FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Pinnacle Gas Resources, Inc.
Cabin Creek Phase IV
ENVIRONMENTAL ASSESSMENT –WY-070-**09-005**

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Pinnacle Gas Resources, Inc.'s Cabin Creek Phase IVCoal Bed Natural Gas (CBNG) POD comprised of the following 31 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	CABIN CREEK IV CB FED	01-01	NENE	1	57N	76W	WYW74207
2	CABIN CREEK IV CB FED	03-01	NENW	1	57N	76W	WYW74207
3	CABIN CREEK IV CB FED	05-01	SWNW	1	57N	76W	WYW74207
4	CABIN CREEK IV CB FED	11-01	NESW	1	57N	76W	WYW74207
5	CABIN CREEK IV CB FED	07-01	SWNE	1	57N	76W	WYW74207
6	CABIN CREEK IV CB FED	13-01	SWSW	1	57N	76W	WYW74207
7	CABIN CREEK IV CB FED	15-01	SWSE	1	57N	76W	WYW74207
8	CABIN CREEK IV CB FED	03-02	NENW	2	57N	76W	WYW71502
9	CABIN CREEK IV CB FED	08-02	SENE	2	57N	76W	WYW74207
10	CABIN CREEK IV CB FED	11-02	NESW	2	57N	76W	WYW71502
11	CABIN CREEK IV CB FED	05-02	SWNW	2	57N	76W	WYW71502
12	CABIN CREEK IV CB FED	07-02	SWNE	2	57N	76W	WYW71502
13	CABIN CREEK IV CB FED	09-02	NESE	2	57N	76W	WYW74207
14	CABIN CREEK IV CB FED	01-03	NENE	3	57N	76W	WYW160906
15	CABIN CREEK IV CB FED	07-03	SWNE	3	57N	76W	WYW7102
16	CABIN CREEK IV CB FED	09-03I	NESE	3	57N	76W	WYW149628
17	CABIN CREEK IV CB FED	05-03	SWNW	3	57N	76W	WYW7102
18	CABIN CREEK IV CB FED	09-03	NESE	3	57N	76W	WYW149628
19	CABIN CREEK IV CB FED	11-03	NESW	3	57N	76W	WYW149628
20	CABIN CREEK IV CB FED	03-03	NENW	3	57N	76W	WYW7102
21	CABIN CREEK IV CB FED	03-27	NENW	27	58N	76W	WYW149629
22	CABIN CREEK IV CB FED	05-27	SWNW	27	58N	76W	WYW149629
23	CABIN CREEK IV CB FED	13-27	SWSW	27	58N	76W	WYW149629
24	CABIN CREEK IV CB FED	09-27	NESE	27	58N	76W	WYW149629
25	CABIN CREEK IV CB FED	11-27	NESW	27	58N	76W	WYW149629
26	CABIN CREEK IV CB FED	15-27	SWSE	27	58N	76W	WYW149629
27	CABIN CREEK IV CB FED	07-27	SWNE	27	58N	76W	WYW149629
28	CABIN CREEK IV CB FED	03-34	NENW	34	58N	76W	WYW51884
29	CABIN CREEK IV CB FED	10-34	NESE	34	58N	76W	WYW51884
30	CABIN CREEK IV CB FED	13-34	SWSW	34	58N	76W	WYW0316679A
31	CABIN CREEK IV CB FED	12-35	NWSW	35	58N	76W	WYW149629

The following impoundments were inspected and approved for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	Creswell #3	SENW	34	58N	76W	5.56	0.74	FEE
2	Creswell #4	NENE	3	57N	76W	62.92	4.1	FEE

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 Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003.

RATIONALE: The decision to authorize Alternative C, as described in the attached Environmental Assessment (EA), 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 ½ 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 Landowner(s).
3. Alternative C will not result in any undue or unnecessary environmental degradation.
4. It is in the public interest to approve these wells, as the leases are being drained of federal gas, resulting in a loss of revenue for the government.
5. Mitigation measures applied by the BLM will alleviate or minimize environmental impacts.
6. Alternative C is the environmentally-preferred Alternative.
7. The proposed action is in conformance with the PRB FEIS and the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001.

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 Alternative C and, therefore, an environmental impact statement is not required.

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: _____

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Pinnacle Gas Resources, Inc.
Cabin Creek Phase IV
PLAN OF DEVELOPMENT
WY-070-09-005

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 Buffalo Field Office. This project EA addresses site-specific resources and impacts that were not covered within the PRB FEIS.

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on 7 federal oil and gas mineral leases issued to the applicant by the BLM.

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

The proposed action is in conformance with the terms and the conditions of the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management, Buffalo Field Office (BFO), April 2001 and the PRB FEIS, as required by 43 CFR 1610.5

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

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

Proposed Action Title/Type: Pinnacle Gas Resources, Inc.'s Cabin Creek Phase IV Plan of Development (POD) for 64 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There were 64 wells proposed within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 2 wells per location. Each well will produce from Cook-Canyon or Wall-Pawnee coal seams. This is denoted on the well number as CC-Cook-Canyon or WP-Wall-Pawnee. Proposed wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	CABIN CREEK IV CB	01CC-01	NENE	1	57N	76W	WYW74207
2	CABIN CREEK IV CB	01WP-01	NENE	1	57N	76W	WYW74207
3	CABIN CREEK IV CB	03CC-01	NENW	1	57N	76W	WYW74207
4	CABIN CREEK IV CB	03WP-01	NENW	1	57N	76W	WYW74207
5	CABIN CREEK IV CB	05WP-01	SWNW	1	57N	76W	WYW74207
6	CABIN CREEK IV CB	05CC-01	SWNW	1	57N	76W	WYW74207
7	CABIN CREEK IV CB	07CC-01	SWNE	1	57N	76W	WYW74207
8	CABIN CREEK IV CB	07WP-01	SWNE	1	57N	76W	WYW74207
9	CABIN CREEK IV CB FED	11CC-01	NESW	1	57N	76W	WYW74207
10	CABIN CREEK IV CB FED	11WP-01	NESW	1	57N	76W	WYW74207
11	CABIN CREEK IV CB FED	13WP-01	SWSW	1	57N	76W	WYW74207
12	CABIN CREEK IV CB FED	13CC-01	SWSW	1	57N	76W	WYW74207
13	CABIN CREEK IV CB FED	15CC-01	SWSE	1	57N	76W	WYW74207
14	CABIN CREEK IV CB FED	15WP-01	SWSE	1	57N	76W	WYW74207
15	CABIN CREEK IV CB	05CC-02	SWNW	2	57N	76W	WYW71502
16	CABIN CREEK IV CB	05WP-02	SWNW	2	57N	76W	WYW71502
17	CABIN CREEK IV CB FED	03CC-02	NENW	2	57N	76W	WYW71502
18	CABIN CREEK IV CB FED	03WP-02	NENW	2	57N	76W	WYW71502
19	CABIN CREEK IV CB FED	07CC-02	SWNE	2	57N	76W	WYW71502
20	CABIN CREEK IV CB FED	07WP-02	SWNE	2	57N	76W	WYW71502
21	CABIN CREEK IV CB FED	11CC-02	NESW	2	57N	76W	WYW71502
22	CABIN CREEK IV CB FED	11WP-02	NESW	2	57N	76W	WYW71502
23	CABIN CREEK IV CB	09CC-02	NESE	2	57N	76W	WYW74207
24	CABIN CREEK IV CB	09WP-02	NESE	2	57N	76W	WYW74207
25	CABIN CREEK IV CB BLM	08WP-02	SENE	2	57N	76W	WYW74207
26	CABIN CREEK IV CB FED	08CC-02	SENE	2	57N	76W	WYW74207
27	CABIN CREEK IV CB	09CC-03	NESE	3	57N	76W	WYW149628
28	CABIN CREEK IV CB	09WP-03	NESE	3	57N	76W	WYW149628
29	CABIN CREEK IV CB	11CC-03	NESW	3	57N	76W	WYW149628
30	CABIN CREEK IV CB	11WP-03	NESW	3	57N	76W	WYW149628
31	CABIN CREEK IV CB	01CC-03	NENE	3	57N	76W	WYW160906
32	CABIN CREEK IV CB	01WP-03	NENE	3	57N	76W	WYW160906
33	CABIN CREEK IV CB	03CC-03	NENW	3	57N	76W	WYW7102
34	CABIN CREEK IV CB	03WP-03	NENW	3	57N	76W	WYW7102
35	CABIN CREEK IV CB	07CC-03	SWNE	3	57N	76W	WYW7102
36	CABIN CREEK IV CB	07WP-03	SWNE	3	57N	76W	WYW7102
37	CABIN CREEK IV CB FED	05CC-03	SWNW	3	57N	76W	WYW7102
38	CABIN CREEK IV CB FED	05WP-03	SWNW	3	57N	76W	WYW7102
39	CABIN CREEK IV CB	03CC-27	NENW	27	58N	76W	WYW149629
40	CABIN CREEK IV CB	03WP-27	NENW	27	58N	76W	WYW149629

