DECISION RECORD
FOR
Pinnacle Gas Resources, Inc.
Cabin Creek Phase VI Federal POD
ENVIRONMENTAL ASSESSMENT –WY-070-10-094

DECISION: BLM's decision is to approve a combination of alternatives C and D as summarized below and described in the attached EA and authorize Pinnacle Gas Resources, Inc.'s Cabin Creek Phase VI Federal POD Coal Bed Natural Gas (CBNG) POD comprised of the following 40 Applications for Permit to Drill (APDs):

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	01-01	57N	77W	1	NENE	WYW144217
2	CABIN CREEK VI CB	03-01	57N	77W	1	NENW	WYW144217
3	CABIN CREEK VI CB	07-01	57N	77W	1	SWNE	WYW144217
4	CABIN CREEK VI CB	11-01	57N	77W	1	NESW	WYW144217
5	CABIN CREEK VI CB	13-01	57N	77W	1	SWSW	WYW144217
6	CABIN CREEK VI CB	01-02	57N	77W	2	NENE	WYW144217
7	CABIN CREEK VI CB	03-02	57N	77W	2	NENW	WYW144217
8	CABIN CREEK VI CB	05-02	57N	77W	2	SWNW	WYW144217
9	CABIN CREEK VI CB	07-02	57N	77W	2	SWNE	WYW144217
10	CABIN CREEK VI CB	09-02	57N	77W	2	NESE	WYW144217
11	CABIN CREEK VI CB	11-02	57N	77W	2	NESW	WYW144217
12	CABIN CREEK VI CB	13-02	57N	77W	2	SWSW	WYW144217
13	CABIN CREEK VI CB	15-02	57N	77W	2	SWSE	WYW144217
14	CABIN CREEK VI CB	03-03	57N	77W	3	NENW	WYW144217
15	CABIN CREEK VI CB	11-03	57N	77W	3	NESW	WYW144217
16	CABIN CREEK VI CB	12-03	57N	77W	3	NWSW	WYW144217
17	CABIN CREEK VI CB	07-04	57N	77W	4	SWNE	WYW141874
18	CABIN CREEK VI CB	09-10	57N	77W	10	NESE	WYW144217
19	CABIN CREEK VI CB	15-10	57N	77W	10	SWSE	WYW144217
20	CABIN CREEK VI CB	01-11	57N	77W	11	NENE	WYW144218
21	CABIN CREEK VI CB	03-11	57N	77W	11	NENW	WYW144218
22	CABIN CREEK VI CB	05-11	57N	77W	11	SWNW	WYW144218
23	CABIN CREEK VI CB	07-11	57N	77W	11	SWNE	WYW144218
24	CABIN CREEK VI CB	09-11	57N	77W	11	NESE	WYW144218
25	CABIN CREEK VI CB	13-11	57N	77W	11	SWSW	WYW144218
26	CABIN CREEK VI CB	03-12	57N	77W	12	NENW	WYW144218
27	CABIN CREEK VI CB	05-12	57N	77W	12	SWNW	WYW144218
28	CABIN CREEK VI CB	07-12	57N	77W	12	SWNE	WYW144218
29	CABIN CREEK VI CB	13-25	58N	77W	25	SWSW	WYW147351

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
30	CABIN CREEK VI CB	07-26	58N	77W	26	SWNE	WYW144225
31	CABIN CREEK VI CB	09-27	58N	77W	27	NESE	WYW144225
32	CABIN CREEK VI CB	15-27	58N	77W	27	SWSE	WYW144225
33	CABIN CREEK VI CB	07-34	58N	77W	34	SWNE	WYW144225
34	CABIN CREEK VI CB	09-34	58N	77W	34	NESE	WYW144225
35	CABIN CREEK VI CB	01-35	58N	77W	35	NENE	WYW144225
36	CABIN CREEK VI CB	03-35	58N	77W	35	NENW	WYW144225
37	CABIN CREEK VI CB	05-35	58N	77W	35	SWNW	WYW144225
38	CABIN CREEK VI CB	07-35	58N	77W	35	SWNE	WYW144225
39	CABIN CREEK VI CB	09-35	58N	77W	35	NESE	WYW144225
40	CABIN CREEK VI CB	11-35	58N	77W	35	NESW	WYW144225

SUMMARY OF SELECTED ALTERNATIVE

The approved action is Alternative C with additional individual components of Alternative D that will mitigate project-specific impacts to sage-grouse and their habitat.

The following water management infrastructure was inspected and approved for use in association with the water management strategy for the Cabin Creek VI POD. The two off channel impoundments are given a Secondary designation due to lack of bonds. Secondary water management facilities have been reviewed and analyzed but will not be "approved" until needed for water management. The operator will submit the request to construct via Sundry Notice and provide additional information as well as bonding as required.

Water Management Infrastructure Name / Number	Qtr/Qtr	Sec.	TWP	RNG	Surface Disturbance (Acres)	Lease #
Water Discharge Points (Direct to Powder River)	NENE	20	57N	77W	NA	Fee
Perry Stock Impoundment	SWSE	31	57N	76W	32.6	Fee
CB Fed 13-11 Injection Well (Secondary)	SWSW	11	57N	77W	0.5	WYW144218
C. Ritchie Pit #1(Secondary)	Lot 10	7	57N	76W	6.1	WYW144211
Pee-Gee #1 (Secondary)	NWSE	1	57N	77W	6.0	WYW144217

The following wells and associated infrastructure will be deferred until an adequate Class III cultural resource inventory and cultural site evaluations can be conducted.

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	15-03	57N	77W	3	SWSE	WYW144217
2	CABIN CREEK VI CB	11-12	57N	77W	12	NESW	WYW144218
3	CABIN CREEK VI CB	09-26	58N	77W	26	NESE	WYW144225

The following components of Alternative D are included in the selected alternative:

1. The following wells are denied due to wildlife impacts and poor reclamation potential.

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	09-01	57N	77W	1	NESE	WYW144217
2	CABIN CREEK VI CB	11-11	57N	77W	11	NESW	WYW144218
3	CABIN CREEK VI CB	05-26	58N	77W	26	SWNW	WYW144225
4	CABIN CREEK VI CB	05-34	58N	77W	34	SWNW	WYW144225

This approval is subject to adherence with all of the operating plans and mitigation measures contained in the Master Surface Use Plan of Operations, Drilling Plan, Water Management Plan, and information in individual APDs. This approval is also subject to operator compliance with all mitigation and monitoring requirements contained within the Powder River Oil and Gas Project Final Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003.

RATIONALE: The decision to authorize the selected alternative, as summarized above, is based on the following:

1. The Operator, in their POD, has committed to:
   - Comply with all applicable Federal, State and Local laws and regulations.
   - Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
   - Offer water well agreements to the owners of record for permitted water wells within 0.5 mile of a federal CBNG producing well in the POD.
   - Provide water analysis from a designated reference well in each coal zone.
2. The Operator has certified that a Surface Use Agreement has been reached with the Landowners.
3. The selected alternative will not result in any undue or unnecessary environmental degradation.
4. It is in the public interest to approve these wells, as approval of this development will help meet the nation's future needs for energy reserves, and will help to stimulate local economies by maintaining stability for the workforce.
5. The selected alternative incorporates appropriate local greater sage-grouse research and the best available science from across the species' range in development of the attached conditions of approval.
6. Mitigation measures from the range of alternatives were selected to best meet the purpose and need, and will be applied by the BLM to alleviate environmental impacts. Four wells from the proposed action are denied for the following reasons:
   - The 9-1 well because of limited potential for reclamation success and the amount of surface disturbance. See Section 4.2.1 in EA.

- 11-11 well because of fragmentation of large stands of sagebrush necessary for winter and nesting habitat for sage grouse. See Section 4.2.2.4.2.1 in EA.
- 5-26 well because of fragmentation of large stands of sagebrush necessary for winter and nesting habitat for sage grouse. See Section 4.2.2.4.2.1 in EA.
- 5-34 well because it is in line of sight and within a 0.25 mile of a raptor nest. See Section 4.1.5.6 in EA.

7. Approval of this alternative is in conformance with the *Powder River Basin Oil and Gas Project Environmental Impact Statement and Proposed Plan Amendment* (PRB FEIS), *Record of Decision and Resource Management Plan Amendments for the Powder River Basin Oil and Gas Project* (PRB FEIS ROD), ((refer to Appendix E of that document relative to adaptive management), and the Approved Resource Management Plan (RMP) for the Public Lands Administered by the Bureau of Land Management, Buffalo Field Office (BFO), April 2001

8. The selected alternative incorporates components of the Wyoming Governor's Sage Grouse Implementation Team's "core population area" strategy, the Governor's executive order, and local research to provide mitigation for sage-grouse, while meeting the purpose and need for the Cabin Creek Phase VI Federal POD Project.

ADMINISTRATIVE REVIEW AND APPEAL: Under BLM regulations, this decision is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received.

Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Field Manager: _____ Date: 3/11/2010

FINDING OF NO SIGNIFICANT IMPACT
FOR
Pinnacle Gas Resources, Inc.
Cabin Creek Phase VI Federal POD
ENVIRONMENTAL ASSESSMENT –WY-070-10-094

FINDING OF NO SIGNIFICANT IMPACT: Based on the analysis of the potential environmental impacts, I have determined that NO significant impacts are expected from the implementation of the selected alternative, and, therefore, an environmental impact statement is not required.

In conformance with Appendix E of the PRB FEIS ROD, the BLM BFO has initiated actions within the PRB FEIS analysis area in response to additional information regarding impacts to sage-grouse. These measures include:

1. Early initiation of a Resource Management Plan (RMP) revision, based on the evaluation of monitoring data generated under the mitigation monitoring and reporting plan (MMRP) in the PRB FEIS Record of Decision

2. Establishment of sage-grouse Focus Areas, encompassing approximately 1 million acres of sage-grouse habitat. These areas are managed under strict guidelines designed to preserve sage-grouse habitat for development of alternatives during the RMP process.

3. Initiation of a population viability analysis in the Powder River Basin. This is a 24-month project involving the U.S. Geological Survey (USGS), BLM Miles City Field Office, BLM BFO, and the University of Montana.

4. Development of alternatives that modify the proposed action to reflect the findings of the best available science regarding sage-grouse management.

5. Development of conditions of approval, specific to sage-grouse management, that incorporate some recommendations from recent research, the Northeast Local Sage-grouse Working Group, the Wyoming Game and Fish Department (WGFD), BLM, and the Petroleum Association of Wyoming.

The implementation of the selected alternative best meets the stated purpose and need for the proposed action. With the application of mitigating measures selected from alternatives C and D, combined with incorporation of the larger planning actions and research initiated by the State of Wyoming and BLM, BFO sage-grouse population viability in the Powder River Basin should not be compromised.

Field Manager: _____ Date: 3/11/2010

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Pinnacle Gas Resources, Inc.
Cabin Creek Phase VI Federal POD
PLAN OF DEVELOPMENT
WY-070-10-094

INTRODUCTION

This site-specific analysis tiers into and incorporates by reference the information and analysis contained in the Powder River Basin Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS), #WY-070-02-065 (approved April 30, 2003), pursuant to 40 CFR 1508.28 and 1502.21. This document is available for review at the BLM Buffalo Field Office (BFO). This project environmental assessment (EA) addresses site-specific resources and impacts that were not covered within the PRB FEIS.

1. PURPOSE AND NEED

The purpose and need of this EA is to determine how and under what conditions to allow Pinnacle Gas Resources, Inc. to exercise lease rights granted by the United States to develop the oil and gas resources on federal leaseholds as described in their proposed action.

Development of the Cabin Creek Phase VI Federal POD wells would return royalties to the federal Treasury as well as stimulate local economies.

The BLM recognizes the extraction of natural gas is essential to meeting the nation's future needs for energy. As a result, private exploration and development of federal gas reserves are integral to the agencies' oil and gas leasing programs under the authority of the Mineral Leasing Act of 1920, as amended, and the Federal Land Policy Management Act (FLPMA) of 1976. The oil and gas leasing program managed by BLM encourages the development of domestic oil and gas reserves and reduction of the U.S. dependence on foreign sources of energy.

This action responds to the goals and objectives outlined in the 1985 Buffalo RMP and the PRB FEIS. This action helps move the project area toward desired conditions for mineral development with appropriate mitigation consistent with the goals, objectives and decisions outlined in these two documents.

1.1. Conformance with Applicable Land Use Plan and Other Environmental Assessments:

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS. The BFO RMP revision began in December of 2008 and is expected to be completed in 2012.

1.2. Resource Issues:

Proposed Action and Management of Sage Grouse Habitat:

For the RMP revision, BFO established Focus Areas with rigorous interim protections in order to preserve "decision space" during the revision process. Outside the Focus Areas, BFO continues to apply appropriate, but less rigorous, site-specific mitigating measures for sage-grouse habitat as recommended by the best available science. Actions within BFO Focus Areas will be limited to impacts consistent with 640 acre spacing, and must have a plan of development that demonstrates that the proposal can be

managed in a manner that effectively conserves sage-grouse habitats (in Focus Areas) affected by the proposal.

The Cabin Creek Phase VI Federal POD does not occur within a focus area. However, high quality nesting, brood-rearing and winter sage-grouse habitat, as indicated by the University of Montana model, occurs throughout the project area.

Lack of Cultural Inventories:
Cultural resource inventory deficiencies, noted during the project analysis, could not be completed by the original cultural contractor, Foothills Archaeological Consultants. Pinnacle Gas Resources hired a second contractor to finish the work (Cultural Resource Analysts, Inc.). However, inclement weather led to delays in finishing the cultural resource inventory and the deficiencies were never completed. Therefore, approval of actions in these locations is recommended to be deferred, pending a completed Class III cultural resource inventory.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Four alternatives, A, B, C and D, were evaluated in determining how to best meet the stated purpose and need of the proposed action. A brief description of each alternative follows.

2.1. Alternative A - No Action

A No Action Alternative was considered in the PRB FEIS, Volume 1, pages 2-54 through 2-62. This alternative would consist of no new federal wells. An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove, and dispose of all oil and gas deposits" in the lease lands, "subject to the terms and conditions incorporated in the lease." Thus, under this alternative, the operator's proposal would be denied.

2.2. Alternative B- Proposed Action

Alternative B summarizes the Cabin Creek Phase VI Federal POD Project as originally submitted to the BLM by Pinnacle Gas Resources, Inc., prior to any BLM review or modifications.

Proposed Action Title/Type: Pinnacle Gas Resources, Inc.'s Cabin Creek Phase VI Federal POD Plan of Development (POD) for 66 APDs, including 65 CBNG wells and 1 injection well, and associated infrastructure.

Proposed Well Information: There are 66 wells (65 CBNG wells and 1 injection well) proposed within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each CBNG well will potentially produce from 4 coal seams (Cook, Canyon, Wall and Pawnee). The wellhead and accompanying structure will require a maximum area of approximately 20' x 20'. Well house color is Covert Green, selected to blend with the surrounding vegetation. The proposed wells are located as follows:

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	01-01	57N	77W	1	NENE	WYW144217
2	CABIN CREEK VI CB	03-01	57N	77W	1	NENW	WYW144217
3	CABIN CREEK VI CB	05-01	57N	77W	1	SWNW	WYW144217
4	CABIN CREEK VI CB	07-01	57N	77W	1	SWNE	WYW144217
5	CABIN CREEK VI CB	09-01	57N	77W	1	NESE	WYW144217
6	CABIN CREEK VI CB	11-01	57N	77W	1	NESW	WYW144217

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
7	CABIN CREEK VI CB	13-01	57N	77W	1	SWSW	WYW144217
8	CABIN CREEK VI CB	15-01	57N	77W	1	SWSE	WYW144217
9	CABIN CREEK VI CB	01-02	57N	77W	2	NENE	WYW144217
10	CABIN CREEK VI CB	03-02	57N	77W	2	NENW	WYW144217
11	CABIN CREEK VI CB	05-02	57N	77W	2	SWNW	WYW144217
12	CABIN CREEK VI CB	07-02	57N	77W	2	SWNE	WYW144217
13	CABIN CREEK VI CB	09-02	57N	77W	2	NESE	WYW144217
14	CABIN CREEK VI CB	11-02	57N	77W	2	NESW	WYW144217
15	CABIN CREEK VI CB	13-02	57N	77W	2	SWSW	WYW144217
16	CABIN CREEK VI CB	15-02	57N	77W	2	SWSE	WYW144217
17	CABIN CREEK VI CB	03-03	57N	77W	3	NENW	WYW144217
18	CABIN CREEK VI CB	05-03	57N	77W	3	SWNW	WYW144217
19	CABIN CREEK VI CB	09-03	57N	77W	3	NESE	WYW144217
20	CABIN CREEK VI CB	11-03	57N	77W	3	NESW	WYW144217
21	CABIN CREEK VI CB	12-03	57N	77W	3	NWSW	WYW144217
22	CABIN CREEK VI CB	15-03	57N	77W	3	SWSE	WYW144217
23	CABIN CREEK VI CB	01-04	57N	77W	4	NENE	WYW141874
24	CABIN CREEK VI CB	07-04	57N	77W	4	SWNE	WYW141874
25	CABIN CREEK VI CB	09-04	57N	77W	4	NESE	WYW141874
26	CABIN CREEK VI CB	01-10	57N	77W	10	NENE	WYW144217
27	CABIN CREEK VI CB	03-10	57N	77W	10	NENW	WYW144217
28	CABIN CREEK VI CB	07-10	57N	77W	10	SWNE	WYW144217
29	CABIN CREEK VI CB	09-10	57N	77W	10	NESE	WYW144217
30	CABIN CREEK VI CB	15-10	57N	77W	10	SWSE	WYW144217
31	CABIN CREEK VI CB	01-11	57N	77W	11	NENE	WYW144218
32	CABIN CREEK VI CB	03-11	57N	77W	11	NENW	WYW144218
33	CABIN CREEK VI CB	05-11	57N	77W	11	SWNW	WYW144218
34	CABIN CREEK VI CB	07-11	57N	77W	11	SWNE	WYW144218
35	CABIN CREEK VI CB	09-11	57N	77W	11	NESE	WYW144218
36	CABIN CREEK VI CB	11-11	57N	77W	11	NESW	WYW144218
37	CABIN CREEK VI CB	13-11	57N	77W	11	SWSW	WYW144218
38	CABIN CREEK VI CB	13-11 INJ	57N	77W	11	SWSW	WYW144218
39	CABIN CREEK VI CB	15-11	57N	77W	11	SWSE	WYW144218
40	CABIN CREEK VI CB	11-12	57N	77W	12	NESW	WYW144218
41	CABIN CREEK VI CB	01-12	57N	77W	12	NENE	WYW144218
42	CABIN CREEK VI CB	03-12	57N	77W	12	NENW	WYW144218
43	CABIN CREEK VI CB	05-12	57N	77W	12	SWNW	WYW144218
44	CABIN CREEK VI CB	07-12	57N	77W	12	SWNE	WYW144218
45	CABIN CREEK VI CB	11-25	58N	77W	25	NESW	WYW147351
46	CABIN CREEK VI CB	13-25	58N	77W	25	SWSW	WYW147351

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
47	CABIN CREEK VI CB	15-25	58N	77W	25	SWSE	WYW147351
48	CABIN CREEK VI CB	05-26	58N	77W	26	SWNW	WYW144225
49	CABIN CREEK VI CB	07-26	58N	77W	26	SWNE	WYW144225
50	CABIN CREEK VI CB	09-26	58N	77W	26	NESE	WYW144225
51	CABIN CREEK VI CB	11-26	58N	77W	26	NESW	WYW144225
52	CABIN CREEK VI CB	09-27	58N	77W	27	NESE	WYW144225
53	CABIN CREEK VI CB	15-27	58N	77W	27	SWSE	WYW144225
54	CABIN CREEK VI CB	09-33	58N	77W	33	NESE	WYW144227
55	CABIN CREEK VI CB	05-34	58N	77W	34	SWNW	WYW144225
56	CABIN CREEK VI CB	07-34	58N	77W	34	SWNE	WYW144225
57	CABIN CREEK VI CB	09-34	58N	77W	34	NESE	WYW144225
58	CABIN CREEK VI CB	11-34	58N	77W	34	NESW	WYW144225
59	CABIN CREEK VI CB	01-35	58N	77W	35	NENE	WYW144225
60	CABIN CREEK VI CB	03-35	58N	77W	35	NENW	WYW144225
61	CABIN CREEK VI CB	05-35	58N	77W	35	SWNW	WYW144225
62	CABIN CREEK VI CB	07-35	58N	77W	35	SWNE	WYW144225
63	CABIN CREEK VI CB	09-35	58N	77W	35	NESE	WYW144225
64	CABIN CREEK VI CB	11-35	58N	77W	35	NESW	WYW144225
65	CABIN CREEK VI CB	13-35	58N	77W	35	SWSW	WYW144225
66	CABIN CREEK VI CB	15-35	58N	77W	35	SWSE	WYW144225

Water Management Proposal: The following impoundments were proposed as "secondary" for use in association with the water management strategy for the POD. Secondary water management facilities will be included in the review and analyzed but will not be "approved" until needed by the operator for water management. At that time, the operator will submit the request to construct via Sundry Notice and provide additional information as well as bonding as required.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	C. Ritchie Pit #1	Lot 10	7	57N	76W	31.22	6.1	WYW144211
2	Pee-Gee #1	NWSE	1	57N	77W	18.28	6.0	WYW144217

County: Sheridan

Applicant: Pinnacle Gas Resources, Inc.

