4.4 percent in 2003, with an average labor force of 284,538, an increase of 6171 over the average labor force of 278,367 in 2003 (Wyoming Department of Employment [WDOE] 2003 and 2005).

Table 3-15 displays the number of jobs and relative contributions to weekly salaries made by primary employers in Campbell County (CCEDC 2003). The coal mining sector and oil and gas operations provide the greatest number of jobs and highest average wages of all the industries in the county. Wages in the mining sector are approximately 1.5 times higher than the average Campbell County weekly wage. Average annual salary in Campbell County was \$40,924 in 2003, based on fourth quarter statistics. The average annual salary for residents employed in the mining sector was higher than any other major industry in the county at \$61,776.

TABLE 3-15 CAMPBELL COUNTY EMPLOYMENT AND PERSONAL INCOME FOURTH QUARTER 2003			
Employment Sector	Average Monthly Employment (Number of Jobs)	Percent of Total	Average Weekly Wage
Mining (includes oil & gas)	6105	29.2%	\$1,188
Total Government (includes public schools)	3,467	16.6%	\$648
Retail Trade	2,033	9.7%	\$424
Construction	1,898	9.1%	\$747
Accommodation, Food Service	1,511	7.2%	\$200
Wholesale Trade	1,049	5.0%	\$1,038
Real Estate & Rental & Leasing	183	0.9%	\$495
Health Care and Social Services	848	4.1%	\$797
Administrative & Waste Services	734	3.5%	\$482
Other Services	618	3.0%	\$517
Professional, Technical Services	571	2.7%	\$731
Transportation & Warehousing	569	2.7%	\$602
Manufacturing	479	2.3%	\$858
Finance & Insurance	316	1.5%	\$801
Information	193	0.9%	\$564
Utilities	180	0.9%	\$1,310

Arts, Entertainment, Recreation	72	0.3%	\$161
Agriculture	36	0.2%	\$821
Educational Services	34	0.2%	\$204
Management of Companies	26	0.1%	\$1,365
Total Employment	20,923	100%	\$787

Source: Labor Market Information, 4th Quarter 2003

3.11.4 Environmental Justice

Executive Order 12898, signed by President Bill Clinton on February 11, 1994, and titled “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” provides that federal agencies will make environmental justice a part of their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of federal programs on these populations. The Order requires the USFS to ensure effective public notification and access to information about this site-specific Proposed Action, to work to gain public participation in the analysis and decision making processes, and to mitigate such effects if they should occur.

The racial and economic status and composition of the community and persons living in and near the proposed Project Area in Campbell County, Wyoming, was considered during a review of what effect the proposed project could have on socio-economic conditions in the Analysis Area. This review considered whether minorities, low-income populations or American Indian tribes are present in the area that could or would be affected by the Project.

Public scoping for and about the site-specific Proposed Action included contacts with American Indian tribes known or presumed to have an interest in mineral development projects occurring on the TBNG. All local landowners, Campbell County Commissioners, the potentially affected domestic livestock grazing association(s) and the general public were contacted directly, or otherwise made aware of the proposal. Local landowner, county, tribal and general public representation and participation were sought in a manner consistent with USFS, agency and departmental regulations and policy, and with government-to-government relationships between the United States and tribal governments.

3.12 VISUAL RESOURCES

The landscape of the Project Area and surrounding Analysis Area is characterized by rolling hills and shallow valleys. Topographic highs occur in buttes and hills flanking the perimeter of the Project Area; however, the Project Area itself displays little variation in elevation and there are no critical viewpoints. There are views to the west to stream and the Little Powder River valleys and to the north and east to escarpments. The surface is covered primarily with native short and mid-grasses and sagebrush (see Section 3.5). Desired conditions of the Analysis Area within SCGA are MAP 5.12, General Forest and Rangelands: Range Vegetation Emphasis. This MAP states that signs of motorized travel, hunting, hiking, timber harvest, mining and livestock grazing may be evident (USFS 2001a).

Human modifications to the environment are evident throughout and surrounding the Analysis Area. The Analysis Area is here defined as the Project Area and the area in the surrounding two miles. These modifications that define the visual quality include oil and gas field development, grazing activities, highways, county and USFS roads, pipeline ROWs and electrical transmission lines. Oil and gas facilities that are associated with conventional oil and gas production can include tanks and other large stationary pieces of equipment. Oil and gas facilities installed on well pads on federal lands are painted with standard colors approved by the appropriate surface management agency that are intended to allow

the equipment to be less visually apparent. Facilities in various stages of reclamation may display immature vegetation forms, which may reduce visual quality.

SCGA is somewhat developed with oil wells, roads and fences. However, the area is still relatively free of visual encumbrances. Large uninterrupted vistas include tree-lined breaks, variegated hills, sweeping valleys and on occasion a view from high ground of the Inyan Kara and Devil's Tower to the east.

Regulatory Environment, Policy, and Guidelines

Management of visual resources within the TBNG is determined by policy directives contained in the 2001 (USFS 2001a) Grassland Plan and the 2001 FEIS for the Northern Great Plains Management Plans Revision (USFS 2001b). Scenery management guidelines for the TBNG emphasize consistency with the Scenic Integrity Objectives designated in a MAP. The Project Area is part of the SCGA in the TBNG and designated as Category 5.12, as described above. The Project Area is classified as "low" in terms of scenic integrity, meaning that the natural landscape appears moderately altered by oil and gas development, and, to a lesser extent, by fences and stock water impoundments needed for livestock grazing (BLM 2003a). Planned visible facilities would blend and harmonize with natural features to meet the desired condition for the landscape. Modifications to the visual landscape should be compatible or complementary to the character of the landscape.

3.13 NOISE

Noise is defined as unwanted or annoying sound that is typically associated with human activities and that interferes with or disrupts normal human activities. Sound and noise are measured as sound pressure levels in units of decibels (dB). Response to noise varies according to its type, its perceived importance, its appropriateness in the setting and time of day, and the sensitivity of the individual receptor. Human hearing is simulated by measurements in the A-weighting (dBA) network, which de-emphasizes lower frequency sounds to simulate the response of the human ear. Noise values are logarithmic measurements. An increase in noise from 10-dBA to 20-dBA is approximately double the "loudness." Furthermore, sound level intensity decreases by approximately six dBA for each doubling of distance from the source.

The Project Area, and Analysis Area of the surrounding two miles around the Project Area, has land uses associated with sparsely populated rural regions. The major sources of ambient noise are industrial facilities that currently exist in the area, including operating wells, traffic noise from state and county roads and local access roads, and frequent high winds. Background noise measurements have not been made in the Project Area. Background noise levels for the EPA category "farm in valley" are: daytime, 29 dBA; evening, 39 dBA; and nighttime, 32 dBA. Local conditions, such as topography and frequent winds, can alter background noise conditions. Some typical sound levels from common noise sources that may be found near the Project Area or could be associated with the Proposed Action are listed in **Table 3-16**. Anticipated noise levels in this area are approximately 40 dBA during the day with an additional five to 10 dBA during normal windy conditions (BLM 2003a).

TABLE 3-16 TYPICAL SOUND LEVELS FROM COMMON NOISE SOURCES	
Noise Source (at 50 feet, unless noted)	Scale of A-weighted Sound Level (dBA)
Typical construction site	80
Heavy truck at 50 feet	75
Drilling rig at 200 feet	74
Rural areas close to industrial facilities and transportation corridors	50-70
Normal conversation 2 people, 5 feet apart	60
Rural areas away from industrial facilities and transportation corridors	30 (night) -40 (day)

Source: BLM 2003a, page(s) 3-274-275; 2BLM 1992b

A temporary generator will be set at each well site. Anticipate noise levels from these sources are presented in **Table 3-17**.

TABLE 3-17 TYPICAL SOUND LEVELS FROM PRB TEMPORARY GENERATORS	
Distance (feet)	Sound Level (dBA)
33	65
100	55
200	49
400	43
800	37

Source BLM 2003a, page(s) 4-335

Noise Guidelines and Standards

The TBNG has issued Standards and Guidelines that address noise limitations with respect to specified activities (oil and gas operations, construction, reclamation, seismic exploration, drilling of water wells and prescribed burning) (USFS 2001a). The Grassland Plan has also identified distance offset requirements for activities near certain types of wildlife and/or habitat, which effectively reduces noise levels that are audible to wildlife. Some of these Standards and Guidelines are seasonally applied and are species-specific in order to maximize the protective measures. TBNG Standards and Guidelines that affect noise perceived by wildlife are summarized in the **Table 3-18**.

TABLE 3-18 TBNG STANDARDS, GUIDELINES, AND STIPULATIONS THAT AFFECT NOISE LEVELS PERCEIVED BY WILDLIFE				
Wildlife Species	Noise	Limitation Distance Offset¹	dBA equivalent to distance offset	Standard or Guideline
mountain plover	NA	Most development prohibited within 0.25 mile from known nests or nesting areas	28 dB decrease in perceived noise	Standard 25, 28, 29 (p. 1-15)
	NA	Restricted access to facilities in occupied habitat	NA	Guideline 30 (p. 1-16)
sage grouse	NA	Restricted construction within 0.25 mile of active display grounds	28 dB decrease in perceived noise	Standard 46 (p. 1-18)
	NA	Restricted construction within 2.0 miles of active display grounds March 1 – June 15	53 dB decrease in perceived noise	Standard 47, 48 (p. 1-18)
	49 dB	Noise limitation on display grounds from March 1 – June 15		Guideline 49 (p. 1-18)
	49 dB at 800 feet from the noise source	No development or operations within 2.0 miles if resulting noise exceeds limit March 1 – June 15		Guideline 52 (p. 1-18)
raptors	NA	Restricted development within line of sight distances from active nests and winter roost sites, including seasonal restrictions	Varies from 22 dB to 42 dB, according to particular raptor	Standard 76, 77 (p. 1-21)

¹Noise limitations described in dBs as specified in the Grassland Plan (USFS 2001a)
NA=Data not available

Noise measurements are typically measured using the dBA scale, which adjusts high and low frequencies to more closely approximate human hearing. To convert measurements made in the dBA scale to the dB scale, a correction factor would be added to the dBA measurements at the determined high and low frequencies. Although it is possible to convert specified frequencies from the dBA scale to dB scale, it may not be possible to represent noise measurements measured in dBs as representative of the sound pressure levels experienced by a particular animal species. Just as the dB scale was adjusted for human hearing, the dB scale may not accurately represent perceived sound levels by any particular animal species. The TBNG Standards and Guidelines that address noise levels in the **Table 3-18** are written in terms of dBs. However, the analysis of noise impacts contained in the PRB FEIS refers to noise impacts to wildlife in terms of dBAs. For this reason, the discussion of noise impacts to wildlife is described in terms of dBAs, for which noise measurements are commonly available.

4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this chapter is to describe the environmental consequences of implementing either of the Alternatives presented in Chapter 2. The resources that could potentially be impacted include the physical, biological, social and economic human and natural environments. A scientific and analytical approach is used to address the effects sustained by each resource. In addition, all key issues and concerns raised during the scoping process are addressed in this chapter.

For the purposes of this analysis, short-term effects are those that would occur during the project construction and drilling/completion phases. Long term effects would be those primarily associated with the production phase and over the life of the well.

Federal agencies are encouraged to tier to (or reference) other EIS's to eliminate repetitive discussions of the same issue and focus on the actual issues ripe for decision at each level of environmental review (40 CFR 1502.20). This EA adopts and incorporates by reference a number of analyses and assessments, including basin- and Grassland-wide analyses of cumulative effects anticipated by oil and gas development through the Wyoming portion of the PRB found in the programmatic PRB FEIS (BLM 2003a) and ROD (BLM 2003b), the Environmental Impact Statements for the Northern Great Plains Management Plans Revision (USFS 2001b) and the Final Environmental Impact Statement for Oil and Gas Leasing on the Thunder Basin National Grassland (USFS 1994). Direct, indirect and cumulative impacts to resources from drilling and production activities including the Wildhorse Field Development plus other past, current, and foreseeable projects in the PRB were addressed in the PRB FEIS (BLM 2003a). Likewise, agency management plans, including the Grassland Plan (USFS 2001a) were designed to mitigate development-associated effects derived from the analyses presented in the PRB FEIS. The Spring Creek Assessment (USFS 2002b) provides an interdisciplinary analysis of the condition of the SCGA. These analyses were supplemented with current information specific to the project's Analysis Areas. The intent of this EA is to address site-specific affected resources and impacts not addressed in detail in the analyses referenced.

The BLM's Reasonably Foreseeable Developments (RFDS) as discussed in the PRB FEIS envisions development of nearly 480 productive non-CBM wells in the PRB study area within 10 years, with most development occurring between 2003 and 2011. Average well life is estimated at fifteen years and reclamation would be completed two to three years following cessation of production (BLM 2003a). It is anticipated that the number of wells shut-in and abandoned will exceed the number of wells drilled (BLM 2003a Appen. A:2). Impacts from the Proposed Action represent a very small fraction of the disturbance levels analyzed in the FEIS. A comparison of the Proposed Action to projected basin-wide development is illustrated in **Table 4-1**.

TABLE 4-1 COMPARISON OF PROPOSED ACTION TO CUMULATIVE PROJECTED OIL AND GAS DEVELOPMENT, POWDER RIVER BASIN			
New Oil and Gas Facilities	PRB Oil & Gas FEIS Preferred Alternative¹	Wildhorse Alternative A: Proposed Action	Proposed Action as a percent of FEIS Cumulative Impact
Federal wells	1,791	5.0	0.28%
Non-Federal wells	1,409	0.0	0.00%
Total wells	3,200	5.0	0.15%
Total short-term disturbance (acres)	8,800	23.68	0.26%
Total long-term disturbance (acres)	7,520	18.88	0.25%

¹Source: Powder River Basin FEIS, Table S-1

4.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

4.1.1 Alternative A – Proposed Action

The Analysis Area is defined as identical to the Project Area for geology, minerals, flood hazards and wind-blown deposits. The Analysis Area for paleontological resources is defined as the locations of proposed construction. The Project and Analysis Areas are located in the northeastern Powder River Basin. The geology, minerals and paleontology of the Project Area were analysed in the Environmental Impact Statement for the Northern Great Plains Management Plans Revision (USFS 2001b), the FEIS for Oil and Gas Leasing on the Thunder Basin National Grassland (USFS 1994), and in the PRB FEIS (BLM 2003a). A project specific assessment of the paleontology of the Project Area was also completed (USFS 2006).

Geology

Implementation of the Proposed Action would alter existing landscape features during construction of roads, pipelines, and well pads; however, impacts to topography and physiography would be minimal as most of the proposed construction areas in the Project Area are relatively flat and characterized by grassland and sagebrush steppe features. Short-term disturbance would total approximately 23.68 acres. Reclamation would restore disturbed surfaces to their original contours and conditions. Long-term surface disturbance of approximately 18.88 acres would comprise 2.8 percent of the Project Area. Erosion could increase because of the construction of well locations, facilities, and pipelines after reclamation is initiated but prior to the re-establishment of vegetation; however, USFS and BLM required reclamation procedures would minimize the effects of this disturbance in the Project Area. These regulations, in addition to USFS Requirements and National Grassland Plan Standards and Guidelines that Apply (Section 2.4), would reduce the potential impacts to the surface geologic environment.

Agencies require site-specific information on landslide and slope stability for all areas where ground-disturbing activities are proposed. Construction designs planned for the Proposed Action have been developed in accordance with stipulations on oil and gas development and related standard Conditions of Approval for oil and gas development as per the Grassland Plan (USFS 2001a), on generally accepted engineering standards for site conditions and in accordance with the BLM Gold Book (BLM 2005) and

on generally accepted best practices.

Minerals – Oil and Gas

The Proposed Action would result in the irretrievable loss of subsurface natural oil and gas associated with the affected federal leases. However, the Proposed Action would also permit Ballard to develop its Federal oil and gas leases to help meet the public’s need for oil and gas, and avoid the loss of use of Federal mineral resources. In addition, should the wells prove successful, oil from Ballard’s leases would return royalty revenues to the Federal Treasury.

The Grassland Plan describes the theme for this area (MAP 5.12) as primarily “managed for the sustainability of physical, biological, and scenic values associated with woody vegetation and open grassland” (USFS 2001a). Desired Conditions under the Management Area Prescription direction for the portion of SCGA encompassing the Project Area includes a management emphasis on a balance of resource uses and opportunities, including minerals management.

Paleontology

A paleontological resource evaluation of the proposed Project Area was conducted by the Forest Service on January 18, 2006. The field survey focused on areas where potentially fossiliferous outcrops may be impacted by proposed construction sites. These areas included ROWs for roads, pipelines, and well pads. The surveys found that none of the proposed construction disturbed significant outcrops of bedrock that might yield fossil specimens. The conclusion of the report was based on the apparent scarcity of fossils in the Tullock Member in this area (USFS 2006). USFS Requirements and National Grassland Plan Standards and Guidelines that apply, Standard COAs and Site Specific COAs (Appendix B) incorporated within the Proposed Action as design criteria (Section 2.5) would minimize potential loss of paleontological resources. The existing condition of paleontological resources would continue to meet the desired conditions in the Grassland Plan (USFS 2001a).

Flood Hazards

The well sites would not be located in any areas subject to flooding. Roads with stream crossings would be constructed to manage flows and reduce potential to increase flood hazards. Proposed construction would be conducted in accordance with implemented USFS Requirements and National Grassland Plan Standards and Guidelines that apply and Standard COA and Site Specific COAs (Appendix B) incorporated within the Proposed Action as design criteria (Section 2.5).

Wind Blown Deposits

Active wind blown deposits do not occur in the Project Area. Proposed construction would be conducted in accordance with implemented USFS Requirements and National Grassland Plan Standards and Guidelines that apply and Standard COA and Site Specific COAs (Appendix B) incorporated within the Proposed Action as design criteria (Section 2.5) for sediment control and reclamation. These measures would minimize potential for initiation of wind blown deposition.

4.1.2 Alternative B – No Action

Under the No Action Alternative, the oil and gas reserves on federal lands in the Project Area would not be developed and thus would not be available to meet national energy demands. Ballard’s rights to develop their leases would be denied, which would violate the contractual agreements between the government and the leaseholders. Development of private and state leases may result in the incidental drainage and loss of federal natural gas reserves. Paleontological resources would not be adversely affected or potentially discovered as a result of Project development. Flood hazards and potential for

wind blown deposits would continue to exist in their current capacity.

4.1.3 Cumulative Effects for Action Alternative

Cumulative impacts to geologic resources would result mainly from mineral extraction activities within the vicinity of the Wildhorse Creek Oil Field Development Project. Some alterations to topography from construction of roads, and disturbance from well sites would result from additional oil and gas development near the Project Area. Project-related increases in possible geological hazards appear to be unlikely as no major landslides have been mapped and seismic activity within the Project Area is low.

Irreplaceable loss of the oil and gas resource because of lease development would occur as a result of implementing the Proposed Action. Development of the Project would incrementally contribute to the loss of the oil and gas resources as analyzed in the PRB FEIS (BLM 2003a). Drilling for oil and gas has occurred in and is planned for areas near the Project Area. Approximately 71 wells have been drilled or filed on within two miles of the proposed Project, however only seven are producing wells or approved APDs (WOGCC 2006). As shown in Table 4-1, wells drilled under the Proposed Action would represent much less than one percent (0.15%) of the total non-CBM well construction analyzed in the PRB FEIS. Likewise, short-term and long-term cumulative surface disturbance would impact less than one percent of the 48,740 acres comprising SCGA, the 572,000 acres comprising TBNG and the eight million acres comprising the PRB.

Implementation of Alternative A would prevent loss of the oil and gas resource to drainage by wells located on nearby private and state leases.

Surface disturbance associated with construction of the well sites is unlikely to result in permanent loss of paleontological information due to the lack of potential to encounter fossiliferous beds in the Project Area.

4.2 AIR QUALITY

4.2.1 Alternative A - Proposed Action

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (i.e., temporary power generators), are potential causes of decreases in air quality. These issues are more likely to generate public concern where natural gas development activities occur near residential areas. The proposed action is not near residential areas. No compression facilities are planned with this project.