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
41	CABIN CREEK IV CB	05CC-27	SWNW	27	58N	76W	WYW149629
42	CABIN CREEK IV CB	05WP-27	SWNW	27	58N	76W	WYW149629
43	CABIN CREEK IV CB	07CC-27	SWNE	27	58N	76W	WYW149629
44	CABIN CREEK IV CB	07WP-27	SWNE	27	58N	76W	WYW149629
45	CABIN CREEK IV CB	09CC-27	NESE	27	58N	76W	WYW149629
46	CABIN CREEK IV CB	09WP-27	NESE	27	58N	76W	WYW149629
47	CABIN CREEK IV CB	11CC-27	NESW	27	58N	76W	WYW149629
48	CABIN CREEK IV CB	11WP-27	NESW	27	58N	76W	WYW149629
49	CABIN CREEK IV CB	13CC-27	SWSW	27	58N	76W	WYW149629
50	CABIN CREEK IV CB	13WP-27	SWSW	27	58N	76W	WYW149629
51	CABIN CREEK IV CB	15CC-27	SWSE	27	58N	76W	WYW149629
52	CABIN CREEK IV CB	15WP-27	SWSE	27	58N	76W	WYW149629
53	CABIN CREEK IV CB FED	13CC-34	SWSW	34	58N	76W	WYW0316679A
54	CABIN CREEK IV CB FED	13WP-34	SWSW	34	58N	76W	WYW0316679A
55	CABIN CREEK IV CB	01CC-34	NENE	34	58N	76W	WYW149629
56	CABIN CREEK IV CB	01WP-34	NENE	34	58N	76W	WYW149629
57	CABIN CREEK IV CB	03CC-34	NENW	34	58N	76W	WYW51884
58	CABIN CREEK IV CB	03WP-34	NENW	34	58N	76W	WYW51884
59	CABIN CREEK IV CB FED	10CC-34	NESE	34	58N	76W	WYW51884
60	CABIN CREEK IV CB FED	10WP-34	NESE	34	58N	76W	WYW51884
61	CABIN CREEK IV CB FED	12CC-35	NWSW	35	58N	76W	WYW149629
62	CABIN CREEK IV CB FED	12WP-35	NWSW	35	58N	76W	WYW149629
63	CABIN CREEK IV CB	14CC-36	SESW	36	58N	76W	WYW149629
64	CABIN CREEK IV CB	14WP-36	SESW	36	58N	76W	WYW149629

County: Campbell

Applicant: Pinnacle Gas Resources, Inc.

Surface Owners: Bow and Arrow Ranch c/o Vaughn Creswell, US DOI BLM, Office of State Land and Investments

Project Description:
The proposed action involves the following:

- Drilling of 64 total federal CBM wells to the Cook, Canyon, Wall and Pawnee coal zones with depths ranging from 795-1000 feet for the Cook and Canyon coal seams and with depths ranging from 1000-1250 feet for the Wall and Pawnee coal seams. Two wells will be drilled per location with each well targeting two 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 at the well head.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: Treatment of water at a facility and subsequent discharge to the Middle Powder River. The treatment facility and river discharge were evaluated and described in the Cabin Creek Phase I POD and EA (EA# WY-070-07-057, approved 4/9/07).

- An unimproved and improved road network.

- An above ground power line network to be constructed by a contractor. 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 shall be placed at the 8 proposed power drops.

- A storage tank of 1000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 6 months or until overhead power is installed. Fuel deliveries are anticipated to be every 7 days. Noise level is expected to be 84 decibels at 4 feet distance based on field testing of similar sized generators with 10-15 mph wind conditions. Noise levels are attenuated at, or below, 49 decibels at an estimated distance of 600 feet to ½ mile.

- A buried gas, water and power line network, and 1 proposed compression facility approved under the Cabin Creek Phase III POD.

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 and/or APDs 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 COA 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.

2.3. Alternative C – Environmentally Preferred

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 identified by BLM and the operator following the initial project proposal (Alternative B). 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, and 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. The specific changes identified for the Cabin Creek Phase IV POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

	Well Name	Well Location	Qtr/Qtr	Sec	TWP	RNG	Lease #	Comments
1	Cabin Creek IV CB Fed	11-3	NESW	3	57N	76W	WYW149628	Well moved to East ±200ft to put on more gentle slope
2	Cabin Creek IV CB Fed	9-3	NESE	3	57N	76W	WYW149628	Well moved to South ±500ft from the top of a hill to the bottom of the hill; This will reduce the surface disturbance; Stayed in same Qtr/Qtr.
3	Cabin Creek IV CB Fed	3-34	NENW	34	58N	76W	WYW51884	Well moved by operator to avoid raptor nest
4	Cabin Creek IV CB Fed	9-27	NESE	27	58N	76W	WYW149629	Well moved to SW ±300ft to reduce surface disturbance and avoid a constructed pad from being built. Template road design required on first 600ft then engineered design required.
5	Cabin Creek IV CB Fed	11-27	NESW	27	58N	76W	WYW149629	Well moved to a flatter location which avoided crossing a small drainage
6	Cabin Creek IV CB Fed	7-27	SWNE	27	58N	76W	WYW149629	Well moved to alternate location but in the same Qtr/Qtr as the original location had no feasible means of access. Engineer road design required off main road to bottom of main hill then template design to well location.
7	Cabin Creek IV CB Fed	9-2	NESE	2	57N	76W	WYW74207	Well moved to SW ±200ft by operator to avoid a narrow hill top
8	Cabin Creek IV CB Fed	13-1	SWSW	1	57N	76W	WYW74207	Well moved to SE ±10ft to a gentler slope. Template road design required.
9	Cabin Creek IV CB Fed	3-3	NENW	3	57N	76W	WYW7102	Well moved to SE ±150ft to a more gentle slope which avoided the need for a constructed well pad
10	Cabin Creek IV CB Fed	12-35	NWSW	35	58N	76W	WYW149629	Well moved to old P&A location to the East to put well out of line of sight of a raptor nest discovered during the onsite. Engineer designs required on 2 drainage crossings (PLWC02 & PLWC03) and a template design is required also.
11	Cabin Creek IV CB Fed	3-02	NENW	2	57N	76W	WYW71502	The access road was moved to come from the West as it was not feasible to have the road cross Fence Creek itself. The operator has dropped this well as

	Well Name	Well Location	Qtr/Qtr	Sec	TWP	RNG	Lease #	Comments
								it has acquired the state lease to the north and will drill a state well next to the existing road instead of the federal well. Template road design required.
12	Cabin Creek IV CB Fed	3-27	NENW	27	58N	76W	WYW149629	The access road was changed to a template road design.
13	Cabin Creek IV CB Fed	5-27	SWNW	27	58N	76W	WYW149629	Engineer drainage crossing (PLWC01) with culvert
14	Cabin Creek IV CB Fed	15-27	SWSE	27	58N	76W	WYW149629	Main road will require curve widening, cross drains, signage, ditch blocks and surfacing. Turnout required where main road continues on to the scoria pit.
15	Cabin Creek IV CB Fed	13-27	SWSW	27	58N	76W	WYW149629	Template road design will be required
16	Cabin Creek IV CB Fed	1-1	NENE	1	57N	76W	WYW74207	Template road design required
17	Cabin Creek IV CB Fed	8-2	SENE	2	57N	76W	WYW74207	Template road design required
18	Cabin Creek IV CB Fed	1-34	NENE	34	58N	76W	WYW149629	Well is dropped as the road is not feasible and would likely be unreclaimable.
19	Cabin Creek IV CB Fed	14-36	SESW	36	58N	76W	WYW149629	Well is dropped as it is in line of sight of a raptor nest and is within 100 year floodplain

The following modifications to the proposed action were made by the operator during the processing of the project:

1. The operator changed the water management strategy to include 2 proposed off-channel pits, and 2 proposed injection wells.