Surface Owners: Schauer Enterprises, LLC-Mike Schauer, PeeGee Ranch-Giles W. Pritchard-Gordon, Clifton J. Ritchie, US DOI-BLM

Project Description:
The proposed action involves the following:

- Drilling of 66 (65 CBNG wells and 1 injection well) wells in 4 coal zones to depths of

- approximately 1140 feet. Multiple seams will be produced by co-mingling production (a single well per location capable of producing from multiple coal seams).

- Drilling and construction activities are anticipated to be completed within two years, the term of an APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners may impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire POD.

- Well metering shall be accomplished by telemetry/well visitation. Routine metering and maintenance would entail 1 visit per week to each well.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 1 proposed injection well which would be drilled to 4000 feet, an existing EMIT treatment facility with associated outfalls, 2 proposed off channel impoundments and associated discharge points within the Middle Powder River primary watershed.

- An unimproved and improved road network.

- An above ground power line network to be constructed by the operator. The proposed route has not been reviewed by the contractor. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction has not been scheduled and will not be completed before the CBNG wells are producing. If the power line network is not completed before the wells are in production, then temporary diesel generators or diesel bi-fuel generators shall be placed at the 11 power drops.

- A storage tank of 500-1000 gallon capacity shall be located with each diesel or diesel bi-fuel generator. Generators are projected to be in operation for 4-6 months or until overhead power is installed. Fuel deliveries are anticipated to be 2 times per week for diesel generators and 2 times per month for diesel bi-fuel generators. Noise mufflers will be installed on the exhaust of engines to reduce the exhaust noise.

- A buried gas, water and power line network.

- One compression facility.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and WMP in the POD and individual APDs. Also see the subject POD for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production and standard practices is also available in the PRB FEIS, Volume 1, pages 2-9 through 2-40 (January 2003).

Implementation of committed mitigation measures contained in the MSUP, Drilling Program and WMP, in addition to the Standard COAs contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

Additionally, the Operator, in their POD, has committed to:

1. Comply with all applicable Federal, State and Local laws and regulations.

2. Obtain the necessary permits for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
3. Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD
4. Provide water analysis from a designated reference well in each coal zone.

The Operator has certified that a Surface Use Agreement has been reached with the Landowners and that a copy of the Master Surface Use Plan has been provided to each landowner.

2.3. Alternative C – Modified Proposed Action

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of the project modifications of the initial project proposal (Alternative B) identified by BLM and the operator. At the on-sites, all areas of proposed surface disturbance were inspected to insure that the project would meet BLM multiple use objectives to conserve natural resources while allowing for the extraction of Federal minerals. In some cases, access roads were re-routed, well locations, pipelines, discharge points and other water management control structures were moved, modified, mitigated or dropped from further consideration to alleviate environmental impacts. Alternatives to the different aspects of the proposed action are always considered and applied as pre-approval changes, site specific mitigation, and/or Conditions of Approval (COAs), if they will alleviate environmental effects of the operator's proposal.

Alternative C also incorporates the results of sage-grouse habitat mapping efforts in the project area and on-site verification of habitat suitability. This alternative represents BFO efforts to reduce project-specific impacts to sage-grouse habitat while maintaining proposed spacing and infrastructure requirements consistent with the purpose and need of the proposed action.

Returned Wells:

The following APDs were submitted with errors or without components necessary to be considered complete APDs. The BFO provided the operator with a deficiency letter that outlined the necessary information to correct and submit in order for the APD's to be considered complete. The operator failed to submit the requested corrections and components within the 45 day timeframe outlined in Onshore Order #1, and therefore the following wells are being returned:

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	05-01	57N	77W	1	SWNW	WYW144217
2	CABIN CREEK VI CB	15-01	57N	77W	1	SWSE	WYW144217
3	CABIN CREEK VI CB	05-03	57N	77W	3	SWNW	WYW144217
4	CABIN CREEK VI CB	09-03	57N	77W	3	NESE	WYW144217
5	CABIN CREEK VI CB	01-04	57N	77W	4	NENE	WYW141874
6	CABIN CREEK VI CB	09-04	57N	77W	4	NESE	WYW141874
7	CABIN CREEK VI CB	01-10	57N	77W	10	NENE	WYW144217
8	CABIN CREEK VI CB	03-10	57N	77W	10	NENW	WYW144217
9	CABIN CREEK VI CB	07-10	57N	77W	10	SWNE	WYW144217
10	CABIN CREEK VI CB	13-11 INJ	57N	77W	11	SWSW	WYW144218
11	CABIN CREEK VI CB	15-11	57N	77W	11	SWSE	WYW144218

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
12	CABIN CREEK VI CB	01-12	57N	77W	12	NENE	WYW144218
13	CABIN CREEK VI CB	11-25	58N	77W	25	NESW	WYW147351
14	CABIN CREEK VI CB	11-26	58N	77W	26	NESW	WYW144225
15	CABIN CREEK VI CB	09-33	58N	77W	33	NESE	WYW144227
16	CABIN CREEK VI CB	11-34	58N	77W	34	NESW	WYW144225
17	CABIN CREEK VI CB	13-35	58N	77W	35	SWSW	WYW144225
18	CABIN CREEK VI CB	15-35	58N	77W	35	SWSE	WYW144225

Due to issues identified at the onsite inspection, the operator requested in letter dated January 8, 2010 that the following well be returned:

Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
CABIN CREEK VI CB	15-25	58N	77W	25	SWSE	WYW147351

Subsequent to the time of POD submittal, the water management strategy has changed. The operator has discontinued the use of the EMIT treatment facility. Pinnacle received an approved modified Wyoming Pollutant Discharge Elimination System (WYPDES) permit from the Wyoming Department of Environmental Quality (Permit # WY0056162) to discharge untreated produced water directly to the Powder River using Assimilative Capacity Credits. They will use an existing water discharge point located in Sec 20 T57N R76W. In the months that there are no Assimilative Capacity Credits available (August and September) the water will be discharged to an existing impoundment as approved under WYPDES Permit #WY0055204. A portion of the water will be used for land application disposal. Additionally, because the proposed injection well APD was returned for uncorrected deficiencies, injection will become a secondary option for water management and will not be approved until the APD is resubmitted and approved.

2.3.1. Changes as a result of the on-sites

Overhead Power:

Overhead Power lines were removed from the project. The operator is consulting with Powder River Energy regarding load requirements, and at this time the operator is unsure how much power will be provided from the Lower Powder River Road side and how much power will be provided from the Passaic Road side. The operator is also not sure if they would contract the installation of the power lines or if Powder River Energy would install the power lines.

Compression Facility:

One compression facility was proposed in the NENW of Section 36, T58N, R77W, but was dropped from further consideration due to the fact that there is no need for an additional station. The operator has 3 other compressor stations approved for use but yet to be built in Cabin Creek Phase III and Cabin Creek Phase V.

		Changes Agreed to at the Onsite for Cabin Creek VI
	Well #	Changes
1	7-12	The well location was changed from a slot to a non-constructed pad. Road is engineered from intersection across drainage then primitive road to the well site.
2	7-1	Template road from bottom to crest of hill then primitive road to well site.

		Changes Agreed to at the Onsite for Cabin Creek VI
	Well #	**Changes**
3	3-12	The well location was changed from a slot to a non-constructed pad. The location is on an old reclaimed oil pad. Access is a primitive road from main road to the drainage, where it was changed from spot upgrade to improved template due to length.
4	13-1	The location is a drive-through location next to the main road.
5	11-2	A turnout will be constructed at this location.
6	15-11	The location is a drive-through location, changed from a slot to a non-constructed well pad. The well was moved 60ft W to minimize fragmentation of sage grouse habitat.
7	11-11	The road and pipeline corridor will be limited to 20ft disturbance width and will follow the natural breaks in the sagebrush to reduce sage grouse habitat fragmentation.
8	3-11	Drive-through location
9	9-3	The well location was changed from a slot to a non-constructed pad. The well was moved 50ft to South.
10	3-3	Drive-through location
11	1-10	Moved well slightly so that the pad will fit the topography. Re-engineered pad due to only 1 well being proposed.
12	9-10	Drive-through location
15	11-34	Moved well ±75ft to the West to avoid tight location and to avoid taking out a large ponderosa pine.
16	5-34	This well is line of sight of a raptor nest and is within a ¼ mile of the nest-recommend denial.
17	1-1	Moved well 20ft to the North to a flatter location
18	3-35	Moved well 50ft to the West to a clearing
19	7-4	Moved well 20-25ft to the East to a more level location
20	9-27	Moved well 60ft to the South to avoid a slot location
21	11-35	Moved well 75-100ft to South to avoid a slot location
22	15-27	Changed well location from a slot to a non-constructed pad
23	15-35	Moved well 25-50ft to Southeast at landowner's request; changed from a non-constructed pad to a slot
24	15-25	The location was dropped by the operator; can drill from a fee location to the north.

2.3.2. Site Specific Conditions of Approval, Alternative C

1. No surface disturbing activities will be authorized on federal lands prior to the approval of a Pesticide Use Permit (PUP) unless Pinnacle Gas Resources Inc. provides documentation and the BLM Authorized Officer approves of:

   - Current year weed survey with photos showing that no state listed invasive and/or noxious species are present in the areas to be disturbed.

2. All drainage ditches and culverts shall be kept clear and free flowing, and will also be maintained in accordance with the original construction standards. If any additional erosion occurs during the life of the project, the company needs to control it through additional culverts or wing ditches.

3. All engineered road segments must be completed, including any culverts, low water crossings and required surfacing, before the drilling rig or other drilling equipment moves onto the pad.

4. The following road will have a 10 mph design speed posted on both sides of the road to inform travelers of the reduced stopping sight distance and reduced meeting sight distance:
11-02-5777

5. For all wells spudded after November 1, the reserve pit fluids must be removed and the pits closed prior to spring wildlife restrictions, unless an exception is granted by the BLM authorized officer.

6. All pit spoil must be placed back in the pit once dry. If necessary, the pit area should be mounded slightly or restored to the original contour to allow for settling and positive surface drainage.

7. No salvaged trees will be pushed up against live trees or buried in the spoil material.

8. All trees salvaged from the construction of the well locations/access roads will be clearly segregated from the spoil material, to prevent burying of trees in the spoil material.

9. All salvaged trees will either be chipped and used in reclamation of the well location/access road, hauled off, used for erosion control, or per the surface owner's wishes.

10. Improved roads with utility corridor working width will not exceed 50 feet with a clearing and blading not to exceed 40 feet in width unless a specific design is included in the plan and profile section of the master surface use plan.

11. Primitive roads with utility corridor working width will not exceed 40 feet with a clearing and blading not to exceed 30 feet in width.

12. Pipeline installation and/or corridors without road access working width will not exceed 35 feet with clearing and blading not to exceed 20 feet.

13. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a diameter of 75 feet or less from the well stake.

14. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the Cabin Creek VI Federal POD is Covert Green.

15. The following well locations and access road/corridor in the project area have been identified to have limited reclamation potential, and require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, etc.) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within 30 days of the initiation of construction activities.

	Well Name	**Well #**	**TWP**	**RNG**	**Section**	**Qtr/Qtr**	**Lease #**
1	CABIN CREEK VI CB	05-02	57N	77W	2	SWNW	WYW144217
2	CABIN CREEK VI CB	11-02	57N	77W	2	NESW	WYW144217
3	CABIN CREEK VI CB	15-02	57N	77W	2	SWSE	WYW144217
4	CABIN CREEK VI CB	05-12	57N	77W	12	SWNW	WYW144218
5	CABIN CREEK VI CB	05-34	58N	77W	34	SWNW	WYW144225

16. The operator will seed on the contour to a depth of no more than 0.5 inch. To maintain quality and purity, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

15-19" Precipitation Zone
Loamy Ecological Site Seed Mix

Species - *Cultivar*	**% in Mix**	**Lbs PLS***
Western Wheatgrass - *Rosana*	20	2.4
Idaho fescue – *Joseph* **OR** Spike fescue	30	3.6
Green needlegrass - *Lodorm*	30	3.6
Rocky Mountain beeplant *(Cleome serrulata)*	10	1.2
White – *Antelope* or Purple Prairie Clover - *Bismarck*	5	0.6
Lewis - *Appar*, Blue, or Scarlet flax	5	0.6
Totals	**100%**	**12 lbs/acre**

*PLs = pure live seed. Northern Plains adapted species double this rate if broadcast seeding.

Realty:

1. The approval of this project does not grant authority to use off lease Federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective which is the date signed by the authorized officer.

2.3.2.1. Wildlife

2.3.2.1.1. Raptors:

1. No surface disturbing activity shall occur within 0.5 mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey. Surveys shall be conducted by a biologist following the most current BLM protocol. All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities. A 0.5 mile timing restriction will be applied if a nest is identified as active. This timing limitation will affect the following:

BLM Nest ID	**Infrastructure**
554	Well 5-34, access and utility corridor.
5285	Well 13-34, access and utility corridor. Meter drop in Section 4.
5287	Well 13-34, access and utility corridor. Meter drop in Section 4.
5288	Wells 12-3 and 13-34, access and utility corridors. Meter drop in Section 4.
5308	Well 12-3, access and utility corridor.
5309	Wells 12-3, 15-3, 11-3, access and utility corridors.
5701	Well 5-34, access and utility corridors.
5704	Wells 7-35, 5-35, 1-35, access and utility corridors.
5705	Wells 1-35, 7-35, 9-26, 13-25, access and utility corridors.
5706	Wells 13-25, 9-26, 1-35, access and utility corridors.
5707	Well 9-35, Meter drop and stock tank in Section 35.
5708	Wells 5-2, 13-2, 11-3, 15-3, 3-11, access and utility corridors.
5709	Wells 5-2, 3-3, 9-34, 13-35, access and utility corridors. Stock tank in Section 3.
5710	Wells 3-3, 5-34, 7-34, 9-34, 13-34, access and utility corridors.

BLM Nest ID	Infrastructure
5712	Well 15-27 access and utility corridor.
5713	Wells 5-26, 7-26, access and utility corridors. Stock tank in Section 26.

2. Surveys for new raptor nests shall be conducted, annually, within 0.5 miles of the POD boundary on or after April 15, and prior to or during the first nest occupancy check.

3. Nest occupancy checks shall be completed for all raptor nests identified within a 0.5 mile of any infrastructure associated with the POD for as long as the POD is under construction. Once construction of the POD has ceased, nest occupancy checks shall continue for the first five years on all identified nests within a 0.5 mile of the POD boundary. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31of each survey year.

4. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.

5. Well metering, maintenance and other site visits within 0.5 miles of raptor nests should be minimized during the breeding season (February 1 – July 31).

2.3.2.1.2. Sage-Grouse:

The following conditions will reduce impacts to sage-grouse:

1. No surface disturbing activities are permitted within the Cabin Creek VI POD boundary between March 1 and June 15 to protect nesting and brood-rearing sage-grouse. This condition will be implemented on an annual basis for the life of the project. This timing limitation applies to the entire project area.

2. Disruptive activity is restricted on or within a 0.25 mile radius of the perimeter of occupied or undetermined sage-grouse leks from 6:00 pm to 8:00 am from March 15-May15. "Disruptive activities are those that "…require people and/or activity to be in nesting habitats for a duration of 1 hour or more during a 24 hour period…" (BLM 2009). This condition applies to the Remington sage-grouse lek located within 0.25 mile of the access road passing through T57N, R76W, section 19.

2.3.2.1.3. Sharp-Tailed Grouse:

The following conditions will alleviate impacts to sharp-tailed grouse:

1. Disruptive activities are prohibited within 0.25 mile of the Fence Creek Road sharp-tailed grouse lek located NWSW section 29 T58N, R77W between April 1 and May 31, prior to completion of a grouse lek survey. This condition will be implemented on an annual basis for the life of the project. This timing limitation will affect the access road passing within 0.25 mile of the lek.

2.3.2.2. Water Management

1. Sundry notices will be provided to BLM for approval if the secondary impoundments will be added to the water management infrastructure. Impoundments located over Federal mineral will be bonded for the amount of the reclamation estimate with the Wyoming State Office of the BLM. Impoundments over fee mineral will require proof of impoundment reclamation bonding with the WDEQ or WOGCC.

2. The proposed injection well 13-11 Inj SWSW Sec 11 T57N R77W, is not approved with this action. If the operator intends to install this well for water management, a new APD must be provided to the BLM for approval.

3. The operator will provide a copy of the approved Wyoming State Engineer's Office (WSEO) SW-3 permit and the modification for the impoundment located in the SWSE Section 31 T57N R76W as well as proof of bonding with the WDEQ.

4. WYPDES Permit #WY0055204 requires full containment in the impoundment located at SWSE Section 31 T57N R76W. Therefore, the impoundment will not be allowed to discharge except as a result of a storm event.

2.3.2.3. Cultural

All surface disturbing activity in the following areas will be monitored by BLM cultural resource use Permit (CRUP) holder or permitted crew chief. These areas were identified as having poor surface visibility during the class III inventory by Cultural Resource Analysts Inc. The submission of two copies of a monitoring report to BFO is required within 30 days of the completion of all monitoring work.

1. All surface disturbing activity associated with the construction of the following wells and associated infrastructure:
   T57N R77W: 13-01, 3-10, 07-10, 09-10, 15-10, 09-11, 13-11, 11-12
   T58N R77W: 11-25, 07-26, 09-33, 07-34, 03-35, 05-35, 13-35

2. All surface disturbing activity associated with the construction of the following wells:
   T57N R77W: 11-01, 07-11, 01-12, 05-12, 07-12

3. All surface disturbing activity associated with the construction of the following infrastructure:
   T58N R77W: Infrastructure leading to 05-25, 11-26, 11-34 wells
   Infrastructure along Fence Creek RD in sections 33, 34, and 35
   T58N R77W: Infrastructure along Fence Creek RD in section 3

4. All surface disturbance activity associated with the construction of the Pee Gee #1 and C. Ritchie #1 reservoirs.

2.3.3. Programmatic Conditions of Approval

2.3.3.1. Soils

1. The Companies, on a case by case basis depending upon water and soil characteristics, will test sediments deposited in impoundments before reclaiming the impoundments. Tests will include the standard suite of cations, ions, and nutrients that will be monitored in surface water testing and any trace metals found in the CBNG discharges at concentrations exceeding detectable limits.

2.3.3.2. Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.
2. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-1 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

2.3.3.3. Air Quality

1. During construction, emissions of particulate matter from well pad and resource road construction will be minimized by application of water, or other dust suppressants, with at least 50% control efficiency. Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced or otherwise stabilized to reduce the amount of fugitive dust generated by

traffic or other activities, and dust inhibitors (surfacing materials, non-saline dust suppressants, and water) could be used as necessary on unpaved collector, local and resource roads that present a fugitive dust problem. The use of chemical dust suppressants on BLM surface will require prior approval from the BLM authorized officer.

2.4. Alternative D - Sage Grouse Emphasis

Alternative D represents a modification of Alternative C based on the application of mitigation measures designed to reduce impacts across multiple resources, including sage-grouse and sage-grouse habitat. Alternative D is the same as Alternative C with the addition of the project-level modifications identified by BLM, guided by sage-grouse research within the Powder River Basin and across the species' range. Alternative D represents BFO efforts to reduce project-specific impacts to sage-grouse habitat, while maintaining drainage requirements consistent with the purpose and need of the proposed action.