Generators

Under the Proposed Action, potential emissions sources include five diesel-powered generators that would be required for power generation, one to serve each of the five wells. Generators contribute to regulated air pollution emissions associated with oil and gas development projects. The generators would be permitted by the WDEQ Air Quality Division prior to operations. Permitted emission requires that sources meet compliance with all rules and regulations of the WDEQ Division of Air Quality and the Wyoming Environmental Quality Act. Limits for emissions from these sources are regulated by this Division.

The power rating for the generator type is 70 to 100 kilowatts (kW). This equates to approximate maximum power of 131 hp. These generators would be in operation continuously, cycling between idling and power phases. The temporary generators which would be used on this project are certified by the

EPA to conform to Tier 2 nonroad emissions regulations. These generators would comply with Wyoming Air Quality regulations. Using the 1.0 grams of NO_x per horsepower-hour noted in the PRB FEIS for these smaller engines, total NO_x emissions for generators would be approximately 5.46 tons/year. This calculation was conservative in that it assumed operation at maximum horsepower throughout each day over the entire year.

Impacts of emissions from temporary generation units were analyzed in the PRB FEIS (BLM 2003a). Using the summary information from Near-Field Concentrations from a Single Temporary Generator (BLM 2003a), the expected emissions from use of these generators would result in localized short-term increases in carbon monoxide (CO), nitrous oxides (NO_x), PM₁₀ and SO₂ but are expected to be below applicable NAAQS and Wyoming Ambient Air Quality Standards. All maximum near-field direct project NO₂, PM₁₀ and SO₂ concentrations are expected to be below applicable PSD Class II increments and all Maximum far-field direct project concentrations are expected to be below applicable PSD Class I increments (BLM 2003a and BLM 2003a).

Fugitive Dust

Impacts of emissions from fugitive dust were analyzed in the PRB FEIS (BLM 2003a). The development scenario of the proposed project is typical of the operations analyzed under this FEIS. Construction emissions would occur during the proposed road and well pad construction, well drilling and well completion phases.

Vehicle traffic and associated emissions would increase slightly as a result of the Proposed Action. Emissions associated with vehicle traffic would include fugitive particulate emissions as a result of travel on unpaved roads. The level of vehicle traffic associated with the development of 5 wells under the Proposed Action is considered minimal when compared to the vehicle traffic analyzed for 17,754 miles of improved and two-track roads in the programmatic PRB FEIS (BLM 2003a).

Fugitive dust emissions from vehicles on unpaved roads are calculated from the following formula Final Environmental Impact Statement for the PRB FEIS (BLM 2003a, (Appendix F, p. F11; AP-42, Section 3.13.2 in BLM 2003a):

$$\left(E \left[\frac{lb}{VMT} \right] \right) = 5.9 \times k \times \left(\frac{s}{12} \right) \times \left(\frac{S}{30} \right) \times \left(\frac{W}{3} \right)^{0.7} \times \left(\frac{w}{4} \right)^{0.5} \times \left(\frac{365 - p}{365} \right)$$

Where:

VMT = Vehicle mile traveled; highest use estimated as 232.5 per day

k = particle size multiplier; 0.36 for PM₁₀ and 0.095 for PM_{2.5}

s = road silt content; 12 percent for a rural dirt road

S = average vehicle speed; 25 mph

W = vehicle weight; 3 tons for project vehicles

w = number of wheels; 4 wheels for project vehicles

p = number of days with more than 0.01 inches of precipitation; 100 for the expanded Project Area

- (Vehicle miles traveled would be greatest during the 1-2 month long construction period; therefore vehicle miles traveled would be estimated for the highest expected use. Actual vehicle miles traveled would likely be much lower during the operation period. Assuming all 4.65 miles of road (existing and new) as proposed in Alternative A are traveled each day, and a typical day

of construction activity involves 5 round trips by 5 vehicles over the entire 4.65 mile road network, $5 \times 5 \times 4.65 \times 2 = 232.5$ VMT/day.)

Use of this equation predicts that the expected fugitive PM emission factor would be 1.66 lbs/ VMT. The daily traffic during the construction phase is estimated at 232.5 miles per day on unpaved roads within the Project Area. Therefore, the estimated average daily PM₁₀ plus PM_{2.5} emissions from vehicles during the construction phase would be 385.95 lbs or 0.19 ton. These emissions would occur throughout the Project Area.

Watering of roads would be required during the construction phase. Based on information in the PRB FEIS (BLM 2003a), watering of roads would control approximately 70 percent of fugitive emissions. After this reduction in emissions, the expected fugitive PM emission would be approximately 0.133 ton of combined PM₁₀ and PM_{2.5} per day. Assuming 60 days of construction, the total PM emissions from this phase of operation would be 7.98 tons. These emissions estimates represent highest expected road-use days. Actual vehicle miles traveled per day are likely to be less than those estimated, once the construction phase (one to two months) is completed. For comparison, the Air Quality Technical Support Document (BLM 2003a) for the PRB FEIS estimated a maximum of 9.9 tons of combined PM₁₀ and PM_{2.5} emissions per day for the entire PRB project during the highest activity year (2007) (BLM 2003a). Any dust generated by vehicles at a given location would be localized and the effects would be short-term.

The construction phase of the project is expected to occur during 60 days of on-site work over a twelve (12) month period. Construction is not expected to occur simultaneously in the surrounding area as some well construction has already been completed within 1 to 2 miles of this proposed project. Road use following the construction phase would be limited to the periodic maintenance activities and the occasional recreation, Forest Service or lessee user. During the operation phase, a pick-up truck and/or a tanker would travel the 4.65 miles of unpaved road one to several times weekly during the operations phase. Any dust generated by vehicles at a given location would be localized and short-term.

Project design criteria would reduce fugitive dust emissions from traffic on un-paved roads. Watering of access roads would occur as needed or required by the Forest Service both during the construction and operation phases of the project. Implementing reduced speed limits on unpaved roads would also decrease fugitive dust emissions from vehicle traffic. Implementation of construction methods, including roadbed compaction, proper sloping and surfacing with clean gravel, would also reduce fugitive dust.

Fugitive dust emissions would also occur from wind blown erosion, however, these impacts would be negligible. Cumulative effects of fugitive dust emissions from this source are considered in the model described in the PRB FEIS (BLM 2003a).

Vehicle Exhaust:

The EPA through the implementation of standards for new vehicles regulates vehicle exhaust emissions. States may also impose vehicle emissions testing programs for vehicles registered in their state. Vehicle traffic and associated emissions would increase slightly as a result of the Proposed Action. Emissions associated with vehicle traffic would include NO_x and CO emissions from vehicle tailpipes. Diesel fueled vehicles may also emit SO_x. These emissions are expected to be so small that the impact is not quantifiable.

Vehicle exhaust emissions can be estimated for NO_x using the equation:

$$E = \frac{\left(1.5 \frac{\text{gm}}{\text{mile}}\right) \times \left(VMT \frac{\text{miles}}{\text{day}}\right)}{\left(454 \frac{\text{gm}}{\text{lb}}\right)}$$

Where:

E = NO_x emissions in lbs/day

VMT= vehicle miles traveled; highest use estimated at 232.5 / day

Vehicle miles traveled would be greatest during the 1-2 month long construction period; therefore vehicle miles traveled will be estimated for the highest expected use. Actual vehicle miles traveled would likely be much lower during the operation period. Assuming all 4.65 miles of road (existing and new) as proposed in Alternative A are traveled each day, and a typical day of construction activity involves 5 round trips by 5 vehicles over the entire 4.65 mile road network, $5 \times 5 \times 4.65 \times 2 = 232.5$ VMT/day.

The NO_x emission factor of 1.5 gm NO_x per vehicle mile for project vehicles is taken from Final Environmental Impact Statement for the Powder River Oil and Gas Project (BLM 2003a, page(s) AP-42, Volume II, Table I.18)

Calculation of the emissions using an EPA methodology and a NO_x emission factor of 1.5 gm NO_x per vehicle mile results in an estimated 0.77 lbs. of NO_x produced per day, or about 0.0004 tons per day. These emissions would be distributed over the Project Area. These emissions estimates represent highest expected road use days, which would be during the construction period. For comparison, the Air Quality Technical Support Document (BLM 2003a) for the PRB FEIS (BLM 2003a) estimated 40.44 tons of NO_x emissions per day for the entire PRB project.

Exhaust emissions from drill rigs and other construction equipment would be short term and localized. These emissions are not regulated other than by methods previously described above.

The level of vehicle traffic associated with the development of 5 wells under the Proposed Action is considered minimal when compared to the vehicle traffic analyzed for 17,754 miles of improved and two-track roads in the programmatic PRB FEIS (BLM 2003a).

4.2.2 Alternative B – No Action

Under the No Action Alternative, none of the proposed activities would occur on NFS administered lands. No new emissions would occur at this time in association with this Project. Slight increases in traffic on existing roads may occur as trends in recreational use change over the years yielding slight increases in vehicle exhaust and fugitive dust emissions. Current sources of air pollutants in and near the Project Area would continue to affect air quality from private, state or other federal sources.

4.2.3 Cumulative Effects for Action Alternative

Modeling results of direct, indirect, and cumulative impacts from various sources of air pollution associated with the proposed Action Alternative and other projects in the PRB are described in the Air Quality Impact Technical Support Document by Argonne (2002) in the PRB FEIS (BLM 2003a) and in the Proposed Plan Amendment for the PRB O&G Project (BLM 2003a). The proposed development of five wells is subject to the same air quality laws as those analyzed in the above documents. A summary of effects of the proposed Action Alternative on air quality is presented in **Table 4-2** below. Project-related vehicle traffic and five diesel-fired generators would slightly increase cumulative air emissions of PM₁₀ and NO₂ levels in the short-term, but these increases would not result in adverse effects on ambient

air quality within the Project Area nor contribute to violations of state or federal air quality standards.

TABLE 4.2. SUMMARY OF DIRECT AND INDIRECT EFFECTS ON AIR QUALITY BY ALTERNATIVE		
	Alternative A (Proposed Action)	Alternative B (No Action)
Generators	Temporary natural diesel-fired generators would be used. Emissions from the generators are estimated at 5.46 tons of NO _x per year (0.015 tons NO _x per day).	No new generators would be built; therefore, no additional emissions from generators would occur.
Fugitive Dust (PM₁₀ + PM_{2.5})	0.19 tons of combined PM ₁₀ and PM _{2.5} emissions per day were estimated to occur during the construction period from vehicle traffic on new and existing unpaved roads. This represents a conservative estimate during the highest use days. Actual emissions are likely to be lower, especially after the construction phase is completed.	Slight increases in traffic on existing roads may occur as trends in recreation use change over the years yielding slight increases in fugitive dust emissions.
Vehicle Exhaust	0.0004 tons of NO _x emissions per day were conservatively estimated to occur during the construction period from vehicle traffic on new and existing roads. This represents the highest use days. Actual emissions are likely to be lower following completion of construction.	Slight increases in traffic on existing roads may occur as trends in recreation use change over the years yielding slight increases in vehicle exhaust emissions.

4.3 WATER RESOURCES

4.3.1 Alternative A – Proposed Action

Surface Water

Implementation of the Proposed Action would result in minimal localized direct impacts and no indirect impacts to the hydrology of Wild Horse Creek. No water will be released in association with this project.

No direct or indirect impacts from accelerated erosion or increased sediment load are expected to result from the implementation of the Proposed Action. Potential direct impacts could result from reconstruction of an existing crossing in an upper reach of the stream. Potential for erosion and increased sediment load would be effectively minimized by the design criteria and construction techniques committed to by the Applicant (see Sections 2.1 and 2.6).

Surface and ground water quality in the Analysis Area, the Wildhorse Creek watershed, could be compromised by accidental spills of petroleum products or other pollutants. The risk associated with such impacts would be reduced to a level that is not significant by application of the measures discussed in Section 2.5 of this EA. Additional precautionary measures would include worker briefings prior to drilling and construction, use of quality construction materials and methods, and the application of proper health and safety techniques.

With the implementation of construction and reclamation designs and the design criteria discussed in Section 2.5 of this EA, the Proposed Action would meet the desired condition of the surface water resource in the Project Area.

Ground Water

Shallow water wells, such as those in the Analysis Area, and wells with low hydraulic head are most affected by decreased inputs from precipitation and channel flow. Water wells can change in character over time, due to changes in integrity of the casing and borehole and changes in inputs and outflow over the well's area of effect. Outflow from aquifers in the Analysis Area, which is to the north, are increased during drought conditions, as evapotranspiration at exposures increases. The majority of the water wells permitted in the Analysis Area were drilled 20 to 40 years ago and many were marginal producers when permitted, yielding no more than 7 to 10 gpm. Over time regular pumping can overcome the recharge rate in the area of effect and result in a well with reduced production potential. Well failures or deterioration in well performance can also result from chemical incrustation or biofouling of the well screen and the formation of materials around the intake portion of the well (Driscoll 1986).

Causes of well deterioration or failure can also stem from a number of natural causal factors. In this area, recharge of aquifers, particularly the shallow aquifers, has been compromised by the drought conditions of the past 6 years. Evaporation rates were measured by Lenfest (Lenfest 1987) for selected streams in the Powder River Basin, Wyoming and Montana. The net surface area of the alluvial valley was found to have a significant effect on the amount of evaporation discharge. For example, for a stream with an alluvial valley width of 200 feet, evaporation during April through October was found to be 0.12 cubic feet per second (cfs), or 54 gal/min. per mile. A stream with an alluvial valley of 100 feet was found to have evaporation of 14 gal/min per mile. During other months of the year, rates would be much less, perhaps 25 percent of the growing-season amount (BLM 2003a).

Concerns about loss of groundwater stem from Powder River Basin coalbed methane development, which requires the dewatering of the target coal seam to produce natural gas. The proposed wells are not targeting aquifers and would not produce volumes of water. The proposed wells are much deeper than the aquifers serving the permitted water wells and springs in the Analysis Area. Drilling and completion procedures for oil and gas wells are strictly controlled by WOGCC and BLM requirements that ensure each formation remains as isolated as it is under natural conditions and that the integrity of the well bore remains intact. Surface disturbance in the recharge area would not result in a measurable change in inputs, not would drainages be impacted in such a way as to alter the channel flow. Disruption or reduction of groundwater flow is unlikely to result from the proposed wells.

Any potential for impacts from the proposed project would be greatly reduced through implementation of the project plans, best management practices, and Standards and Guidelines as described in Sections 2.1 and 2.6 Development in accordance with these plans and requirements is unlikely to result in any leakage or mixing of groundwater in the formations penetrated, or to affect inflow or discharge rates of the aquifers.

4.3.2 Alternative B – No Action

Under the No Action Alternative, current patterns of surface water flow and groundwater recharge and outflow in and near the Project Area would continue to affect water resources from private, state or other federal sources, or perhaps more importantly, from atmospheric influences.

4.3.3 Cumulative Effects for Action Alternative

Potential cumulative impacts to the Little Powder River watershed stem from most managed activities in SCGA, including roads management, recreation, grazing and mineral development. Desired conditions in SCGA for grazing were discussed in Chapter 3, Section 3.5.1. As discussed in this section, grazing management is meeting desired conditions, therefore grazing is not significantly contributing to cumulative impacts to water resources. Road densities in the Project Area are low based on the Thunder Basin National Grassland Roads Analysis Report (USFS 2004). While the Proposed Action would incrementally add to the road density, the cumulative effects from roads would not be expected to significantly change that density. Therefore road density is not significantly contributing to cumulative impacts to water resources, as the Proposed Action would increase road density by only approximately 1.2 percent.

Potential cumulative impacts to the SCGA from oil and gas development were analyzed in the PRB FEIS (BLM 2003a). Surface waters in the Wild Horse Creek drainage are ephemeral to intermittent. The potential for impacts to the watershed from the proposed development is limited to the reconstruction of an existing crossing in Section 18. See discussion of this crossing and potential impacts in Section 4.3.1 above.

Cumulative Effects Surface Water:

Alternative A Proposed Action: The cumulative effects of past, present and reasonably foreseeable future oil and gas development have been analyzed in the PRB FEIS (BLM 2003a). The effects of this project are expected to be proportional to the cumulative effects of overall development in the respective drainages. This project is not expected to measurably contribute to the effects summarized in this programmatic document. The primary issues are control of runoff, storm water and sediment movement during construction and management and maintenance of control structures and reclamation. These are adequately addressed in the implementation of design criteria as found in Sections 2.1 and 2.6. Oil and gas development and other managed activities are expected to be in accordance with the TBNG LRMP, and associated Standards and Guidelines.

Cumulative Effects to Ground Water:

Alternative A Proposed Action: Direct and indirect effects of the project focus on the potential effects to ground water within 1.0 mile radius of proposed wells which may effect domestic or stock water wells in the area. Ground water cumulative effects analysis would focus on past, present and reasonably foreseeable future projects that have the potential to affect groundwater aquifers in the Fort Union and Wasatch formations. These are large and connected formations which span the Powder River Basin. Ballard proposes 5 wells with no aquifer as a target completion zone and no depletion of any aquifer included as part of the Proposed Action. Any potential impacts would be expected to result from inadequate or insufficient completion of the well bores going through the relatively shallow well source aquifers. Implementation of the design criteria for well completion will prohibit the movement of groundwater between aquifers and/or the loss of groundwater in any one aquifer. Implementation of control and mitigation measures for accidental spills would minimize potential for impacts to surface waters. Given the design criteria to be implemented and adherence to the Standards and Guidelines to be met by oil and gas development and operations projects, no cumulative effects are anticipated to result from the proposed action.

Past and Present Projects: Grazing allotments are serviced by stock water wells in the Analysis Area. Continued pumping of these wells during drought will contribute to cumulative ground water effects. Other oil and gas operations are expected to be managed in the manner detailed in this document and not

expected to impact groundwater resources.

Reasonably Foreseeable Future Projects: The level of development oil and gas development occurring is that projected in the PRB FEIS (BLM 2003a Appendix A) Reasonably Foreseeable Development Scenario. Any potential impacts have been addressed in that document.

4.4 SOIL

4.4.1 Alternative A – Proposed Action

Implementation of the Proposed Action would result in disturbance to soils from construction of well sites and roads. Anticipated impacts are:

- Clearing or mowing of protective vegetative cover at well sites resulting in increased potential for accelerated soil erosion.
- Compaction of soils and damage to protective vegetative cover by initial and continuing use of roads and well sites.
- Burial and loss of productivity beneath well sites and all-weather, graveled roads.

Design criteria described in Section 2.5, Standards and Guidelines, described in Section 2.4 and those measures detailed in the Project COA (**Appendix B**) would minimize soil loss due to accelerated erosion and would optimize re-establishment of protective vegetation in these soils. Total maximum, short-term soil disturbance would be approximately 23.68 acres. Following near-term post construction reclamation of disturbed areas, remaining long-term surface disturbance would total approximately 18.88 acres.

Approximately 1148.5 acres of the Analysis Area have soils posing severe water or wind erosion potentials and hazards, potential limiting salinity or SAR levels, or other limiting reclamation factors (**Table 4-3**). This acreage represents less than ten percent of the total Analysis Area. None are within the Project Area.

TABLE 4-3 DISTURBANCE OF SENSITIVE SOIL TYPES, PROPOSED ACTION			
Soil Sensitivity	Acres in Analysis Area	Percentage of Analysis Area	Acres of Long-term Surface Disturbance of Soil Type In Project Area
Severe Water Erosion Hazard	0	0	0
Severe Wind Erosion Hazard	87.80	0.81	0
Potential Limiting Salinity or SAR Soil Levels	36.87	0.34	0
Clayey soils with High Shrink-Swell Potential	1023.8	9.49	0
Total	1148.47	10.64	0

Source: Prink 2002

Wind and Water Erosion Hazard

There are no wells or infrastructure proposed on the 87.80 acres of soils with severe wind erosion hazards in the Analysis Area. To minimize wind erosion on all soil types, on-site inspections for the proposed infrastructure were made with consideration for minimizing soil loss. None of the soils within the

Analysis Area are characterized by high or severe water erosion hazards.