2. The operator changed the installation of the overhead power from Powder River Energy Corporation to Pinnacle contracting with KLJ to install the overhead powerlines for Pinnacle and Pinnacle then selling the powerlines back to Powder River Energy. This is due to Powder River Energy's inability to provide power to the project area at this time. It is estimated that it could be 2 or more years before Powder River Energy would be able to install new overhead power in the area.

3. The operator dropped one of the twin locations and went to one well per location, co-mingling 4 coal seams at the same time.

These additional changes resulted in additional onsites that needed to be conducted. During the onsite investigation, 2 potential off-channel impoundments were evaluated. As a result of those onsites, the current water management strategy proposed is as follows:

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: Treatment of water at a facility and subsequent discharge to the Middle Powder River. The treatment facility and river discharge were evaluated and described in the Cabin Creek Phase I POD and EA (EA# WY-070-07-057, approved 4/9/07). 2 proposed off-channel secondary pits with 2 proposed discharge points and 1 proposed injection well.

The other proposed injection well is not anticipated being needed at this time and will not be pursued by the operator.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

Programmatic mitigation measures are those, determined through analysis, which may be appropriate to apply at the time of APD approval if site specific conditions warrant. These mitigation measures can be applied by BLM, as determined necessary at the site-specific NEPA APD stage, as COAs and will be in addition to stipulations applied at the time of lease issuance and any standard COA.

2.3.2.1. Groundwater

1. In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed and revised a guidance document, "Compliance Monitoring and siting Requirements for Unlined Impoundments Containing Coalbed Methane Produced Water" (September, 2006) which can be accessed on their website. For all WYPDES permits the BLM will require that operators comply with the latest DEQ standards and monitoring guidance.

2.3.2.2. Surface Water

1. Channel Crossings:
   a) Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
   b) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

3. The operator will supply a copy of the complete approved SW-4, SW-3, or SW-CBNG permits to BLM as they are issued by WSEO for impoundments.

2.3.2.3. 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.

2.3.2.4. Wetland/Riparian

1. Power line corridors will avoid wetlands, to the extent possible, in order to reduce the chance of waterfowl hitting the lines. Where avoidance can't occur, the minimum number of poles necessary to cross the area will be used.

2. Wetland areas will be disturbed only during dry conditions (that is, during late summer or fall), or when the ground is frozen during the winter.

3. No waste material will be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways.

4. The lower edge of soil or other material stockpiles will be located outside the active floodplain.

5. Disturbed channels will be re-shaped to their approximate original configuration or stable geomorphological configuration and properly stabilized.

6. Reclamation of disturbed wetland/riparian areas will begin immediately after project activities are complete.

2.3.2.5. 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. The Companies will locate facilities so that noise from the facilities at any nearby sage grouse or sharp-tailed grouse display grounds does not exceed 49 decibels (10 dBA above background noise) at the display ground.

3. The Companies will construct power lines to minimize the potential for raptor collisions with the lines. Potential modifications include burying the lines, avoiding areas of high avian use (for example, wetlands, prairie dog towns, and grouse leks), and increasing the visibility of the individual conductors.

4. The Companies will locate aboveground power lines, where practical, at least 0.5 mile from any sage grouse breeding or nesting grounds to prevent raptor predation and sage grouse collision with the conductors. Power poles within 0.5 mile of any sage grouse breeding ground will be raptor-proofed to prevent raptors from perching on the poles.

5. The Companies will limit the construction of aboveground power lines near streams, water bodies, and wetlands to minimize the potential for waterfowl colliding with power lines.

6. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

1. Surveys for active bald eagle nests and winter roost sites will be conducted within suitable habitat by a BLM approved biologist. Surface disturbing activities will not be permitted within one mile of suitable habitat prior to survey completion.

2. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle nest sites. A seasonal minimal disturbance buffer zone of one mile will be established for all bald eagle nest sites (February 15 – August 15).

3. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle winter roost sites. A seasonal minimal disturbance buffer zone of 1 mile will be established for all bald eagle winter roost sites (November 1 – April 1). These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.

4. Within ½ mile of bald eagle winter roost sites additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 and 3:00 may be necessary to prevent disturbance (November 1 – April 1).

5. Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to bald eagles or their habitat.

2.3.2.6.2. Black-footed Ferret

1. If any black-footed ferrets are located, the USFWS will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.

2. Additional mitigation measure may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to black-footed ferrets or their habitat. In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2.3.2.6.3. Mountain Plover

1. A mountain plover nesting survey shall be conducted following U.S. Fish and Wildlife Service protocol within occupied black-tailed prairie dog colonies prior to permit authorization.

   Outside of occupied black-tailed prairie dog colonies, a mountain plover nesting survey following U.S. Fish and Wildlife Service protocol is encouraged prior to construction initiation, as project modifications can be made if necessary to protect nesting plovers and natural gas production. If requested in writing, then authorization may be granted for construction activities to occur between August 1 and March 15, outside the mountain plover breeding season. A mountain plover nesting survey following U.S. Fish and Wildlife Service protocol shall be conducted during the first available survey period (May 1 – June 15). Additional measures such as monitoring and activity restrictions may be applied if mountain plovers are documented.

2. A disturbance-free buffer zone of 0.25 mile will be established around all occupied mountain plover nesting habitat between March 15 and July 31.

3. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ½ mile of occupied mountain plover nesting habitat.

2.3.2.6.4. Ute Ladies'-tresses Orchid

1. Moist soils near wetlands, streams, lakes, or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.

2.3.2.7. Visual Resources

1. The Companies will mount lights at compressor stations and other facilities on a pole or building and direct them downward to illuminate key areas within the facility while minimizing the amount of light projected outside the facility.

2.3.2.8. Noise

1. Noise mufflers will be installed on the exhaust of compressor engines to reduce the exhaust noise.

2. Where noise impacts to existing sensitive receptors are an issue, noise levels will be required to be no greater than 55 decibels measured at a distance of one-quarter mile from the appropriate booster (field) compressor. When background noise exceeds 55dBA, noise levels will be no greater than 5dBA above background. This may require the installation of electrical compressor motors at these locations.

2.3.2.9. Air Quality

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 percent 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.

2.3.3. Site specific mitigation measures

General

1. All changes made at the onsite will be followed. They have all been incorporated into the operator's POD.

2. The approval of this project does not grant authority to use off lease Federal lands. No access or surface activity is allowed on or off the affected leases on Federal lands until right-of-way grants become authorized.

3. No surface disturbing activities will be authorized on federal lands prior to the approval of a Pesticide Use Permit unless Pinnacle Gas Resources Inc. provides documentation of:
    a. Current year weed survey with photos showing that no state listed invasive species are present in the areas to be disturbed.

4. Please contact Mary Maddux, Natural Resource Specialist, @ (307) 684-1164, Bureau of Land Management, Buffalo, if there are any questions concerning these COAs.