In conjunction with project-level modifications, site-specific measures applied for specific wells and infrastructure would maintain open corridors for sage-grouse, provide contiguous habitat patches, and reduce disturbance in and adjacent to modeled high quality sage-grouse habitat.

This alternative incorporates mitigation designed around site-specific habitat characteristics to minimize habitat fragmentation and accelerate the return of effective habitat upon reclamation.

The project-level modifications identified for the Cabin Creek Phase VI Federal POD Alternative D are listed below:

1. The following wells would be denied due to impacts to wildlife and reclamation potential:
    a. CB Fed 5-26: Access road would impact habitat connectivity in high quality sage-grouse nesting habitat and well is within 0.25 mile of a raptor nest.
    b. CB Fed 5-34: Within 0.25 mile and direct line-of-sight of a raptor nest and impacts habitat connectivity in high quality sage-grouse habitat.
    c. CB Fed 9-01: High-gradient slope location with poor reclamation potential, also within high quality sage-grouse nesting habitat.
    d. CB Fed 11-11: Well site and access would impact habitat connectivity in high quality sage-grouse nesting habitat.

2.4.1. Programmatic and Site specific mitigation measures – Alternative D

All programmatic and site specific measures from Alternative C apply.

2.5. Alternatives Considered but not Analyzed in Detail

1. Class V shallow injection systems (horizontal pipe networks) or Subsurface Drip Irrigation-this alternative was eliminated from further consideration because of uncertain regulatory compliance and cost effectiveness.
2. Misters-this alternative was eliminated from further consideration because of concern regarding soil salinity.

2.6. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure originally proposed by the operator (Alternative B), and the infrastructure within the BLM/operator modified proposals (Alternative C and Alternative D) are presented below.

Table 2.1 Summary of the Alternatives
Figures within alternatives B-D represent the additional proposed facilities and do not include the existing facilities.

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Proposed Action) Proposed Number/ Acres/Miles	Alternative C (Modified Proposed Action) Revised Number/ Acres/Miles	Alternative D (Environmental Alt. I) Revised Number/ Acres/Miles
Total CBNG Wells	0	65	44	40
Well Locations Nonconstructed Constructed Slotted	 0 0 0	 53 or 15.9 acres 7 or 4.37 acres 5 or 0.4 acres	 36 or 10.8 acres 4 or 2.27 acres 4 or 0.32 acres	 35 or 10.5 acres 2 or 1.25 acres 3 or 0.24 acres
Injection Wells	0	1 Twin well included in slot above	0	0
Compressors Number of Compressors	0	1 5 acres	0	0
Template/ Spot Upgrade Roads No Corridor With Corridor	5.1 miles 30.9 acres	18.44 miles 0 111.8 acres	16.3 miles 0 98.8 acres	17.7 miles 0 107.3 acres
Engineered Roads No Corridor With Corridor	0	3.66 miles 0 22.2 acres	2.43 miles 0 14.7 acres	2.26 miles 0 13.7 acres
Primitive Roads No Corridor With Corridor	5.5 miles 16.7 acres	7.73 miles 0 37.5 acres	6.83 miles 0 33.1 acres	6.11 miles 0 29.6 acres
Buried Power No Corridor With Corridor	0	26.83 miles 1.37 mi or 3.3 acres Accounted with the roads above	Same as Alt B	Sames as Alt B
Overhead Powerlines	0	8.8 miles 32.11 acres	0	0
Treatment Facilities	1 existing 4.6 acres	Same as Alt A	Same as Alt A	Same as Alt A
Impoundments On-channel Off-channel Lined Unlined	1 1 0 32.6 Acres	0 0 0 0 0	Same as Alt B	Same as Alt B

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Proposed Action) Proposed Number/ Acres/Miles	Alternative C (Modified Proposed Action) Revised Number/ Acres/Miles	Alternative D (Environmental Alt. I) Revised Number/ Acres/Miles
Water Discharge Points	2	0 0acres	Same as Alt B	Same as Alt B
TOTAL ACRES DISTURBANCE	**52.2 acres**	**200.5 acres**	**163.3 acres**	**165.6 acres**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

This section describes the environment that would be affected by implementation of the Alternatives described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues.

Applications to drill were received on December 21, 2007. Field inspections of the proposed Cabin Creek Phase VI Federal POD CBNG project were conducted on 7/21/09, 7/22/09, 7/23/09, 7/27/09, 7/30/09, 9/17/09, 10/27/09, and 11/3/2009 by:

DATE	NAME	TITLE	AGENCY
7/21, 7/22, 7/23, 7/27, 7/30, 9/17, 10/27, 11/3/09	Mary Maddux	Natural Resource Specialist	BLM-Buffalo Field Office
7/22, 7/23/09, 10/27/09	Clint Crago	Archaeologist	BLM-Buffalo Field Office
7/22, 7/23/09, 10/27/09	Ardy Hahn	Archaeologist	BLM-Buffalo Field Office
7/22, 7/23/09	Jodi Crago	Archaeologist Technician	BLM-Buffalo Field Office
7/21/09	Casey Freise	NRS/Hydrologist	BLM-Buffalo Field Office
7/21, 7/22, 7/23, 7/27, 7/30/09, 10/27/09	Pat Cole	Wildlife Biologist	BLM-Buffalo Field Office
7/21, 7/22, 7/23, 7/27, 7/30/09, 10/27/09, 11/3/09	Don Brewer	Wildlife Biologist	BLM-Buffalo Field Office
7/21, 7/22, 7/23, 7/27, 7/30/09, 10/27/09	Stacy Gunderson	Civil Engineer	BLM-Buffalo Field Office
7/21, 7/22, 7/23, 7/27, 7/30, 9/17, 10/27, 11/3/09	Scott Straessler	Project Manager	Pinnacle Gas Resources Inc.
7/21, 7/22, 7/27, 7/30/09, 10/27/09	Manny Rodriguez	Field Technician	Pinnacle Gas Resources Inc.
7/21, 7/22, 7/23, 7/27/09	April Kohler	GIS/Field Technician	Pinnacle Gas Resources Inc.
7/21/09	Terry Webster	Hydrology	Pinnacle Gas Resources Inc.

DATE	NAME	TITLE	AGENCY
10/27/09	Bill Ostheimer	Wildlife Biologist	BLM-Buffalo Field Office
9/17/09	Mike Schauer	Landowner	Schauer Enterprises
9/17/09	Larry Sare	Landman	Pinnacle Gas Resources Inc.

3.1. Topographic Characteristics of Project Area

The Cabin Creek VI project area is located approximately 17 miles north of Arvada, Wyoming. The project area is accessed from 2 main entry points. The first is off of the Passaic County Road in Section 30 of T57N/R78W, and the second is off of the Lower Powder River Road in Section 31 of T57N/R76W, going through Pinnacle Phase 3.

The elevation in the project area ranges from 3,700 to 4,200 feet above sea level. The area varies from flat, grassy pastures that are next to the main drainages, to moderately rough to rough terrain with many steep draws and ridges. The ridgetops are generally fairly flat, broad plateaus bisected by steep draws and side slopes. A mixture of grasses and sagebrush covers the ridgetops, and juniper and ponderosa pine trees grow on the steep draws and side slopes. Some of the steeper draws have active headcuts, with erosion due to snow runoff and precipitation events. Livestock grazing and CBNG development are the primary land uses at this time. The surface ownership is a combination of fee and federal surface.

3.2. Vegetation & Soils

3.2.1. Soils

Using the Natural Resource Conservation Service, (NRCS, USDA), Technical Guides for the Major Land Resource Area 58B Northern Rolling High Plains, in the 15-19" Northern Plains precipitation zone, the landforms, soils and predominant ecological sites occurring within the proposed POD are found to be Loamy to Shallow Loamy, as shown in table 3.1:

Table 3.1 Summary of Ecological Sites

Ecological Site	Acres	Percent
CLAYEY (15-19 NP)	409	7
LOAMY (15-19 NP)	2372	41
SANDY (15-19 NP)	298	5
SHALLOW LOAMY (15-19 NP)	2573	45

<u>Loamy/Shallow Loamy Ecological Site Description:</u>

Loamy soils: Loamy sites occur on hill slopes with associated alluvial fans and stream terraces and occur on land ranging from nearly level up to 50% slopes. These soils are deep to moderately deep (greater than 20" to bedrock), well-drained & moderately permeable. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick. These layers consist of the A horizon with very fine sandy loam, loam, or silt loam texture and may also include the upper few inches of the B horizon with sandy clay loam, silty clay loam or clay loam texture.

Shallow loamy soils: Shallow Loamy sites generally occur on hill sides, ridges and escarpments and occur on steep slopes and ridge tops, but may occur on all slopes. These the soils are shallow (less than 20"to bedrock) well-drained soils formed in alluvium over residuum or residuum. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind except igneous which is virtually impenetrable to plant roots. The surface soil will have one or more of the following textures: very fine sandy loam, loam, silt loam, sandy clay loam, silty clay loam, and clay loam. Thin ineffectual layers of other textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick.

Erosion and reclamation potential of soils varies throughout the project area, but the majority of the wells in the Cabin Creek Phase VI POD are proposed in areas of steep slopes (Table 3.2) or poor reclamation potential (Table 3.3):

Table 3.2 Dominant soils affected by the Cabin Creek VI POD include

Map Unit	Map Unit Name	Acres	Percent
237	RENOHILL, MOIST-ULM ASSOCIATION, 3 TO 10 PERCENT SLOPES	409	7
119	CEDAK-RECLUSE ASSOCIATION, 3 TO 6 PERCENT SLOPES	2372	41
148	HARGREAVE-MOSKEE ASSOCIATION, 3 TO 9 PERCENT SLOPES	298	5
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	2573	45

Table 3.3 Reclamation Potential in the Cabin Creek VI POD

Reclamation Potential	Acres	Percent
Moderate	1587	28
Poor	3810	66
Good	373	6

The following well is in areas of both high erosion and poor reclamation potential:

	Well Name	Well #	TWP	RNG	Section	Qtr/Qtr	Lease #
1	CABIN CREEK VI CB	09-01	57N	77W	1	NESE	WYW144217

Impacts associated with this well are analyzed in section 4.2.1 under Alternative D.

3.2.2. Roads

The existing roads located within the Cabin Creek VI POD boundary vary from primitive to surfaced crown and ditch. The existing road network is used for both ranch activities and Oil and Gas development. Over 50% of the existing roads are primitive roads, and a majority of these have ruts from overuse and/or use during inclement weather. The existing template roads have fewer ruts and less road damage than the primitive roads, especially in areas where drainage is controlled. Some of the existing roads will be utilized for accessing proposed Cabin Creek VI Federal wells. The additional average daily traffic associated with the Cabin Creek VI POD will result in more road maintenance and in some cases, upgrades.

3.2.3. Vegetation

To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and from the Natural Resources Conservation Service published soil survey soils information.

The wells and infrastructure in the project area are located in areas of loamy and shallow loamy soils, which support a Mixed Sagebrush/Grass Plant Community and a Western Wheatgrass/Cheatgrass Plant Community.

Mixed Sagebrush/Grass Plant Community

Historically, this plant community evolved under grazing by bison and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush management. Big sagebrush is a significant component of this plant community. A mix of warm and cool-season grasses make up the majority of the understory with the balance made up of annual cool-season grasses, and miscellaneous forbs.

Dominant grasses include needleandthread, western wheatgrass, little bluestem and green needlegrass. Grasses of secondary importance include blue grama, prairie junegrass, and Sandberg bluegrass. Forbs commonly found in this plant community include plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Sagebrush canopy ranges from 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear can also occur.

When compared to the Historic Climax Plant Community, sagebrush and blue grama have increased. Production of cool-season grasses, particularly green needlegrass, has been reduced. The cool-season mid-grasses are protected by the sagebrush canopy, but this protection makes them unavailable for grazing. Cheatgrass (downy brome) has invaded the site. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope.

This plant community is resistant to change. A significant reduction of big sagebrush can only be accomplished through fire or brush management. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Western Wheatgrass/Cheatgrass Plant Community

This plant community is created when the Mixed Sagebrush/Grass Plant Community or the Heavy Sagebrush Plant Community is subjected to fire or brush management not followed by prescribed grazing. Rhizomatous wheatgrasses and annuals will dominate the site.

Cheatgrass has increased, with western wheatgrass and thickspike wheatgrass maintaining at a similar or slightly higher level. Virtually all other cool-season mid-grasses are severely decreased. Blue grama is the same or slightly less than found in the HCPC. Plant diversity is low.

3.2.4. Wetlands/Riparian

Fence Creek and Big Remington Creek are large ephemeral systems typical of this part of the country. There are isolated portions of both these drainages where wetland/riparian areas are apparent. These isolated pockets can contain short reaches of flowing water, pockets of standing water and occasional stands of cottonwood trees. Within the project boundary, Big Remington Creek is primarly a deeply incised gully with nearly vertical sidewalls and a narrow (less than 100 feet wide) flat-bottomed floodplain. Any guide channel would only occur intermittently within this system. Flows in Big Remington Creek are due to snowmelt events or thunderstorms. The latter type of occurrence is characterized by a very large flow of water in a very short time, the proverbial “wall of water”.

Fence Creek exhibits characteristics of ephemeral systems which border on intermittent. Within the project area the floodplain is much better developed and broader, grading into the first terrace, which abuts the steep gully sides. Isolated individuals and small stands of cottonwoods occur along this system through the project area.

3.2.5. Invasive Species

The Integrated Pest Management Plan (IPM) submitted by the operator identified Leafy Spurge, Houndstongue, and Canada Thistles as noxious weeds present within the project area. Common

lambstongue, Burdock, and Black Henbane were identified as species of concern within the Cabin Creek Phase VI Project area. The following state-listed noxious weeds and/or weed species of concern infestations were discovered by a search of BLM GIS metadata collated from information provided by Johnson and Campbell County Weed and Pest:

- Leafy Spurge

Additionally, the operator or BLM confirmed the following infestations and/or documented additional weed species during subsequent field investigations:

- Leafy Spurge

The state-listed noxious weeds are listed in PRB FEIS Table 3-21 (p. 3-104) and the Weed Species of Concern are listed in Table 3-22 (p. 3-105.

3.3. Wildlife

Several resources were consulted to identify wildlife species that may occur in the proposed project area. Resources that were consulted include the wildlife database compiled and managed by the BLM Buffalo Field Office (BFO) wildlife biologists, the PRB FEIS, the Wyoming Game and Fish Department (WGFD) big game and sage-grouse maps, and the Wyoming Natural Diversity Database (WYNDD).

A habitat assessment and wildlife inventory surveys of the Cabin Creek VI project area were performed by Western Land Services in 2007 and 2008 (Martini and Aksamit 2007, Western Land Services 2008). Western Lands Services performed surveys for bald eagle nesting and roosting habitat, raptor nest occupancy and productivity, greater sage-grouse and sharp-tailed grouse lek and nesting habitat, black-tailed prairie dog colony delineation, mountain plover breeding and nesting habitat and activity, and Ute ladies'-tresses orchid habitat. All surveys were conducted according to the Powder River Basin Interagency Working Group's protocols (available on the BFO internet website at http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html).

BLM biologists conducted field visits on July 21-23, 27, 30, October 27, and November 3, all in 2009. During that time, the biologists verified the wildlife survey information, evaluated impacts to wildlife resources, and recommended project modifications where wildlife issues arose. Wildlife species common to the habitat types present are identified in the PRB FEIS (pg. 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.

3.3.1. Threatened and Endangered and Sensitive Species

3.3.1.1. Threatened and Endangered Species

Within the BLM Buffalo Field Office there are three species that are Threatened or Endangered under the Endangered Species Act.

3.3.1.1.1. Black-footed ferret

The black-footed ferret is listed as Endangered under the ESA. The affected environment for black-footed ferrets is discussed in the PRB FEIS on pg. 3-175. WGFD has identified seven prairie dog complexes, located partially or wholly within the BFO administrative area, as potential black-footed ferret reintroduction sites (Grenier et al. 2004). The Cabin Creek VI project area is located approximately seven miles north of the Arvada complex, the nearest potential reintroduction area.

A black-footed ferret population requires at least 1,000 acres of prairie dog colonies, separated by no more than 1.5 km, for survival (USFWS 1989). Two black-tailed prairie dog colonies were identified within 0.75 miles of the project boundary by Western Lands Services, covering approximately 133 acres. Black-footed ferret habitat is not present within the project area.

3.3.1.1.2. Blowout Penstemon

Blowout penstemon is listed as Endangered under the ESA. It is a regional endemic species with documented populations in the Sand Hills of west-central Nebraska and the northeastern Great Divide Basin of Carbon County, Wyoming. Suitable blowout penstemon habitat consists of sparsely vegetated, early successional, shifting sand dunes and blowout depressions created by wind. In Wyoming, the habitat is typically found on sandy aprons or the lower half of steep sandy slopes deposited at the base of granitic or sedimentary mountains or ridges.

The Cabin Creek VI project area does not contain areas with these characteristics, and blowout penstemon is not expected to occur.

3.3.1.1.3. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is listed as Threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS on pg. 3-175.

The PRB FEIS reported that only four orchid populations had been documented within Wyoming, but since the writing of that document, five additional sites were located in 2005 and one in 2006 (Heidel pers. comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. A WYNDD model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties.

Western Lands Services surveyed for potential Ute ladies'-tresses habitat in the project area and concluded that the area has limited potential to support the species. No perennial streams were located and the ephemeral drainages did not possess the hydrology necessary to propagate the orchid.

3.3.1.2. Sensitive Species

Wyoming BLM has prepared a list of sensitive species on which management efforts should be focused towards maintaining habitats under a multiple use mandate. The goals of the policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems
- Ensure sensitive species are considered in land management decisions
- Prevent a need for species listing under the ESA
- Prioritize needed conservation work with an emphasis on habitat

This section lists those species on the Wyoming BLM sensitive species list that, according to the PRB FEIS, may occur in the Powder River Basin Oil and Gas Project Area, which includes the Cabin Creek Phase VI Federal POD project area. The following discussion for each of those sensitive species includes an analysis of whether the species is likely to occur in or be affected by the proposed Cabin Creek Phase VI Federal POD. According to the PRB FEIS, spotted bats were not likely to be affected by the Powder River Basin Oil and Gas Project, and are therefore not discussed in this section. The authority for the sensitive species policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

3.3.1.2.1. Baird's Sparrow

The affected environment for Baird's sparrow is discussed in the PRB FEIS on pg. 3-188. In addition to being listed as a Wyoming BLM sensitive species, Baird's sparrows are listed by USFWS as a BCC for Region 17. Baird's sparrows nest in extensive grasslands and mesic-meadow areas that support dense residual vegetation and litter accumulation. Habitat is present in the project area.

3.3.1.2.2. Bald Eagle

The affected environment for bald eagles is described in the PRB FEIS on pg. 3-175. At the time the PRB FEIS was written, the bald eagle was listed as a threatened species under the ESA. Due to successful recovery efforts, it was removed from the ESA on 8 August 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, the BLM shall continue to comply with all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (PRB Oil & Gas Project BO), #WY07F0075) (USFWS 2007) shall continue to be complied with.

In addition to being listed as a Wyoming BLM sensitive species, bald eagles are a WGFD SGCN with a NSS2 rating, due to populations being restricted in numbers and distribution, ongoing loss of habitat, and sensitivity to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region17.

The project area is approximately 2.5 miles from bald eagle winter roosting habitat along the Powder River and approximately 6.7 miles north of the nearest documented bald eagle nest. Roosting habitat is present in upland areas containing mature ponderosa pines and in cottonwood trees along Fence Creek.
Bald eagle observation made during field surveys conducted between January 13, 2006 and February 14, 2008 by Western Lands Services are given in Table 3.4.

Table 3.4 Bald Eagle Winter Roost Survey Results for Cabin Creek VI POD.

Survey Date	Time	Location	Observations/ Comments
1/26/06	0720-0900	4980331N 417197E	Aerial Survey, 1 Mature, 1 Immature bald eagle
12/6/06	0700-0900	4979764N 415436E	1 Mature bald eagle perched in dead ponderosa pine
12/10/07	0700-0800	Fence Creek	1 mature
12/19/07	0810-0840		No eagles
12/27/07	0800-0915		No eagles
01/02/08	0731-0915	Fence Creek	2 immature bald or golden eagles
2/14/08	0715-0800	Prairie dog town	1 mature

3.3.1.2.3. Brewer's Sparrow

The affected environment for Brewer's sparrow is discussed in the PRB FEIS on pg. 3-200. In addition to being listed as a BLM Wyoming sensitive species, Brewer's sparrows are a WGFD SGCN, with a rating of NSS4 because populations are declining, habitat is vulnerable with no ongoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

The Brewer's sparrow is dependent on shrub-dominated plant communities that provide protective cover, song perches, and nest sites. The Brewer's sparrow nests in sagebrush throughout the species' range. Brewer's sparrow habitat is present in the project area.