Sodic and Saline Soils

There are approximately 36.87 acres of soils with elevated salinity levels in the Wildhorse Analysis Area. This soil type would not be impacted by the Proposed Action.

High Shrink/Swell and Compaction-Prone Soils

Compaction can increase the potential for accelerated water erosion on sloping soils and reduce soil productivity. Implementation of the Proposed Action would not disturb the soils within the Analysis Area with high shrink/swell potential. This soil type would not be impacted by the Proposed Action.

Soils with Limited Reclamation Potential

None of the actual disturbance associated with proposed wells or roads would occur in soils with characteristics that would pose difficulties to successful reclamation/re-vegetation, that is in soils with wind or water erosion hazards, high salinity or SAR, or clayey soils. Soils in areas that would be disturbed by Project activities have fair to poor ratings as sources of reclamation material. Following successful reclamation/re-vegetation of those disturbed lands to be reclaimed shortly after construction, well drilling, and completion, remaining long-term disturbance to soils posing difficulties to successful reclamation/re-vegetation would total approximately 4.9 acres.

4.4.2 Alternative B – No Action

Under the No Action Alternative, none of the proposed activities would occur on NFS lands. Disturbance of soils by conventional well drilling and field development associated with this Project would not occur; however, disturbances to soils by continuing conventional oil and gas development could occur within the Analysis Area. Likewise, conventional development would continue on adjacent state and private lands. Ranching, hunting and recreation-associated impacts would likely continue at the current level.

4.4.3 Cumulative Effects for Action Alternative

The Wildhorse Analysis Area is in the Wild Horse Creek watershed and is within the watershed of a tributary to Little Powder River. The Little Powder River watershed is a subunit of the PRB FEIS' Project Area for which impacts are quantified. Within that watershed, short-term and long-term cumulative effects to soils from oil and gas development including CBM development, as analyzed, would impact approximately 16,591 acres through short-term disturbance and 7970 acres through long term disturbance (BLM 2003a). The Proposed Action short-term disturbance of 23.68 acres equates to 0.14 percent of the total short-term disturbance analyzed in the FEIS (BLM 2003a) The Proposed Action long-term disturbance of 18.88 acres equates to 0.24 percent of the total long-term disturbance analyzed in the FEIS (BLM 2003a).

Cumulative impacts to soils may arise from increased traffic from both commercial and recreational users due to increased road access and some off-road use. Soil disturbance from excavation and compaction, accelerated erosion, and loss of productivity within the Analysis Area and the SCGA would result mainly from additional conventional oil and gas development and operations, continuing livestock grazing and ranching operations, hunting and dispersed recreation. All these activities are expected to continue at current levels. Cumulative impacts to soils from the Proposed Action in addition to past, current, and foreseeable projects in the PRB, are addressed in the PRB FEIS (BLM 2003a). The FEIS cumulative

impacts analysis for soils includes those impacts anticipated to result from implementation of the Proposed Action on TBNG lands in the Project Area.

4.5 VEGETATION RESOURCES

4.5.1 Alternative A - Proposed Action

Proposed roads were routed to avoid or minimize impacts to wetland resources during on-site visits. Short-term surface disturbance to vegetative cover of approximately 23.68 acres would result from construction of roads and well pads. Following near-term reclamation, long-term disturbance would amount to approximately 18.88 acres. Roads comprise most of the long-term disturbance. Project-constructed roads not required for USFS management purposes would be reclaimed at the end of the Project. Some permanent loss of vegetation cover would occur where roads are not reclaimed.

Possible indirect impacts to vegetation cover could include soil erosion and/or the potential for the spread of noxious weeds with surface disturbance. Ballard is committed to measures to reduce the possibility of introduction and spread of non-native invasive species (see Section 2.5). Ballard would monitor constructed facilities for the spread of noxious weeds and would take control measures approved by the USFS or BLM. Following reclamation efforts, noxious weed populations would be managed using mechanical, chemical, or biological controls at the direction of the USFS and Wyoming Weed and Pest Control following the terms outlined in the 2001 Grassland Plan.

Changes in vegetation type caused by disturbance would alter domestic and wildlife food supplies by decreasing potential forage. Successful reestablishment of vegetation would minimize these effects. Significant deleterious effects to wildlife food supply and to vegetation type and diversity are unlikely because the amount of vegetation cover that would experience long-term disturbance resulting from the Proposed Action is limited to less than one percent of the Project Area.

No true riparian or wetland areas exist in the area. Horse Creek, which runs through the area is an ephemeral stream. No impacts to riparian or wetland areas are expected.

4.5.2 Alternative B – No Action

Under the No Action Alternative, no additional negative impacts to vegetation or wetland areas would occur. Conventional oil and gas development would continue on state, private, and federal lands near the Project Area. Ranching-associated impacts would likely continue at their present magnitude.

4.5.3 Cumulative Effects for Action Alternative

New and reconstructed roads, as well as other associated soil-disturbing project activities have the potential to be a primary source for spread of weeds. This and other development in the area may have a cumulative impact on translocation of noxious weeds in the area and outside the area. Implementation of the measures found in Sections 2.1 and 2.5 for control of noxious weeds will minimize such cumulative effects. The new and reconstructed roads represent a 1.2 percent increase in existing roads in the Spring Creek watershed. Therefore, it is reasonable to expect a relative increase in extent of weed populations resulting from the Proposed Action. Project design criteria will reduce that potential increase.

4.6 WILDLIFE RESOURCES

The nature of the available habitat in SCGA and the Project and Analysis Areas is discussed in Section 3.5. The dominant vegetation in the SCGA includes Wyoming big sagebrush, needle-and-thread grass, blue grama and ponderosa pine. Bare ground and cushion plants are also present along the edges of draws. Woody shrubs including snowberry, cottonwoods, Russian olive, chokecherry and buckbrush (skunkbrush) are commonly found in the draws. Streams are ephemeral or intermittent and no perennial water exists in the Analysis Areas.

4.6.1 Alternative A - Proposed Action

Development associated with the Proposed Action would result in short-term disturbance of 23.68 acres to pronghorn and mule deer habitat. This development is consistent with that analyzed in the PRB FEIS (BLM 2003a). Neither species has crucial range within the Project Area. The proposed short-term disturbance to habitat is associated with roads and well pads, which would be at least partially reclaimed as soon as practical following construction. Reclaimed areas would produce less forage for a few years until re-vegetation is successful. Grasses and forbs may be more abundant and productive initially in reclaimed areas; however, shrub communities would likely take eight to 20 years to completely recover (BLM 2003a).

Surface disturbance and increased human activity in the area would likely result in some increased mortality, particularly for small and relatively immobile individuals near construction activities. Increased wildlife mortality associated with vehicle collisions is a potential direct impact resulting from increased road mileage and traffic. The highest potential for mortality would exist during the construction phase. The majority of construction and maintenance operations would occur during daylight hours.

Most raptors would be intolerant of human activity and would avoid nesting and foraging in proximity to drilling or construction activity. Elevated noise levels have been shown to be a factor in raptor displacement (BLM 2003a). Long-term elevated noise levels would be restricted to the vicinity of well pads proposed within the Project Area. To help prevent reproductive failure for any potential raptors near the diesel generators, noise would be regulated and limited to 49 decibels, which is about the same noise level as that characteristic of a rural area during the day (BLM 2003a). Timing stipulations would restrict construction activities during nesting season. No surface occupancy stipulations of 0.25 miles for raptor nests, as well as, appropriate timing limitation stipulations would help reduce noise disturbance (see Section 3.13.2). Currently there is one raptor nest within 0.25 mile of the proposed location of the 4-18 well site. This nest will be protected with timing limitation stipulations.

Wild Horse Creek is a WDEQ Class 3B water which does not naturally support nor have the ability to support fish populations or spawning. Within the Project Area, streams are ephemeral or intermittent. Potential for impacts to wildlife which require aquatic habitat during their life cycles, such as fish, and amphibians, is expected to be negligible.

Habitat loss and fragmentation would likely result from construction activities associated with the Proposed Action. Big game could avoid areas of human activity both short-term and long-term. Avoidance could result in under-use of suitable habitat and overuse of more stressed habitat (BLM 2003a). Wildlife distribution patterns for both large and small mammals could change as a result in the reduction of forage and hiding cover, nesting and breeding cover, and thermal cover. Negative impacts to small mammal populations could potentially pose a threat to raptor populations (BLM 2003a).

Construction of new roads would increase access opportunities that could increase the possibility of legal hunting and poaching big game.

4.6.2 Alternative B – No Action

If the No Action Alternative were implemented, none of the proposed development would occur on federal NFS land. No additional negative impacts to wildlife resources would occur. However, existing impacts such as conventional oil and gas development, recreation and hunting would continue on state, federal, and private lands near the Project Area. Future development could also be approved within the Project Area.

4.6.3 Cumulative Effects for Action Alternative

Cumulative impacts to wildlife within the Project Area would result mainly from additional oil and gas development in the Analysis Area. Ranching, hunting and recreational activities are expected to contribute minimally to cumulative impacts to wildlife. Effects to wildlife would be within the cumulative impacts considered in the PRB FEIS.

Ongoing energy development and continued stock grazing near the Project Area could lead to declining numbers or loss of diversity in pronghorn and mule deer populations. However, the small amount of short-term surface disturbance associated with oil and gas development in SCGA, and the fact that development does not occur simultaneously throughout the watershed, indicate that alternate forage areas would be available for big game species. Conventional oil and gas development within the Project Area appears to be in a mature phase and although there is renewed interest in the potential of the area, extensive additional development is not anticipated. Grazing activity should continue near current levels. Other long-term effects on big game would be due to natural forces, such as severe winters, drought conditions affecting forage productivity, or loss of habitat through range fires.

Following construction and field development, most additional impacts to raptors and other birds would result from oil and gas field operations (periodic well maintenance), and continued grazing, recreation and hunting. Oil and gas development beyond the Project Area could require additional primary power transmission lines. Lines would be buried, or if above ground, lines would be equipped with the best available protection against raptor electrocution (Avian Power Line Interaction Committee 1996). Increased road mileage within the Project Area could result in increased human interaction with various bird species, although the amount of additional long-term mileage would depend upon the degree of USFS-required reclamation of existing roads.

The PRB FEIS forecasts a 25 percent overall increase in traffic resulting from oil and gas development (BLM 2003a), most of which would occur during the construction phase. Collision caused mortality of big game animals could increase by a comparable amount, particularly along paved roads capable of supporting higher vehicle speeds. Collisions with raptors and other bird species would tend to be less, although owls are particularly at risk (BLM 2003a). Adherence to reduced speed limits set as design criteria for the project will decrease the risk of collision.

4.7 THREATENED, ENDANGERED, SENSITIVE, AND MANAGEMENT INDICATOR SPECIES,

4.7.1 Alternative A - Proposed Action

The Thunder Basin Grassland-wide Standards and Guidelines, defined in Chapter 1 of the Thunder Basin National Grassland Land and Resource Management Plan (LRMP), provide direction for managed activities in order to meet Grassland management objectives. While all the Standards and Guidelines apply, only those described below, which address current conditions and proposed actions, will be implemented to limit development impacts of the proposed project to protected species.

Standards and Guidelines will be implemented with the proposed project for protection of active sage grouse leks, one of which, the Spring Creek lek, is within two miles of all proposed project activities. Standard F-47 (USFS 2001a) will be implemented to prohibit construction and oil and gas drilling activities within 2.0 miles of active sage grouse display grounds from March 1 to June 15. Guideline F-48 (USFS 2001a) will prevent workover operations for maintenance of oil and gas wells within two miles of active sage-grouse display grounds from March 1 to June 15. Guideline F-49 (USFS 2001a) will limit noise from nearby operations on sage grouse display ground to 49 decibels from March 1 to June 15.

Standard F-46 (USFS 2001a), prohibiting construction of new oil and gas well facilities within 0.25 miles of active sage-grouse display grounds, though applicable, will not be implemented, as no project activities fall within this type of zone. This Standard would apply to any future activities and any future establishments of active leks in and near the project.

Sharp-tailed grouse leks will be offered protection by implementation of Std. F-14 (USFS 2001a), prohibiting construction of new facilities within 0.25 miles of active sharp-tailed display grounds, and Gdln. F-15 (USFS 2001a), prohibiting construction and oil and gas drilling activities within 1.0 mile of active sharp-tailed display grounds from March 1 to June 15 with respect to the 11-20 well. This Standard and Guideline would apply to any future activities and any future establishments of active leks in and near the project.

Standards 76, Pages 1-20, 1-21 and 77, Page 1-21 (USFS 2001a). Guideline 78, Page 1-22 (USFS 2001a), prohibiting construction activities within 0.125 mile of a raptor nest in the Project Area (category “other”) from Feb 1 to July 31 will be implemented to protect a red-tailed hawk nest with potential to be impacted by construction and drilling activities associated with the 4-18 and 31-19 wells.

Project design criteria include construction methods, equipment and engineering which will keep surface disturbance to a minimum necessary for safe construction and operations activities. This will reduce effects from habitat loss and/or fragmentation.

New roads could result in an increase in vehicle collisions with the birds; however, the anticipated traffic will be limited. Overall the proposed increased road use during construction activities should not be considered unreasonable or unnecessary barriers or hazards to the wildlife though project construction activities might discourage individuals from foraging in the immediate area during times of high human activity. The total duration of construction activities would be short term. An individual’s likelihood of successfully avoiding the area for the duration of project activity is high. Speed limits will be reduced within the Project Area for human health and safety reasons as well as to reduce the risk of collision with any wildlife or livestock.

Implementation of these measures, and Standards and Guidelines will reduce the effects of the proposed project on all species in the area.

USFWS Listed Species

The Project Area and Analysis Area of SCGA contains suitable foraging habitat for bald eagle, however observation data indicate that any other use of SCGA by this species is rare or limited. No bald eagle nests are known within the Project or Analysis Areas.

Under this Alternative, the proposed development is unlikely to have any measurable impact on populations. There is enough suitable habitat surrounding the Project Area to absorb any individuals who could be displaced from the Project Area during construction and operations. The project and Analysis Area are not unique within the SCGA, therefore it is reasonable to assume that an individual disturbed by project activity could find avenues for avoidance without putting undue stress on the animal.

Sources of direct mortality of bald eagles include collisions of eagles with vehicles. In a recent study, 20 percent of known bald eagle mortalities associated with humans were due to collisions with a vehicle and/or electrocution by power lines (Harmata et al. 1999). There are no power lines to be constructed with this project.

The effect to bald eagles from an increase in traffic will be limited. Eagle use of the area is sporadic and primarily during winter when there will be less human activity in association with this project. The proposed project is expected to have localized environmental effects that are not expected to affect any federally listed species or their habitat. Since bald eagles have not been located or identified within the Project Area, there no direct or indirect effects are expected to result from the implementation of this project.

Agency-Designated Sensitive Species

The Proposed Action Alternative may adversely impact individual northern harriers, ferruginous hawks, and short-eared owls but it is not likely to result in a loss of viability of those species in the Project Area nor cause a trend toward federal listing. No raptor nests will be disturbed or destroyed though other direct impacts to raptors and owls in the Project Area include fragmentation of foraging and nesting habitats and limited increased risk of vehicle collisions. Clearance surveys for raptors indicate that there are no known nests for these species in the vicinity of the Project Area that are considered active by the USFS.

Sensitive non-raptor species dependent upon brushy draws, prairie grassland or sage shrubland environments include greater sage grouse, Lewis' woodpecker, loggerhead shrike, sage sparrow, grasshopper sparrow, Brewer's sparrow, and chestnut-collared longspur. The Proposed Action may adversely impact loggerhead shrike, grasshopper sparrow, greater sage grouse, Brewer's sparrow, Lewis' woodpecker, sage sparrow or chestnut-collared longspur but is not likely to result in a loss of viability of those species in the Project Area nor cause a trend toward federal listing. These bird species could undergo short-term displacement due to surface disturbance and fragmentation of foraging and nesting habitat in 23.68 acres of short-term disturbance and 18.88 acres of long-term disturbance. Increased linear habitat disturbances could result in limited increased risk of vehicle collisions, as well as, potential increased predation from mammalian predators along travel corridors.

Similarly, long-term disruptions of mammal species of concern are considered unlikely. Again, individual swift fox may be adversely impacted, but overall populations should remain viable. Swift fox

are not known to den within the Project Area, but may be infrequent visitors. Main effects to swift fox would be disturbance and fragmentation of marginal denning and foraging habitats and limited increase risk of vehicle collisions. However, these effects are expected to be minimal as long-term disturbance of vegetative cover would be minimized and swift foxes are largely nocturnal whereas Project-associated activity would largely occur during the day.

There is little suitable habitat for Townsend's big-eared bat or the fringe-tailed myotis in the Project Area, and any potential roost sites and foraging habitat would not be expected to suffer adverse effects due to construction of the Proposed Action. Direct and indirect impacts would be minimized as bats are largely nocturnal and Project-associated activities would largely occur during the day. Implementation of the Proposed Action Alternative may adversely impact individual Townsend's big-eared bats or fringe-tailed myotis, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing of these species.

Development of the proposed project may adversely impact individual northern leopard frogs but would not have any measurable impact on populations. Northern leopard frogs may not be present within the Project Area or occur at very low densities so effects are expected to be negligible. Vehicular traffic or equipment operations associated with the Project could cause mortalities; however, these effects would be minimized during the winter months when amphibians hibernate. Indirect effects may include loss of foraging habitat and increased predation. As suitable habitat for this species is extremely limited, it seems unlikely that short-term disruption of this species would occur.

No potential habitat and no populations of Barr's milkvetch were identified during USFS clearance surveys in the Project Area. No impacts to the species are expected.

USFS Management Indicator Species

Effects of oil and gas development on both species were analyzed under the FEIS of the Northern Great Plains Management Plans Revisions (USFS 2002a) and the FEIS for the PRB O&G Project (BLM 2003a). The Spring Creek Assessment (USFS 2002b) also assessed these species and their habitats.

Grassland-wide Direction detailed in the LRMP includes Standards and Guidelines designed to direct managed activities to meet Grassland management objectives. Standards and Guidelines (Gdln's.) will be implemented with the proposed project to limit development near leks and limit activity during the MIS breeding season. These will include Ch.1 Std. F-14 (USFS 2001a), Gdln. F-15 (USFS 2001a), Std. F-46 (USFS 2001a), Std. F-47 (USFS 2001a), Gdln. F-48 (USFS 2001a), and Gdln. F-49 (USFS 2001a).

greater sage grouse

The proposed project may have direct environmental effects on greater sage-grouse in the Analysis Area. Such effects could include direct mortality from collision with a vehicle, direct loss of habitat, fragmentation, and/or degradation of habitats. Indirect effects of the proposed project may result from human activity in the Project Area. Human activity, in or near suitable habitat, noise or disturbance could reduce habitat utilization or result in displacement. Such effects will be reduced with the implementation of the Standards and Guidelines protecting sage grouse activities and habitats, listed above. Although there is no project construction proposed within 0.25 miles of known leks, Standard F-46, prohibiting the construction of new oil and gas facilities within 0.25 miles of active display grounds, would apply to any future activities. Project design criteria include construction methods, equipment and engineering which will keep surface disturbance to a minimum necessary for safe construction and operations activities. This will reduce effects from habitat loss and/or fragmentation.

New roads could result in an increase in vehicle collisions with the birds; however, the anticipated traffic will be limited. Overall the proposed increased road use during construction activities should not be considered unreasonable or unnecessary barriers or hazards to the wildlife though project construction activities might discourage individuals from foraging in the immediate area during times of high human activity. The total duration of construction activities would be short term. An individual's likelihood of successfully avoiding the area for the duration of project activity is high. Speed limits will be reduced within the Project Area for human health and safety reasons as well as to reduce the risk of collision with any wildlife or livestock. In addition, implementation of Std. F-47 (USFS 2001a) and Gdln. F-48 (USFS 2001a) will reduce disturbances to nesting sage grouse by prohibiting drilling, construction and workover activities from March 1 to June 15. This timing limitation will apply to the entire Project Area.