Surface Use

1. The operator will notify the BLM-Buffalo Field Office at least 48 hours prior to starting any construction activities of the well locations within the Cabin Creek IV POD. This applies to all of the federal wells.

2. The following wells will be inspected by the BLM with the drilling contractor prior to start of any surface disturbing activities to ensure the location can be drilled in a safe, workman like manner:
    - 12-35
    - 5-27
    - 3-2
    - 11-2
    - 9-27
    - 9-2
    - 8-2
    - 5-1
    - 3-27
    - 12-35
    - 13-34
    - 3-3
    - 5-3
    - 7-3
    - 8-2

- 13-1
- 15-1
- 1-1
- 3-2

3. All template and engineered roads used in conjunction with accessing federal wells must be fully built (including all water control structures such as wingditches, culverts, relief ditches, low water crossings, etc.) and functional to BLM standards as outlined in the 9113 manual prior to drilling of the well.

4. All roads, well pads, rig slots, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for review prior to construction.

5. The following wells will have their reserve pits lined:
    - 3-3
    - 11-1
    - 5-1
    - 3-1

6. For all wells spudded after November 1, the reserve pit fluids must be removed immediately following completion activities to avoid potential conflicts with raptor timing limitations and the standard COA that reserve pits be closed within 90 days, unless an exception is granted by the BLM Authorized Officer.
7. 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.
8. No salvaged trees will be pushed up against live trees or buried 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. Noise mufflers will be installed on the exhaust of all generators to reduce the exhaust noise.
11. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

Grade	**Drainage Spacing**
2-4%	310 ft
5-8%	260 ft
9-12%	200 ft
12-16%	150 ft

12. Topsoil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches and redistributed for interim reclamation activities. This requirement will not be applied for trenches installed with wheel trenchers.

13. All rig slots locations approved with the POD will be reclaimed back to approximate original contour following well completion. This includes the following locations: 7-27, 3-34, and the 7-2.

14. All pipelines and/or utility corridor will be installed in the roadway or immediately adjacent to the access roads. If placed immediate adjacent to the access roads the disturbance will be contained within the disturbance allowed for road construction.

15. 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.

16. Primitive roads (2-tracks) with utility corridor working width will not exceed 40 feet with a clearing and blading not to exceed 30 feet in width. Construction of primitive roads access/utility corridor within the Cabin Creek IV POD will minimize impact to sagebrush by minimizing road width, mowing and wheel trenching.

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

18. A minimum 20 foot undisturbed vegetative buffer will be maintained for erosion features along all access roads unless addressed with proper mitigation in the detailed road designs.

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

20. All stock water tanks installed on BLM surface will be installed with a rock apron of 4 inch aggregate surrounding the tank and extending a minimum of 8 feet out from the tank.

21. 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 Phase IV POD is Covert Green for locations located in sagebrush shrublands and Beetle for locations located in ponderosa and juniper trees.

22. Provide 4" of aggregate where grades exceed 8%. Surface material must meet requirements set forth in Wyoming Supplement to BLM Road Manual 9113.

23. The following well locations and access road/corridor in the project area have been identified to have limited reclamation potential that will 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.

Lease	Well #	Aliquot	Sec	T	R
WYW149629	3-27	NENW	27	58N	76W
WYW149629	7-27	SWNE	27	58N	76W
WYW7102	3-3	NENW	3	57N	76W
WYW7102	5-3	SWNW	3	57N	76W

Lease	Well #	Aliquot	Sec	T	R
WYW149628	11-3	NESW	3	57N	76W
WYW71502	7-2	SWNE	2	57N	76W
WYW74207	9-2	NESE	2	57N	76W
WYW74207	13-1	SWSW	1	57N	76W
WYW74207	8-2	SENE	2	57N	76W
WYW149629	9-27 access road	NESE	27	58N	76W
WYW149629	13-27 access road	SWSW	27	58N	76W
WYW74207	7-1	SWNE	1	57N	76W
WYW74207	3-1	NENW	1	57N	76W
WYW74207	1-1	NENE	1	57N	76W
WYW74207	15-1	SWSE	1	57N	76W

24. The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231) specifically the following:

    Reclamation Standards:

    1. The reclaimed area shall be stable and exhibit none of the following characteristics:
       a. Large rills or gullies.
       b. Perceptible soil movement or head cutting in drainages.
       c. Slope instability on, or adjacent to, the reclaimed area in question.
    2. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.
    3. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
       a. Successful onsite establishment of species included in the planting mixture or other desirable species.
       b. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.
    4. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.

25. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested,

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:

Loamy Ecological Sites

Species – *Cultivar*	**% in Mix**	**Lbs PLS**
Western Wheatgrass (Pascopyrum smithii)/or ***Thickspike Wheatgrass*** (Elymus lanceolatus ssp. lanceolatus)	30	3.6
Bluebunch Wheatgrass (Pseudoroegneria spicata ssp. Spicata)	10	1.2
Green needlegrass (Nassella viridula)	25	3.0
Slender Wheatgrass (Elymus trachycaulus ssp. trachycaulus)	20	2.4
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
Rocky Mountain beeplant (Cleome serrulata)	5	0.6
Totals	**100%**	**12 lbs/acre**

Ponderosa Pine/Little Bluestem Ecological Site:

Species	**% in Mix**	Lbs PLS*
Needleandthread (Hesperostipa comata ssp. Comata) Or ***Indian ricegrass*** (Achnatherum hymenoides)	10	1.2
Bluebunch Wheatgrass (Pseudoroegneria spicata ssp. Spicata)	25	3.0
Sideoats grama (Bouteloua curtipendula)	20	2.4
Thickspike Wheatgrass (Elymus lanceolatus ssp. lanceolatus)	30	3.6
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
American vetch(Vicia Americana)	5	0.6
Totals	**100%**	**12 lbs/acre**

This is a recommended seed mix based on the native plant species listed in the NRCS Ecological Site descriptions, U.W. College of Ag. and seed market availability.

Wildlife

Bald Eagles

The following conditions will alleviate impacts to bald eagles:

1. No project related actions shall occur within one mile of bald eagle habitat along the Powder River annually from November 1 through April 1 (CM9), prior to a winter roost survey or from February 1 through August 15 (CM8) prior to a nesting survey. This timing limitation will be in effect unless surveys determine the nest/roost to be inactive. This affects the following wells and infrastructure:

Township/Range	Section	Wells and Infrastructure
T57N/R76W	1	**Well(s):** 01-01-5776, 07-01-5776, 11-01-5776 & 13-01-5776 All proposed roads and corridor within this section **Except** the NWNW & SWNW of this section. All proposed overhead power **within this section**.
T57N/R76W	2	**Well(s):** 09-02-5776 All proposed roads and corridor within the **NESE & NWSE** of this section.

   a. If a roost is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile will be established for all bald eagle winter roost sites. A seasonal minimum disturbance buffer zone of 1 mile will be established for all bald eagle roost sites (November 1 - April 1). Additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 AM and 3:00 PM may be necessary to prevent disturbance.
   b. If a nest is identified and construction has not been completed, a disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) would be established year round for all bald eagle nests. A seasonal minimum disturbance buffer zone of 1 mile will be established for all bald eagle nest sites (February 1 - August 15).
2. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

Burrowing Owls

1. The following conditions will alleviate impacts to burrowing owls:
   A burrowing owl survey will be required in suitable burrowing owl habitat (i.e. active and inactive prairie dog colonies listed below) between April 15 and June 15. If a burrowing owl nest if identified, a 0.25 mile buffer will be applied to the nest and no surface disturbing activity shall occur within 0.25 miles of all identified prairie dog colonies from April 15 to August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s) identified below. This timing limitation will then be in effect, annually, unless surveys determine the nest(s) to be inactive.