3.3.1.2.4. Ferruginous Hawk

The affected environment for ferruginous hawk is discussed in the PRB FEIS on pg. 3-183. In addition to being listed as a Wyoming BLM sensitive species, ferruginous hawks are a WGFD SGCN, with a rating of NSS3 because the species is widely distributed, population status and trends are unknown but are suspected to be stable, they are experiencing ongoing loss of habitat, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

According to the BLM data base, ferruginous hawk populations within the Powder River Basin have declined in recent years. Ferruginous hawks are sensitive to human disturbance; pairs may abandon nests even when mildly disturbed during nest building or incubation (Smith and Murphy 1978, White and Thurow 1985, Olendorff 1993, Washington Department of Fish and Wildlife 1996). Furthermore, disturbed nests fledge fewer young, and they often are not reoccupied the year following disturbances (White and Thurow 1985). Rather than becoming acclimated to repeated disturbance, ferruginous hawks become sensitized and flush at greater distances (White and Thurow 1985), which may result in increased clutch or brood mortality due to exposure, predation, starvation, or nest desertion.

Foraging habitat and prey is available throughout the project area, and although no ferruginous hawk nests were found in survey efforts, they may occur in the project area.

3.3.1.2.5. Greater Sage-Grouse

The Greater sage-grouse is listed as a sensitive species by BLM (Wyoming). In recent years, several petitions have been submitted to the USFWS to list greater sage-grouse as Threatened or Endangered. On March 5, 2010, the USFWS issued a proposed rule, finding that listing the greater sage-grouse as threatened was warranted, but precluded by other listing priorities (FWS-R6-ES-2010-0018).

There are 5,769 acres within the Cabin Creek POD boundary, of which 3,066 acres (53%) are modeled high quality nesting habitat and 1,317 acres (23%) are high quality winter habitat. Sage-grouse winter and nesting habitats overlap and occur on flat topography that is separated by less suitable steeper slopes often supporting ponderosa pine-Rocky Mountain juniper woodlands. Sagebrush ecosystems are diverse and composed of native shrubs, grasses, and forbs although some areas include a significant component of exotic annual brome grasses.

BLM guidance is to maintain open corridors for sage-grouse, provide contiguous habitat patches, and reduce disturbance in and adjacent to modeled high quality sage-grouse habitat (IM WY-2010-012). The following Cabin Creek VI wells and infrastructure are located in areas of high quality sage-grouse habitat that could affect corridor width or habitat continuity:

CB Fed 5-26: Access road
CB Fed 5-34: Well location
CB Fed 9-01: Well location
CB Fed 11-11: Access road and well location

Impacts to sage-grouse leks due to oil and gas development are discernible to a distance of four miles, and some leks may be extirpated within this distance (Walker et al. 2007, Walker 2008). WGFD records indicate that seven sage-grouse leks occur within four miles of the project area; six occupied and one undetermined (Table 3.5).

Table 3.5 Sage-grouse leks within 4 miles of the Cabin Creek VI POD boundary.

Lek Name	Legal Location	Distance from Project Area (mi)	Management Status
41-MT State Line	T9SR46ES34 NENW	3.54	occupied
41-Remington Creek	T57NR76WS19 NWSW	1.59	occupied
PO-41	T9SR45ES34 SE	3.70	occupied
PO-42	T9SR45ES36 SWNW	2.68	occupied
PO-45	T9SR46ES20 SW	3.51	occupied
PO-46	T9SR46ES29 E1/2	2.87	occupied
PO-46A	T9SR46ES30 SE	2.67	undetermined

Eighteen sage-grouse leks occur within the 11-mile effects analysis area; 12 occupied and six undetermined. Radio-locations show that sage-grouse trapped on leks in Montana moved to other seasonal habitats (i.e., April-January 2008 and 2009) within the 11-mile effects analysis area. Portions of the Cabin Creek VI POD and planned future developments (e.g., Cabin Creek VIII POD) occur in habitat identified by Montana BLM as crucial sage-grouse habitat (BLM-MCFO 2008). This area lies between a Wyoming sage-grouse focus area and crucial sage-grouse habitat in Montana and likely functions as a linkage zone (see Chapter 4,figure 2). This area was identified by Doherty et al. (in press) as one where high habitat value is juxtaposed with high risk due to potential future energy development. Doherty et al. (2008) noted that while CBNG development is pervasive over much of the PRB, some suitable habitat remains. However, as these areas are developed, it is uncertain that sage-grouse can adapt to anticipated impact magnitudes.

3.3.1.2.6. Loggerhead Shrike

In addition to being listed as a Wyoming BLM sensitive species, loggerhead shrikes are listed by USFWS as a BCC for Region 17. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating they are in need of monitoring. Loggerhead shrike habitat, which is open prairies with brush and tree, is present throughout the project area, and the species is suspected to occur. The affected environment for loggerhead shrike is discussed further in the PRB FEIS on pg. 3-187.

3.3.1.2.7. Mountain Plover

Mountain plovers are a BLM sensitive species typically associated with high, dry, short grass prairies (BLM 2003). Mountain plover nesting habitat is often associated with heavily grazed areas such as prairie dog colonies and livestock pastures. The affected environment for mountain plover is discussed further in the PRB FEIS on pg. 3-177 to 3-178.

Small, isolated patches of suitable mountain plover habitat are present within the project area. However, the rolling terrain of the project area limits its suitability for mountain plover. No mountain plovers were observed during surveys conducted in May and June 2008 (Martini and Aksamit 2007).

3.3.1.2.8. Sage Sparrow

Sage sparrows are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, habitat is restricted but not undergoing significant loss, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a Bird of Conservation Concern (BCC) for Region 17. Considered a sagebrush obligate, the Sage Sparrow inhabits prairie and foothills shrub habitat where sagebrush is present. It prefers tall shrubs and low grass cover, where sagebrush is clumped in a patchy landscape. Also, it is area-sensitive, requiring large blocks of unfragmented habitat to successfully breed and survive. The project area supports sage sparrow habitat, and the species may

occur. The affected environment for sage sparrow is discussed further in the PRB FEIS on pg. 3-200 to 3-201.

3.3.1.2.9. Sage Thrasher

In addition to being listed as a Wyoming BLM sensitive species, sage thrashers are a WGFD SGCN, with a rating of NSS4, because populations are declining, habitat is vulnerable but not undergoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating the action and focus should be on monitoring and because Wyoming has a high percentage of and responsibility for the breeding population. They are also listed by USFWS as a BCC for Region 17. This species is considered a sagebrush obligate. Sage Thrasher abundance is generally positively correlated with the amount of sage cover and negatively correlated with grass cover. Suitable sage thrasher habitat occurs throughout the project area, and the species may occur. The affected environment for sage thrasher is discussed further in the PRB FEIS on pg. 3-199 to 3-200.

3.3.1.2.10. Western Burrowing Owl

The burrowing owl is a small, long-legged owl found throughout open landscapes of North and South America. Burrowing owls can be found in grasslands, rangelands, agricultural areas, deserts, or any dry open area with low vegetation where abandoned burrows dug by mammals such as ground squirrels (*Spermophilus spp*.), prairie dogs (*Cynomys spp.),* and badgers (*Taxidea taxus*) are available. Black-tailed prairie dog colonies provide the primary habitat for burrowing owls (Klute et al. 2003).

Current population estimates for the United States are not well known but trend data suggest declines throughout the burrowing owl range (McDonald et al. 2004). Primary threats are habitat loss and fragmentation, mostly due to intensive agricultural and urban development, and habitat degradation, due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

In addition to being listed as a Wyoming BLM sensitive species, burrowing owls are a WGFD SGCN, with a rating of NSS4. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action, and they are also a USFWS BCC in Region 17. Additional information regarding western burrowing owl (herein after referred to as burrowing owl) is available in the PRB FEIS on pg. 3-186.

The BFO database indicates that no burrowing owl nests have been reported within 0.5 mile of the Cabin Creek VI project area. However, two prairie dog colonies are documented to occur within the project boundary. Burrowing owl nesting is possible within the Cabin Creek VI POD boundary.

3.3.1.2.11. Black-tailed Prairie Dog

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS (pg 3-179). At the time the PRB FEIS was written, the black-tailed prairie dog was added to the list of candidate species for federal listing in 2000 (USFWS 2000). It was removed from the list in 2004. Wyoming BLM considers black-tailed prairie dogs a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a WGFD SGCN, with a rating of NSS3, because populations are declining, and habitat is vulnerable but not undergoing significant loss.

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 aerial imagery indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001, but aerial surveys conducted in 2003 indicated that approximately 47% of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier et al. 2004). Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented and isolated (Miller 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other

problems that affect long term population viability, such as landowner poisoning and disease (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

Two black-tailed prairie dog colonies totaling approximately 133 acres were identified by Western Lands Services in the Cabin Creek VI project area.

3.3.1.2.12. Fringed Myotis

The affected environment for fringed myotis is discussed in the PRB FEIS on pg. 3-188 to 3-189. In addition to being listed as a BLM WY sensitive species, the fringed myotis is a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. The fringed myotis occupies a variety of habitats, including grasslands and basin-prairie shrublands, usually in proximity of drinking water (Hester and Grenier 2005). After feeding, it uses night roosts, which may include buildings, rock crevices, and bridges (Hester and Grenier 2005), all of which occur in the vicinity of the project area.
Fringed myotis may occur in the project area.

3.3.1.2.13. Long-eared Myotis

The affected environment for long-eared myotis is discussed in the PRB FEIS on pg. 3-201. In addition to being listed as a BLM WY sensitive species, the long-eared myotis is a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. Although long-eared myotis primarily inhabit coniferous forest and woodland, they are occasionally found in cottonwood riparian areas and sagebrush grasslands where roost sites are available (Hester and Grenier 2005). Roosts include cavities in snags, under loose bark, stumps, buildings, and rock crevices (Hester and Grenier 2005), all of which may occur in the vicinity of the project area, so long-eared myotis may occur in the Cabin Creek Phase VI Federal POD project area.

3.3.1.2.14. Swift Fox

The affected environment for swift fox is discussed in the PRB FEIS on pg. 3-189. In addition to being listed as a BLM WY sensitive species, swift fox is also listed as a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected to be stable, and habitat is vulnerable but is not undergoing significant loss.

The project area does not contain suitable swift fox habitat. Swift fox are not expected to occur in the project area, but due to the species' ability to cover a wide range of habitats, they are mentioned here.

3.3.1.2.15. Townsend's Big-eared Bat

The affected environment for Townsend's big-eared bat is discussed in the PRB FEIS on pg. 3-189. In addition to being listed as a BLM WY sensitive species, Townsend's big-eared bat is listed as a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. Townsend's big-eared bats occur in sagebrush and other shrublands, and roosts include rock outcrops and buildings, which occur in the vicinity of the project area. It may be limited to areas with reliable, accessible sources of drinking water (Hester and Grenier 2005), such as the Powder River. Foraging areas include riparian corridors (Hester and Grenier 2005). Townsend's big-eared bat may occur in the project area.

3.3.2. Big Game

The Cabin Creek VI POD area contains diverse big game habitat composed of moderately rough terrain, rolling hills, flat ridge-tops, and deep draws (Martini and Aksamit 2007). Plant communities are composed of scattered deciduous trees and shrubs along ephemeral streams, shrub-grass-forb uplands, and ponderosa pine-Rocky Mountain juniper woodlands on steep terrain.

WGFD data indicate that the project area contains winter yearlong range for mule deer and yearlong range for pronghorn. Winter-yearlong use occurs when animals make general use of habitat on a year-round basis. However, there is a significant influx of additional animals into the area from other seasonal ranges during the winter months. Yearlong use is when a population of animals make general use of habitat within the range on a year-round basis. Animals may leave the area under severe conditions. No crucial big game habitat is known to occur in the area. The affected environment for pronghorn is discussed in the PRB FEIS on pp. 3-117 to 3-122 and for mule deer on pp. 3-127 to 3-132.

Populations of pronghorn and mule deer within their respective hunt areas are above WGFD objectives. The most current big game range maps are available from WGFD.

3.3.3. Aquatics

The Cabin Creek VI POD area is drained by three ephemeral tributaries to the Powder River (i.e., Fence Creek, Remington Creek, and Big Remington Creek) which is located two miles away. According to Peterson (1990), ephemeral stream communities are generally composed of taxa adapted to standing water. These communities are discussed further in the PRB FEIS (pp. 3-153 to 3-154).

3.3.4. Migratory Birds

Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year. According to Instruction Memorandum No. 2008-050, BLM must include migratory birds in every NEPA analysis of actions that have the potential to affect migratory bird species of concern in order to fulfill its obligations under the Migratory Bird Treaty Act.

The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified three groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest. Habitat that occurs in the project area include rough to moderately rough terrain with numerous ridges and deep draws (75%) with the remaining consisting of rolling hills and flats cut by steep to moderately steep draws (25%) (Western Lands Services 2007). The primary vegetation throughout the project area is sagebrush grassland with scattered stands of cottonwoods in draws, ponderosa pine and juniper in steep draws, on ridge tops and on north facing slopes. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds have declined more consistently in the last 30 years than any other ecological association of birds (WGFD 2009). Species that may occur in these vegetation types in northeast Wyoming, according to the Wyoming Bird Conservation Plan, are listed in Table 3.6 and are grouped by Level as identified in the Plan.

Table 3.6 High priority bird species that occur in the major vegetation type within the Cabin Creek Phase VI Federal POD project area

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
	Ferruginous hawk	Yes
	Greater sage-grouse	Yes
	Long-billed curlew	Yes
	McCown's longspur	
	Mountain plover	Yes

Level	Species	Wyoming BLM Sensitive
	Sage sparrow	Yes
	Short-eared owl	
	Upland sandpiper	
	Western burrowing owl	Yes
Level II	Black-chinned hummingbird	
	Bobolink	
	Chestnut-collared longspur	
	Dickcissel	
	Grasshopper sparrow	
	Lark bunting	
	Lark sparrow	
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	
Level III	Common poorwill	
	Say's phoebe	

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153). This discussion includes a list of habitat requirements and foraging patterns for the species listed above, with the exception of upland sandpipers, common poorwills, and Say's phoebes, which are discussed here. Upland sandpipers prefer Great Plains grasslands, dryland grass pastures, hayfields, and alfalfa fields. They nest in grass-lined depressions in the ground and feed on insects and seeds on the ground where grasses are low and open. Common poorwills inhabit sparse, rocky sagebrush; open prairies; mountain-foothills shrublands; juniper woodlands; brushy, rocky canyons; and ponderosa pine woodlands. They prefer clearings, such as grassy meadows, riparian zones, and forest edges for foraging. They lay eggs directly on gravelly ground, flat rock, or litter of woodland floor. Nests are often placed near logs, rocks, shrubs, or grass for some shade. They feed exclusively on insects, catching them by leaping from the ground or a perch, or picking them up from the ground. Say's phoebes inhabit arid, open country with sparse vegetation, including shrub-steppe, grasslands, shrublands, and juniper woodlands. They nest on a variety of substrates such as cliff ledges, banks, bridges, eaves, and road culverts and often reuse nests in successive years. They eat mostly insects and berries. Species observed by BLM biologists during field surveys include: robin, Townsend's solitaire, mountain bluebird, spotted towhee, lark bunting, lark sparrow, chipping sparrow, cliff swallow, rock wren, and common poorwill.

3.3.5. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Three raptor species are known to have used nests within 0.5 miles of the project area: Cooper's hawk, red-tailed hawk, and great-horned owl.

Twenty-four raptor nest sites have been documented to occur within 0.5 mile of the project boundary. These are listed in the Table 3.7. Nests in the project area are located in ponderosa pine, juniper and cottonwood trees. One nest is reported as on the ground on a hillside but was not located during surveys for the Cabin Creek VI project. The last survey information was in 2008, in which two nests were active, in use by red-tailed hawks. Two nests have been taken over by black-billed magpies. Raptors observed during field visits include: American kestrel, red-tail hawk, and Cooper's hawk.

Table 3.7 Documented raptor nests within the Cabin Creek VI project area[1].

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
535	408099E 4982082N	S20 T58N R77W	CTL	2008	Unknown	INAC	n/a
				2007	Unknown	DNLO	n/a
543	408575E 4982434N	S20 T58N R77W	CTL	2008	Unknown	UNK	n/a
				2007	Unknown	DNLO	n/a
545	408657E 4982250N	S20 T58N R77W	CTL	2008	Fair	INAC	n/a
				2007	Fair	INAC	n/a
				2007	Good	INAC	n/a
				2000	Unknown	ACTI	GRHO
554	410196E 4979434N	S33 T58N R77W	CTL	2008	Fair	INAC	n/a
				2000	Good	ACTI	RETA
5285	409608E 4978414N	S4 T57N R77W	POL	2008	Good	INAC	n/a
				2007	Good	ACTI	GRHO
5286	409674E 4978243N	S4 T57N R77W	POL	2008	Good	INAC	n/a
				2007	Good	INAC	n/a
5287	409649E 4978093N	S4 T57N R77W	POL	2008	Unknown	UNK	n/a
				2007	Excellent	ACTI	RETA
5288	409631E 4977424N	S4 T57N R77W	POL	2008	Good	INAC	n/a
				2007	Good	ACTI	GRHO
5307	410537E 4976682N	S10 T57N R77W	POL	2008	Good	INAC	n/a
				2007	Good	INAC	n/a
5308	410735E 4977211N	S3 T57N R77W	POL	2008	Good	INAC	n/a
				2007	Good	INAC	n/a
5309	410872E 4977211N	S3 T57N R77W	POL	2008	Unknown	UNK	n/a
				2007	Good	ACTI	RETA
5701	410204E 4979571N	S33 T58N R77W	CTL	2007	Fair	INAC	n/a
5703	411717E 4976842N	S10 T57N R77W	JUN	2007	Good	ACTI	BBMA
5704	412772E 4979790N	S35 T58N R77W	POL	2008	Good	ACTI	RETA
				2007	Good	ACTI	RETA
5705	413132E 4980233N	S26 T58N R77W	POL	2008	Good	INAC	n/a
				2007	Good	INAC	n/a
5706	413477E 4980554N	S26 T58N R77W	POL	2008	Fair	INAC	n/a
5707	414015E 4979165N	S36 T58N R77W	POL	2008	Good	UNK	n/a
				2007	Good	INAC	n/a
5708	412022E 4977498N	S2 T57N R77W	POL	2008	Good	UNK	n/a
				2007	Good	INAC	n/a
5709	411766E 4978379N	S3 T57N R77W	POL	2008	Good	UNK	n/a
				2007	Good	ACTI	RETA
5710	410981E 4979279N	S34 T58N R77W	POL	2008	Poor	UNK	n/a
				2007	Poor	INAC	n/a

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
5712	411452E 4980504N	S27 T58N R77W	POL	2008	Good	ACTI	RETA
				2007	Good	ACTI	RETA
5713	412430E 4980986N	S26 T58N R77W	POL	2008	Poor	UNK	n/a
				2007	Poor	ACTI	COHA
5714	414927E 4981193N	S25 T58N R77W	GHS	2008	Unknown	DNLO	n/a
				2007	Poor	INAC	n/a
5715	414510E 4981589N	S25 T58N R77W	POL	2008	Good	INAC	n/a
				2007	Good	INAC	n/a

Notes

1. Where nests were surveyed by more than one consultant, results may have varied. All results are reported here.
2. CTL = Cottonwood (live); JUN = Juniper; GHS = Ground/Hillside; PON = Ponderosa Pine
3. ACTI = Active; DNLO = Did not locate; INAC = Inactive; OCCU = Occupied; UNK = Unknown.
4. BBMA = Black-billed magpie; COHA = Cooper's Hawk; GRHO = Great-horned owl; RETA = Red-tailed hawk

Table 3.8 Proposed and existing infrastructure within 0.5 mile of documented raptor nests in the Cabin Creek VI project area

BLM Nest ID	Infrastructure
554	Well 5-34, access and utility corridor.
5285	Well 13-34, access and utility corridor. Meter drop in Section 4.
5287	Well 13-34, access and utility corridor. Meter drop in Section 4.
5288	Wells 12-3 and 13-34, access and utility corridors. Meter drop in Section 4.
5308	Well 12-3, access and utility corridor.
5309	Wells 12-3, 15-3, 11-3, access and utility corridors.
5701	Well 5-34, access and utility corridors.
5704	Wells 7-35, 5-35, 1-35, access and utility corridors.
5705	Wells 1-35, 7-35, 9-26, 13-25, access and utility corridors.
5706	Wells 13-25, 9-26, 1-35, access and utility corridors.
5707	Well 9-35, Meter drop and stock tank in Section 35.
5708	Wells 5-2, 13-2, 11-3, 15-3, 3-11, access and utility corridors.
5709	Wells 5-2, 3-3, 9-34, 13-35, access and utility corridors. Stock tank in Section 3.
5710	Wells 3-3, 5-34, 7-34, 9-34, 13-34, access and utility corridors.
5712	Well 15-27 access and utility corridor.
5713	Wells 5-26, 7-26, access and utility corridors. Stock tank in Section 26.