Noise from human activity likewise would be short-term and concentrated during the construction phase. Active leks will be protected by implementation of Gdln. F-49 (USFS 2001a), limiting noise on sage grouse display grounds from nearby facilities and activities from March 1 to June 15. This timing limitation will apply to the entire Project Area.

Direct habitat loss and degradation could contribute to grouse use of the area but is unlikely to significantly affect individuals or populations. Surveys will be on-going to locate grouse leks and provide for reduced disturbance to leks.

Minimal adverse effects are expected to result from implementation of the Proposed Action. Given the trend of population increase, with the current oil and gas activity level and projected similar level of future activity, the project is unlikely to threaten the population viability or reduce the local habitat capability below its potential for greater sage-grouse. The project may affect foraging birds. The proposed increased road use should not be considered unreasonable or unnecessary barriers to wildlife. This determination is based upon minimal impacts to available suitable habitat, the fact that the proposed project mostly utilizes existing roads, and the species' likelihood to avoid the area for the duration of project activities. Although the project has potential for individual birds to be adversely affected it will not contribute to population decline for the species throughout TBNG.

Grassland-wide Direction detailed in the LRMP includes Standards and Guidelines designed to direct managed activities to meet Grassland management objectives. Standards and Guidelines will be implemented with the proposed project to limit development near sage-grouse leks and limit activity during the MIS breeding season. These will include Ch.1 Std. F-14 (USFS 2001a), Gdln. F-15 (USFS 2001a), Std. F-46 (USFS 2001a), Std. F-47 (USFS 2001a), Gdln. F-48 (USFS 2001a), and Gdln. F-49 (USFS 2001a). These sage-grouse protections will serve to protect sharp-tailed grouse as well. In addition, other protection will be offered by implementation of Std. F-14 (USFS 2001a), prohibiting construction of new facilities within 0.25 miles of active display grounds, and Gdln. F-15 (USFS 2001a), prohibiting construction and oil and gas drilling activities within 1.0 mile of active sharp-tailed display grounds from March 1 to June 15. This Standard will be implemented for the Anderson lek should any activities encroach on the protection buffer, however at this time no project activities are planned within that area. Project design criteria include construction methods, equipment and engineering which will keep surface disturbance to a minimum necessary for safe construction and operations activities. This will reduce effects from habitat loss and/or fragmentation. Project activities will likely take place outside of the breeding/brood-rearing season, offering further protection during breeding and brood rearing seasons.

sharp-tailed grouse

The proposed project may have direct environmental effects on sharp-tailed grouse in the Analysis Area. Such effects could include direct mortality from collision with a vehicle and direct loss of habitat, fragmentation, and degradation of habitats through project construction activities. Indirect effects of the

proposed project may result from human activity in the Project Area. Human activity, in or near suitable habitat, including displacement, noise or disturbance could reduce habitat utilization. Such effects will be reduced with implementation of Std. F-46 (USFS 2001a) which prohibits the construction of new oil and gas facilities within 0.25 miles of active sharp-tailed grouse display grounds. Although there is no project construction proposed within that buffer area, this Standard would apply to any future activities. Project design criteria include construction methods, equipment and engineering which will keep surface disturbance to a minimum necessary for safe construction and operations activities. This will reduce effects from habitat loss and/or fragmentation.

New roads could result in an increase in vehicle collisions with the birds; however, the anticipated traffic will be limited. Overall the proposed increased road use during construction activities should not be considered unreasonable or unnecessary barriers or hazards to the wildlife though project construction activities might discourage individuals from foraging in the immediate area during times of high human activity. The total duration of construction activities would be short term. An individual's likelihood of successfully avoiding the area for the duration of project activity is high. Speed limits will be reduced within the Project Area for human health and safety reasons as well as to reduce the risk of collision with any wildlife or livestock. In addition, implementation of Std. F-14 (USFS 2001a) and Gdln. F-15 (USFS 2001a) will reduce disturbances to nesting sharp-tailed grouse by prohibiting drilling, construction and workover activities from March 1 to June 15 within 1 mile of any active sharp-tailed leks.

Noise from human activity likewise would be short-term and concentrated during the construction phase. Active sage grouse leks receive additional protection in the form of timing stipulations, which limit construction activities within one mile for sharp-tailed grouse during the breeding season. In addition, the protection offered by the implementation of Std. F-49 (USFS 2001a) limiting noise on sage grouse display grounds from nearby facilities and activities from March 1 to June 15 will provide protection to sharp-tailed grouse as the protection buffer for sage grouse in the area overlaps that of the sharp-tailed protection buffer. Any leks which may subsequently establish would also be protected by this implementation.

Direct habitat loss and degradation could contribute to lack of use by grouse in the area but is unlikely to significantly affect individuals or populations. Surveys will be on-going to locate grouse leks and provide for reduced disturbance. Disturbance and /or fragmentation to all other habitat types used by grouse that are located outside a disturbance buffer could occur.

The Proposed Action Alternative, with implementation of the Standards and Guidelines as discussed, is not expected to threaten the population viability or reduce the local habitat capability below its potential for sage-grouse or sharp-tailed grouse, though the project may affect foraging birds. The proposed increased road use should not be considered unreasonable or unnecessary barriers to resident populations. This determination is based upon minimal impacts to available suitable habitat, the fact that the proposed project for the most part utilizes existing roads, and the species' likelihood to avoid the area for the duration of project activities. Although the project has potential for individual birds to be adversely affected it will not contribute to population decline for the species throughout TBNG.

4.7.2 Alternative B – No Action

If none of the proposed activities were to occur on NFS lands because of implementing the No Action Alternative, no additional negative impacts to special status species would occur. Alternative A would not increase disturbances on USFS lands around known wildlife; however, ongoing recreation, grazing, hunting and conventional oil and gas development would continue within the Project Area, and on state, private, and federal lands near the Project Area for the foreseeable future with some adverse effects to threatened, endangered, and sensitive species.

4.7.3 Cumulative Effects for the Proposed Action Alternative

According to 50 CFR, Part 402, Subpart A – Cumulative Effects are defined under the NEPA process as the incremental impacts of past, present, and reasonably foreseeable future actions conducted by any entity (federal, state, private, and others). Cumulative effects under the ESA are those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Livestock grazing, recreation, and small and big game hunting have dominated land use in the project and Analysis Areas. Mineral exploration and development has also been a part of the land use and management plan for SCGA. Livestock grazing and hunting are expected to continue at the current level, while recreation and mineral extraction are expected at the current or increased levels.

Effects to threatened, endangered and sensitive animal and plant species would be within the cumulative impacts considered in the PRB FEIS (BLM 2003a). The proposed Action Alternative would not directly or indirectly affect bald eagles or their potential habitat and are therefore not expected to contribute to any cumulative adverse impacts. Implementation of the Action Alternative would not contribute to cumulative adverse effects to the bald eagle within the Project Area. Cumulative impacts within the Project Area would result mainly from additional oil and gas development in the Analysis Area. These two activities are expected to occur at an increased rate in the future. Conventional oil and gas development, ranching and recreational activities are expected to contribute minimally to cumulative impacts to wildlife, including fish, and special status species. These activities have occurred the past and are expected to continue at similar levels. In addition to these activities, past, present, and reasonably foreseeable activities in the PRB included in the PRB FEIS (BLM 2003a) were agriculture, urban and rural housing development, construction of roads and railroads and gravel mining.

Cumulative short- and long-term disturbances to the bald eagle arise from multiple sources. The proposed activities have occurred in the past and most of all current activities are expected to continue at similar levels. Implementation of either of the Action Alternative is unlikely to contribute to cumulative adverse effects to the bald eagle within the Project Area. The Project Area contains suitable foraging habitat for bald eagle. Documented sightings in the SCGA are limited and survey and observation data indicate that use of the SCGA by this species is rare or limited. There would be minimal disturbance of potential bald eagle foraging habitat. There is enough suitable habitat surrounding the Project Area to absorb any individuals who could be displaced from the Project Area during construction and operations. The Project and Analysis Areas are not unique within the SCGA, therefore it is reasonable to assume that an individual could avoid project activity without putting undue stress on the animal.

With respect to agency-designated sensitive species, common cumulative effects for all managed activities include potential for habitat disturbance, loss and/or fragmentation. Increased roads can result in increased mammalian predation opportunities, utilizing these corridors for foraging. There is always a potential for some individuals to be killed or injured by vehicles associated with the Proposed Action, however, project criteria call for reduced speeds in the Project Area and an increase in traffic is expected to be minimal and of short duration, as the construction activity will be completed in a matter of weeks. It is expected that all species disturbed by the activity will be able to avoid it, as there is an abundance of more suitable habitat to occupy in the surrounding areas. Any displaced individuals would have to compete for available adjacent territories, and if adjacent habitats are at carrying capacity, intraspecific competition may result in nutritional stress, decrease in fecundity, or mortality to affected individuals. Overall, despite the potential for death, injury, or displacement of some individuals, cumulative impacts are not expected to significantly reduce the size or viability of populations of these species. The cumulative effects of the proposed project will be reduced by implementation of Standards and

Guidelines protecting raptors and grouse activities and habitat as well as the project design criteria will reduce impacts of the proposed project.

With respect to MIS, regional trends indicate a increase in the grouse populations. Management of SCGA provides for increased quality habitat for the species, as evidenced in the Grassland-wide and SCGA Standards and Guidelines. Vegetation monitoring data indicates that objectives are being met or conditions are approaching Standards and Guidelines. Indications of the most severe effects on recruitment and population trends of sage-grouse stem from weather conditions. Weather conditions influence populations, with the greatest stress resulting from winters with greater depths and longer duration of snow cover, drought conditions leading to decreased residual cover, and wet, cool spring weather which affects nesting and early brood rearing success. Drought conditions in the northeastern Wyoming during 2000, 2001, 2002 and 2004 may have contributed to the population declines in sage-grouse. During drought years, sage-grouse populations appear to do more poorly within areas of higher disturbance compared to populations in areas of lesser disturbance. The trends in lek attendance data for the area suggest that sage-grouse will most likely continue to do poorly in areas with higher disturbance. As fewer lands remain relatively less impacted, continued declines in sage-grouse are expected (Oedekoven 2004). There is evidence to suggest that the grouse populations in the area are not necessarily declining, but are moving around to avoid disturbance, whether from natural or human-induced conditions.

These present and possible future activities are expected to continue whether or not the proposed project is implemented. The cumulative effects of this project in conjunction with other past, present, or reasonably foreseeable future projects in the area are not expected to have significant adverse impacts on wildlife within the Analysis Area. The proposed action will not conflict with the current Grassland Plan, and future objectives to manage the area for sage grouse and sharp-tailed grouse. Both species of grouse have populations that appear to be increasing in the SCGA, as well as across the Grassland. Habitat conditions appear to be remaining consistent in SCGA, and are close to meeting the seral stage and structure prescribed in the TBNG LRMP. Furthermore, implementation of this particular proposal is compatible with the direction and scope of other decisions regarding oil and gas activity within the Analysis Area in the past (BLM 2003a and USFS 2001a). The cumulative effects of the proposed project will be reduced by implementation of Standards and Guidelines protecting sage grouse activities and habitat.

4.8 ACCESS

4.8.1 Alternative A - Proposed Action

Implementation of the Proposed Action would have varying impacts on access and travel management. Analysis of the proposed new roads accessing the wells resulted in a determination that the selected access is the most appropriate for the mineral lease (USFS 2005). Implementation would be consistent with land use policies developed in the Grassland Plan (USFS 2001a). Evaluation of the SCGA of the TBNG by USFS planners determined that the Project/Analysis Area and vicinity contain no resource areas worthy of special environmental protective measures.

Direct and indirect effects would include an increase in traffic on county, USFS and private roads. This increase would be intermittent and temporary and would occur during daylight hours to gain access to the wells during drilling and completion. After completion, of drilling and construction activities, traffic to the wells would consist of daily trips for facility monitoring and infrequent trips to perform maintenance. Value for recreation use is low, as these are minor roads with no points of interest (USFS 2005). Resources management value would be high, allowing better vehicle access to previously vehicle-

inaccessible areas by USFS personnel and lessee.

4.8.2 Alternative B - No Action

The absence of approval and implementation of the Action Alternative would not preclude other types of development in the Project Area. Adjacent hunting and recreation activity is likely to continue and could affect the Project Area in the foreseeable future. The limited recreational use of the affected TBNG lands would continue, as would domestic grazing, both of which would require access to the Project Area.

4.8.3 Cumulative Effects for Action Alternative

Cumulative impacts to access or transportation near the Project Area would result mainly from mineral resource extraction of conventional oil and gas development, and from recreation, hunting and ranching activities. These activities are likely to continue adjacent to the Project Area in the foreseeable future.

Increased traffic associated with development is unlikely to add to the existing levels of wear on state highways and county roads, but could result in some additional level of maintenance. Road wear would be greatest during the construction phase and decline thereafter. Increased traffic would potentially result in increased numbers of vehicle accidents. Long-term cumulative effects of increased roads in the small Project Area are expected to be minimal and impacts to recreation would not essentially change. The development of the five wells under the Action Alternative would result in 4.65 miles of road construction or reconstruction. This represents 0.03 percent of the estimated 17,754 miles of improved and two-track roads analyzed in the programmatic PRB FEIS (BLM 2003a, Table S-1). This also represents an increase of 1.2 percent in road density within the Spring Creek watershed.

4.9 LAND USES

4.9.1 Alternative A - Proposed Action

Detailed analysis of the impacts on land use from oil and gas development was documented in the programmatic PRB FEIS (BLM 2003a). A project specific analysis was done by the USFS (Rose-Ritchie 2006). The project specific impacts are consistent with those documented in the PRB FEIS (BLM 2003a). Evaluation of the SCGA of the TBNG by USFS planners determined that the Project Area and vicinity contain no resource areas requiring special environmental protective measures.

Recreational activities, including off-road vehicle use and hunting, are not expected to substantially change. Some recreational activities, such as hunting, may not occur near active well locations during drilling or completion operations due to increased human activity and noise. Value of the proposed well access roads for recreation use is low, as these are minor roads with no points of interest. The additional roads would allow more ready access to previously vehicle-inaccessible areas by USFS personnel and lessee.

Direct and indirect impacts on rangeland vegetation associated with the Proposed Action are limited to a minimal loss of forage, an increased potential for soil disturbance or contamination from spills or leaks, an increased potential for vehicle/livestock collisions, and an increased potential for the spread of noxious and invasive weeds (see Section 3.5.3 Non-native invasive and Noxious Weeds). These impacts would be diminished by Ballard's design criteria which would reduce the possibility of introduction and spread of non-native invasive species (see Section 2.5). Ballard would monitor constructed facilities for the spread of noxious weeds and would take control measures approved by the USFS or BLM. Following reclamation efforts, noxious weed populations would be managed using mechanical, chemical, or

biological controls at the direction of the USFS and Wyoming Weed and Pest Control following the terms outlined in the 2001 Grassland Plan.

Forage in the Project Area would be reduced slightly during drilling and field development and reseeded and reclaimed following construction completion would further decrease the amount of lost forage. Only the area used for roads and production equipment would remain disturbed for the life of the Project. The Proposed Action would result in the short-term loss of approximately 23.68 acres and a long-term loss of 18.88 acres. Livestock grazing activities would continue within the Pickrel and York Allotments in the Project Area. No additional fencing and/or cattle guards are anticipated in the Project Area, except for the temporary enclosure around drilling operations to protect livestock from entering reserve pits and fence off production equipment at the wellhead. Well pads would be kept clear of vegetation to accommodate drilling and production equipment, and reduce the possibility of fires resulting from sparks. T

The increased traffic associated with the Proposed Action could correspondingly increase the potential for vehicle accidents with livestock or wildlife; however, maximum speed on all operator constructed and maintained roads is limited to 25 miles per hour (Standard COA Appendix B) and adherence to this limit would result in decreased likelihood of collisions.

Impacts to oil and gas development, recreation, hunting and grazing as a result of implementing the Proposed Action would be minimal. Implementation would be consistent with land use policies developed in the Grassland Plan (USFS 2001a).

4.9.2 Alternative B – No Action

No land use changes would occur on NFS land if the No Action Alternative were chosen; however, this would not preclude other types of development in the Project Area. Adjacent oil and gas activity is likely to continue and affect the Analysis Area in the foreseeable future. The limited recreation use of the affected TBNG lands would continue, as would domestic and wildlife grazing. All these activities would continue on adjacent federal, private, and state lands. Stock water wells would be expected to continue to be potentially affected by drawdown due to grazing development on adjacent lands or due to any ongoing drought effects. Effects of oil and gas development on non-TBNG lands would be similar to the effects that would result from implementing the Proposed Action.

4.9.3 Cumulative Effects for Action Alternative

Cumulative impacts to oil and gas, recreational activity, and grazing would not be expected to interfere with ongoing hunting, grazing, recreation or conventional petroleum development outside the Project Area. Cumulative effects associated with additional development proposed by the Action Alternative are anticipated to be minimal.

The process of extracting oil or gas could not be expected to cause drawdown in adjacent stock water wells. Safeguards against migration of groundwater are imposed and implemented through standard engineering practices as well as federal and state development requirements.

The surface disturbance associated with the Action Alternative would have minor impacts on the productivity of the Pickrell and York grazing allotments in the Project Area. Gradual erosion in the existing grazing carrying capacity could result from increased oil and gas development, and road construction but are expected to be minimal with the implementation of planned design criteria for control of runoff and sediment.

Project development may result in some game leaving the Project Area for undeveloped or post-development areas outside the Project Area. Long-term cumulative effects of possible increased wildlife movement on hunting success, however, are expected to be minimal.

4.10 CULTURAL RESOURCES

4.10.1 Alternative A - Proposed Action

Surveys of the Ballard Project Area combined with existing data from surveys previously conducted in the general area indicate that there no prehistoric and historic sites are present in the Area of Potential Effect of the Proposed Action. Therefore, it is unlikely that construction in surveyed Project Area would disturb resources of significance (Greer and Greer 2005a, b, c, d, e).

No impacts to Native American cultural values are expected. No concerns regarding the Proposed Action have been received from contacted Native American tribes. No sites of cultural or spiritual significance to Native Americans are known to occur within the Project Area.

Potential impacts from surface disturbance/soil mixing and possible dispersement of affected, non-eligible sites or isolated finds of artifacts and/or fragments could result from road and pad construction. The development of additional road mileage would increase access to areas previously more isolated, possibly resulting in an increased potential of indirect impacts of illegal collecting of artifacts or increased vandalism. These impacts would be reduced through enforcement by the USFS of the Archeological Resource Protection Act of 1979. Measures intended to meet regulations relative to the Act are incorporated in the design criteria and in the lease stipulations for the Proposed Action. Detailed analysis of the impacts on cultural resources from oil and gas development was documented in the programmatic PRB FEIS (BLM 2003a). The project specific impacts are consistent with those documented in the PRB FEIS (BLM 2003a).

4.10.2 Alternative B – No Action

Possible adverse impacts to cultural resources in the Project Area from the proposed development project would not occur if the proposed project was not approved. Conversely, there would be not further documentation of cultural resource sites and materials that might be discovered as the Project was implemented. Oil and gas development would continue on state, private, and federal lands adjacent to and in the vicinity of the Project Area. Cultural resource sites and materials on state and private would be protected by state regulations, where applicable. The absence of approval and implementation of the Proposed Action would not preclude other types of development in the Project Area.

4.10.3 Cumulative Effects for Action Alternative

Destruction or degradation of undocumented cultural resources from the Project Area would represent a cumulative loss of information regarding history in the area. Surface disturbance within the vicinity of the proposed Project would result mainly from oil and gas development. All future activities could result in the incidental collecting of artifacts. Conventional oil and gas development, ranching, and recreational activities are expected to contribute minimally to cumulative impacts to cultural resources. Mitigation and monitoring measures required for federal oil and gas development in the Project Area effectively protect existing heritage resources on federal lands.