#	Status	Legal	Approximate Size
1	Active	T57N/R76W, Sec. 3, SESE	6.6 acres
2	Active	T57N/R76W, Sec. 2, SWSW	7.1 acres
3	Active	T57N/R76W, Sec. 2 & 3 T58N/R76W, Sec. 34 & 35	371 acres

Mountain Plover

The following conditions will alleviate impacts to mountain plovers:

1. A mountain plover nesting survey is required in suitable habitat prior to commencement of surface disturbing activities in the following areas:
   - T57N/R76W, Sec. 3, SESE
   - T57N/R76W, Sec. 2, SWSW
   - T57N/R76W, Sec. 2 & 3
   - T58N/R76W, Sec. 34 & 35

   Mountain plover nesting surveys shall be conducted by a biologist following the most current USFWS Mountain Plover Survey Guidelines (the survey period is May 1-June 15). All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.

   a. No surface disturbing activities are permitted in the suitable habitat area listed above, from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season. This timing limitation will be in effect unless surveys determine no plovers are present.
   b. If occupied mountain plover habitat is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between March 15 and July 31. If no mountain plover observations are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 15).
   c. Maximum allowed travel speed on roads within 0.5 mile of identified mountain plover nesting areas shall not exceed 25 miles per hour from March 15 to July 31.
   d. No dogs will be permitted at work sites to reduce the potential for harassment of mountain plovers.

Raptors

The following conditions will alleviate impacts to 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 for the current breeding season. This timing limitation will affect the following:

Township/Range	Section	Wells and Infrastructure
T58N/R76W	27	**Wells:** 11-27-5876 & 13-27-5876 **All** road & utility corridor and overhead power lines within the **SE & SW** of this section.
T58N/R76W	34	**Wells:** 03-34-5876, 10-34-5876 & 12-35-5876 **All** road & utility corridor and overhead power lines within the **NW & SE** of this section. **Impoundment:** Creswell #3
T58N/R76W	35	**Well:** 12-35-5876 **All** road & utility corridor within the **NWSW** of this section.
T57N/R76W	1	**Wells:** 01-01-5776, 03-01-5776, 07-01-5776, 11-01-5776 & 15-01-5776 **All** road & utility corridor and overhead power lines within the **NE, SE, SENW, NESW** of this section.
T57N/R76W	2	**All** road & utility corridor within the **NWNW** of this section.
T57N/R76W	3	**Well:** 05-03-5776 **All** road & utility corridor within the **SENW** of this section.

   a. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside

this window may not depict nesting activity. If a survey identifies active raptor nests, a 0.5 mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.

b. Nest productivity checks shall be completed during project construction and for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. This applies to the following nest(s):

c. 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.

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

Sage Grouse

1. The following conditions will minimize impacts to sage-grouse:
   a. A survey is required for sage-grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.
   b. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
   c. Well metering, maintenance and other site visits within 2.0 miles of documented sage grouse lek sites should be minimized as much as possible during the breeding season (March 1– June 15).

Sharp-tailed Grouse

1. The following conditions will minimize impacts to sharp-tail-grouse:
   a. A survey is required for sharp-tailed grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.
   b. If an active lek is identified during the survey, the 0.64 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
   c. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.64 mile buffer until the following breeding season (April 1).
   d. Creation of raptor hunting perches will be avoided within 0.64 miles of documented sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on grouse.

Migratory Birds

1. Each existing overhead electrical power transformer pole designated to supply electrical power for the Cabin Creek IV POD will be upgraded to meet 2006 APLIC standards at the time of power installation for this project.

Contact Jim Verplancke at (307)684-1057 at the Bureau of Land Management, Buffalo, if there are any specific questions concerning these Wildlife COAs.

Water Management

1. The operator will submit a sundry requesting a change of status to primary along with bonding information for reservoirs designated as secondary before construction begins on these water management structures.

Cultural

1. All surface disturbing activities within the boundaries of site 48CA6402, must be limited to non-contributing portions of the site on the west side of the Fence Creek road. Additionally, a construction monitor will be required within the boundaries of site 48CA6402.

2.4. Alternatives considered but not analyzed in detail

The operator did not address alternative water management strategies such as irrigation, or direct discharge of untreated by-product water. In the original submission the operator proposed to transport all produced water to a treatment facility and discharge point approved under the Cabin Creek Phase I plan of development (WY-070-EA07-057) via a pipeline network approved under the Cabin Creek Phase III plan of development (WY-070-EA07-089). The operator then proposed utilizing 2 off-channel impoundments, injection wells as well as the potential use of 2 additional treatment facilities. 2 injection wells were proposed but only one is being considered for use at this time by the operator, the other injection well is not anticipated as being needed due to the reduction in drilling and bringing new wells on line within the Cabin Creek Complex. The 2 additional treatment facilities proposed were dropped by the operator as the existing treatment facility was expanded and it is anticipated it will be adequate to handle the current and future water production at this time in co-junction with impoundments and injection wells. Additional "beneficial uses" are outlined on page 15 of the water management plan under the heading "Beneficial Use".

2.5. 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 proposal (Alternative C) are presented in Table 2.5.

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	11	64	31
Well Locations			
Nonconstructed	11	32	28
Constructed			0
Slotted			3
Conventional Wells	17	0	0
Gather/Metering Facilities	0	0	0
Compressors	1	0	0
Ancillary (Staging/Storage Areas)	1	0	2
Template/Spot Upgrade Roads			
No Corridor			
With Corridor	6.9		1.1
Engineered Roads			
No Corridor			
With Corridor			3.31
Primitive Roads			
No Corridor	0.5	0.5	0.7
With Corridor	2.4	14.3	8.2
Buried Utilities			
No Corridor	0.13		
With Corridor			
Overhead Powerlines	4.36	2.56	1.63
Treatment Facilities	1	1	1
Impoundments			
On-channel			0
Off-channel			2
Lined			0
Unlined			2
Water Discharge Points	1	1	3
Channel Disturbance			
Headcut Mitigation			
Channel Modification			
TOTAL ACRES DISTURBANCE	**98.6**	**74.2**	**88.9**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on 1/16/2007. Field inspections of the proposed Cabin Creek Phase IV CBNG project were conducted on 4/30/2008, 5/7/2008, 5/20/2008, 5/21/2008, 6/19/2008, and 9/25/2008 by:

DATE	NAME	TITLE	AGENCY
5/7/,5/20,5/21/2008	Jake Kendrick	Surveyor	Prestfeldt Surveying
5/7/, 5/20, 5/21/2008	Jim Aksamit	Senior Project Manager	Western Land Services
5/7/, 5/20, 5/21/2008	Allen Aksamit	Wildlife Biologist	Western Land Services
5/7/, 5/20, 5/21/2008	Greg Tracy	Water Resource Specialist	Western Land Services
5/7/, 5/20, 5/21/2008	Scott Straessler	Project Manager	Pinnacle Gas Resources, Inc.
5/7/, 5/20, 5/21/2008	Jason Koltiska	Landowner Representative	Bow & Arrow Ranch
5/7/, 5/20, 5/21/2008	Jim Verplancke	Wildlife Biologist	BLM-BFO
5/7/, 5/20, 5/21/2008	Mary Maddux	Natural Resource Specialist	BLM-BFO
5/20/08	Clint Crago	Archaeologist	BLM-BFO
5/20,5/21/2008	Brad Rogers	Wildlife Biologist	USFWS
5/20, 5/21/2008	Scott Covington	Wildlife Biologist	USFWS
5/21/2008	Hilaire Peck	Civil Engineer	BLM-BFO
5/21/2008	Ted Hamersma	Civil Engineer Tech.	BLM-BFO
4/30/2008	Mark Deibert	Hydrologist	Western Land Services
4/30/2008	Terry Webster	Hydrologist	Pinnacle Gas Resources, Inc.
4/30/2008	Ben Adams	Hydrologist	BLM-BFO

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. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.1.

Table 3.1 - Critical elements requiring mandatory evaluation are presented below.