3.3.6. Plains Sharp-tailed Grouse

Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is found where grasslands are intermixed with shrublands, especially wooded draws, shrubby riparian area, and wet meadows.

The mosaic of grasslands, sagebrush-grasslands, and woody draws in Cabin Creek VI project area has the potential to support sharp-tailed grouse during most of the year. Cottonwoods, junipers, and deciduous riparian shrubs could provide buds and berries to sustain grouse through the winter. Sharp-tailed grouse

leks are known to occur 1.8 and 4.3 miles from the POD boundary. Further, sharp-tailed grouse were observed near the POD boundary in May and June 2007 (Martini and Aksamit 2007).

3.3.7. Sagebrush Obligates

Sagebrush communities are the primary vegetation type in the project area (Martini and Aksamit 2007). Occurrence of Wyoming big sagebrush within these communities facilitates development of environmental conditions that support hundreds of plant and animal species (Welch 2005, Wisdom et al. 2005). Species most dependent on sagebrush ecosystems for survival are considered obligate (e.g., sage-grouse, sage thrasher, Brewer's sparrow, sage sparrow, sagebrush lizard) or near-obligate (e.g., pronghorn, vesper sparrow) (Rowland et al. 2006). Many of these species are socially and/or ecologically important including several Wyoming BLM sensitive species.

Much of the Cabin Creek VI project area supports diverse, native shrub-grass-forb plant communities. Common species include Wyoming big sagebrush, silver sagebrush, greasewood, sageworts, winterfat, western wheatgrass, green needlegrass, indian ricegrass, needle and thread, prairie junegrass, basin wildrye, yellow scurfpea, blue flax, purple prairie clover, yarrow, prairie coneflower, prickly lettuce, and salsify. Past ecosystem disturbances in the area included wildfire, grazing, tillage agriculture, and sagebrush conversion to grassland. Consequently, the area also contains areas supporting a significant component of annual brome grasses; leafy spurge; and scotch, bull, and Canada thistles. Further description of disturbance dynamics in the project area is provided in Chapter 4.

3.4. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection. Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals. There are no additional reservoirs permitted with this project, but there is potential mosquito habitat in existing reservoirs and stock-water tanks in the project area.

3.5. Water Resources

The project area is within the Middle Powder River drainage system. The majority of the project area lies within the Powder River-Big Remington Creek drainage. The wells and infrastructure located in T58N R77W lie within the Fence Creek drainage.

3.5.1. Groundwater

WDEQ water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for TDS: 500 mg/l TDS for Drinking Water (Class I), 2000 mg/l for Agricultural Use (Class II) and 5000 mg/l for Livestock Use (Class III).

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area shows 11 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 48 to 883 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

The ROD includes a Monitoring, Mitigation and Reporting Plan (MMRP). The objective of the plan is to monitor those elements of the analysis where there was limited information available during the preparation of the EIS. The MMRP called for the use of adaptive management where changes could be made based on monitoring data collected during implementation.

Specifically relative to groundwater, the plan identified the following (PRB FEIS ROD page E-4):

- The effects of infiltrated waters on the water quality of existing shallow groundwater aquifers are not well documented at this time;
- Potential impacts will be highly variable depending upon local geologic and hydrologic conditions;
- It may be necessary to conduct investigations at representative sites around the basin to quantify these impacts;
- Provide site specific guidance on the placement and design of CBM impoundments, and;
- Shallow groundwater wells would be installed and monitored where necessary.

3.5.2. Surface Water

The project area is primarily within the Big Remington drainage, which is tributary to the Middle Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Middle Powder River watershed, the EC ranges from 1421 µmhos/cm at Maximum monthly flow to 2154 µmhos/cm at Low monthly flow and the SAR ranges from 3.92 at Maximum monthly flow to 4.62 at Low monthly flow. These values were determined at the USGS station located on the Powder River at Moorhead, Montana (PRB FEIS page 3-49).

The operator has enlarged a stock impoundment located in Section 31 T57N R76W for CBNG water management from fee actions. This impoundment has been downsized from the enlarged 249.9 acre-feet due to the competency of the dam structure. The present dam structure is located in the former pool area of the enlarged structure, thus reducing the volume of water impounded. During the irrigation season, water from this impoundment is used to irrigate cultivated fields (alfalfa) nearby.

The operator did not identify any springs within this project area.

For more information regarding surface water, please refer to the PRB FEIS Chapter 3 Affected Environment pages 3-36 through 3-56.

3.6. Economics and Recovery of CBNG Resources

Development of this project would have effects on the local, state, and national economies. Based on the estimates in the BLM's 2009 Reasonably Foreseeable Development Scenario, the drilling of the 44 proposed wells in alternative C of Cabin Creek Phase VI Federal POD will generate approximately 0.23 billion cubic feet of gas (BCFG) per well, over the life of the well. Actual revenue from this amount of

gas is difficult to calculate, as there are several variables contributing to the price of gas at any given time. Regardless of the actual dollar amount, the royalties from the gas produced in the Cabin Creek Phase VI Federal POD would have several benefits. The federal government collects 12.5% of the royalties from all federal wells, which helps offset the costs of maintaining the federal agencies that oversee permitting.

In addition to generating federal income, approximately 49% of the royalties from the Cabin Creek Phase VI Federal POD wells would return to the State of Wyoming. This revenue from mineral development drives Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. The development of the Cabin Creek Phase VI Federal POD project would also provide local revenue by employing workers in the area to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area. The pool of individuals employed to work on the Cabin Creek Phase VI Federal POD project would also result in an increase in demand for goods and services from nearby communities, primarily that of Clearmont, Wyoming.

3.7. Cultural Resources

Class III cultural resource inventory was performed for the Cabin Creek Phase VI Federal POD prior to on-the-ground project work (BFO project no. 70100018). Cultural Resource Analysts, Inc. conducted a block class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports*. Clint Crago, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The following resources are located in or near the project area.

Table 3.9 Cultural Resources Inventory Results

Site Number	Site Type	Eligibility
48SH156	Prehistoric Lithic Scatter	Not Eligible
48SH157	Prehistoric Lithic Scatter	Not Eligible
48SH158	Prehistoric Stone Circle and Lithic Scatter	Unevaluated
48SH189	Historic Trash Scatter	Not Eligible
48SH218	Historic Logs/Debris Scatter	Not Eligible
48SH219	Prehistoric Stone Circle and Lithic Scatter	Unevaluated
48SH220	Prehistoric Lithic Scatter	Not Eligible
48SH222	Prehistoric Lithic Scatter	Unevaluated
48SH665	Historic Homestead	Not Eligible
48SH1427	Prehistoric Lithic Scatter	Eligible
48SH1428	Prehistoric Open Camp and Lithic Scatter	Eligible
48SH1429	Prehistoric Open Camp	Not Eligible
48SH1617	Historic Homestead	Not Eligible

Site Number	Site Type	Eligibility
48SH1619	Prehistoric Lithic Scatter	Not Eligible
48SH1641	Historic Homestead and Prehistoric Artifact	Not Eligible
48SH1716	Prehistoric Lithic Scatter and Historic Homestead	Not Eligible

3.8. Air Quality

Existing air quality throughout most of the Powder River Basin is in attainment with all ambient air quality standards. Although specific air quality monitoring is not conducted throughout most of the Powder River Basin, air quality conditions in rural areas are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations.

Existing air pollutant emission sources within the region include following:

- Exhaust emissions (primarily CO and nitrogen oxides [NOx]) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- Dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas and road sanding during the winter months;
- Transport of air pollutants from emission sources located outside the region;
- Dust (particulate matter) from coal mines;
- NOx, particulate matter, and other emissions from diesel trains and,
- SO2 and NOx from power plants.

For a complete description of the existing air quality conditions in the Powder River Basin, please refer to the PRB Final EIS Volume 1, Chapter 3, pages 3-291 through 3-299.

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action (Alternative B) resulted in development of Alternatives C and D. These changes have reduced impacts to the environment which will result from this action; therefore only the environmental consequences of Alternative C and Alternative D are described below.

4.1. Alternative C

4.1.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance are quantified in table 2.1.

As stated in Chapter 2, overhead power lines were removed from the project description following the onsites. This is due to the uncertainty of routes and to the fact this it is unknown which side of the project area will be used as its main access for power. In addition, at this time, the proponent is uncertain whether the overhead power will be installed by the operator via contractor or by Powder River Energy. For analysis purposes, generators are expected to be used for the life of the project.

The effects to soils resulting from well pad, access roads and pipeline construction include:

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water

erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.

- Loss of soil vegetation cover, biologic crusts, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.

- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.

- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery.

- Modification of hill slope hydrology.

- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

These impacts, singly or in combination, would increase the potential for valuable soil loss due to increased water and wind erosion, invasive plant establishment, and increased sedimentation and salt loads to the watershed system.

Cumulative Effects
Most soil disturbances would be short term impacts with expedient, successful interim reclamation and site stabilization, as committed to by the operator in their POD Surface Use Plan and as required by BLM in COAs.

The PRB FEIS made predictions regarding the potential impact of produced water to the various soil types found throughout the Basin, in addition to physical disturbance effects. "Government soil experts state that SAR values of 13 or more cause potentially irreversible changes to soil structure, especially in clayey soil types, that reduce permeability for infiltration of rainfall and surface water flows, restrict root growth, limit permeability of gases and moisture, and make tillage difficult." (PRB FEIS page 4-144).

Mitigation Measures
Impacts to vegetation and soils from surface disturbance will be reduced by following the operator's plans and BLM applied mitigation. Please refer to the Conditions of Approval Section in Chapter 2.

The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). The Wyoming Reclamation Policy applies to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to an approved "Reference Site" or NRCS Ecological Site Transition State. Final reclamation measures are used to achieve this goal. BLM

reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.

The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of two or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

Compaction resulting from project activities may be remediated by plowing or ripping.

4.1.2. Wetland/Riparian

The water management strategy for this project is to discharge untreated produced water directly to the Powder River for 10 months of the year. The historical average flow rate of the Powder River by month at the Montana line ranges from a low of 140 cfs in September to 1335 cfs in June. The 2.1 cfs produced water from this project will add between 0.2 to 1.5% to the river flow. This additional flow should not adversely impact the flow of the river.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

The PRB FEIS identified effects to gallery forests of mature cottonwood trees stating that "(they) may be lost by bank undercutting caused by the increased surface water flows in channels." Included in the ROD is programmatic mitigation "which may be appropriate to apply at the time of APD approval if site specific conditions warrant."(ROD page A-30). One of the conditions included in that section addresses the impact to trees in A.5.8-2: "To reduce adverse effects on existing wetlands and riparian areas, water discharge should not be allowed if increased discharge volumes or subsequent recharge of shallow aquifers will inundate and kill woody species, such as willows or cottonwoods."(ROD Page A-32).

4.1.3. Invasive Species

Based on the investigations performed during the POD planning process, the operator has committed to the control of noxious weeds and species of concern using the following measures in an Integrated Pest Management Plan (IPMP) included in the proposal:

1. Control Methods, which would include Physical/Mechanical, Chemical, and Biological
2. Preventive practices
3. Education

In order to prevent the further spread of Leafy Spurge, Houndstongue, Canada Thistle, or other noxious weeds identified as being potentially within the project area, a Condition of Approval has been applied that no surface disturbing activities will take place without an approved PUP unless the proponent can provide documentation that no state listed noxious/invasive weeds are present in the areas to be disturbed.

Cheatgrass or downy brome (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) are known to exist in the affected environment. These two species are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time.

4.1.4. Cumulative Effects

The use of existing facilities along with the surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread. Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants such as salt cedar, Canada thistle and perennial pepperweed. However, mitigation as required by BLM applied COAs will reduce potential impacts from noxious weeds and invasive plants.

The PRB FEIS stated that cumulative impacts to soils could occur due to sedimentation from water erosion that could change water quality and fluvial characteristics of streams and rivers in the sub-watersheds of the Project Area. SAR in water in the sub-watersheds could be altered by saline soils because disturbed soils with a conductivity of 16 mmhos/cm could release as much as 0.8 tons/acre/year of sodium (BLM 1999c). Soils in floodplains and streambeds may also be affected by produced water high in SAR and TDS. (PRB FEIS page 4-151).

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur to soils and vegetation as a result of discharged produced CBNG water. The cumulative effects on vegetation and soils are within the analysis parameters and impacts described in the PRB FEIS for the following reasons:

- They are proportional to the actual amount of cumulatively produced water in the Middle Powder River drainage, which is approximately 45% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The WMP for the Cabin Creek Phase VI Federal POD proposes that associated produced water will not contribute significantly to flows downstream

No additional mitigation measures are required.

4.1.5. Wildlife

Comprehensive understanding of the effects of the Cabin Creek VI POD on wildlife resources is fundamental to developing effective conservation strategies. Conservation strategies for the Cabin Creek VI POD were developed during onsite inspections conducted by BLM and Pinnacle Gas Resources, Inc. personnel. Further, aerial imagery and geospatial datasets for big game, raptors, bald eagles, sage-grouse, sharp-tailed grouse, mountain plover, black-tailed prairie dogs, sagebrush, wildfire, and land use were evaluated for the analysis.

Ecosystems are composed of plant and animal communities that change through time with exposure to complex combinations of positive or negative influences. Ecosystem influences result in direct, indirect, and cumulative effects. Following are assessments of the direct, indirect and cumulative effects associated with implementation of Alternative C.

4.1.5.1. Threatened and Endangered Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.1.

Table 4.1 Summary of Threatened and Endangered Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (*Mustela nigripes*)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NS	NE	Suitable habitat will not be directly impacted.
Blowout penstemon (*Penstemon haydenii*)	Sparsely vegetated, shifting sand dunes	NS	NE	No suitable habitat present.
Threatened				
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NP	NE	No suitable habitat present.

Presence
K - Known, documented observation within project area.
S - Habitat suitable and species suspected, to occur within the project area.
NS - Habitat suitable but species is not suspected to occur within the project area.
NP - Habitat not present and species unlikely to occur within the project area.

Project Effects
LAA - Likely to adversely affect
NE - No Effect
NLAA - May Affect, not likely to adversely affect individuals or habitat.

4.1.5.1.1. Black-Footed Ferret Direct and Indirect Effects

Direct and indirect effects to black-footed ferret are discussed in the PRB FEIS (pg. 4-251).
Implementation of the proposed development will have no effect on the black-footed ferret because habitat is not present in the project area, and the species is not likely to occur.

4.1.5.1.2. Blowout Penstemon Direct and Indirect Effects

Suitable habitat is not present within the proposed Cabin Creek VI project area. Implementation of the proposed coal bed natural gas project will have no effect on the blowout penstemon.

4.1.5.1.3. Ute Ladies'-Tresses Orchid Direct and Indirect Effects

Suitable habitat is not present within the proposed Cabin Creek Phase VI Federal POD project area. Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial. Implementation of the proposed coal bed natural gas project will have no effect on the Ute ladies'- tresses orchid.

4.1.5.1.4. Threatened and Endangered Species Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pp. 4-250 to 4-257. No additional mitigation measures are required.

4.1.5.2. Sensitive Species

BLM will take necessary actions to meet the policies set forth in sensitive species policy (BLM Manual 6840). BLM Manual 6840.22A states that "The BLM should obtain and use the best available information deemed necessary to evaluate the status of special status species in areas affected by land use plans or other proposed actions and to develop sound conservation practices. Implementation-level planning should consider all site-specific methods and procedures which are needed to bring the species and their habitats to the condition under which the provisions of the ESA are not necessary, current listings under special status species categories are no longer necessary, and future listings under special status species categories would not be necessary."

Table 4.2 summarizes the habitat requirements and potential impacts of the Cabin Creek VI project on all Wyoming BLM sensitive species that occur in the BFO administrative area. Some sensitive species are of particular concern in the project area, due to their demonstrated or suspected sensitivity to CBNG development or because they were recently considered for listing under the ESA. These species include bald eagle, black-tailed prairie dog, greater sage-grouse, mountain plover, and western burrowing owl. Bald eagle habitat and greater sage-grouse habitat are present in the project area, and those species are discussed in further detail in this section. The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

Table 4.2 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (*Rana pipiens*)	Beaver ponds and cattail marshes from plains to montane zones.	S	MIIH	New ponds will be constructed but natural surface water unaffected.
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	NP	NI	The project area is outside the species' range, and the species is not expected to occur .
Fish				
Sturgeon chub (*Macrhybopsis gelida)*	Swift, rocky riffles throughout the Powder River.	S	NI	Amount of water discharged to the Powder River not of sufficient magnitude to have impacts to this species. Changes in water quality not expected to have an impact.
Yellowstone cutthroat trout (*Oncoryhynchus clarki bouvieri*)	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	NP	NI	The project area is outside the species' range, and the species is not expected to occur .
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	S	MIIH	Shortgrass prairie and sagebrush cover will be affected.
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body with reliable prey source nearby.	K	MIIH	Infrastructure within approx. three mile of mature cottonwood galleries.
Brewer's sparrow (*Spizella breweri*)	Sagebrush shrubland	S	MIIH	Sagebrush cover will be affected.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	K	MIIH	Nesting habitat will be impacted and human activities will increase
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	WIPV	Sagebrush cover will be affected.
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	NP	NI	Suitable habitat not present.
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NP	NI	Habitat not present
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	NP	NI	Non-suitable habitat present.
Peregrine falcon (*Falco peregrinus*)	Cliffs	NP	NI	No nesting habitat present.
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	NP	NI	Habitat not present.
Western Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	S	MIIH	Prairie dog colonies will be impacted by reservoir construction
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	NP	NI	Permanently wet meadows not present.
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	NP	NI	Streamside habitats not present.
Mammals				
Black-tailed prairie dog (*Cynomys ludovicianus*)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Prairie dog colonies will be impacted by reservoir construction
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	S	MIIH	Construction may impact foraging areas and alter habitat conditions.
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	S	MIIH	Construction may impact foraging areas and alter habitat conditions.
Swift fox (*Vulpes velox*)	Grasslands	S	MIIH	Prairie dog colonies will be impacted by reservoir construction.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.
Plants				

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	NP	NI	Habitat not present.
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	NP	NI	Project area outside of species' range.

Presence
K - Known, documented observation within project area.
S - Habitat suitable and species suspected, to occur within the project area.
NS - Habitat suitable but species is not suspected to occur within the project area.
NP - Habitat not present and species unlikely to occur within the project area.

Project Effects
NI - No Impact.
MIIH - May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.
WIPV - Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI - Beneficial Impact

4.1.5.2.1. Bald Eagle Direct and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS on pg. 4-251 to 4-253. A more recent study completed in 2004 suggests that two-tracks and improved project roads pose minimal collision risk to bald eagles. In one year of monitoring road-side carcasses the BLM BFO reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; bald and golden eagles were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads do not affect bald eagles.

Activities associated with the Cabin Creek VI project may impact bald eagles by disturbing birds roosting in cottonwood or ponderosa pine trees, or foraging in the area. The project will not impact any identified nests or winter roost concentration areas.

4.1.5.2.2. Black-tailed Prairie Dog Direct and Indirect Effects

Impacts to black-tailed prairie dogs are discussed in the PRB FEIS on pg. 4-255 to 4-256.
An existing two-track road proposed for improvement passes through the prairie dog colonies. Because it is an existing road on private surface, and re-routing would cause greater resource impacts, no attempt was made to re-route the road. There will be direct habitat loss associated with the road, and vehicle traffic will increase prairie dog mortality.