The inventory surveys completed in support of this proposed Project has contributed new information on

the cultural resources of the Project Area and the PRB. The absence of cultural resources of significance or eligible for listing on the National Register of Historic Places (NRHP) based on inclusive block surveys of the Project Area indicates the implementation of the Action Alternative would have minimal adverse impact to cultural resources in combination with other actions in the region.

4.11 SOCIO-ECONOMICS

4.11.1 Alternative A - Proposed Action

Implementation of the Proposed Action would increase tax revenue generated for the municipal, county, state, and federal governments and would provide royalty payments to both the state and nation. The estimates of revenues generated from the five wells that comprise the Proposed Action are based on the discussions and assumptions presented in the PRB FEIS. Using the PRB FEIS assumption of \$36,000 taxable value per well (BLM 2003a), Campbell County could receive approximately \$1,800 per well, based on a five percent sales and use tax or approximately \$9,000 from five wells. Ad valorem taxes generated in Campbell County for five non-CBM wells would be expected to generate approximately \$112,024 at the county tax rate of 6.3 percent (BLM 2003a). Based upon basin-wide calculations made for the PRB, severance taxes on five wells would be expected to generate an additional \$142,187 for the state (BLM 2003a). Federal royalties would be generated by production of the Project wells on the TBNG. The federal and state governments would each receive approximately \$278,072 in federal oil and gas royalties from the five wells (BLM 2003a).

Influx of outside workers could increase demands on local housing, schools, and social services. However, construction of the Proposed Action would require minimal numbers of employees, most of whom are expected to be drawn from local communities. Continued income made by Project employees would benefit and support the local economy.

No disproportionately high and adverse human health or environmental effects would occur to minority or low income groups, or American Indian tribes. The public involvement efforts undertaken by the ID Team and District Ranger were adequate to have identified such groups, if they exist or could have had an interest in the Project. The USFS Supervisor has determined that there would be no disproportional social or economic adverse impacts to these groups as a result of the implementation of the proposed development. Equal access opportunity for minorities and people with disabilities would be maintained at a level at, or above, that which is presently found to exist in the Project Area. It is highly unlikely that a reduction in the public use of the federal lands in that area would occur by such persons or groups as a result of the implementation of the proposed Project.

4.11.2 Alternative B – No Action

Under the No Action Alternative, no new wells would be developed. No new employment opportunities in the oil and gas sub-sector would be available because of the proposed project. No Project-related tax revenues would be generated to support the county and state economies. Local communities would not receive beneficial economic returns associated with the sale of goods and materials to facilitate Project development. The No Action Alternative would result in a permanent loss of oil and gas royalties to the United States. Oil and gas development would continue on private, state, and federal surface adjacent to the Project Area, increasing the possibility of drainage by offset wells.

4.11.3 Cumulative Effects for Action Alternative

Basin-wide cumulative impacts analysis of socioeconomic issues is described in the PRB FEIS (BLM

2003a). As one of the largest oil and gas producing counties in Wyoming, Campbell County’s minerals extraction industries make a major contribution to the economic well being of the state. As the largest employer in Campbell County, minerals development would remain the economic focus of the county and its employees would continue to earn the highest average salaries among industrial workers. Ranching and recreation activities are expected to continue near current levels.

Analysis done for the PRB FEIS (BLM 2003a) suggest that “quality of life” issues would be expected to be minimally affected, if at all, by oil and gas development. While development would lead to some increased demands on local government services, the net economic effects of this mineral exploitation in the vicinity of the proposed Project are expected to be highly beneficial.

4.12 VISUAL RESOURCES

4.12.1 Alternative A – Proposed Action

Implementation of the Proposed Action would result in short-term impacts to the visual resources during drilling and completion of each of the five wells. Drilling rigs would be easily discerned on the relatively flat landscape; however, drilling and completion operations would require a relatively short period, minimizing the amount of time when visual resources would be adversely affected and project activities are not within view of the area county roads.

The on-site inspections made for the Proposed Action considered scenic integrity as part of the final determination of the location of facilities, though some long-term adverse impacts to visual resources in or near the Project Area would result with implementation of the Project. Well and associated facilities would be located in the Project Area for the life of the well. These production facilities would be painted in approved colors to blend in with the natural environment, as specified in the Project’s design criteria (Section 2.5). Roads would be located to minimize disturbance as part of the Project. The wells and associated production facilities would slightly modify the Project Area; however, further oil and gas development is not expected to fundamentally alter the current status of the visual character in and around the Project Area. The existing landscape is modified by the presence of wells within a two-mile radius of the Project, as well as roads, fences, stock ponds, and reservoirs used for livestock management.

4.12.2 Alternative B – No Action

Impacts to visual resources would not occur because of modifications to the landscape associated with the No Action Alternative. Conventional oil and gas development including production facilities would, however, continue to take place on federal, state, and private lands near the Project Area. Future conventional oil and gas development may occur within the Project Area. Modifications to the viewshed from grazing and recreation activities would continue to occur, including the installation of fences and stock tanks.

4.12.3 Cumulative Effects for Action Alternative

Cumulative impacts to visual resources within the Project Area would result mainly from additional oil and gas development and recreation and ranching activities. Conventional oil and gas development, ranching operations, and recreational activities would be expected to contribute minimally to impacts. The density associated with oil and gas development in the area could alter some area landscapes from a dominantly rural to a more rural/industrial character. However, the scenario for full development does not indicate that this is likely.

Visibility near the Project Area could be affected by increases in fugitive dust emissions associated with both development. Permit requirements, mitigation efforts, and implementation monitoring enforced by WDEQ AQD act to minimize emissions and resultant degradation to area visibility.

Basin-wide cumulative impacts analysis of socioeconomic issues is described in the PRB FEIS (BLM 2003a). As one of the largest oil and gas producing counties in Wyoming, Campbell County's minerals extraction industries make a major contribution to the economic well being of the state. As the largest employer in Campbell County, minerals development would remain the economic focus of the county and its employees would continue to earn the highest average salaries among industrial workers. Ranching and recreation activities are expected to continue near current levels.

Analysis done for the PRB FEIS (BLM 2003a) suggest that visual resources would be expected to be minimally affected, if at all, by oil and gas development. While development would lead to some increase in facilities visible from public travelways, the visual character of the predominantly rural landscape would remain rural. Energy development is no generally visible from more than a few miles away, except to air travelers. The anticipated project effects are consistent with those analyzed in the PRB FEIS (BLM 2003a) and are consistent with the management goals for visual resources determined by policy directives contained in the 2001 (USFS 2001a) Grassland Plan and the 2001 FEIS for the Northern Great Plains Management Plans Revision (USFS 2001b).

4.13 NOISE

The purpose of the noise analysis in this EA is to estimate and characterize construction and operational impacts resulting from the Alternative. The anticipated noise level in rural areas is approximately 40 dBA during the day and 30 dBA during the night. These noise levels assume that these rural areas are distant from transportation corridors (highways and railroads) and populated areas and that the wind speed is very low. However, the wind speed within the PRB is generally high, so estimated existing noise levels are likely 5 to 10 dBA higher during normal windy conditions in Wyoming (BLM 2003a). Detailed predictive noise modeling to precisely define future noise levels was not performed for this Project. Although there are not any quantitative statutory guidelines, noise levels above 55 dBA are considered an adverse noise impact for this analysis.

4.13.1 Alternative A – Proposed Action

Noise levels would be temporarily elevated above the rural background noise of 35 to 40 dBA during the construction of the proposed wells and associated roads and facilities. Construction related noise would result from vehicle traffic, construction equipment and drilling rigs. Locally, noise could be elevated above the 55 dBA threshold discussed earlier. The level of noise that can be generated by earthwork and construction activities would be perceived as more than three times as loud as normal conversation (see **Table 3-18**). However, this elevated noise at each drill site would occur for only during the short drilling period. Increased traffic associated with construction activities would increase noise levels along Highway 59 and other secondary roads within the TBNG during that period. Noise from the construction of well pads, roads, drilling operations, and traffic would occur during daylight hours, would be temporary, and would be limited to the times when construction actually occurs. Adverse noise impacts would be local in nature, usually only affecting areas within 0.25 mile of the noise producer. Compliance with Occupational Safety and Health Administration (OSHA) oil and gas activity requirements for noise exposure is a site mandate, so anticipated impacts on Ballard's construction and operations personnel would be minimized.

Regular or sustained noise anticipated in the Project Area would be associated with temporary generators, one at each of the well sites.

Overall noise from routine operations in the TBNG would likely increase as humans use secondary roads for access; however, the gain in additional road miles because of Project implementation would be 4.65 miles, a distance which is not expected to generate significantly more traffic in the area. No developed recreation areas are located near the Project Area.

Indirect impacts of elevated noise levels associated with increased human activities (construction and road use) and facility operations have been shown to be factors in the displacement of wildlife including raptors, sage-grouse, and other birds from areas of otherwise suitable habitat. Possible effects of noise depend upon the patterns of occurrence and the intensity of the noise. Responses of individual species may vary from tolerance to avoidance of the affected habitats. Timing limitations and distance offsets would restrict construction activities during nesting season, thereby reducing adverse noise impacts to all breeding birds. Enforcement of TBNG Standards and Guidelines would substantially reduce noise disturbance to raptor sites and sage-grouse by 90 to 100 percent. The overall effect of noise generated by the Project on populations of birds is anticipated to be minor (BLM 2003a). However, the reduction of raptor, passerine, and sage-grouse populations as a result of the proposed Project could still potentially occur (BLM 2003a).

No adverse impacts caused by noise are expected to affect recreational users of the TBNG. It is possible that wildlife may temporarily re-locate while construction activities occur. If so, hunters and/or wildlife would likely move away from the construction activity. In most cases, hunters and other recreational users would probably avoid areas with construction activity by more than 0.5 mile from construction and therefore would not be exposed to levels above 55 dBA. The impacts from construction noise would be short-lived, temporary, and transient.

4.13.2 Alternative A – No Action

Noise impacts associated with wind, existing industrial activities, and transportation corridors would remain essentially the same under the No Action Alternative. Noise impacts associated with coal mining operations, conventional oil and gas, roads, and highways in the Project Area are expected to increase as mineral development continues in the region.

4.13.3 Cumulative Effects for Action Alternative

Within the TBNG of the MBRNF there are 3200 proposed non-CBM wells (BLM 2003a). The wells under the Proposed Action would comprise 0.16 percent of the estimated total new wells expected to be established over the next ten years in the TBNG. Implementation of the TBNG Standards and Guidelines would help to protect wildlife from impacts of activities. The greatest noise would occur in the short-term from impacts such as construction and drilling activities, and the proposed generators; however, these temporary noise impacts would not add substantially to the long-term ambient noise level within the TBNG or the PRB. Noise from each well incrementally adds to overall noise levels within the greater area; however, elevated sound levels are local phenomena and on a windless day, most noise will fade to background levels within less than a mile. The cumulative effects of noise would be that noise will be distributed at more locations in the area.

4.14 Summary of Cumulative Effects

TABLE 4.4 SUMMARY OF CUMULATIVE EFFECTS ACTIONS AND ANALYSES		
PAST ACTIONS DATE (month and year)	PRESENT ACTIONS SEASON/DATE	FUTURE ACTIONS SEASON/DATE (USUALLY 10 YEARS)
Wildfire – year round	Wildfire	Wildfire
Dispersed use	Dispersed use	Dispersed use
Grazing	Grazing	Grazing
Roads	Roads	Roads
Special Use Permit	Special Use Permit	Special Use Permit
		Trail
		Trailhead expansion
Oil and Gas Development	Oil and Gas Development	Oil and Gas Development
Fences		Fences
Travel Management	Travel Management	Travel Management
Powerlines	Powerlines	Powerlines

Information below includes: Function; Implementation Date; Area size (Acres, miles); Activities (type of disturbance); Length of project.

Wildfire: Average number of fires in the SCGA is 1 per year with an average 330 acres burned (USFS 2002b). Assume that average would carry through present and future.

Dispersed use: Use is low, during hunting season it is high.

Grazing: Fence density is low; approximately 149 miles of existing fencing. None proposed. Average grazing season- year-round. Average AUM's- 13,750 on SCGA. No proposed new or increase.

Roads: Road density-low; 360 miles of existing roads; approximately 12 miles of proposed roads.

Powerline: (associated with oil and gas, and neighboring private, development/ 20 Year terms/varying, continuing).

Water developments: (210 existing, including dams, developed wells, undeveloped springs and water pipelines. Term: indefinite. Past, present, future.)

Crude oil transmission pipeline: (two current, 20 year terms, permitted 2002).

Trailhead expansion: Designation of motorized trails by 2009.

Oil and Gas Development: Current actions include 21 producing oil wells and 23 oil fields in or adjacent to the Area; three ongoing exploratory efforts and nine potential new wells.

Travel Management: Planned and foreseen future actions include designation of motorized routes, and potential closure of some existing roads.

5.0 CONSULTATION AND COORDINATION

The EA documenting the NEPA analysis conducted for the Proposed Action was prepared by a third party contractor working under the direction of and in cooperation with the lead agency for the Project, the USFS, Douglas Ranger District, Douglas, Wyoming. Other individuals that were contacted with regard to this project can be found in the project record.

5.1 INTERDISCIPLINARY TEAM MEMBERS

The Forest Service consulted the following individuals, federal, state, and local agencies, tribes, and non-Forest Service personnel during the development of this EA. MBRNF, TBNG, and ID Team Members can be found in **Table 5-1**.

Mike Sierz	ID Team Leader	Douglas Ranger District
Kurt Staton	Rangeland Management Specialist	Douglas Ranger District
Kyle Schmitt	Rangeland Management Specialist	Douglas Ranger District
Ian Ritchie	Archaeologist	Douglas Ranger District
Jeff Sorkin	Regional Office Air Quality	Rocky Mountain Region
Cristi Lockman	Wildlife Biologist	Douglas Ranger District
William Munro	Wildlife Biologist	Douglas Ranger District
Dave Gloss	Hydrologist	Brush Creek/Hayden Ranger District
Marilee Houtler	NEPA Coordinator	Douglas Ranger District
Marcia Rose-Ritchie	Recreation	Douglas Ranger District
Ernie Gipson	Rangeland Management Specialist	Douglas Ranger District

5.2 FEDERAL, STATE, AND LOCAL AGENCIES CONSULTED

U.S.D.I Bureau of Land Management - Buffalo Field Office
U.S. Fish & Wildlife Service – Ecological Services Office
U.S. Environmental Protection Agency
State of Wyoming, Office of Federal Land Policy
State of Wyoming, Office of State Lands and Investments
State of Wyoming, Department of State Parks & Cultural Resources – SHPO
State of Wyoming, Wyoming Game & Fish Department
State of Wyoming, State Engineer’s Office
State of Wyoming, Department of Agriculture

5.3 BALLARD PETROLEUM HOLDINGS LLC

Mike Perius
Bob Fisher

5.4 THIRD-PARTY CONTRACTORS

Greystone, an ARCADIS Company

Kathy Russell, Project Manager - NEPA coordinator

Tracey Ostheimer – NEPA

Jie Chen – Graphics

Dave Cameron - Technical Review

Brian Heath - Wildlife

Ben Shoup – Geology and paleontology

Greer Services Archeological Consultants

John and Mavis Greer

6.0 REFERENCES

- Avian Power Line Interaction Committee. 1996. Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996. Edison Electric Institute and Raptor Research Foundation. Washington, D.C. 155 pages.
- Baxter, G.T. and M.D. Stone. 1980. Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Department, Lander, WY.
- Beske, A E. 1994. 1994 Raptor nest survey on the Thunder Basin National Grassland. USFS Douglas Ranger District, Medicine Bow National Forest. Unpublished report.
- Campbell County Economic Development Corporation (CCEDC). 2003. Workforce Statistics. [Web page]. Located at <http://www.ccedc.net/templates/template1/index.php?pid=300&RND=0.24426100+1103757706>.
- Case, J. C., C.S. Arneson, and L.L. Hallbe. 1998. Wyoming Surficial Geology: Spatial Data and Visualization Center, Laramie, Wyoming. [Web Page] Located at <http://www.sdvc.uwyo.edu/24k/surfgeol.html>. Accessed February 26, 2006.
- Case, J. C., R.N. Toner, and R. Kirkwood. 2002. Basic Seismological Characterization for Campbell County, Wyoming [Web Page]. Wyoming State Geological Survey Located at <http://www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/seischar/Campbell.pdf>. Accessed: February 22, 2005.
- Cerovski, A.O., M. Grenier, B. Oakleaf, L. Van Fleet, and S. Patla. 2004. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Wyoming Game and Fish Department Nongame Program, Lander. 206pp.
- Connelly, J.W., M.A. Schroeder, A.R. Sands and C.E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 2000. 28(4): 967-985.
- Driscoll, F. 1986. Groundwater and Wells. US Filter/Johnson Screens. 2nd Ed. Johnson Filtration Systems Inc.. St. Paul, Minnesota. Environment Canterbury, 2002. Water Quality Investigations.
- Executive Order 122898. 1994. "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations". Signed by Bill Clinton, Feb. 11. 1994.
- Gipson, E. 2006. Rangeland Specialist Report for Ballard Proposed Oil Field Development. USDA Forest Service, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger District.
- Greer, M. and J. Greer, 2005a. Class I File Search and Class III Cultural Resource Inventory for the Ballard Petroleum Wild Horse Creek Federal 11-20 Well Pad and Access Road. Casper, Wyoming.
- Greer, M. and J. Greer, 2005b. Class I File Search and Class III Cultural Resource Inventory for the Ballard Petroleum Wild Horse Creek Federal 4-18 Well Pad and Access Road. Casper, Wyoming.
- Greer, M. and J. Greer, 2005c. Class I File Search and Class III Cultural Resource Inventory for the Ballard Petroleum Wild Horse Creek Federal 44-18 Well Pad and Access Road. Casper, Wyoming.

- Greer, M. and J. Greer, 2005d. Class I File Search and Class III Cultural Resource Inventory for the Ballard Petroleum Wild Horse Creek Federal 31-19 Well Pad and Access Road. Casper, Wyoming.
- Greer, M. and J. Greer, 2005e. Class I File Search and Class III Cultural Resource Inventory for the Ballard Petroleum Wild Horse Creek Federal 42-19 Well Pad and Access Road. Casper, Wyoming.
- Harmata, A. R., et al. 1999. Using marine surveillance radar to study bird movements and impact assessment. *Wildl. Soc. Bull.* 27: 44--52. (Fish Wildl. Prog., Biol. Dept., Montana State Univ., Bozeman, MT 59717, USA.)
- Hausel, D.W., Ray E. Harris, Jon K King, Wane M. Sutherland. 1990. Metallic and Radioactive Minerals and Lapidary Materials Map of the Powder River Basin and Adjacent Uplifts. Scale 1:500,000. Geological Survey of Wyoming, Map Series 32.
- Holm, M. 2001. Oil and Gas Resources of Thunder Basin National Grassland, Wyoming. U.S.D.A. Forest Service, Rocky Mountain Region.
- Keinath, D., B. Heidel and G. P. Beauvais. 2003. Wyoming Plant and Animal Species of Concern. Prepared by the Wyoming Natural Diversity Database - University of Wyoming, Laramie, Wyoming. Accessed on the web at <http://uwadmnweb.uwyo.edu/WYNDD>.
- Kent, B.H. and Berlage, L.J. (1980) Geologic Map of the Recluse 1⁰ x ½⁰ Quadrangle, Campbell and Crook Counties, Wyoming. United States Geological Survey. Scale = 1:100,000.
- Lenfest, L. W. Jr., 1987. Evapotranspiration Rates at Selected Sites in the Powder River Basin, Wyoming and Montana, US Geological Survey Water-Resources Investigations Report 82-4105.
- Lockman, C. 2004. Inventory and completion report for sage-grouse and sharp-tailed grouse on Thunder Basin National Grassland.
- Lowry, M. E., and Wilson Jr., J. F., et al., 1986, Hydrology of Area 50, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming and Montana, U.S. Geological Survey Water- Resources Investigations Open-File Report 83-545, 137 p.
- Merrill, Evelyn, T. Kohley, M. Herdendorf, W. Reiners, K. Driese, R. Marrs, and S. Anderson. 1996. Wyoming Gap Analysis: A Geographic Analysis of Biodiversity, Final Report. USGS Biological Resources Division: Laramie Wyoming.
- National Agricultural Statistics Service, 2002 USDA. Wyoming Statistical Office. Campbell County Agriculture [Web Page]. Located at <http://www.nass.usda.gov/census/census02/profiles/wy/cp56005.PDF>.
- Nicholoff, S. H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners In Flight. Wyoming Game and Fish Department, Lander, WY. Located at <http://www.blm.gov/wildlife/plan/WY/Wyoming%20Bird%20Conservation%20Plan.htm>.
- Oedekoven, O.O. 2004. Sage grouse job completion report—Sheridan region (Project No. W-27- R). Wyoming Game and Fish Department, Sheridan, WY.