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species		X		Jim Verplancke
Floodplains		X		Mary Maddux, Ben Adams
Wilderness Values			X	Mary Maddux
ACECs			X	Mary Maddux
Water Resources	X			Mary Maddux, Ben Adams
Air Quality		X		Mary Maddux
Cultural or Historical Values	X			Clint Crago
Prime or Unique Farmlands			X	Mary Maddux
Wild & Scenic Rivers			X	Mary Maddux
Wetland/Riparian	X			Mary Maddux, Ben Adams
Native American Religious Concerns			X	Clint Crago
Hazardous Wastes or Solids		X		Mary Maddux

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Invasive, Nonnative Species	X			Mary Maddux
Environmental Justice		X		Mary Maddux

3.1. Topographic Characteristics of Project Area

The Cabin Creek IV project area is located south of the Montana/Wyoming border in Campbell County. The project area is roughly 35 miles Northeast of Clearmont, Wyoming. The main access into the project area is via Lower Powder River Road and through the Cabin Creek III POD. Another potential access into the project area is using the existing Fence Creek Oil Field Road coming from the west from the Passaic County Road.

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. For the most part the tops of the ridges are broad plateaus that are fairly flat with a mixture of grasses and sagebrush; however there are portions that pinch together into narrow fingers. Other areas are broad but become narrow and form a bowl lip where the topography encounters an adjacent ridgeline. This varying relief in the topography can be a challenge in finding suitable well site locations that do not require some type of constructed pad. The steep draws and side slopes are characterized with Juniper and Ponderosa pine trees. Some of the steeper draws have active headcuts and erosion due to snow runoff and precipitation events. Fence Creek horizontally dissects the project area. The entire project area has been identified as having leafy spurge. Salt cedar and Russian knapweed have been identified on the eastern side of project area running along the Powder River. The elevation varies in the area from 3,500 to 4,000 feet above sea level. Livestock grazing and CBNG and conventional oil development are the primary land uses at this time. The surface ownership is mostly fee with a state section in the middle and federal surface scattered throughout the POD.

3.2. Vegetation & Soils

Surveys of the project area revealed that sagebrush shrubland is the primary vegetation type present within the Cabin Creek IV POD. This vegetation type includes a combination of sparse, moderately dense and dense sagebrush crown closure with a variety of understory grasses and forbs. Common species associated with this vegetation type include Wyoming big sagebrush, silver sagebrush, western wheat grass, junegrass, needle and thread grass, Sandberg bluegrass, prickly pear cactus, scarlet globemallow and rabbit brush.

Stands of Ponderosa pine and juniper occur throughout and surrounding the project area. Ponderosa and juniper stands mainly occur on the sides and bottoms of the numerous draws in the area. Ponderosa and juniper stands can be characterized as being moderately sparse to dense. Scattered juniper and ponderosa also occur within sagebrush communities and on ridge tops and flats throughout the project area.

The Cabin Creek IV POD topography consists of approximately 75% rough to moderately rough terrain with numerous ridges and deep draws. Scattered cottonwood trees occur in the draws within the project area. The primary habitat is sagebrush grassland dominated by big sagebrush. In creek and ravine bottoms silver sagebrush is the primary shrub type. Sagebrush communities occur throughout the project area. The elevation within the project area ranges from approximately 3,700 to 4,200 feet above sea level. Livestock grazing, a small, active conventional oil field (Fence Creek Oil Field) and recent CBNG development are the current land uses in the area.

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate ecological

sites for the area contained within this proposed action, BLM specialists' analyzed data from onsite field investigations and Natural Resources Conservation Service (NRCS) publish soil survey soils information. The associated ecological sites found within the Cabin Creek Phase IV POD boundary are listed in Table 3.2 below.

Table 3.2-Ecological Sites with Acreage

Ecological Site	Acres	Percent
LOAMY (10-14NP)	1215	34
LOWLAND (10-14NP)	171	5
PONDEROSA PINE and LITTLE BLUESTEM	1536	43
SANDY (10-14NP)	80	2
SHALLOW LOAMY (10-14NP)	550	16

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

Species typical of short grass prairie comprise the project area flora. Specific species observed throughout the project area include ponderosa pine, little bluestem, some juniper, western wheatgrass, cheatgrass, Wyoming big sagebrush, bluebunch wheatgrass, and pricklypear. Differences in dominant species within the project area vary with soil type, aspect and topography.

Using the Natural Resource Conservation Service, (NRCS, USDA), Technical Guides for the Major Land Resource Area 58B Northern Rolling High Plains, in the 10-14" Northern Plains precipitation zone, the landforms, the soils and the predominant ecological sites occurring within the proposed POD are found to be Loamy to Shallow Loamy. Loamy sites occur on hill slopes with assoc. alluvial fans & stream terraces. 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.

The loamy soils on the well locations 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.

At the remaining well locations, the soils are shallow (less than 20"to bedrock) and well-drained formed in alluvium over residuum or residuum. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. 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.

Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 2 to 4 inches on ridges to 6+ inches in bottomland. Erosion potential varies from none to minor depending on the soil type, vegetative cover and slope. The main soil limitation for both types of ecological sites includes landslides that may occur on all slopes, but they are dominant on the steep and very steep slopes that have a south or east facing aspect. An additional soil limitation for a shallow loamy ecological site is depth to bedrock. Reclamation potential of soils also varies throughout the project area. The following table outlines the BLM reclamation potential associated with the Cabin Creek Phase IV POD.

Reclamation Potential	Acres	Percent
Moderate	1391	39
Poor	2150	60
Well	31	1

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.

Compared to the HCPC, 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.

3.2.1. Wetlands/Riparian

Fence Creek is the dominant ephemeral system within the Cabin Creek IV POD. There are isolated portions of this drainage 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, Fence Creek is deeply incised with steep sidewalls and a narrow (less than 100 feet wide) flat-bottomed floodplain. Flows in Fence 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 span of time.

The Powder River is located approximately 2 miles to the east of the Cabin Creek IV POD boundary.

3.2.2. Invasive Species

The following state-listed noxious weeds and/or weed species of concern infestations were discovered by a search of inventory databases on the Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info):

- leafy spurge
- Russian knapweed
- salt cedar

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 were performed by Western Lands Services (2006, 2007, 2008). Western Lands Services performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol in 2007 & 2008. Surveys were conducted for Ute ladies'-tresses orchid September 2007. Western Lands Service found the habitat unsuitable for ULT. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits on May 7, 20 & 21, 2008. Follow up visits were conducted on June 19, 2008 and September 25, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations 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. Big Game

Big game species expected to be within the Cabin Creek IV project area include pronghorn antelope, mule deer, white-tailed deer, and elk. Pronghorn antelope and mule deer were observed throughout the project area during the onsite visits. Small resident populations of white-tailed deer and elk inhabit the area and were observed by Western Lands Services while conducting wildlife surveys. The WGFD has determined that the project area contains Yearlong range for pronghorn antelope and White-tailed deer and Winter-Yearlong range for mule deer. White-tailed deer are typically found along the Powder River riparian areas and Fence Creek while pronghorn and mule deer are found both along the Powder River and throughout the uplands. The project area falls within the Clermont herd unit (308) for pronghorn antelope, the Powder River herd unit (303) for white-tailed deer and the Powder River herd unit (319) for mule deer. Elk are found in the upland areas year round but in low numbers and this population is not managed in this area by the WGFD. The elk population has no assigned herd unit number by WGFD and is made up of satellite groups that are speculated to be a culmination of individuals escaped from a commercial elk ranch located approximately 20 miles to the west of the project area and immigrated from wild herds located in Montana's Custer National Forest and/or Wyoming's Fortification Creek herd.

Winter-Yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months

there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions.

Populations of pronghorn antelope, white-tailed deer and mule deer within their respective hunt areas are above WGFD objectives. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by Fence Creek, an ephemeral tributary of the Powder River. No natural springs were identified within the Cabin Creek IV project area but the Coal Bank Spring in located within one mile of its boundary at T58N/R76W, Sec. 33 NENW. The Coal Bank Spring drains directly into Fence Creek but no flow was observed downstream through the project area. Fish that have been identified in the Powder River watershed are listed in the PRB FEIS (3-156-159).