4.1.5.2.3. Greater Sage-grouse Direct and Indirect Effects

The goal of this analysis is to foster understanding of project-related effects to sage-grouse and sage-grouse habitat in order to develop effective conservation measures designed to sustain lek persistence and habitat connectivity over the long term (BLM 2009).

Direct effects to sage-grouse habitats due to surface disturbances will cause direct loss of habitat. The Cabin Creek VI POD Alternative C includes 44 wells, 16.3 miles of template/spot upgrade road, 2.43 miles of engineered road, and 6.83 miles of primitive road (Table 2.1). Most roads also include utility corridors. These disturbances are distributed within a 5,769-acre POD boundary resulting in direct disturbance of 163.3 acres of habitat.

Table 4.3 Direct effects by alternative within modeled high quality winter and nesting habitat.

Alternative		**Existing Habitat**	**# Wells Within High Quality Habitats**
No Action		5,769 acres	none
Alternative C	Nesting	3,066 acres	34 wells
	Winter	1,317 acres	12 wells
Alternative D	Nesting	Same as Alt. C	30 wells
	Winter	Same as Alt. C	12 wells

Indirect effects include habitat fragmentation (i.e., habitat partitioning trending toward isolation) and degradation associated with: 1) human-caused displacement; 2) auditory disturbance; 3) infrastructure avoidance; 4) changes in predator species composition, abundance, and efficacy; 5) facilitated infestation and spread of noxious weeds; and 6) spread of west Nile virus. These effects are difficult to quantify but are related to disturbance arrangement, intensity, and extent. Indirect effects may extend for some distance; reducing habitat effectiveness in zones surrounding CBNG developments (WGFD 2009).

Walker et al. (2007) used 350 meters (1,148 feet) from wells to approximate the area affected by CBNG development because this metric was less sensitive to variation in spacing of wells and therefore more accurately estimated the total area affected by CBNG development. This metric was used to quantify indirect effects to sage-grouse associated with the Cabin Creek VI POD (Table 4.4). Analysis revealed that 1,946 acres of modeled high quality nesting habitat and 745 acres of high quality winter habitat would be indirectly affected by implementation of Alternative C.

Table 4.4 Indirect effects based on a 350-meter effects area within modeled high quality winter and nesting habitat.

No Action		**Alternative C**		**Alternative D**	
Winter	Nesting	Winter	Nesting	Winter	Nesting
none	none	745 acres	1,946 acres	681 acres	1,771 acres

The magnitude of impact to sagebrush habitat due to this alternative warrants special emphasis on avoidance, minimization, and reclamation measures. Diverse seed mixtures composed of multiple ecological drivers (e.g., moisture-capturing shrubs, nitrogen-fixing forbs) and functional/structural groups (e.g., shrubs, half-shrubs, cool-season grasses, C_4 grasses, sage-grouse food-forbs) should be considered. Further information regarding direct and indirect impacts to sage-grouse are provided in the PRB FEIS on pg. 4-257 to 4-273.

Well sites and associated access routes with greatest potential impact to high quality sage-grouse habitat include CB Fed 5-26, CB Fed 9-01, CB Fed 5-34, and CB Fed 11-11. Direct disturbance of high quality sagebrush habitat associated with these wells was verified during onsite visits. Further, arrangement of these wells expands impact extent and impairs habitat connectivity at the POD periphery.

Refer to 2.3.1 Changes as a result of the on-sites to see measures that would be employed to reduce or compensate for direct and indirect effects.

4.1.5.2.3.1. Greater Sage-grouse Cumulative Effects

Cumulative effects associated with the proposed action were evaluated within an 11-mile radius of the Cabin Creek POD boundary to encompass most seasonal sage-grouse habitat, as directed in recent BLM guidance (BLM 2009).

Sagebrush ecosystems provide required sage-grouse seasonal habitats (e.g., nesting, brood-rearing, winter) that have experienced severe loss and alteration across western North America. This resulted in species-wide population declines and a 50% range contraction (Braun 1998, Schroeder et al. 2004). The sage-grouse population within northeast Wyoming has also exhibited a steady long term downward trend as measured by lek attendance (WGFD 2008b Figure 1).

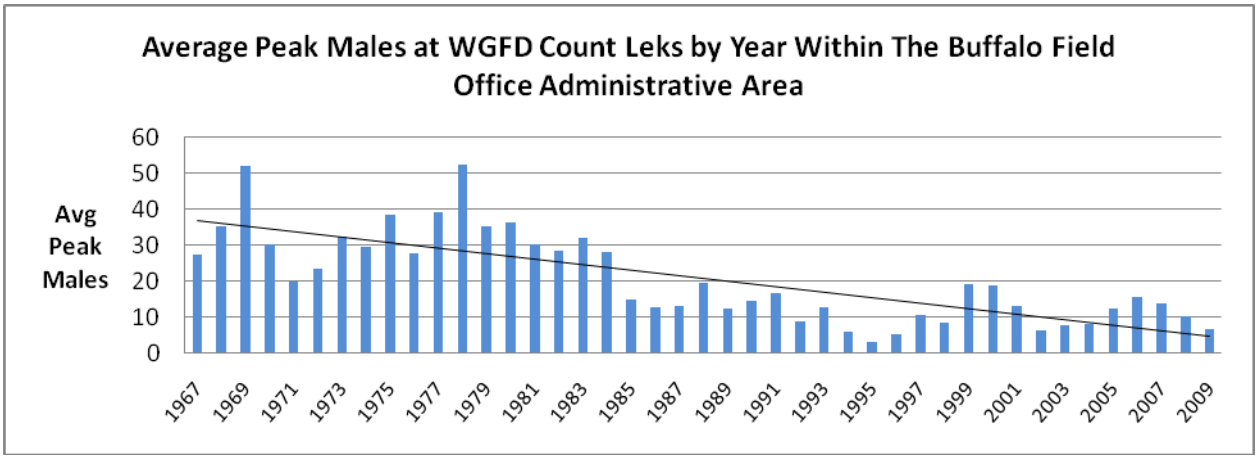


Figure 1. Average peak number of male sage-grouse per active lek and trend line within the BFO 1967-2009

Declining sage-grouse populations result from natural and human-caused stressors, including periodic drought, wildfire, heavy grazing, tillage agriculture, and energy development (e.g.,CBNG). These stressors can combine in complex ways to impact sagebrush ecosystems upon which grouse depend for recruitment and survival.

The compounding ecological impacts of early livestock overgrazing (1880-1910; Cassity 2007, Patterson 1952) with climate are unknown but may have initiated ongoing gully advance and mesic meadow degradation that is evident throughout the Basin (Leopold and Miller 1954). Recent grazing history in the Cabin Creek VI project area includes cattle managed through a BLM leasing program.

Early 20th century sage-grouse declines appear partially due to tillage agriculture focused in high quality valley locations (Aldridge et al. 2008, Cassity 2007). Most agricultural conversions in the Cabin Creek VI project area likely occurred prior to 1972 and are permanent (Smith et al. 2005). Within the 11-mile effects analysis area, 5,436 acres are currently in agricultural production (Figure 2).

Wildfire was naturally stand-replacing, infrequent and episodic in sagebrush ecosystems; with long fire-free periods (Baker 2006). However, the Cabin Creek VI effects analysis area was fire-prone from 1990 to 2009 relative to other areas in the BFO. Fire occurred over 34,311 acres during that period, including 13,665 and 7,737 acres of modeled high quality nesting habitat within the 11-mile effects analysis area, and a BLM focus area, respectively (Figure 2). There is concern that man-caused fire initiations may be increasing due to wide-spread CBNG development and associated human presence. For example, while most fire causes are unknown, one documented human-induced fire burned 862 acres within the 11-mile effects analysis area in 2008.

Energy development began in the PRB in the late 1800's, but development accelerated after the 1960's and has included mainly coal mining, conventional oil, and development of CBNG (BLM 2005). Energy-related disturbance in the PRB is projected to increase from 220,257 acres in 2003 to 514,732 acres in 2020 (BLM 2005), but the area of sagebrush-specific disturbance is unknown. While reclamation measures have been, or will be applied to most of this area, habitat function for sage-grouse will not recover for many decades. Sage-grouse will re-occupy disturbed areas following ecological recovery (Braun 1998). However, energy-related disturbances are occurring at much greater rates than ecosystem recovery. Consequently, energy-related impacts to sage-grouse accrue as disturbance advances across the landscape.

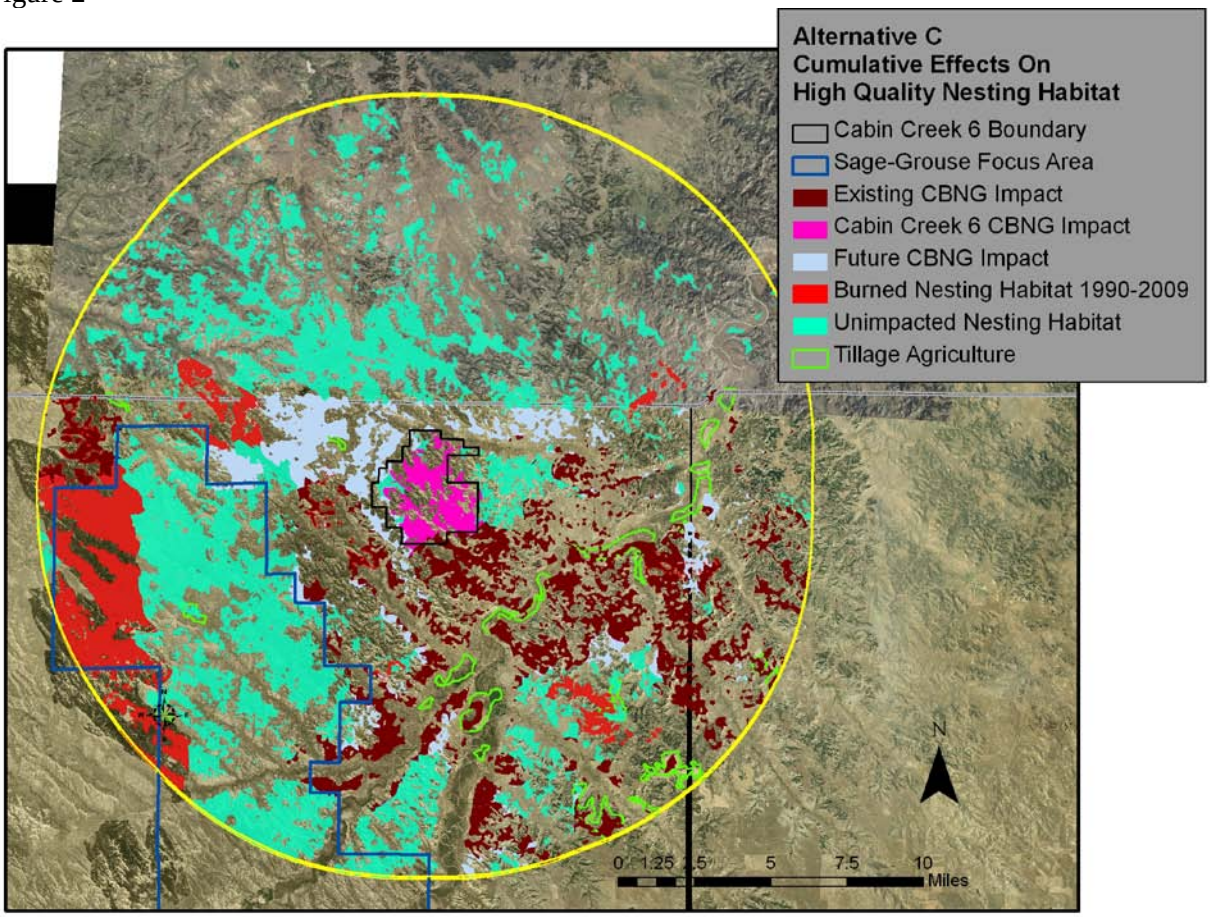
Studies indicate that oil or gas development exceeding approximately one well pad per square mile resulted in calculable impacts on breeding sage-grouse populations (Holloran et al. 2005, and Walker et al. 2007). According to WGFD (2009) recommendations, the extreme threshold of impact occurs at a CBNG well density of three wells per square mile. Extreme impacts are those that occur within two miles of leks or within identified nesting/brood-rearing habitat, and cause loss or impairment of habitat function that cannot be mitigated on site and will lead to eventual abandonment of most leks. Well density analysis (WGFD 2009) was used to quantify cumulative effects to sage-grouse due to the Cabin Creek VI POD (Table 4.5). The analysis revealed that implementation of Alternative C would impact 2,607 acres of modeled high quality nesting habitat (Table 4.5).

Table 4.5 Extreme CBNG well density effects (>3 wells/mi ^{2}) on high quality nesting habitat within the 11-mile effects analysis area (WGFD 2009, BLM 2009).

	Total high quality nesting habitat	**Existing extreme effects**	**Extreme effects with the Cabin Creek VI POD**	**All reasonably foreseeable extreme CBNG effects**
No Action	106,568 acres	23,969 acres (22.5%)	None	35,183 acres (33.0%)
Alternative C	Same as above	Same as above	26,576 acres (24.9%)	37,790 acres (35.5%)
Alternative D	Same as above	Same as above	26,395 acres (24.8%)	37,609 acres (35.3%)

Reasonably foreseeable actions include CBNG POD's that have been received for review (e.g., Cabin Creek VIII POD). Future development as proposed within the 11-mile effects analysis area would result in extreme impacts to an additional 13,821 acres. Further, the Cabin Creek VIII POD is planned to be developed within an area that is crucially important to maintaining population viability within the Montana portion of the PRB (BLM 2008). Cumulatively, current and proposed CBNG developments would impair an important zone of connectivity linking Wyoming sage-grouse populations to those in Montana (Figure 2).

Figure 2



MITIGATION MEASURES

The BFO Resource Management Plan (BLM 2001) and the PRB FEIS Record of Decision (BLM 2003) included a two-mile timing limitation on surface-disturbing activities around sage-grouse leks. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). Wyoming BLM adopted the two-mile recommendation in 1990 (BLM 1990).

The two-mile recommendation was based on early research indicating that most nests were located within two miles of a lek (BLM 2004). However, recent research conducted within the Great Plains portion of the sage-grouse range indicated that nest location is related more to habitat quality (e.g., concealment) than to lek proximity (Herman-Brunson et al. 2009). For example, Moynahan et al. (2007) found that 40% of sage-grouse hens nested further than three miles from leks in northcentral Montana. Recent research in the Powder River Basin suggests that impacts to leks from energy development are discernable out to a minimum of four miles, and that some leks within this radius have been extirpated as a direct result of energy development (Walker et al. 2007, Naugle et al. *In press*). Based on these studies, the BLM has determined that a two-mile timing limitation is insufficient to prevent population decline. Consequently, timing stipulations to protect breeding, nesting, and brood-rearing sage-grouse are recommended for the entire POD area.

The PRB FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development,

but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270)."

Based on this analysis, the proposed action would reduce sage-grouse recruitment and winter survival by: 1) directly disturbing 163.3 acres; 2) indirectly impacting 745 and 1,946 acres of high quality winter and nesting habitat, respectively; and 3) impairing the functional effectiveness of 2,607 acres of modeled high quality nesting habitat. These effects will result in a decline in male attendance at the seven leks that occur within four miles of the project area, and reduction of the local grouse population within a crucial interstate linkage zone. Especially concerning is cumulative habitat impairment due to foreseeable CBNG development (e.g., Cabin Creek VIII) because of greater high quality habitat impacts and effects to landscape-scale connectivity.

4.1.5.2.4. Mountain Plover Direct and Indirect Effects

An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (pp. 4-254 to 4-255).

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominantly prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat.

Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % a year over the last 30 years, which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995).

Use of roads and pipeline corridors by mountain plovers may increase their vulnerability to vehicle collision. Roads in the Cabin Creek VI project are designed for speeds of 15 mph; designing roads for a travel speed up to 25mph provides drivers an opportunity to notice and avoid mountain plovers and allows mountain plovers sufficient time to escape from approaching vehicles. Even if a nesting plover flushes in time, the nest likely would still be destroyed. To reduce impacts to nesting mountain plovers, the BLM BFO requires a 0.25 mile timing limitation for potential nesting habitat prior to nest survey completion and a 0.25 mile timing limitation for all occupied nesting habitat for the entire nesting season.

4.1.5.2.5. Western Burrowing Owl Direct and Indirect Effects

Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. CBNG infrastructure such as well houses, compressors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USFS Thunder Basin National Grasslands in Campbell County, WY, (who cooperated with the BLM in the creation of the PRB FEIS), recommends a 0.25 mile timing restriction buffer zone for burrowing owl nest locations during their nesting season (April 15 to August 31). Instruction Memorandum No. 2006-197, directs the field offices to "use the least restrictive stipulations that effectively accomplish the resource objectives or uses." Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months from six and one half months and from 0.5 mile to 0.25 mile.

4.1.5.2.6. Sensitive Species Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS (pp. 4-257 to 4-273).

4.1.5.3. Big Game Direct and Indirect Effects

Under Alternative C winter yearlong range for mule deer and yearlong range for pronghorn would be directly impacted by the construction of 44 wells, template/spot upgrade roads (16.3 miles), engineered roads (2.43 miles), and primitive roads (6.83 miles) (Table 2.1). This project infrastructure would result in 163.3 acres of disturbance distributed within a 5,769-acre POD boundary.

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction (Hiatt and Baker 198). While big game animals are expected to return to the project area following construction, continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to the new disturbances (Lustig 2003). Habitat effectiveness for big game is anticipated to be reduced in the project area. However, the site is not mapped as crucial habitat by the Wyoming Game and Fish Department (WGFD 2009). Further information regarding direct and indirect effects to big game is provided in the PRB FEIS on pp. 4-181 to 4-215.

The amount of anticipated big game habitat disturbance warrants effective reclamation efforts designed to facilitate re-establishment of diverse plant community assemblages including sagebrush, grass, and food-forbs.

4.1.5.3.1. Big Game Cumulative Effects

Reasonably foreseeable CBNG development includes the Cabin Creek VIII POD that is planned to occur in an identified pronghorn migration route. Consequently, maintaining landscape permeability to pronghorn migration will be an important consideration for future development in the area.

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-181 to 4-215.

4.1.5.4. Aquatics Direct and Indirect Effects

Altered temperatures, flow (timing and volume), turbidity, and chemical composition of surface-discharged produced water could modify aquatic plant and animal communities (see section 4.1.2.). However, produced water is not anticipated to significantly affect natural surface water flow or quality. Impacts to aquatics are discussed further in the PRB FEIS on pp. 4-235 to 4-247.

4.1.5.4.1. Aquatics Cumulative Effects

The planned water management is not anticipated to affect natural surface water. The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, (pp. 4-247 to 4-249). No additional mitigation measures are required.

4.1.5.5. Migratory Birds Direct and Indirect Effects

Direct and indirect effects to migratory birds are discussed in the PRB FEIS (pp. 4-231 to 4-235).

Disturbance of habitat within the project area is likely to impact migratory birds. Direct impacts to native habitats will result with the construction of wells, roads, and pipelines. Reclamation and other activities that occur in the spring may be detrimental to migratory bird survival. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Activities will likely displace migratory birds farther than the immediate area of physical disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Habitat fragmentation will result in more than just a quantitative loss in the total area of habitat available; the remaining habitat area will also be qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses through displacement were much greater than the direct physical habitat losses.

Those species that are edge-sensitive will be displaced further away from vegetative edges due to increased human activity, causing otherwise suitable habitat to be abandoned. If the interior habitat is at carrying capacity, then birds displaced from the edges will have no place to relocate. One consequence of habitat fragmentation is a geometric increase in the proportion of the remaining habitat that is near edges (Temple 1986). In severely fragmented habitats, all of the remaining habitat may be so close to edges that no interior habitat remains (Temple and Cary 1988). Over time, this leads to a loss of interior habitat species in favor of edge habitat species. Other migratory bird species that utilize the disturbed areas for nesting may be disrupted by the human activity, and nests may be destroyed by equipment.

There were observations during the on site visits of migratory birds that had drowned in stock tanks. It is likely that these occurrences would increase with the introduction of more reservoirs and stock tanks. Pinnacle has made an effort to mitigate this by using a stock tank design that should be less hazardous to birds. The effectiveness of these is unknown.

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable.

4.1.5.5.1. Migratory Birds Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-235. No additional mitigation measures are required.