- Prink, C. 2002. Soil Survey of Campbell County, Wyoming, Northern Part. Natural Resource Conservation Service. United States Department of Agriculture, Natural Resources Conservation Service.
- Rankl, J. G., and M. E. Lowry. 1990. Ground-Water Flow Systems in the Powder River Structural Basin, Wyoming and Montana. U.S. Geological Survey Water-Resources Investigations Report 85-4229. 39 pages.
- Rose-Ritchie, M. 2006. Personal communication. Recreation Technician , U.S. Forest Service, Thunder Basin National Grassland Douglas Ranger District. Douglas, WY.
- Russell, K.D. 2005. Biological Evaluation/Botany for Ballard Petroleum Holdings, LLC. Wildhorse Creek Oilfield Development. Thunder Basin National Grassland Douglas Ranger District. Douglas, WY. 49 pages.
- Russell, K.D. 2006. Biological Evaluation/Wildlife for Ballard Petroleum Holdings, LLC. Wildhorse Creek Oilfield Development. Thunder Basin National Grassland Douglas Ranger District. Douglas, WY. 102 pages.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2005. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2005. Version 6.2.2006. USGS Patuxent Wildlife Research Center, Laurel, MD*
- Tesky, Julie L. 1994. *Tympanuchus phasianellus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2004, October 19].
- United States Code Title 42, Chapter 82, Subchapter I, Resource Conservation and Recovery Act. (RCRA)
- USDI BLM (BLM). 1999. Final Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming. BLM, Pinedale Field Office, Pinedale, WY.
- U.S. Bureau of Land Management (BLM). 2002. Oil and Gas Activity on Public Lands, Wyoming and the United States. BLM Wyoming State Office. Cheyenne, Wyoming.
- U.S. Bureau of Land Management (BLM). 2003a. Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project. BLM Buffalo Field Office. Buffalo, Wyoming. 890 pages.
- U.S. Bureau of Land Management (BLM). 2003b. Record of Decision and Resource Management Plan Amendments for the Power River Basin Oil and Gas Project. BLM Wyoming State Office. Buffalo Field Office, Buffalo, Wyoming. 21 pp.
- U.S. Bureau of Land Management and U.S. Forest Service. (BLM) 2005. Surface Operating Standards for Oil and Gas Development (Gold Book). 4th Edition. BLM/FS Rocky Mountain Regional Coordinating Committee. 49 pages.

- U.S. Census Bureau, Population Division. 2003. [Web Page] Wyoming Quick Facts. Campbell County. Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, County Business Patterns, 1997 Economic Census, Minority- and Women-Owned Business, Building Permits, Consolidated Federal Funds Report, 1997 Census of Governments Located at <http://quickfacts.census.gov/qfd/states/56/56005.html>
- U.S. Census Bureau, Population Division. 2006. Wyoming Incorporated Place Population Estimates: April 1, 2000 to July 1, 2005 (SUB-05EST) [Web Page]. Release date June 6 2006. Located at <http://eadiv.state.wy.us/pop/SUB-05EST.htm>.
- U.S. Environmental Protection Agency (USEPA). 2005. Monitor Trends Report – Criteria Air Pollutants, Campbell County, Wyoming. Acquired on the Internet. <http://www.epa.gov/air/data/reports.html>.
- U.S. Environmental Protection Agency (USEPA). 2006a. Little Powder Watershed Profile. Acquired on the Internet. http://cfpub.epa.gov/surf/huc.cfm?huc_code=10090208.
- U.S. Environmental Protection Agency (USEPA). 2006b. Upper Little Missouri Watershed Profile. Acquired on the Internet. http://cfpub.epa.gov/surf/huc.cfm?huc_code=10110201.
- U.S. Fish and Wildlife Service (USFWS). 2002. Birds of conservation concern 2002. Division of Migratory Bird Management, Arlington, Virginia. 99 pp. [Online version available at <<http://migratorybirds.FWS.gov/reports/bcc2002.pdf>>]
- U.S. Forest Service (USFS). 1994. Oil and Gas Leasing on the Thunder Basin National Grassland, Douglas Ranger District, Final Environmental Impact Statement. Medicine Bow National Forest. Laramie, Wyoming.
- U.S. Forest Service (USFS). 2001a. Land and Resource Management Plan for the Thunder Basin National Grassland, Medicine Bow-Routt National Forest Rocky Mountain Region, USDA Forest Service, Rocky Mountain Regional Office. Lakewood, Colorado. (Grassland Plan)
- U.S. Forest Service (USFS). 2001b. Final Environmental Impact Statement for the Northern Great Plains Management Plans Revision, USDA Forest Service, Rocky Mountain Regional Office. Lakewood, Colorado.
- U.S. Forest Service (USFS). 2002a. Record of Decision for the Final Environmental Impact Statement and Land and Resource Management Plan Revision - Thunder Basin National Grassland, Medicine Bow-Routt National Forest Rocky Mountain Region, USDA Forest Service, Rocky Mountain Regional Office.
- U.S. Forest Service (USFS). 2002b. Spring Creek Assessment. USDA Forest Service, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger District.
- U.S. Forest Service (USFS). 2004. Thunder Basin National Grassland, Roads Analysis Report. USDA Forest Service, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger District.
- U.S. Forest Service (USFS). 2005. Small Projects Road Analysis for Land and Mineral Projects, Douglas Ranger District: Ballard Proposed Oil Well Field Development-RAP. USDA Forest Service, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger

District.

U.S. Forest Service (USFS). 2006. Paleontology Report. Ballard Petroleum Holdings LLC. USDA Forest Service, Medicin Bow-Routt National Forests and Thunder Basin National Grassland, Douglas Ranger District.

U.S. Geological Survey (USGS). 2006a. USGS 06324970 Little Powder River AAB Dry Creek, Near Weston, WY. Acquired on the internet.
http://waterdata.usgs.gov/nwis/uv/?site_no=06324970&PARAMeter_cd=00065,00060,72020.

U.S. Geological Survey (USGS). 2006b. Water Quality Samples for Wyoming, USGS 06324970 Little Powder River ab Dry Creek, near Weston, WY. Acquired on the Internet.
http://nwis.waterdata.usgs.gov/wy/nwis/qwdata?site_no=063249708.

University of Wyoming. 2003. Wyoming Economic Atlas: Counties in Profile [Web Page]. Campbell County. Laramie, WY. Located at <http://agecon.uwyo.edu/EconDev/Campbell.htm>.

Wyoming Department of Administration and Information (WDAI). 2004a. Division of Economic Analysis. Department of Administration and Information. Equality State Almanac. State of Wyoming [Web Page]. 9th Edition 2002 Cheyenne, Wyoming. Located at <http://eadiv.state.wy.us/almanac/almanac.asp>.

Wyoming Department of Administration and Information (WDAI). 2004b. Division of Economic Analysis. Personal Income by Major Source and Earnings by Industry (NAICS): 2001 to 2002. [Web Page]. Located at http://eadiv.state.wy.us/i&e/Earn01_02.htm.

Wyoming Department of Environmental Quality, Water Quality Division (WDEQ WQD) 2001a. Wyoming Surface Water Classification List. Acquired on the Internet.
<http://deq.state.wy.us/wqd/watershed/surfacestandards/Downloads/Standards/2-3648-doc.pdf>.

Wyoming Department of Environmental Quality, Water Quality Division (WDEQ WQD) 2001b. Water Quality Rules and Regulations. Chapter 1. Wyoming Surface Water Quality Standards. Acquired on the Internet. http://deq.state.wy.us/wqd/WQDRules/Chapter_01.pdf.

Wyoming Department of Employment (WDOE). 2003. 2003 Wyoming Benchmark Labor Force Estimates [Web Page] Located at <http://doe.state.wy.us/lmi/laus/03bmk.htm>.

Wyoming Department of Employment (WDOE). 2005. 2005 Wyoming Benchmark Labor Force Estimates [Web Page] Located at <http://doe.state.wy.us/lmi/laus/05bmk.htm>.

Wyoming Department of Revenue (WDR). 2004. State of Wyoming Department of Revenue 2003 annual report [Web Page]. Located at <http://revenue.state.wy.us/PortalVBVS/uploads/2003AnnualReport.pdf>.

Wyoming Game and Fish Department (WGFD). 2003a. Wyoming Greater Sage-Grouse Conservation Plan. Wyoming Game and Fish Department, Cheyenne, WY. 97 pp.

Wyoming Game and Fish Department (WGFD). 2003. Wildlife Observation System, GIS Data Files. Cheyenne, Wyoming.

Wyoming Game and Fish Department (WGFD). 2006. Prairie Streams Project. Acquired on the Internet.

<http://gf.state.wy.us/fish/AAC/CurrentProjects/PrairieStream/index.asp#>

Wyoming Game and Fish Department (WGFD). 2006b. Comprehensive Wildlife Conservation Strategy. <http://gf.state.wy.us/wildlife/CompConvStrategy/Species/Fish/>

Wyoming Oil and Gas Conservation Commission (WOGCC). 2006. Well database accessible online at <http://wogcc.state.wy.us/>.

Wyoming State Climatologist, Office of the (WSCO). 2006. Wyoming Drought Update Report: 24 October 2005. Acquired on the Internet. <http://www.wrds.uwyo.edu/wrds/wsc/df/droughtupdate.pdf>.

Wyoming State Engineer's Office (WSEO). 2006. Water Rights Database. Date acquired on the Internet. <http://seo.state.wy.us/srbd/index.aspx>.

Wyoming State Geological Survey. (WSGS) 1987. Geologic Map of the Newcastle 1° x 2° Quadrangle, Northeastern Wyoming and Western South Dakota. Wyoming State Geological Survey Map Series 25-I. Prepared by J.D. Love, A.C. Christiansen, and L.W. McGrew.

Wyoming State Geological Survey. (WSGS) 1989 Industrial Minerals and Construction Materials Map of the Powder River Basin and Adjacent Uplifts, Wyoming. Wyoming State Geological Survey Map Series 30. Prepared by R.E. Harris and J.K. King. 1989.

Wyoming State Geological Survey. (WSGS). 1990. Geologic Map of the Gillette 1° x 2° Quadrangle, Northeastern Wyoming and Western South Dakota. Wyoming State Geological Survey Map Series 25-G. Prepared by J.D. Love, A.C. Christiansen, L.W. McGrew, and J.K. King.

Wyoming State Geological Survey (WSGS). 1990b. Coal Map of the Powder River Basin and Adjacent Areas, Wyoming. Geological Survey of Wyoming. Map Series 33. Prepared by R.W. Jones.

Wyoming State Geological Survey (WSGS) 2005a. Industrial Minerals and Uranium Section, Construction Aggregate in Wyoming [Web Page]. Located at <http://www.wsgs.uwyo.edu/minerals/35aggregate.aspx>. Accessed: April 25, 2006.

Wyoming State Geological Survey (WSGS). 2005b. Landslides in Wyoming [Web Page]. Located at <http://www.wrds.uwyo.edu/wrds/wsgs/hazards/landslides/>. Accessed: November 4, 2004. Accessed; April 25, 2006.

Wyoming Taxpayers Association. 2004. Wyoming Fiscal Facts [Web Page]. Located at http://www.nass.usda.gov/census/census02/volume1/us/st99_2_001_001.pdf.

Wyoming Water Resource Data System (WRDS) 2006a. Wyoming State Climate Office. Acquired on the Internet, <http://www.wrds.uwyo.edu/wrds/wsc/normals/WY05.pdf>.

Wyoming Water Resource Data System (WRDS) 2006c. Climatology of the United States No. 84, 1971-2000. Acquired on the Internet, <http://www.wrds.uwyo.edu/wrds/wsc/normals/WY05.pdf>.

**APPENDIX A
PROJECT MAPS**

APPENDIX B
STANDARD CONDITIONS OF APPROVAL FOR
BALLARD'S WILDHORSE DEVELOPMENT

**Standard Conditions of Approval
Ballard Wildhorse Development
T54N, R69W
Campbell County, Wyoming**

Standard Conditions of Approval are those measures that apply to all oil and gas development. These conditions are applied to both APD and NOS when they are not specifically addressed in those plans by the Companies. It is important to note that site-specific mitigation measures are also developed by the Forest Service authorized officer, as needed, on a case-by-case basis at the onsite inspection to address special, unanticipated issues not addressed by a programmatic mitigation measure or standard conditions of approval (e.g., erosive soils, steep slopes, proximity to existing improvements, etc.). These conditions of approval are subject to change as needed at the discretion of the Douglas District Ranger.

A. DURING CONSTRUCTION AND OPERATION

1. Before any dirt moving or construction begins on the approved site the owner/operator will request a pre-construction meeting with the Forest Service. A designated Forest Service inspector or field manager will review the SUPO and COAs with the owner/operator. The meeting may be on site or at another agreed to location.
2. Actions to insure oil floating on water does not pose a hazard to wildlife will be implemented. Fluid hydrocarbons within the reserve pit will be promptly removed and disposed of in accordance with State Law.
3. Drilling company signs will be allowed on National Forest System lands during the construction and drilling phase(out of the public road right-of-way).
4. Design night lighting to minimize light pollution. Limit continuous or dusk-to-dawn lighting at facilities. Exceptions may be made for the lighting of towers or lines to facilitate flight safety, and staffed, around-the-clock operations. Whenever the facilities are not actively being worked the lights should be at a minimum.
5. The access road will be 16 foot wide surface. No soil disturbance is to occur outside a 30 foot right-of-way.
6. Pipeline Corridors will not be bladed. If clearing is necessary, they will be brush hogged with the material left on site. Pipeline trenching will segregate the topsoil subsoil. The trench will be filled with the sub-soil first and the top soil mounded over the trench. Where the company feels it is necessary to blade the pipeline corridor to have a travel way smooth enough to operate equipment on, they will make a request. The Forest Service will make a site inspection and if they concur, approval will be granted.
7. If snow is on the ground when construction begins, it will be stockpiled separately from the topsoil. Before snow may be remove from and pipeline corridor the operator will request approval from the Forest Service designated inspector or field manager.

B. PRODUCING WELL

1. Production facilities (including dikes) will be placed on cut and a minimum of 20' from the toe of the backcut.
2. All facilities on the oil well production site will be clustered as close as possible with just one turn-around road for access and oil retrieval. Workover Rig ground anchors may be off the reclaimed area as long as they are clearly visible. The road and areas around the facilities are to be surfaced with a minimum of 4" of gravel or scoria. All other areas on the oil well location are to be revegetated. Thereafter, periodic additions of gravel or scoria will be required in order to maintain a rut-free surface for driving and equipment handling. Gravel or scoria which become oil-soaked must be removed and the area resurfaced.
3. Pesticides may not be used to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, trash fish, etc., without the prior written approval of the Forest Service. A request for approval of planned uses of pesticides will be submitted 4 months prior to proposed starting date. Information essential for review will be provided in the form specified. Exceptions to this 4 month prior notification may be allowed, subject to emergency request and approval, only when unexpected outbreaks of pests require control measures which were not anticipated at the time a request was submitted. Only those materials registered by the U.S. Environmental Protection Agency for the specific purpose planned will be considered for use on National Forest System lands. Label instructions will be strictly followed in the application of pesticides and disposal of excess materials and containers.
4. No pits will be allowed on the location during production.
5. Load outs will be inside the dike. A drip barrel will be installed under the end of the loadout line.
6. All production facilities, i.e. pump, pump house, storage tanks, oil-water separator, galvanized dikes, etc. will be painted with a lusterless color (refer to the attached "Standard Environmental" Color Sheet"). The company may choose any of the checked colors on the sheet to meet this requirement. The Forest Service will designate the appropriate colors by using the BLM's Best Management Practices (BMPs) for Fluid Minerals-part 3. The exception being that Wyoming Occupation Health and Safety Act Rules and Regulations are to be complied with where special safety colors are required . All facilities will be painted within six (6) months of installation.

C. ABANDONED WELL

1. All disturbed areas will be scarified. The cut and fill slopes will be recontoured to original contours. The entire disturbed area will then be back-filled with topsoil, landscaped, seeded and fenced with woven wire to exclude livestock. The fence will remain in place during reestablishment of vegetation. It will be removed prior to approval of final abandonment.
2. Waterbars (contour ditches) are to be constructed on the contour at seventy five (75) foot intervals beginning at the top of the disturbed slope. They should be at least one (1) foot deep, with approximately two (2) feet of drop per one hundred (100) feet of length, and with the berm on the downhill side.
3. Seed mix used for reclamation. Use the same mixture and procedure as stated in the APD SUPO # 4. Production Facilities I-10.
4. All disturbed areas must be mulched at the rate of two tons/acre with certified weed free mulch. Acceptable materials to use as mulch consist of hay, straw, wood chips, etc. The mulch must be crimped into the surface with a disk.
5. Upon receipt of "Subsequent Report to Abandon" via the BLM, the reclamation will be inspected (usually after the second growing season) by the Forest Service. Reclamation will be approved when the established vegetative cover is equal to 70% of that of adjacent areas.

D. GENERAL STIPULATIONS

1. During all road building, pad construction, drilling, well completion, producing and abandonment activities, all gasoline and diesel powered equipment used must be equipped with approved spark arresters or mufflers. Notify the Forest Service (307-358-4690) in the event of any fire occurrence.
2. The operator is responsible for all spills of crude oil, automotive fuels, lubricants, liquids and EPA listed hazardous materials. The operator shall give prompt notice to the U.S. Forest Service of any spill. The Operator will report to the Wyoming DEQ all releases that are determined to be a threat to enter the waters of the state and are considered a hazardous substance or an amount greater than 10 barrels of any combination of crude oil/petroleum condensate/produced water or 25 gallon of refined crude oil product.
3. Surface land use is prohibited (Doesn't apply to operation and maintenance of production) from March 1 through June 15 within two (2) miles of a established sage grouse display ground, as delineated on the attached map, and noise from the production facilities (well pad site) shall not exceed 49 decibels at the display ground (see attached

map) or a noise level of more than 10 decibels above the background noise level (39 db), at 800 feet from the noise source (well pad site) from March 1 to June 15.

4. If the operator discovers a sensitive species nest subsequent to well development they will notify the District Ranger, Douglas Ranger District.
5. When constructing facilities or structures within 2 miles of a sage grouse active display ground design them to discourage raptor perching by maintaining a low profile or using perch inhibitors.
6. Limit vehicle speed to less than 35 miles per hour on USFS Local Roads (York Road) and to less than 25 miles per hour on all other USFS Resource Roads (well pad access road).

**Site Specific Conditions of Approval
Ballard Wildhorse Development
T54N, R69W
Campbell County, Wyoming**

The following site specific COAs apply to the Ballard Wildhorse Development:

All wells in proposed action:

- Timing stipulation for sage grouse will apply.
 - Construction and oil and gas drilling activities, including workover operations, are prohibited from March 1 to June 15 within 2.0 miles of an active grouse lek.
 - Noise shall not exceed 49 decibels at the display ground (see attached map) or a noise level of more than 10 decibels above the background noise level (39 db), at 800 feet from the noise source (well pad site) from March 1 to June 15.