The Powder River Basin is one of the last free-flowing prairie stream ecosystems left in the United States, with existing flows, turbidity, and water quality within historic ranges. The Powder River supports an intact native fish community including several rare or declining species. These species have evolved life history strategies that allow them to survive in extreme conditions (Hubert 1993). Native fish species include sauger, shovelnose sturgeon, goldeye, plains minnow, sand shiner, flathead chub, plains killifish, river carpsucker, sturgeon chub, western silvery minnow, channel catfish, fathead minnow, longnose dace, mountain sucker, shorthead redhorse, longnose sucker, stonecat, white sucker and others. Six of these are designated by the WGFD as either Native Species Status (NSS) 1, 2, or 3 species. Species in these designations are considered to be species of concern, in need of more immediate management attention, and more likely to be petitioned for listing under the Endangered Species Act.

NSS1 species (sturgeon chub and western silvery minnow) are those that are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions are declining or vulnerable. NSS2 species (goldeye, shovelnose sturgeon, and sauger) are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions appear to be stable. NSS3 species (plains minnow) are widely distributed throughout their native range and appear stable; however, habitats are declining or vulnerable. For these species, the WGFD has been directed by the Wyoming Game and Fish Commission to recommend that no loss of habitat function occur. Some modification of the habitat may occur, provided that habitat function is maintained (i.e., the location, essential features, and species supported are unchanged).

The sturgeon chub was petitioned for listing under the Endangered Species Act in 2000. The sturgeon chub is a small minnow native to WY and is known to occur only in the Powder River and in one location on Crazy Woman Creek. The sturgeon chub requires large, free-flowing rivers characterized by swift flows, high variable flow regimes, braided channels, high turbidity, and sand/gravel substrates. On April 18, 2001, the U.S. Fish and Wildlife Service determined that the listing was not warranted, due to the sturgeon chub population being more abundant and better distributed throughout their range than previously believed.

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them. Confluence Consulting, Inc. identified the following species present within the Clear Creek and Powder River watersheds: Woodhouse's toad, Northern leopard frog, gopher snake, and garter snake (2004). Because sampling at the upper two sites on Clear Creek occurred late in the season, seasonality may have influenced the lack of reptiles and amphibians observed at these sites.

3.3.3. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Many species that are of high management concern use shrub-steppe and shortgrass prairie areas for their primary breeding habitats (Saab and Rich 1997). Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151). Species observed by Western Lands Services or the BLM biologist include bald eagle, great blue heron, western meadowlark, and Canada goose.

3.3.4. Raptors

Raptors species expected to occur in suitable habitats within the project area include northern harrier, golden eagle, red-tailed hawk, Swainson's hawk, ferruginous hawk, American kestrel, prairie falcon, short-eared owl, great horned owl, bald eagle, rough-legged hawk, merlin, Cooper's hawk, northern goshawk, long-eared owl, and burrowing owl. Most raptor species nest in a variety of habitats including but not limited to; native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities.

Eight raptor nest sites were identified by Western Lands Services (2006, 2007, 2008) and BLM within 0.5 mile of the project area, of these, 1 nest was active in 2008.

Table 3.2. Documented raptor nests within the Cabin Creek IV POD project area.

BLM ID	Species	UTMs	Legal	Substrate	Year/Status	Condition
4269	Red-tailed Hawk	425695E/4977799N	T57N/R76W Sec. 1, SESE	Ponderosa	2006/Inactive 2007/Inactive 2008/Unknown	Good Good Good
4270	Golden Eagle	425036E/4979097N	T58N/R76W Sec. 36, SESW	Ponderosa	2006/Inactive 2007/Inactive 2008/Unknown	Good Good Good
4171	Red-tailed Hawk	425353E/4977995N	T57N/R76W, Sec. 1, NWSE	Ponderosa	2006/Occupied 2007/Inactive 2008/Unknown	Good Good Good
4272	Red-tailed Hawk	421638E/4980638N	T57N/R76W, Sec. 34, NENW	Ponderosa	2006/Inactive 2007/Inactive 2008/Inactive	Good Good Good
4273 & 4037	Unknown Raptor	420794E/4977995N	T57N/R76W, Sec. 4, NESE	Ponderosa	2006/Inactive 2007/Inactive 2008/Inactive	Good Good Good
5379	Unknown Raptor	422593E/4979451N	T57N/R76W, Sec. 34, NESE	Ponderosa	2008/Inactive	Fair
5388	Red-tailed Hawk	421222E/4983079N	T57N/R76W, Sec. 32, SWSW	Ponderosa	2008/Active	Good
5389	Red-tailed Hawk	420692E/4982856N	T57N/R76W, Sec. 31, SWSE	Ponderosa	2008/Inactive	Good

Note: Nests 4273 and 4037 are located in the same ponderosa pine tree.

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

Within the BLM Buffalo Field Office there are two species that are Threatened or Endangered under the

Endangered Species Act.

3.3.5.1.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004).

This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1,000 acres of black-tailed prairie dog colonies for survival (USFWS 1989).

The WGFD believes the combined effects of poisoning and Sylvatic plague on black-tailed prairie dogs have greatly reduced the likelihood of a black-footed ferret population persisting east of the Big Horn Mountains (Grenier 2003). The U.S. Fish and Wildlife Service has also concluded that black-tailed prairie dog colonies within Wyoming are unlikely to be inhabited by black-footed ferrets (Kelly 2004).

Three black-tailed prairie dog colonies were identified during site visits by Western Lands Services within the project area. See table 3.3 below for locations and descriptions of the colonies. Each of these 3 colonies is within 0.5 miles of the other and within 1 mile of 4 separate colonies located outside of the project area. The total area within the 7 associated prairie dog colonies is approximately 563 acres. Sufficient habitat is considered present if there are over 1000 acres separated by less than 1.5km. The project area is located approximately 9.6 miles from the Arvada complex, the nearest potential reintroduction area. Black-footed ferret habitat is not present within the Cabin Creek IV project area.

Table 3.3. Black-tailed Prairie Dog Colonies within the Cabin Creek IV Project Area.

#	Status	Legal	Approximate Size
1	Active	T57N/R76W, Sec. 3, SESE	6.6 acres
2	Active	T57N/R76W, Sec. 2, SWSW	7.1 acres
3	Active	T57N/R76W, Sec. 2 & 3 T58N/R76W, Sec. 34 & 35	371 acres

3.3.5.1.2. Ute Ladies'-Tresses Orchid

Ute ladies'-tresses orchid (ULT) is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. Wyoming Natural Diversity Database model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties. In Wyoming, ULT blooms from early August to early September, with fruits produced in mid August to September (Fertig 2000).

Prior to 2005, only four orchid populations had been documented within Wyoming. 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.

Fence Creek and its tributaries are ephemeral. Fence Creek is typical of most systems within the Powder River Basin having measureable flow only following high-intensity low-frequency precipitation events. No natural springs were identified within the project area. The Coal Bank Spring drains into Fence Creek approximately 0.7 miles upstream of the POD boundary. Habitat assessments for ULT were completed at seven proposed and/or existing culvert crossings; they all exhibited characteristics not suitable for orchid habitat. No surface hydrology was observed. Little associated vegetation was identified due to the high abundance and dominance of upland vegetation and noxious weed species within and adjacent to the survey locations. The dominant soils observed were clays and loams. Suitable orchid habitat is not present within the Cabin Creek IV project area.

3.3.5.2. Sensitive Species

BLM Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. Two habitat types – prairie dog colonies and sagebrush ecosystems – are the most common within the Powder River Basin and contain habitat components required in the life cycle of several sensitive species. The species associated with these ecosystems are described below in general terms. Those species within the Powder River Basin that were once listed or candidates for listing under the Endangered Species Act of 1973 and remain BLM Wyoming sensitive species are also described in more detail in this section. The authority for this 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.