4.1.5.6. Raptors Direct and Indirect Effects

Direct and indirect effects to raptors are discussed in the PRB FEIS (pp. 4-216 to 4-221).
Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to overheating or chilling of eggs or chicks and can result in egg or chick mortality. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Routine human activities near these nests can also draw increased predator activity to the area and resulting in increased nest predation.

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation be located in such a way as to provide an adequate biologic buffer for nesting raptors. A biologic buffer is a combination of distance and visual screening that provides nesting raptors with security such that they will not be flushed by routine activities.

Eighteen of the twenty-four identified raptors nests in the Cabin Creek project area are within 0.5 mile of proposed wells and infrastructure. Two of the nests were now considered to be occupied by magpies. All

raptors using the nests listed will be impacted by the human disturbance associated Cabin Creek VI CBNG project.

On the Cabin Creek VI CBNG Project, well siting options are limited because of the topography. Although alternative options were considered, in many cases well locations could not be moved to increase the distance between the well and the nest. The distance from wells, the topography, and presence of ponderosa pine stands providing cover, along with timing restrictions will reduce the impact project activities will have on nesting raptors on nine of the nests. Five nests are in close proximity to wells and infrastructure, but are out of line of site in canyon bottoms or protected in ponderosa stands.

Nests 554 and 5701 are located in a canyon overlooked by, and within 0.25 miles of well 5-34. Both nests historically were used by red-tailed hawks but were not active in 2008. Only one year of data exists for nest 5701 which is in a large cottonwood and has good potential for use by raptors in the future. Because of the nest size, tree size and location, the nest has potential for use by eagles. Due to these factors, the 5-34 well is not approved as part of this project.

Nest 5706 is on a hillside approximately 0.17 miles from well 9-26 and approximately 0.21 miles from well 13-25. The nest was inactive in 2008 and is out of line of sight from the wells. The disturbance to nesting raptors from these wells are mitigated by the visual barrier provided by the terrain and by timing limitations during construction. There still will be disturbance during well operation that may discourage raptors from using the nest location.

Nest 5712 is in a canyon approximately 0.21 miles from well 15-27. The well is out of line of sight of the nest. The visual barrier presented by the terrain and timing limitations during construction will minimize the disturbance to nesting raptors. There still will be disturbance during well operation that may discourage raptors from using the nest location.

Nest 5713 was used by a Coopers hawks in 2007. Well 5-26 is approximately 0.14 miles to the west of the nest. Timing limitations will protect the nest area during the construction phase of the project but not from maintenance and servicing of the well during the life of the project. To protect the nest and high quality sage-grouse habitat that will be fragmented by the access route, this well is not approved as part of this project.

Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (pp. 4-216 to 4-221).

4.1.5.6.1. Raptors Cumulative Effects

The cumulative effects associated with Alternatives C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-221. No additional mitigation measures are required.

4.1.5.7. Plains Sharp-tailed Grouse Effects

Plains sharp-tailed grouse are not a sensitive species and are not considered rare. However, they are a valuable gamebird and an important part of Great Plains ecosystems. BLM has committed to evaluating project-related effects to sharp-tailed grouse (BLM 2003). Anticipated effects due to the Cabin Creek VI POD are reduced because disturbances would not occur in riparian areas or woody draws that provide critical sharp-tailed grouse habitat. However, the Fence Creek Road passes through a sharp-tailed grouse lek rendering breeding grouse vulnerable to displacing disturbance and/or direct vehicle-caused mortality. These impacts can be reduced by implementing a site-specific condition of approval to use of the Fence Creek Road during the lekking period (i.e., restricting disruptive activity from 6:00 pm to 8:00 am from March 15-May 15).

While sharp-tailed grouse do not share dependency on sagebrush with sage-grouse, they are subject to many similar indirect effects associated with CBNG development. The following discussion regarding indirect effects to sage-grouse applies to sharp-tailed grouse as well.

4.1.5.8. Sagebrush Obligates Direct and Indirect Effects

In Wyoming, existing oil and gas wells are located primarily in landscapes dominated by sagebrush; causing direct loss of this habitat. Associated road networks, pipelines, and powerline transmission corridors can affect sagebrush obligates by influencing vegetation dynamics, fragmenting habitats, and creating soil conditions facilitating the spread of invasive species (Braun 1998, Gelbard and Belnap 2003). For example, density of sagebrush-obligate birds within 100 meters (328 feet) of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001).

The magnitude of impact to sagebrush habitat due to this alternative (e.g., dispersed well placement, 163.3 disturbance acres) warrants special emphasis on avoidance, minimization, and reclamation measures. Reclamation efforts should be designed to facilitate recovery of ecological drivers (e.g., moisture-capturing shrubs, nitrogen-fixing forbs) and functional/structural groups (e.g., shrubs, half-shrubs, cool-season grasses, C_4 grasses, sage-grouse food-forbs) that maintain the value of sagebrush habitat to associated wildlife.

4.1.5.8.1. Sagebrush Obligates Cumulative Effects

Sagebrush ecosystems once covered between 145 and 270 million acres (Eng et al. 1976). Initially considered impediments to socio-economic development, sagebrush ecosystems have suffered an estimated 50% loss due to human-caused factors (Welch 2005), and most remaining sagebrush habitat has been altered (Braun 1998). Human-caused stressors introduced since the late nineteenth century (e.g., heavy grazing, tillage agriculture, sagebrush conversions, energy development) are combining with natural influences (e.g., drought, wildfire) to threaten shrub-steppe ecosystem integrity (Miller and Eddleman 2001) and wildlife population viability (Copeland et al., 2009). Primary threats vary regionally from massive vegetative type conversion in the Great Basin (Pellant 1996), to pervasive risks to wildlife imposed by energy development in the PRB (Doherty et al. In Press).

For over a century, novel stressors have affected PRB shrub-steppe ecosystems, including the Cabin Creek VI project area. Many locations are in the process of ecological recovery following early disturbance (e.g., cropland conversion, livestock overgrazing, sagebrush treatments, oil and gas development, coal mining). However, the status and rate of ecological recovery relative to the rate of disturbance is poorly understood. Spatiotemporal understanding of disturbance dynamics and ecological reintegration in the PRB is imperative because an acute ecosystem stressor (i.e., coalbed natural gas (CBNG)) is entering a reclamation phase (e.g., re-establishment of landscape linkages, enhanced core area patch size, accelerated recovery of plant structural/functional groupings).

Fragmentation of shrub-steppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980). In fragmented habitats, suitable habitat area remains only as remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig and Paloheimo 1988). Sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), reducing reproduction and survival (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrub-steppe has the further potential to affect the conservation of sagebrush-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Consequently, sagebrush obligate species may not return for many decades after reclamation activities are completed.

Management for sage-grouse may provide conservation coverage for sagebrush ecosystems and associated obligates and near-obligates because sage-grouse are dependent on large, contiguous, intact sagebrush landscapes that support multiple plant structural/functional groups (Rowland et al., 2006). Consequently, many of the inferences regarding effects of the action alternatives on sage-grouse can be applied to associated sagebrush obligate and near-obligate species.

4.1.6. West Nile Virus Direct and Indirect Effects

Standing surface water within the project area may potentially increase mosquito breeding habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNv species and its effects in Wyoming.

There is no evidence that treatment, either through the use of larvicides or malithion, on a site specific or basin-wide scale will have any effect on the overall spread of the disease. The State agencies have not instituted state-wide treatment for mosquitoes due to WNv, nor are they requiring any mitigation specific to permitting for CBM operations.

Cumulatively, there are many sources of standing water, beyond CBM discharge, throughout the PRB that would add to the potential for mosquito habitat. Sources include; natural flows, livestock watering facilities, coal mining operations, and outdoor water use and features in and around communities.

BLM will keep monitoring this issue by continuing to consult with the State agencies and the researchers working in the area in order to stay abreast of the most current developments and any need to apply mitigation.

4.1.7. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the Middle Powder River watershed and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies.

The water produced in association with the gas produced from these wells will be piped to an existing discharge to the Middle Powder River for ten months out of the year, and piped to an impoundment located in Section 31, T57N R76W and used for land application disposal (irrigation). If this option does not adequately manage the water produced, the water may be injected into the Fox Hills formation via Class V water injection well, or, the operator has included plans for two off-channel pits to be constructed for full containment surface disposal. The injection well and pits are classified as secondary and will only be constructed after Sundry approval if deemed to be necessary.

The WDEQ has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The WSEO has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state.

The maximum water production is predicted to be 14.6 gpm per well or 949 gpm (2.1 cfs or 1530.5 acre-feet per year) for 65 total wells in this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Middle Powder River

drainage, the projected volume produced within the watershed area was 6030 acre-feet in 2010 (maximum production was estimated in 2005 at 12,328 acre-feet). As such, the volume of water resulting from the production of these wells is 25.4% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.1.7.1. Groundwater

The PRB FEIS predicts an infiltration rate of 37% to groundwater aquifers and coal zones in the Middle Powder River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 351 gpm will infiltrate at or near the discharge points and impoundments (566 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "…the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). However, there is potential for infiltration of produced water to influence the quality of the antecedent groundwater. The WDEQ requires that operators determine initial groundwater quality below impoundments to be used for CBNG produced water storage. If high quality water is detected (Class 3 or better) the operator is required to establish a groundwater monitoring program at those impoundments.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 12 to 1300 feet compared to a range of 1050 to 1560 feet below ground surface for the targeted coal seams, the Canyon, Cook, Wall and Pawnee. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (0.5 mile of a federal CBNG producing well) of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to "…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater storage within the coals and sands units above and below the coals is enormous. Almost 750 million acre-feet of recoverable groundwater are stored within the Wasatch - Tongue River sand and coals (PRB FEIS Table 3-5). Redistribution is projected to result in a rapid initial recovery of water levels in the coal. The model projects that this initial recovery period would occur over 25 years." (PRB FEIS page 4-38).

Adherence to the drilling plan, 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 coal zone. This will ensure that ground water will not be adversely impacted by well drilling and completion operations.

In order to determine the actual water quality of the producing formations in this POD, and to verify the water analysis submitted for the pre-approval evaluation, the operator has committed to designate a reference well within the POD. The reference well will be sampled at the well head for analysis within sixty days of initial production and a copy of the water analysis will be submitted to the BLM Authorizing Officer.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004, and was revised as the

"Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved in June, 2006. The Wyoming DEQ established an Impoundment Task Force which drafted an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments began in the spring of 2006.

Based on information received from the WDEQ, as of September 2009, approximately 2010 impoundment sites have been investigated with more than 2290 borings. Of these impoundments, 272 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 133 impoundments requiring monitoring are presently being used. As of the third quarter of 2009, only 21 of those monitored impoundments caused a change in the "Class of Use" of any parameter in the underlying aquifer water.

4.1.7.1.1. Groundwater Cumulative Effects:

As stated in the PRB FEIS, "The aerial extent and magnitude of drawdown effects on coal zone aquifers and overlying and underlying sand units in the Wasatch Formation also would be limited by the discontinuous nature of the different coal zones within the Fort Union Formation and sandstone layers within the Wasatch Formation." (PRB FEIS page 4-64).

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "…cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBNG development and coal mining would represent less than 0.3 percent of the total recoverable groundwater in the Wasatch and Fort Union Formations within the PRB (nearly 1.4 billion acre-feet, from Table 3-5)." (PRB FEIS page 4-65). No additional mitigation is necessary.

4.1.7.2. Surface Water

The following table shows Wyoming proposed numeric limits for the watershed for SAR, and EC, the average value measured at selected USGS gauging stations at high and low monthly flows, and Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water. It also shows pollutant limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit, and the levels found in the POD's representative water sample.

Table 4.6 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Middle Powder River at Moorhead, MT Gauging station			
Historic Data Average at Maximum Flow		3.92	1421
Historic Data Average at Minimum Flow		4.62	2154
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # WY0056162			
At discharge point	1,161 - 1,560	NS**	7,500
Predicted Produced Water Quality			
Canyon, Cook, Wall, Pawnee	1820	45.2	2780

** = Not stated in permit

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is 1820 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). Direct land application is included in this proposal during the months when discharge to the Powder River is not permitted.

The quality for the water produced from the Cook, Canyon, Wall and Pawnee target coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 14.6 gallons per minute (gpm) is projected is to be produced from these 65 wells, for a total of 949 gpm for the POD. See Table 4.8

The Primary water management strategy for this POD is to pipe the water to an existing water discharge point to the Middle Powder River. The operator has obtained two Wyoming Pollutant Discharge Elimination System (WYPDES) permits for the discharge of water produced from this project from the WDEQ.

	WY0056162 Powder River Discharge	**WY0055204 Impoundment**
	Daily Maximum, Outfall	
Chlorides, mg/l	150	150
Dissolved Iron, µg/l	300	1,000
pH, standard units	6.5 - 9.0	6.5 – 9.0
Dissolved Sodium, mg/l, Jan, Feb, Apr, Aug, Sep, Nov, Dec	166 - 250	
Dissolved Sodium, lbs/mo, March, May, June, July, Oct	26,395 – 312,997	
Specific Conductance, µmhos, cm		7,500
Total Dissolved Solids, mg/l Jan, Feb, Apr, Aug, Sep, Nov, Dec	1,161 – 1,559	5,000
Total Dissolved Solids, lbs/ mo March, May, June, July, Oct	140,231 – 6,632,222	
Sulfates, mg/l	3000	
Total Recoverable Arsenic, µg/l	8.4	7
Total Recoverable Barium, µg/l	1800	1,800
Total Recoverable Radium 226 + 228 , pCi/l	1	
Total Flow, MGD (cfs)		0.6 (0.93)

For more information, please refer to the WMP included in this POD.

Land Application Disposal

The proposed Land Application Disposal (LAD) site in the water management plan for the Cabin Creek VI POD is located in Section 31, Township 57 North, Range 76 West, Sheridan County, Wyoming. The LAD proposal is to add water from this project during August and September to existing center pivot systems currently applying CBNG water produced by current fee mineral development.

The soils in the proposed site were correlated to the Hargreave-Moskee or Talluce-Tullock-Vonalee series during the Order 1 soil inventory of the site. The site and sandy soils currently meet the BLMs criteria of physical and chemical properties needed to assure minimum disturbances to the soil from LAD.

The SAR of the produced water (45.2) will require that soil amendments be applied to reduce potential negative impacts. Mitigation could include stopping the application of federally produced CBNG water, water amendments or additional water treatment applications to prevent any future loss in soil productivity or decline in soil health resulting from the application of CBNG produced water.

Potential impacts exist from LAD and sites must be closely monitored to assure long term soil health and productivity is maintained. Management of the irrigation is critical to the success of the application. On split estate, the land owner may decide to change the management regime that has been analyzed in this EA in order to assess effects. BLM has no control over changes in LAD management.

Irrigation rates should be regulated so that the infiltration rate of the least permeable soil horizon would not be exceeded. If however, the site is not properly regulated, indirect effects could include elevated groundwater levels which could result in saline seeps and change of vegetation composition. Other indirect effects include the potential for leaching of soluble salts to groundwater

Irrigation with water quality identified on range or crop lands should be done with great care and managed closely. With time, salts from the product water can accumulate in the root zone to concentrations which will affect plant growth. Just 1 acre foot of irrigation water of moderately saline quality (EC = 2 dS/m - the upper end of suitability for irrigation water) will introduce 1.8 tons of salt to an acre of land. (MSU Bozeman Water Quality & Irrigation Management)

The sodium hazard of CBM produced water poses additional threats to certain soil resources. Sodic irrigation water causes soil crusting and impairs soil hydraulic conductivity - affecting water availability and aeration, important to vegetation growth and yield. Upon wetting soils with swelling clay, sodium causes the degree of swelling in the clay to increase, causing dispersion and migration of clay particles.

Elevated sodium concentrations can harm some woody plants due to direct toxicity. Water with elevated sodium and directly applied to the plant leaves can burn the leaves. Ions can accumulate in the leaves, causing leaf burn along the outer edge of the leaves. Sodium can indirectly affect crop growth by causing calcium, potassium, and magnesium deficiencies or by adversely affecting soil physical properties.

The water quality analysis (Agriculture Handbook No. 60) of the Delta/Epsilon/Beta-2 POD (addendum 4, representative water quality analysis) water samples showed an average Electrical Conductivity of 4267 umhos/cm. The United States Department of Agriculture (USDA) defines water with an Electrical Conductivity greater than 4 dS/m (4000 umhos/cm) as saline water. This EC limitation is important in the vegetation selection for the LAD site. This coal bed methane product water has a very high salinity hazard which is not suitable for irrigation under ordinary conditions based on standards used for irrigation suitability in Agriculture Handbook No. 60.

The water quality analysis of the Cabin Creek VI POD samples had an average Sodium Adsorption Ratio (SAR) of 45.2. The United States Department of Agriculture (USDA) defines water with a Sodium Adsorption Ratio (SAR) greater than 12 as sodic. This coal bed methane product water has a very high sodium hazard which is generally unsatisfactory for irrigation based on standards used for irrigation suitability in Agriculture Handbook No. 60.

There are 2 primary and 2 secondary discharge points proposed for this project. One of the primary discharge points is located at the river while the other, which will be used only when the river discharge is not permitted, is located at the impoundment located in Section 31, T57N R76W. The two secondary discharges are associated with the proposed secondary off-channel pits. They have been appropriately

sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

One existing impoundment will be used for containment of the produced water during the months of August and September. This impoundment disturbed 32.6 acres for 249.9 acre-feet of water storage. As a secondary strategy to manage the produced water, 2 off-channel impoundments (49.5 acre-feet of total storage) would potentially be constructed within the project area. These impoundments will disturb approximately 12.1 acres. The use of the off-channel impoundments would result in evaporation and infiltration of CBNG water. All these impoundments will fully contain the water discharged to them with no flow through except as a result of a storm event. Criteria identified in "Off-Channel, Unlined CBNG Produced Water Pit Siting Guidelines for the Powder River Basin, Wyoming" (WDEQ, 2002) was used to locate these impoundments. Monitoring may be required based upon WYDEQ findings relative to "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). Existing impoundments will be upgraded and proposed impoundments will be constructed to meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.31 cfs below the reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2005 at a total contribution to the mainstem of the Middle Powder River of 86 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 65 wells is anticipated to be a total of 949 gpm or 2.1cfs to an impoundment during the months of August and September. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment, the produced water re-surfacing in the Powder River from this action is much less than the maximum 2.1 cfs added to the Middle Powder River flows the rest of the year. This amount, 2.1cfs, is 2.4% of the predicted total CBNG produced water contribution. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP Section 6.6). Based on the area of the Fence Creek watershed above the POD (43.8 sq mi) and an assumed density of 1well per location every 80 acres, the potential exists for the development of 350 wells which could produce a maximum flow rate of 5110 gpm (11.4 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

1. Some of these wells have already been drilled and are producing.
2. New wells will be phased in over several years, and
3. A decline in well discharge generally occurs after several months of operation.

The potential maximum flow rate of produced water within the watershed upstream of the project area, 11.4 cfs, is much less than the volume of runoff estimated from the 2-year storm event for Fence Creek of 240 cfs (WMP Appendix 6-B).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP Section 6.6). Based on the area of the Big Remington Creek watershed above the POD (43.7 sq mi) and an assumed density of 1well per location every 80 acres, the potential exists for the development of 350 wells which could produce a maximum flow rate of 5110 gpm (11.4 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

1. Some of these wells have already been drilled and are producing.
2. New wells will be phased in over several years, and
3. A decline in well discharge generally occurs after several months of operation.

The potential maximum flow rate of produced water within the watershed upstream of the project area, 11.4 cfs, is much less than the volume of runoff estimated from the 2-year storm event for Big Remington Creek of 239 cfs (WMP Appendix 6-B).

The proposed method for surface discharge provides passive treatment through the aeration supplied by the energy dissipation configuration at each discharge point outfall. Aeration adds dissolved oxygen to the produced water which can oxidize susceptible ions, which may then precipitate. This is particularly true for dissolved iron. Because iron is one of the key parameters for monitoring water quality, the precipitation of iron oxide near the discharge point will improve water quality at downstream locations.

In order to determine the actual water quality of the producing formations in this POD and to verify the water analysis submitted for the pre-approval evaluation, the operator has committed to designate a reference well to each coal zone within the POD boundary. The reference well will be sampled at the wellhead for analysis within sixty days of initial production. A copy of the water analysis will be submitted to the BLM Authorized Officer.

As stated previously, the operator has committed to offer water well agreements to properly permitted domestic and stock water wells within the circle of influence of the proposed CBNG wells.