Well 4-18

- Construction activities are prohibited from Feb 1 to July 31 to protect a red-tailed hawk nest within 0.125 mile of the well.

Well 31-19

- Construction activities are prohibited from Feb 1 to July 31 to protect a red-tailed hawk nest within 0.125 mile of the well.

APPENDIX C
GLOSSARY

Ad valorem – A tax on items that is imposed at a rate percent of value.

Affected Environment – The natural, physical, and human-related environment that is sensitive to changes caused by proposed actions; the environment under the administration of a land management agency.

Allotment – A unit of land suitable and available for livestock grazing that is managed as one grazing unit.

Alluvial – Deposited by a stream.

Ambient – The environment as it exists at the point of measurement and used as a basis to measure changes or impacts.

Animal Unit Month (AUM) – For operations that involve cows and calves, it is the amount of forage consumed by a 1,000-pound cow and calf (less than 6 months of age) over a 1-month period. It is approximately 1,050 pounds of forage.

API - American Petroleum Institute scale to grade crude oil.

Applications for Permit to Drill (APDs) – regulatory permits for drilling of oil/gas wells.

Aquifer – A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

Artifact – An object (usually portable) created or modified by human action.

Authorizing Officer – Person designated as being in the position to speak for and commit an agency to action.

Best Management Practices – A practice or combination of practices deemed the most effective and practicable (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Big Game – Large species of wildlife that are managed for hunting.

Biological Assessment (BA) – The purpose of a Biological Assessment is to assess the potential environmental effects of the proposed action on Federally endangered, threatened, and proposed species.

Biological Evaluation (BE) The purpose of a Biological Evaluation assess the potential environmental effects of the proposed action on USFS species designated as sensitive.

Biotic – Pertaining to life and living organisms.

Breeding Bird Survey (BBS) -

Bureau of Land Management (BLM)

Bureau of Land Management, Buffalo Field Office (BLM BFO)

Carbon Dioxide (CO₂) – A non-hydrocarbon, corrosive gas that occurs naturally in the gaseous phase in the natural gas reservoir or is injected into the reservoir in connection with pressure maintenance, gas cycling, or other secondary or enhanced recovery projects.

Carbon Monoxide (CO) - a colorless, practically odorless, and tasteless gas or liquid. It results from incomplete oxidation of carbon in combustion.

Casing – (Noun) A steel pipe that maintains the opening of a drill hole. (Verb) The act of installing pipe within a well.

Cation – A positive ion, which in electrolysis travels to the cathode and is discharged there.

Clean Air Act (CAA) – Public Law 84–159, established July 14, 1955, and amended numerous times since. The Clean Air Act: establishes federal standards for air pollutants emitted from stationary and mobile sources; authorizes states, tribes, and local agencies to regulate polluting emissions; requires the agencies to improve air quality in areas of the country which do not meet federal standards; and to prevent significant deterioration in areas where air quality is cleaner than the standards. The act also requires that all federal activities (either direct or authorized) comply with applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans. In addition, before these activities can take place in non-attainment or maintenance areas, the federal agencies must conduct a conformity analysis (and possible determination) to demonstrate that the proposed activity will comply with all applicable air quality requirements.

Clean Water Act (CWA) - 1948 Act (33 U.S.C. 1251 et seq.) specifying permitting requirements for discharges of wastewater and storm water to waters of the United States under the National Pollutant Discharge Elimination System (NPDES) and for the protection of ambient water quality. The State of Wyoming has primacy over the administration of the CWA.

Coalbed – A seam or stratum of coal parallel to the rock stratification.

CFR – Code of Federal Regulations, the compilation of regulations adopted by federal agencies through a rule-making process.

Colluvial – Consisting of a mixture of soil and angular fragments of rock that have accumulated at the foot and on slopes of mountainsides under the influence of gravity.

Conditions of Approval (COAs) -

Conglomerate – A sedimentary rock comprised of an unstratified mixture or stratified layers of cobbles, gravel, and sand.

Coniferous – Referring to a cone-bearing, usually evergreen, tree.

Council on Environmental Quality (CEQ) The President’s Council on Environmental Quality coordinates federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives.

Criteria Pollutants – Air pollutants for which the U.S. Environmental Protection Agency has established state and national ambient air quality standards. These standards include particulate matter (**PM₁₀**), nitrogen oxides (**NO_x**), sulfur dioxide (**SO₂**), carbon monoxide (**CO**), and volatile organic compounds (**VOC**).

Cubic Foot – The volume of gas contained in 1 cubic foot of space at a standard pressure base of 14.7 pounds per square inch absolute (psia) and a standard temperature base of 60 degrees Fahrenheit.

Cultural Resources – The archaeological and historical remains of human occupation or use. Includes any manufactured objects, such as tools or buildings. May also include objects, sites, or geological and geographical locations that are significant to Native Americans.

Cumulative Effects – As defined by Title 40 CFR Part 1508.7, cumulative effects are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person that undertakes the other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

dBA – The sound pressure levels in decibels measured with a frequency weighing network corresponding to the A-scale on a standard sound level meter. The A-scale tends to suppress lower frequencies, usually below 1,000 Hz.

Decibels (dBA) – Units for describing the amplitude of sound frequencies to which the human ear is sensitive.

Direct Effects – As defined by Title 40 CFR Part 1508.9, these effects are caused by the action and occur at the same time and place as the action. Synonymous with direct impacts.

Dispersed Recreation – A general term that refers to recreation use outside the developed recreation sites. This term includes activities such as scenic driving, hunting, hiking, ORV use, and biking.

Disturbance – An event that changes the local environment by removing organisms or opening up an area, facilitating colonization by new, often different, organisms.

Disturbed Area – Area where natural vegetation and soils have been removed or disrupted.

Diversity – The distribution and abundance of different plant and animal communities and species within the area covered by a Land and Resource Management Plan.

Drainage – Natural channel that contains flowing water for some time of the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

Effects – Environmental consequences as a result of a proposed or alternative action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or farther removed in distance but which are still reasonably foreseeable. Also referred to as impacts.

Electrical conductivity (EC) (measured in microhmhos per centimeter, abbreviated $\mu\text{mhos/cm}$) – A measure of electrical conductivity (or specific conductance) in water that is influenced by the mineral content of the water.

Emission – Air pollution discharged into the atmosphere, usually specified by mass per unit time.

Endangered Species – Any species of animal or plant which is in danger of extinction throughout all or significant portions of its range and has been designated “endangered” in the Federal Register by the Secretary of the Interior. Disturbance of the habitat of endangered species is prohibited by the Endangered Species Act of 1973, as amended.

Environmental Analysis – An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; and direct, indirect, and cumulative effects.

Environmental Assessment (EA) – A concise public document which serves to (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a Finding of No Significant Impact; (2) aid an agency’s compliance with the National Environmental Policy Act (NEPA) when no EIS is necessary; (3) facilitate preparation of an EIS when necessary.

Environmental Impact Statement (EIS) – An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; and direct, indirect, and cumulative effects.

Environmental Protection Agency (EPA)

Fugitive Dust – Airborne particles emitted from any source other than through a controllable stack or vent.

Guidelines (Gdlns.) – Guidelines detailed in the Thunder Basin National Grassland Land and Resource Management Plan as part of the land management direction.

Grassland Plan - *Revised Land and Resource Management Plan for the Thunder Basin National Grassland.*

Habitat Fragmentation – The process that increasingly subdivides habitats into smaller units, resulting in their increased isolation as well as loss of total habitat area.

Hydrogen Sulfide (H₂S) – A flammable, poisonous, corrosive gas with an odor that suggests rotten eggs, which can occur naturally in the gaseous phase in natural gas reservoirs.

Impoundment – The accumulation of water in a reservoir or other storage area.

Indirect Effects – As defined by Title 40 CFR Part 1508.8, these effects are caused by the action but occur later in time or are removed in distance from the action, but are still reasonably foreseeable. Synonymous with indirect impacts.

Infiltration – The movement of water or some other liquid into the soil or rock through pores or other openings.

Infrastructure – The basic framework or underlying foundation of a community, including road networks, electric and gas distribution, water and sanitation services, and facilities.

Interdisciplinary Team (ID Team) - Forest Service personnel representing a number of disciplines and roles, assigned to evaluate proposed actions.

Intermittent Stream – A stream that flows only at certain times of the year when it receives water from alluvial groundwater, springs, or from some surface source such as melting snow in mountainous areas.

LRMP – Land and Resource Management Plan

Land Use – Land uses identified for a specific area that establish the types of activities allowed (for example, mining, agriculture, timber production, residential, or industrial).

Lease – Any contract, profit-share arrangement, joint venture, or other agreement issued or approved by the United States under a mineral leasing law that authorizes exploration for, extraction of, or removal of oil or gas.

Lek – An area used by sage grouse for mating displays (strutting ground).

Lithic Scatter – Is a surface scatter of cultural artifacts and debris that consists entirely of lithic (stone) tools and chipped stone debris. This type is a common prehistoric site that is contrasted to a cultural material scatter, which contains other or additional artifact types such as pottery or bone artifacts, to a camp that contains habitation features, such as hearths, storage features, or occupation features, or to other site types that contain different artifacts or features.

Loam – A mixture of sand, silt, and clay that contains between 7 and 27 percent clay, 28 to 50 percent silt, and less than 50 percent sand.

Long-Term Impacts – As used in the Powder River Oil and Gas NEPA analysis, long-term effects generally last beyond the construction period.

LRMP - *Revised Land and Resource Management Plan for the Thunder Basin National Grassland.*

Management Area – An area composed of aggregate pieces of land (generally several to many analysis areas) where specific management objectives and prescriptions are applied.

Management Area Prescription (MAP) – management goals and objectives for specific geographic areas.

Management Direction – A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management Indicator Species (MIS) - a “plant or animal species or habitat components selected in a planning process used to monitor the effects of planned management activities on populations of wildlife and fish, including those that are social or economically important

Medicine Bow – Routt National Forest - MBRNF

Methane (CH₄) – The simplest hydrocarbon; natural gas is nearly pure methane.

Mitigate – To lessen the severity.

Mitigation – Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

Monitor – To systematically and repeatedly watch, observe, or measure environmental conditions to track changes.

National Ambient Air Quality Standards (NAAQS) – The allowable concentrations of air pollutants in the air specified by the federal government. The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare from any unknown or expected adverse effects of air pollutants).

National Environmental Policy Act (NEPA) – The National Environmental Policy Act of 1969 is the national charter for protection of the environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. Regulations at Title 40 CFR Parts 1500–1508 implement the act.

National Forest System (NFS) – of the lands administered by the U.S. Forest Service.

National Pollutant Discharge Elimination System (NPDES) - The Clean Water Act (CWA) of 1948 (33 U.S.C. 1251 et seq.) specifies permitting requirements for discharges of wastewater and storm water to waters of the United States under the National Pollutant Discharge Elimination System and for the protection of ambient water quality.

National Register of Historic Places (NRHP) – A list, maintained by the National Park Service, of areas that have been designated as being of historical significance.

Nitrogen Oxides (NO_x) Nitrogen oxides (primarily NO or NO₂) form when fuel burns at high temperatures, such as in motor vehicle engines.

Noxious Weeds – An alien, introduced, or exotic undesirable species that is aggressive and overly competitive with more desirable native species.

(NRCS) United States Department of Agriculture-Natural Resources Conservation Service.

Ozone – A molecule that contains three oxygen atoms (O₃) produced by passage of an electrical spark through air or oxygen (O₂).

Paleontology – The science that deals with the history and evolution of life on earth.

Particulate Matter (PM)– An airborne suspended particle of soil or liquid matter

PM₁₀ – Airborne suspended particles with an aerodynamic diameter of ≤10 microns

PM₂₅ – Airborne suspended particles with an aerodynamic diameter of ≤25 microns

Partners in Flight (PIF) - a voluntary international coalition of government agencies, conservation groups, academic institutions, private businesses and concerned citizens dedicated to the conservation of common birds including migratory bird species protected under the Migratory Bird Treaty Act.

Passerine – A taxonomic order that includes perching birds and songbirds.

Peak Flow – The highest flow attained when winter snowpack melts or during a large precipitation event.

Perennial – A plant with a life cycle that lasts longer than 2 years. The tops of herbaceous perennials die down at the end of the growing season, but buds, roots, and other underground portions persist.

Perennial Stream – A stream or reach of a stream that flows throughout the year.

Permeability – The capacity of a soil or groundwater aquifer to transmit water.

Permeable – The property or capacity of a porous rock, sediment, or soil to transmit a liquid.

pH – The negative log₁₀ of the hydrogen ion activity in solution; a measure that indicates whether a solution is acid or base.

Porosity – The voids or openings in geological materials.

PRB FEIS - Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project.

Prevention of Significant Deterioration (PSD) – A regulatory program under the Clean Air Act (Public Law 84-159, as amended) to limit degradation of air quality in areas that currently achieve the National Ambient Air Quality Standards.

USFS Region 2 (R2)

Range – Land that produces native forage for animal consumption and lands that are revegetated naturally or artificially to provide forage cover that is managed like native vegetation.

Reach – Most generally, any specified length of a stream, channel, or conveyance.

Recharge – Replenishment of the water supply in an aquifer through the outcrop or along fracture lines.

Reclamation – The process of restoring disturbed areas using any of several methods: recontouring, spreading topsoil or growth medium, seeding, and planting, among others.

Recontouring – Restoration of the natural topographic contours by reclamation measures, particularly in reference to roads.

Record of Decision – A decision document for an environmental impact statement or supplemental EIS that publicly and officially discloses the responsible official's decision regarding the actions proposed in the EIS and their implementation.

Right-of-way - (ROW)

Riparian – Land areas that are directly influenced by water. They usually have visible vegetative or physical characteristics showing this influence. Streamsides, lake borders, or marshes are typical riparian areas.

Roosting – To rest or sleep in a roost. A bird will typically use the same roost over an extended period of time.

Runoff – The part of precipitation that appears in surface streams. The term describes precipitation that is not retained on the site where it falls and is not absorbed by the soil.

Scoping – Procedures agencies use to establish the extent of analysis necessary for a proposed action, (the term includes the range of actions, alternatives, and impacts to be addressed;

identification of significant issues related to a proposed action; and the depth of environmental analysis, data, and task assignments needed).

Sediment – Soil or particles of rock that have been transported to stream channels or other bodies of water. Sediment input comes from natural sources, such as erosion of soil, weathering of rock, agricultural practices, or construction.

Sensitive Species – designation used by BLM and FS applied to species that may become endangered or extinct in the state.

Significant – As used in NEPA, the determination of significance requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole and the affected region, interests, and locality. Intensity refers to the severity of impacts (Title 40 CFR Part 1508.27).

Sodium adsorption ration (SAR) - the Sodium Adsorption Ratio (SAR), is the proportion of sodium (Na) ions compared to the concentration of calcium (Ca) plus magnesium (Mg).

Special Status Species –Species of plants or animals that have appeared in the *Federal Register* as federally endangered, threatened, or proposed species under the Endangered Species Act; species identified by the Bureau of Land Management (BLM) or U.S. Forest Service (FS) as sensitive species, or species on an official state list.

Species of Special Concern – A native species designed by a state wildlife agency because its population is low and limited in distribution or because it has suffered significant reductions as a result of habitat loss.

Specific Conductance (measured in microhmhos per centimeter, abbreviated $\mu\text{mhos/cm}$) – A measure of electrical conductivity, or EC, in water that is influenced by the mineral content of the water.

Spring Creek Geographic Area (SCGA)

sulfur dioxide (SO₂) - a colorless, nonflammable gas with a penetrating odor that irritates the eyes and air passages. It reacts on the surface of a variety of airborne solid particles, is soluble in water and can be oxidized within airborne water droplets. The most common sources of sulfur dioxide include fossil fuel combustion.

sulfur oxides (SO_x) – SO, SO₂, or SO₃

target formation – The geological association of rocks that contain the exploitable mineral reserves.

threatened Species – Any species of animal or plant that is likely to become endangered within the near future throughout all or significant portions of its range. It has been designated in the *Federal Register* by the Secretary of the Interior as a threatened species. Disturbance of the habitat of threatened species is prohibited by the Endangered Species Act of 1973, as amended.

TBNG - Thunder Basin National Grassland

Total Dissolved Solids (TDS) – Total amount of dissolved material, organic or inorganic, contained in a sample of water.

United States Code (U.S.C.)

United States Department of the Interior (USDI)

United States Fish and Wildlife Service (USFWS)

United States Forest Service (USFS)

United States Geological Survey (USGS)

Volatile Organic Compounds (VOC) Volatile organic compounds are compounds that have a high vapor pressure and low water solubility. Many VOCs are human-made chemicals that are used and produced in the manufacture of paints, pharmaceuticals, and refrigerants. VOCs are often components of petroleum fuels, hydraulic fluids, paint thinners, and dry cleaning agents. VOCs are common ground-water contaminants.

water quality – Refers to a set of chemical, physical, or biological characteristics that describe the condition of a river, stream, or lake. The quality of water determines the beneficial uses it can

support. Different instream conditions or levels of water quality are needed to support different beneficial uses.

waters of the United States – A jurisdictional term from Section 404 of the Clean Water Act that refers to water bodies such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, where the use, degradation, or destruction could affect interstate or foreign commerce.

Watershed – All of the land that drains surface water to a specific stream above a designated point (usually its mouth); also called a stream drainage or drainage basin.

Well Pad – A level area constructed to drill a well.

Wetlands – Areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Winter Range – The place where migratory (and sometimes non-migratory) animals congregate during the winter.

Workover – Well maintenance that requires on-site mobilization of a drill rig to repair the well bore equipment (casing, tubing, rods, or pumps) or the wellhead. In some cases, a workover may involve development to improve production from the target formation.

Wyoming Ambient Air Quality Standards (WAAQS)

Wyoming Bird Conservation Plan (WBCP) - Conservation plan developed by the Wyoming state working group of PIF.

Wyoming Game and Fish Department (WGFD)

Wyoming Department of Environmental Quality (WDEQ)

Wyoming Pollution Discharge and Elimination System (WYPDES) - The Clean Water Act (CWA) of 1948 (33 U.S.C. 1251 et seq.) specifies permitting requirements for discharges of wastewater and storm water to waters of the United States under the National Pollutant Discharge Elimination System (NPDES) and for the protection of ambient water quality. The State of Wyoming has primacy over the administration of the CWA. The permitting system is the Wyoming Pollution Discharge and Elimination System.

Water Quality Divisions (WQD) – a division of the Wyoming Department of Environmental Quality.

(WSCO) Office of the Wyoming State Climatologist

Wyoming Oil and Gas Conservation Commission (WOGCC)

Wyoming State Engineer Office (WSEO)

Wyoming State Geological Society (WSGS)

Wyoming Statutes W.S.)

**APPENDIX D
INFORMATION REGARDING
DIRECTIONAL DRILLING AND CLUSTERING**

8-26-05

U.S. Forest Service
Douglas Ranger District
2250 East Richards Street
Douglas, WY 82633-8922
Attn: Mike Sierz, Land Use Authorization Specialist

RE: Wildhorse Field Development, Vertical vs. Directional Drilling

Dear Mike;

Please accept this letter with the supporting documents as Ballard Petroleum LLC s' response to one of the issues brought up by the scooping process for the referenced project.

The referenced project is a plan for the drilling of offsetting wells to the Wildhorse Federal # 2-18. This well was a New Field Discovery in the Muddy Formation. This discovery well was drilled & completed as a 250 + BOPD, 40 API gravity, 0 BWPD oil well during the summer of 2003. It was drilled vertically and fracture stimulated. At the onset of planning for field development, an interdisciplinary team discussed the pros and cons of various drilling and completion techniques, i.e. vertical vs. directional, slim hole vs. standard hole, short surface strings vs. long surface strings and single stage long string cement jobs vs. two stage long string cement jobs. The best applicable plan, considering all aspects & ramifications, was then and is still applicable today, is to drill the wells vertically, setting long surface casing strings and if production is warranted, setting 5 ½" casing to TD & cementing that casing with a single stage cement job covering about 1200' of formations.