In-channel downstream impacts are addressed in the WMP for the Cabin Creek VI POD prepared by Pinnacle Gas Resources Inc. The WDEQ regulates the quality of water discharged to the Powder River in order to meet the irrigation standard requirements downstream. There should be no negative impacts resulting from the discharge of water from this project.

4.1.7.2.1. Surface Water Cumulative Effects

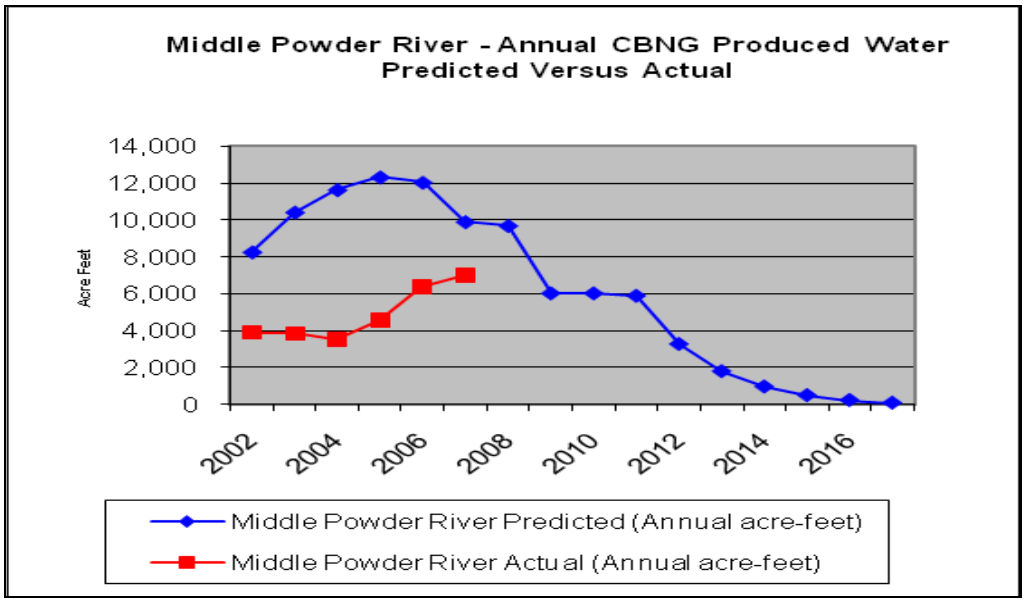
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Middle Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2007, all producing CBNG wells in the Middle Powder River watershed have discharged a cumulative volume of 29,312 acre-ft of water compared to the predicted 64,587 acre-ft disclosed in the PRB FEIS (Table 2-8 pages 2-26). These figures are presented graphically in Figure 4.2 and Table 4.7 following. This volume is 45% of the total predicted produced water analyzed in the PRB FEIS for the Middle Powder River watershed.

Table 4.7 Actual vs. predicted water production in the Middle Powder River watershed *2007 Data Update 3-08-08*

Year	Middle Powder River Predicted (Annual acre-feet)	Middle Powder River Predicted (Cumulative acre-feet from 2002)	Middle Powder River Actual (Annual acre-feet)		Middle Powder River Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	8,257	8,257	3,929	47.6	3,929	47.6
2003	10,421	18,678	3,860	37.0	7,789	41.7
2004	11,640	30,318	3,547	30.5	11,336	37.4
2005	12,328	42,646	4,588	37.2	15,924	37.3
2006	12,044	54,690	6,368	52.9	22,292	40.8
2007	9,897	64,587	7,020	70.9	29,312	45.4
2008	9,689	74,276				
2009	6,030	80,306				
2010	6,030	86,336				
2011	5,899	92,235				
2012	3,276	95,511				
2013	1,797	97,308				
2014	964	98,272				
2015	495	98,767				
2016	231	98,998				
2017	82	99,080				
Total	**99,080**		**29,312**			

Figure 4.2 Actual vs. predicted water production in the Middle Powder River watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. Electrical Conductivity (EC) and SAR are the parameters of concern for suitability of irrigation water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from–existing wells within each of the ten primary watersheds in the Powder River Basin. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

The PRB FEIS states that "Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim MOC (Memorandum of Cooperation) that the two DEQs (Wyoming and Montana Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the two states develop a better understanding of the effects of CBM discharges through the enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, through the implementation of instream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117) However, this MOC expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR. Therefore the Wyoming DEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). The WDEQ has initiated a permitting policy to allow operators to discharge directly to the Powder River in seasons where the river chemistry has an assimilative capacity to dilute the effects of the produced water quality.

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur as a result of discharged produced CBNG water. The cumulative effects relative to this project are within the analysis parameters and impacts described in the PRB FEIS for the following reasons:

1. They are proportional to the actual amount of cumulatively produced water in the Middle Powder River drainage and the total amount that was predicted in the PRB FEIS, which is only approximately 45% of that total.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume and quality of water discharged.

No additional mitigation measures are required.

Refer to the PRB FEIS, Volume 2, page 4-115 – 117 and table 4-13 for cumulative effects relative to the Middle Powder River watershed and page 4 – 117 for cumulative effects common to all sub-watersheds.

4.1.8. Economics and Recovery of CBNG Resources

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

4.1.9. Fluid Minerals

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

4.1.10. Cultural Resources

When a project is constructed in an area with a high potential for buried cultural material, archaeological monitoring is often included as a condition of approval. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation

Office (SHPO) on mitigation or avoidance. Due to the presence of alluvial deposits and the presence of heavy vegetation that prevented an adequate Class III inventory, the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COA's.

No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 2/1/10 that no historic properties exist within the APE. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the *Standard* COA (General)(A)(1).

The following wells and associated infrastructure are recommended to be deferred until an adequate Class III cultural resources inventory and cultural site evaluations can be conducted:

- CB Fed 15-03-57-77
- CB Fed 11-12-57-77
- CB Fed 09-26-58-77

4.1.11. Air Quality

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Air quality impacts modeled in the PRB FEIS concluded that projected oil & gas development would not violate any local, state, tribal or federal air quality standards.

4.2. Alternative D

Following the onsite inspection, the BLM Interdisciplinary Team (IDT) reviewed the surface use and wildlife data with the changes agreed to in the field, and identified further measures designed to reduce the loss of sage-grouse habitat within the project area. BLM determined that the greatest habitat impact from the proposed action is fragmentation of sage-grouse habitat on a landscape scale; specifically, proposed road segments to various well locations, increased risk of West Nile virus, facilitated predation due to travel corridors, and increase in habitat edge in Alternative C. Alternative D was developed to further mitigate habitat loss and fragmentation within the Cabin Creek Phase VI Federal POD.

4.2.1. Vegetation & Soils Direct and Indirect Effects

The following well, which is recommended for denial based on sage-grouse habitat concerns, is also recommended for denial based on reclamation concerns:

- CB Federal 9-1

The 9-1 location is located at the base of a steep north facing hillside, and the location has been determined to have poor reclamation potential. At the onsite, moving the location to the top of the ridgeline was explored but that would have placed it in the non-drilling portion of the lease. Additionally, an engineered road would have to be built, which would go through a sand blowout area. At the onsite, rerouting the road was explored, but any movement of the road would cause greater amounts of surface disturbance. The proponent owns all the mineral leases surrounding this well, so the resource is protected from being drained by another mineral owner.

4.2.1.1. Cumulative effects for Vegetation and Soils

No additional mitigation measures are required.

4.2.2. Wildlife

4.2.2.1. Big Game Direct and Indirect Effects

This alternative will reduce disturbance to big game habitat by four wells and associated infrastructure. However, effects would be largely similar to those indicated for Alternative C.

4.2.2.1.1. Cumulative effects for Big Game

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described in the PRB FEIS. No additional mitigation measures are required.

4.2.2.2. Migratory Birds Direct and Indirect Effects

Alternative D contains the least habitat impact to migratory birds.

4.2.2.2.1. Cumulative effects for Migratory Birds

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described in the PRB FEIS. No additional mitigation measures are required.

4.2.2.3. Raptors Direct and Indirect Effects

Alternative D contains the least habitat impact to raptors. The approval of the project without wells 5-34 and 5-26 will eliminate disturbance that could potentially prevent raptor use of nests 5701 and 5713.

4.2.2.3.1. Cumulative effects for Raptors

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described in the PRB FEIS. No additional mitigation measures are required.

4.2.2.4. Threatened and Endangered and Sensitive Species

4.2.2.4.1. Threatened and Endangered Species Direct and Indirect Effects

4.2.2.4.1.1. Bald eagle

The overall vertical intrusion within the project would be reduced with implementation of Alternative D. With a decreased amount of overhead power there would be a decreased likelihood of power line mortalities.

4.2.2.4.2. Sensitive Species Direct and Indirect Effects

4.2.2.4.2.1. Greater sage-grouse

While wildlife effects already described for Alternative C generally apply, Alternative D was designed to minimize impacts to sage-grouse to the extent practicable. Four CBNG wells were dropped from Alternative C to reduce impacts to high quality sage-grouse habitat. The dropped well numbers are: CB FED 09-01, CB FED 11-11, CB FED 05-34, and CB FED 05-26.

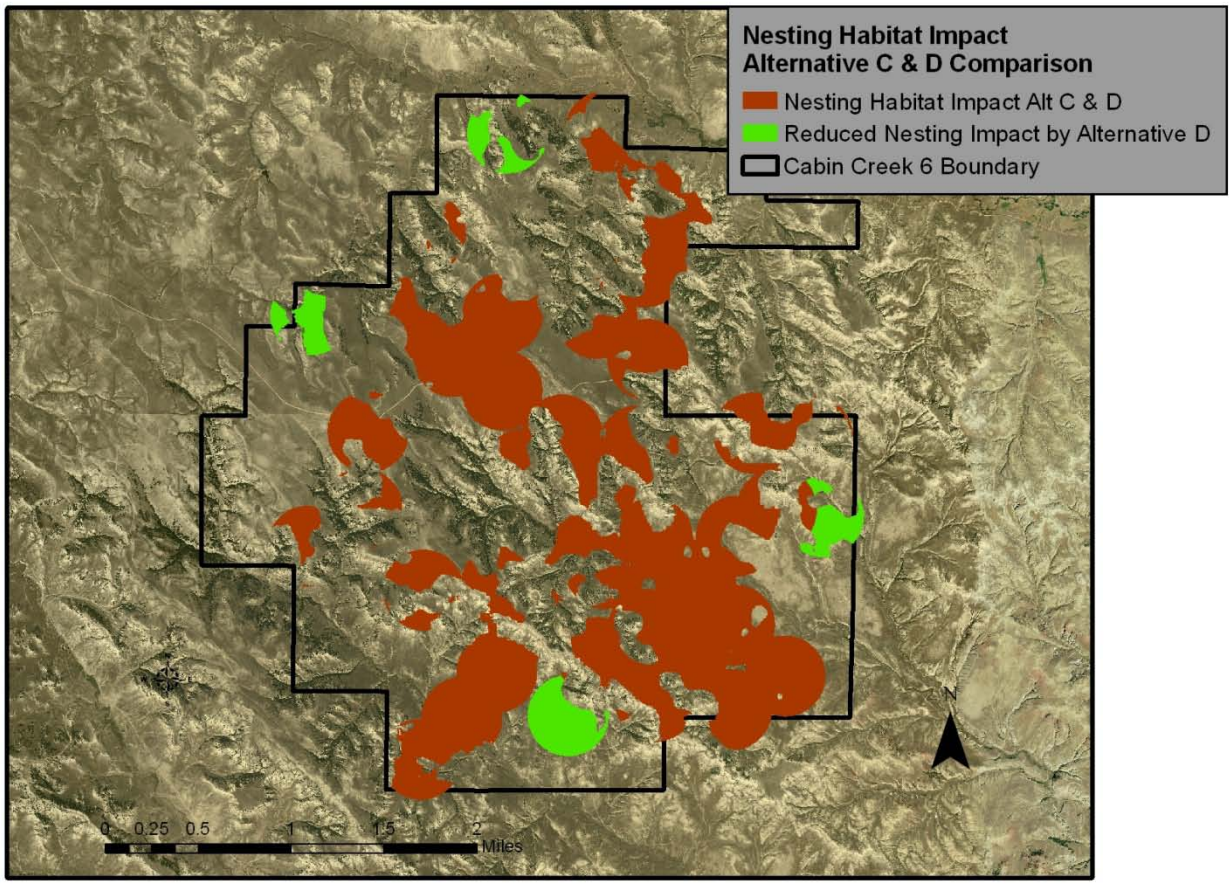
Removal of the four wells and their associated infrastructure would result in reduced effects to high-quality sage-grouse winter and nesting habitat near the Cabin Creek VI POD periphery (i.e, clustering impacts towards the POD center, maintaining habitat connectivity surrounding the POD). These changes reduce the number of wells occurring in high quality nesting habitat from 34 to 31 (Table 4.3).

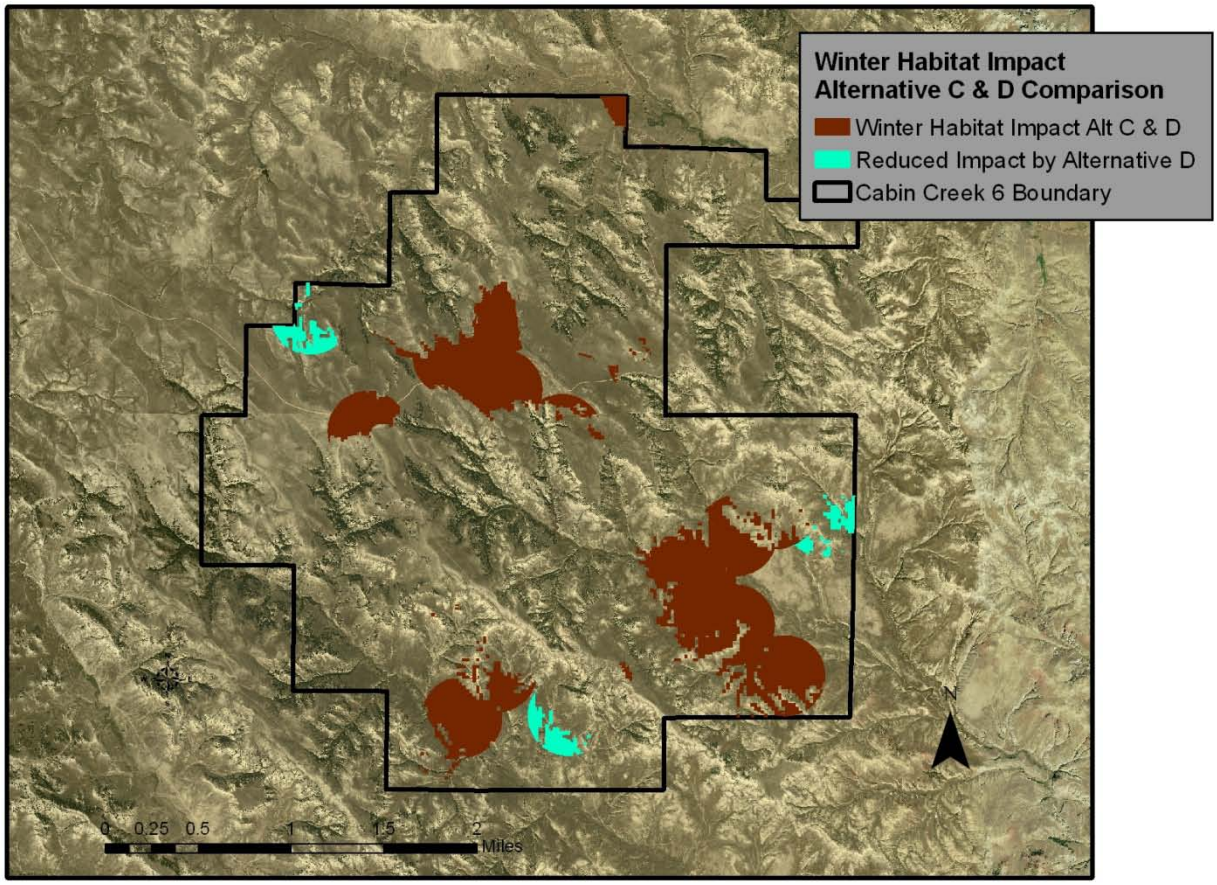
Alternative D reduces indirect impacts based on a 350 meter effects zone (WGFD 2009) from 1,946 acres of modeled high quality nesting habitat to 1,771 acres (Table 4.4, Figure 1). Indirect impact to high quality winter habitat would decline from 745 acres to 681 acres. Cumulative impacts (i.e., extreme well density effects) to modeled high quality nesting habitat associated with implementation of Alternative C

would be reduced by 181 acres with implementation of Alternative D (Table 4.5). Alternative D would result in reduced impact area and extent while maintaining greater habitat connectivity at the POD periphery.

Reduced direct, indirect, and cumulative effects associated with Alternative D would improve potential for the Cabin Creek VI POD area to maintain some wildlife habitat function during future CBNG development, and to recover function more quickly following CBNG drainage and reclamation efforts.

Figure 1 Comparison of Impacts to High Quality Nesting and Winter Habitat by Alternatives C and D assuming a 350 m buffer around wells.





4.2.2.4.2.2. Sharp-tailed grouse

Impacts to sharp-tailed grouse are similar to those indicated above for Alternative C.

4.2.2.4.3. Cumulative effects for Sharp-tailed grouse

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described in the PRB FEIS. No additional mitigation measures are required.

4.2.3. Economics and Recovery of CBNG Resource (Fluid minerals, socio-economics)

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described in the PRB FEIS.

4.2.4. Fluid Minerals

The table below indicates potential for lost resources under Alternative D.

Estimated Lost Gas from Four Undrilled Federal Locations

CBM Gas Volume Estimate – No surrounding wells				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM**
57N	77W	1	CB Fed 09-01-57-77	168.807 MMCFG
57N	77W	11	CB Fed 11-11-57-77	251.625 MMCFG
58N	77W	26	CB Fed 05-26-58-77	323.021 MMCFG
58N	77W	34	CB Fed 05-34-58-77	291.603 MMCFG

Volume estimate is based on coal bed depths provided in drilling plan.
No logs showing coals bed for area could be found.
Water Depth for the wells was estimated at 150'

CBM Gas Volume Estimate – Surrounding 80 acre wells drilled				
TWP	**RNG**	**Sec**	**Well Name**	**Unrecovered CBM**
57N	77W	1	CB Fed 09-01-57-77	18.569 MMCFG
57N	77W	11	CB Fed 11-11-57-77	27.679 MMCFG
58N	77W	26	CB Fed 05-26-58-77	35.532 MMCFG
58N	77W	34	CB Fed 05-34-58-77	32.076 MMCFG

Note: All figures are in thousands of MCFG or thousands of dollars

4.2.5. Comparison Summary of Effects By Cumulative effects

The cumulative effects associated with Alternative D are within the analysis parameters and impacts described I the PRB FEIS. No additional mitigation measures are required.

Table 4.8 Cumulative Effects

Resource/Species	**Alternative A**	**Alternative C**	**Alternative D Sage Grouse emphasis**
Wetlands/Riparian Areas	No existing wetlands/riparian areas would be disturbed.		
Wildlife			
Big Game	No habitat loss or fragmentation. Would likely see increased traffic passing through due to surrounding mineral development	Some habitat loss.	Least habitat loss.
		Some habitat fragmentation.	Least habitat fragmentation.
Raptors	No habitat loss.	Greatest foraging habitat fragmentation.	Least foraging habitat fragmentation.
	No wells authorized near nests.		
Migratory Birds	No habitat loss.	Greatest habitat loss.	Least habitat loss.
	No habitat fragmentation.	Greatest habitat fragmentation.	Least habitat fragmentation.

Resource/Species	Alternative A	Alternative C	Alternative D Sage Grouse emphasis
Threatened and Endangered Species			
Bald eagle	No habitat loss	Increased disturbance in area from human presence.	Same as Alt. C
Sensitive Species			
Greater Sage Grouse	No habitat loss.	Greatest habitat loss.	Least habitat loss.
			Least habitat fragmentation. Increase habitat connectivity.
West Nile Virus	No Impact	likely to have effect on the overall spread of WNV.	Unlikely to have any effect on the overall spread of WNV.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	Interim SHPO	Wyoming State Historic Preservation Office	No

6. OTHER PERMITS REQUIRED

A number of other permits are required from Wyoming State and other Federal agencies. These permits are identified in Table A-1 in the PRB FEIS Record of Decision.

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