Regarding the option to drill vertical wells versus directionally drilling multiple wells from a single well pad we believe it is in the best interest to most parties if the Wildhorse Project is developed using vertical well bores as supported by the following issues.

1. Regulations require the setting of surface casing to a minimum depth of 50' into the Pierre Shale. The average depth needed to accomplish this would be 1850' measured depth (MD).
2. The average depth to the productive Muddy Sandstone is 5500' measured depth.
3. Regulations require the use of standard well-to-well spacing requirements of a minimum 1100' between wellbores.
4. Each producing wellbore would require artificial lift to maximize production, with the most efficient process being the conventional rod pumping method.
5. Every available artificial lift method recommends no more than a 3degree per 100' dogleg severity for effective long-term wellbore use.
6. Preferred standard rod pumping wellbore configurations do not have greater than 15 degrees total angle in the hole.
7. Using current "best drilling practices" for vertical wells, it is anticipated that each well would take approximately 4 days to reach the decision point of whether the well is a producer or a dry-hole.
8. Using current "best drilling practices" for directionally drilled wells, it is anticipated that each directional well would take approximately 7 days to reach the decision point for the well being a producer or dry-hole.

9. As a minimum, all-inclusive drilling costs for a directional well would be 25 % higher than a vertical well.
10. In only 1 case would a multiple well pad operation eliminate more than a ¼ mile of access road on the U.S. Forest Service? This would be for the well # 21-20, which is the least likely vertical well to be drilled anyway.

As part of this discussion on the various options, Halliburton Energy Services, Directional Drilling Planning Services was enlisted to provide an updated drilling plan using the directional drilling option. We provided them only the following minimum standard parameters we did not want to exceed.

1. 1100' distance between surface location & bottom hole location intersection of the pay horizon.
2. No greater than a 3 degree / 100' build rate.
3. Measured depth to Muddy Formation Pay Zone is 5500'.
4. No maximum hole angle parameter.
5. No minimum or maximum depth for desired kick-off-point (KOP).

Attached you will find their Wildhorse Federal # 44-18, Plan # 1 proposal. This proposal would meet our minimum requirements but resulted in numerous operational problems. As operator, we believe these issues would result in a less than efficient and satisfactory wellbore for long-term production & resulting conservation of resources. A brief discussion of some of these problems follows:

1. The estimated KOP would still be in the surface casing portion of the hole. This would require larger directional drilling tools & add to the cost of the well even more.
2. Drilling from the #14-7 surface spot back to the west/northwest to the BHL of the # 44-18 would require the well to be drilled parallel with regional dip. With few exceptions, this results in the well needing directional steering almost immediately in order to maintain a well path that will still hit the intended BHL without exceeding dogleg severity parameters and again adding to the cost.
3. Reversing the drilling pattern would still require the access route and the normal amount of steering which would still result in a minimum of 25% added cost.
4. Conventional rod pumping applications generally recommend around a 15-degree maximum angle in the hole for long-term production operations. This plan has resulted in a 19degree hole angle. Although this is workable, any further reach from a surface spot to a bottom hole spot would result in a significantly larger hole angle and or higher KOP which would even more significantly add to the well costs. Higher drilling costs and added operational costs bring the economic limit higher resulting in less than efficient conservation of resources.

As the initial planning for this project developed, numerous on-site visits were conducted with both regulatory & industry representatives attending. Each site was reviewed and without exception, each well spot was move to some degree in order to best fit each concern from all disciplines. This cooperative effort did discuss the option of directional drilling at that time. Most participants concurred that there was high risk associated with exploratory drilling and that the well spots chosen at these meetings would place vertical wellbores in the least intrusive and most acceptable spots available concerning all regulations and species. As operator, we were charged to support a plan for field development with facts discovered during 2 years of field observations covering botany, archeology, wildlife and range issues. With the completion of the Environmental Analysis we are of the opinion that the best way to continue with the Wildhorse Field Development would be to drill additional exploratory wells vertically.

Please advise us via letter if you wish to discuss any of these issues in more detail & we thank you for your review in advance.

Sincerely

Michael Perius
Operations Superintendent

Enclosures



Ballard Petroleum Holdings, LLC

Campbell County, WY
Sec. 17-T54N-R69W
Wildhorse Federal #44-18
Plan #1

Plan: Plan #1 Proposal

Sperry-Sun Proposal Report

16 August, 2005

Local Coordinate Origin:	Centered on Well Wildhorse Federal #44-18
Viewing Datum:	RKB @ 4120.00ft (Original Well Elev)
TVDs to System:	N
North Reference:	True
Unit System:	API - US Survey Feet

HALLIBURTON



Plan Report for Wildhorse Federal #44-18 - Plan #1 - Plan #1 Proposal

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	Toolface Azimuth (°)
0.00	0.00	287.603	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	287.603	100.00	0.00	0.00	0.00	0.00	0.00	0.00	287.60
200.00	0.00	287.603	200.00	0.00	0.00	0.00	0.00	0.00	0.00	287.60
1,800.00	0.00	287.603	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00	287.60
Kick-Off at 1800.00ft										
1,802.00	0.050	287.603	1,802.00	0.00	0.00	0.00	2.50	2.50	0.00	287.60
Pierre										
1,900.00	2.50	287.603	1,899.97	0.66	-2.08	2.18	2.50	2.50	0.00	0.00
2,000.00	5.00	287.603	1,999.75	2.64	-8.31	8.72	2.50	2.50	0.00	0.00
2,100.00	7.50	287.603	2,099.14	5.93	-18.69	19.61	2.50	2.50	0.00	0.00
2,180.00	9.50	287.603	2,178.26	9.51	-29.96	31.43	2.50	2.50	0.00	0.00
Build Rate= 2.50°/100ft										
2,200.00	10.00	287.603	2,197.97	10.53	-33.19	34.82	2.50	2.50	0.00	0.00
2,300.00	12.50	287.603	2,296.04	18.43	-51.78	54.33	2.50	2.50	0.00	0.00
2,400.00	15.00	287.603	2,393.17	23.62	-74.44	78.09	2.50	2.50	0.00	0.00
2,500.00	17.50	287.603	2,489.17	32.08	-101.11	106.07	2.50	2.50	0.00	0.00
2,556.50	18.912	287.603	2,542.83	37.42	-117.93	123.72	2.50	2.50	0.00	0.00
End of Build at 2556.50ft										
2,600.00	18.912	287.603	2,583.99	41.68	-131.37	137.82	0.00	0.00	0.00	0.00
2,700.00	18.912	287.603	2,678.59	51.48	-162.27	170.24	0.00	0.00	0.00	0.00
2,800.00	18.912	287.603	2,773.19	61.28	-193.16	202.65	0.00	0.00	0.00	0.00
2,900.00	18.912	287.603	2,867.79	71.09	-224.05	235.06	0.00	0.00	0.00	0.00
3,000.00	18.912	287.603	2,962.39	80.89	-254.95	267.47	0.00	0.00	0.00	0.00
3,100.00	18.912	287.603	3,057.00	90.69	-285.84	299.89	0.00	0.00	0.00	0.00
3,200.00	18.912	287.603	3,151.60	100.49	-316.74	332.30	0.00	0.00	0.00	0.00
3,300.00	18.912	287.603	3,246.20	110.29	-347.63	364.71	0.00	0.00	0.00	0.00
3,400.00	18.912	287.603	3,340.80	120.10	-378.53	397.12	0.00	0.00	0.00	0.00
3,500.00	18.912	287.603	3,435.40	129.90	-409.42	429.54	0.00	0.00	0.00	0.00
3,600.00	18.912	287.603	3,530.00	139.70	-440.32	461.95	0.00	0.00	0.00	0.00
3,700.00	18.912	287.603	3,624.61	149.50	-471.21	494.36	0.00	0.00	0.00	0.00
3,800.00	18.912	287.603	3,719.21	159.30	-502.11	526.77	0.00	0.00	0.00	0.00
3,900.00	18.912	287.603	3,813.81	169.11	-533.00	559.18	0.00	0.00	0.00	0.00
4,000.00	18.912	287.603	3,908.41	178.91	-563.90	591.60	0.00	0.00	0.00	0.00
4,100.00	18.912	287.603	4,003.01	188.71	-594.79	624.01	0.00	0.00	0.00	0.00
4,173.98	18.912	287.603	4,073.00	195.96	-617.65	647.99	0.00	0.00	0.00	0.00
Niobrara										
4,200.00	18.912	287.603	4,097.61	199.51	-625.68	656.42	0.00	0.00	0.00	0.00
Hold Angle at 18.912°										
4,300.00	18.912	287.603	4,192.21	209.31	-656.58	688.83	0.00	0.00	0.00	0.00
4,400.00	18.912	287.603	4,286.82	219.12	-687.47	721.25	0.00	0.00	0.00	0.00
4,500.00	18.912	287.603	4,381.42	227.92	-718.37	753.66	0.00	0.00	0.00	0.00
4,600.00	18.912	287.603	4,476.02	237.72	-749.26	786.07	0.00	0.00	0.00	0.00
4,700.00	18.912	287.603	4,570.62	247.52	-780.16	818.48	0.00	0.00	0.00	0.00
4,800.00	18.912	287.603	4,665.22	257.32	-811.05	850.89	0.00	0.00	0.00	0.00
4,900.00	18.912	287.603	4,759.82	267.13	-841.95	883.31	0.00	0.00	0.00	0.00
5,000.00	18.912	287.603	4,854.42	276.93	-872.84	915.72	0.00	0.00	0.00	0.00
5,100.00	18.912	287.603	4,949.03	286.73	-903.74	948.13	0.00	0.00	0.00	0.00
5,200.00	18.912	287.603	5,043.63	296.53	-934.63	980.54	0.00	0.00	0.00	0.00
5,300.00	18.912	287.603	5,138.23	306.33	-965.53	1,012.96	0.00	0.00	0.00	0.00
5,400.00	18.912	287.603	5,232.83	316.14	-996.42	1,045.37	0.00	0.00	0.00	0.00
5,500.00	18.912	287.603	5,327.43	325.94	-1,027.31	1,077.78	0.00	0.00	0.00	0.00
5,557.68	18.912	287.603	5,382.00	331.59	-1,046.14	1,096.48	0.00	0.00	0.00	0.00
Mowry										
5,600.00	18.912	287.603	5,422.03	335.74	-1,058.21	1,110.19	0.00	0.00	0.00	0.00
5,700.00	18.912	287.603	5,516.64	345.54	-1,089.10	1,142.61	0.00	0.00	0.00	0.00
5,735.27	18.912	287.603	5,550.00	349.00	-1,100.00	1,154.04	0.00	0.00	0.00	0.00
WHF 44-18 Proposed BHL										
5,743.73	18.912	287.603	5,558.00	349.83	-1,102.61	1,156.78	0.00	0.00	0.00	0.00



Plan Report for Wildhorse Federal #44-18 - Plan #1 - Plan #1 Proposal

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	Toolface Azimuth (°)
Muddy										
5,800.00	18.912	287.603	5,611.24	355.34	-1,120.00	1,175.02	0.00	0.00	0.00	0.00
5,813.49	18.912	287.603	5,624.00	356.67	-1,124.17	1,179.39	0.00	0.00	0.00	0.00
Skull Creek										
5,900.00	18.912	287.603	5,705.84	365.15	-1,150.89	1,207.43	0.00	0.00	0.00	0.00
5,946.68	18.912	287.603	5,750.00	369.72	-1,165.32	1,222.56	0.00	0.00	0.00	0.00
Total Depth at 5946.68ft										

Based upon Minimum Curvature type calculations, at a Measured Depth of 5,946.68ft the Bottom Hole Displacement is 1,222.56ft in the Direction of 287.60° (Grid).

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,800.00	1,800.00	0.00	0.00	Kick-Off at 1800.00ft
2,180.00	2,178.26	9.51	-29.96	Build Rate= 2.50°/100ft
2,556.50	2,542.84	37.42	-117.93	End of Build at 2556.50ft
4,200.00	4,097.61	198.51	-626.68	Hold Angle at 18.912°
5,946.68	5,750.00	369.72	-1,165.31	Total Depth at 5946.68ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (ft)	+E/-W (ft)	Start TVD (ft)
Target	WHF 44-18 Proposed BHL	287.603	Slot	0.00	0.00	0.00

Targets associated with this wellbore

Target Name	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Shape
WHF 44-18 Proposed BHL	5,550.00	349.00	-1,100.00	Circle

Ballard Petroleum Holdings, LLC

Campbell County, WY

HALLIBURTON

North Reference Sheet for Sec. 17-T54N-R69W - Wildhorse Federal #44-18 - Plan #1

Coordinate System is US State Plane 1983, Wyoming Eastern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Transverse Mercator (Gauss-Kruger)

Central Meridian is -105.00°, Longitude Origin:0.00°, Latitude Origin:0.00°

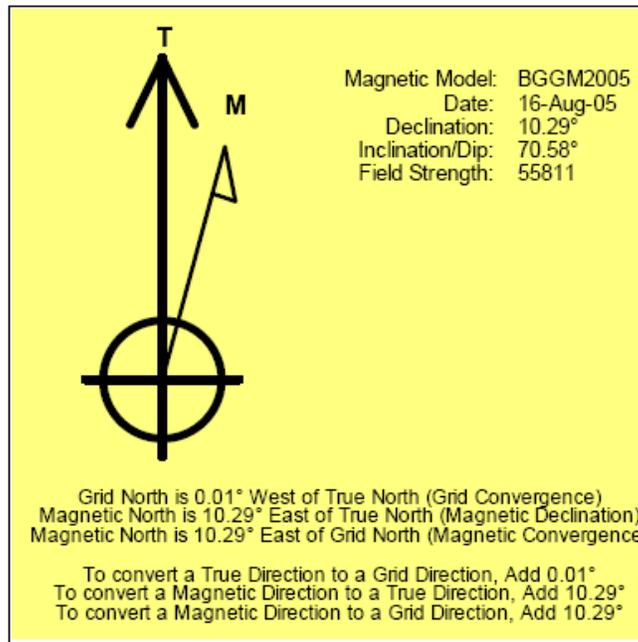
False Easting: 656,166.67ft, False Northing: 0.00ft, Scale Reduction: 0.99993753

Grid Coordinates of Well: 1,515,080.33, 651,477.94

Geographical Coordinates of Well: 44° 39' 26.74" N, 105° 11' 04.87" W

Grid Convergence at Surface is: -0.01°

Magnetic Convergence at surface is: -10.30° (16 August 2005, . BGGM2005)

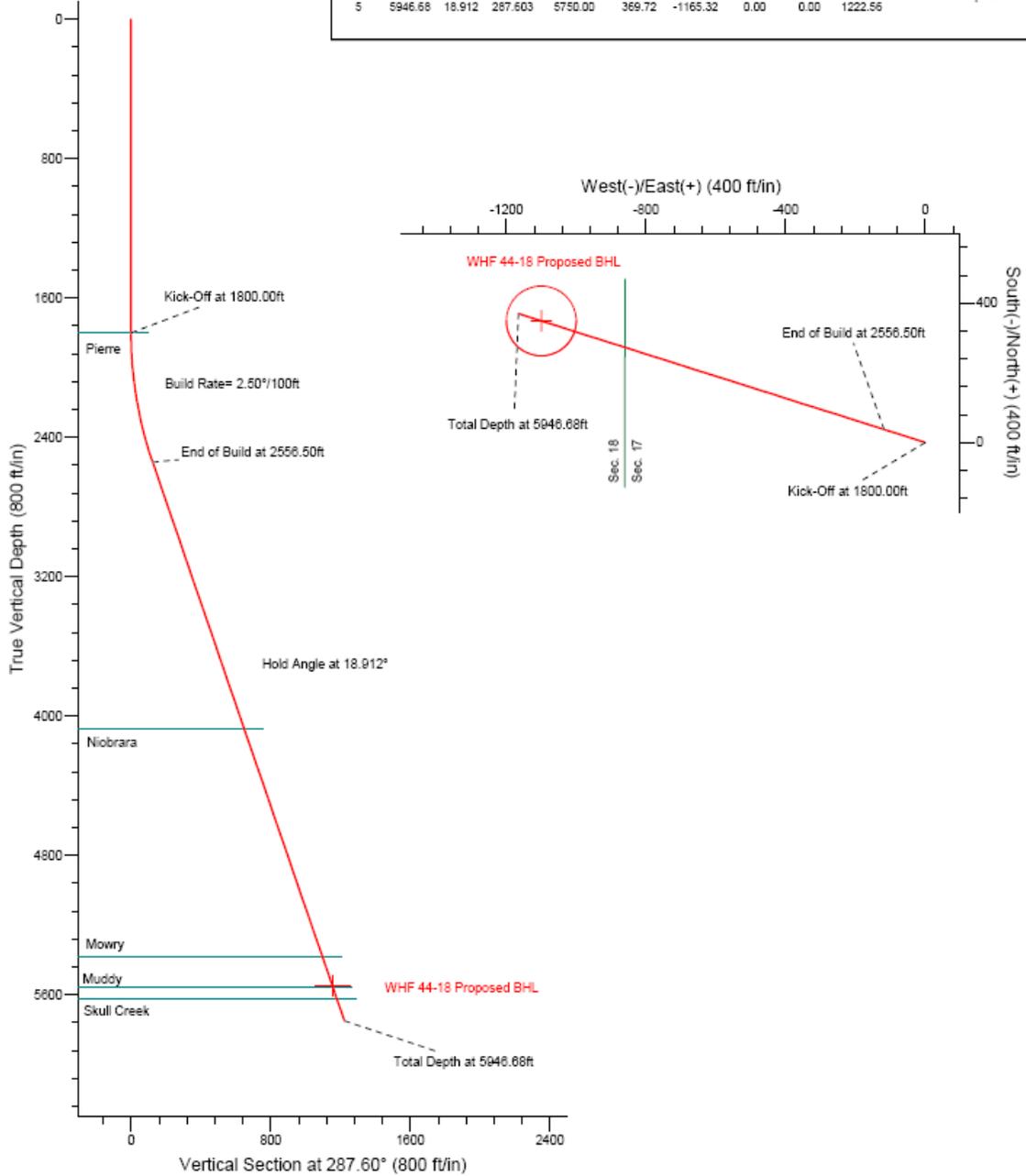


Project: Campbell County, WY
 Site: Sec. 17-T54N-R69W
 Well: Wildhorse Federal #44-18
 Wellbore: Plan #1
 Plan: Plan #1 Proposal

Ballard Petroleum Holdings, LLC



SECTION DETAILS										
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	DLeg	TFace	VSec	Target
1	0.00	0.000	287.603	0.00	0.00	0.00	0.00	0.00	0.00	
2	1800.00	0.000	287.603	1800.00	0.00	0.00	0.00	0.00	0.00	
3	2556.50	18.912	287.603	2542.83	37.42	-117.93	2.50	287.60	123.72	
4	5735.27	18.912	287.603	5550.00	349.00	-1100.00	0.00	0.00	1154.04	WHF 44-18 Proposed BHL
5	5946.68	18.912	287.603	5750.00	369.72	-1165.32	0.00	0.00	1222.56	



01/20/2006 12:59 PM

From [Randy Nordsven@blm.gov](mailto:Randy.Nordsven@blm.gov)

To Mike Sierz mlsierz@fs.fed.us

cc

Subject Ballard's proposal to develop Wildhorse Field

Mike, regarding this proposal, I had Barney Whiteman, petroleum engineer in our office, along with myself, review Ballard's development plans for this field. We both felt that Ballard was being reasonable in their development proposal for wanting to develop these wells vertically. The issue of pumping a directional well is excessive sucker rod wear. This is one of the oil industry's biggest concerns. Unless topography is the driving force, and vertical drilling is out of the question, they will really oppose directional drilling a well. The cost in their proposal to directional drill is quite in line with industry estimates, but their biggest concerns will be pumping these wells with dog legs in the tubing, and the added maintenance of sucker rod replacements. Hopefully, this will help with your decision.