3.3.5.2.1. Prairie dog colony obligates

Prairie dog colonies create habitat for many species of wildlife (King 1955, Reading et al. 1989). Agnew (1986) found that bird species diversity and rodent abundance were higher on prairie dog towns than on mixed grass prairie sites. Several studies (Agnew 1986, Clark 1982, Campbell and Clark 1981 and Reading et al. 1989) suggest that species richness increases with colony size and regional colony density. Prairie dog colonies attract many insectivorous and carnivorous birds and mammals because of the concentration of prey species (Clark 1982, Agnew 1986, Agnew 1988).

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, McCracken et al. 1985, Agnew 1986, Uresk and Sharps 1986, Deisch et al. 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list: swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), and long-billed curlew (*Numenius americanus*). These species were not observed by Western Lands Services or the BLM biologist during onsite field visits.

3.3.5.2.2. Sagebrush obligates

Sagebrush ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; in other words, species requiring sagebrush for some part of their life cycle. Sagebrush obligates within the Powder River Basin, listed as sensitive species by BLM Wyoming include greater sage-grouse, Brewer's sparrow, sage thrasher, and sage sparrow. Sage sparrows, Brewer’s sparrows, and sage thrashers all require sagebrush for nesting,

with nests typically located within or under the sagebrush canopy. Sage thrashers usually nest in tall dense clumps of sagebrush within areas having some bare ground for foraging. Sage sparrows prefer large continuous stands of sagebrush, and Brewer's sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Paige and Ritter 1999). Other sagebrush obligate species include sagebrush vole, pronghorn antelope, and sagebrush lizard. Other than pronghorn antelope, sagebrush obligates were not observed by Western Lands Services or the BLM biologist during onsite field visits.

3.3.5.2.3. Bald Eagle

On February 14, 1978, the bald eagle was federally listed as Endangered. On August 8, 2007, the bald eagle was removed from the Endangered Species list. 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, all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (WY07F0075) (USFWS 2007) shall continue to be complied with.

Bald eagle nesting habitat is generally found in areas that support large mature trees. Eagles typically will build their nests in the crown of mature trees that are close to a reliable prey source. This species feeds primarily on fish, waterfowl, and carrion. In more arid environments, such as the Powder River Basin, prairie dogs, ground squirrels, and lagomorphs (hares and rabbits) can make up the primary prey base. The diets of wintering bald eagles are often more varied. In addition to prairie dogs, ground squirrels, and lagomorphs, carcasses of domestic sheep and big game may provide a significant food source in some areas. Historically, sheep carcasses from large domestic sheep ranches provided a reliable winter food source within the Powder River Basin (Patterson and Anderson 1985). Today, few large sheep operations remain in the Powder River Basin. Wintering bald eagles may congregate in roosting areas generally made up of several large trees clumped together in stands of large ponderosa pine, along wooded riparian corridors, or in isolated groups. Bald eagles often share these roost sites with golden eagles as well.
Field surveys conducted within the project area by airplane, vehicle and foot found that bald eagle nesting habitat is present along the Powder River and in upland areas containing mature ponderosa pine. Roosting habitat is found in the form of cottonwood trees and large ponderosa pine. Surveys for roosting bald eagles found individual bald eagles utilizing cottonwood habitat along the Powder River and Fence Creek. Table 3.4 below shows the 2007-2008 bald eagle winter roost survey results. Bald eagles have displayed "consistent winter use" within 1 mile of the southeast portion of the Cabin Creek IV project area and from proposed CBNG related activities. The nearest identified bald eagle communal roost is 0.5 miles from the POD boundary located NWSW Sec. 12, T57N, R76W.

Table 3.4. Bald Eagle Winter Observations within 1 mile of the Cabin Creek IV Projects Area.

Survey Date	Time	UTMs	Legal	Observation
12/4/07	0740 0746 0753	424369E/4975710N 424195E/4975709N 424955E/4976050N	T57N/R76W, Sec. 13, NWNW T57N/R76W, Sec. 14, NENE T57N/R76W, Sec. 12, SESW	2 mature and 1 immature 1 immature 1 immature
12/10/07	0740	419622E/4980119N	T58N/R76W, Sec. 33, SWNW	1 immature
12/12/07	0745 0755	425011E/4976208N 419695E/4974803N	T57N/R76W, Sec. 12, NESW T57N/R76W, Sec. 16, NWSW	1 mature and 1 immature 1 immature
12/19/07	0810 0825	42604E/4977234N 423399E/4975651N	T57N/R76W, Sec. 5, T57N/R76W, Sec. 14, NENW	1 mature and 1 immature 1 mature
12/27/07	0800	424458E/4976436	T57N/R76W, Sec. 11, NESE	2 mature

3.3.5.2.4. Black-tailed prairie dog

The black-tailed prairie dog was added to the list of Candidate species for federal listing on February 4, 2000 (USFWS 2000). On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. BLM Wyoming considers prairie dogs as a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains.

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

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 Digital Ortho Quads indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001. However, aerial surveys conducted in 2003 to determine the status of known colonies indicated that a significant portion (approximately 47%) of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier 2004).

Three black-tailed prairie dog colonies, totaling approximately 405 acres were identified during site visits by Western Lands Services within the project area. See Table 3.3 for locations and descriptions of black-tailed prairie dog colonies within the Cabin Creek IV project area.

3.3.5.2.5. Burrowing owl

Burrowing owl nesting habitat consists of open areas with mammal burrows. Individual burrowing owls have moderate to high site fidelity to breeding areas and even to particular nest burrows (Klute et al. 2003). Burrow and nest sites are reused at a higher rate if the bird has reproduced successfully during the previous year. Favored nest burrows are those in relatively sandy sites (possibly for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance, and slightly elevated locations. In Wyoming, egg laying begins in mid-April. Incubation is assumed to begin at the mid-point of the laying period and lasts for 26 days (Olenick 1990). Young permanently leave the primary nest burrow around 44 days from hatch (Landry 1979). Juveniles will continue to hunt with and associate with parents until migration (early September through early November) (Haug 1985).

Although habitat exists throughout the project area, neither the BLM BFO databases nor the survey information provided by Western Lands Services indicated that burrowing owl nests have been observed within the project area or within 0.25 mile of the Cabin Creek IV project area in 2006, 2007, or 2008.

3.3.5.2.6. Grouse

3.3.5.2.6.1. 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 January 12th, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was "not warranted" following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse. In 2007, the U.S. District Court remanded that decision, stating that the USFWS' decision-making process was flawed and ordered the USFWS to conduct a new Status Review as a result of a lawsuit and questions surrounding the 2005 review (Winmill Decision Case No. CV-06-277-E-BLW, December 2007).

Greater sage-grouse are found in prairie, sagebrush shrublands, other shrublands, wet meadows, and agricultural areas; they depend upon substantial sagebrush stands for nesting and winter survival (BLM 2003). Suitable sage-grouse habitat is present throughout the project area. Moderately dense to dense sagebrush is present in patches throughout the project area. Sections 27, 34 & 35, T58N/R76W and Sections 1, 2 & 3 T57N/R76W contained large stands of sagebrush and moderate topography. Sage-grouse habitat models indicate that 982.3 acres of the project area contains high quality sage-grouse nesting habitat (20%) and high quality sage-grouse wintering habitat (7.5%) (Walker et al. 2007). Nesting habitat occurs in sagebrush communities throughout the POD. In addition, old and fresh sign was observed within the POD boundary except in areas of steep, rough terrain and forested areas. Individual sage-grouse were observed south of the project area in NENE section 10 T57N/R76W (Western Lands Services 2006, 2007). At the onsite, BLM biologists did not find sage-grouse sign nor were individual birds observed. BLM records identified no sage-grouse leks within 4 miles of the project area. The 4-mile distance was recommended by the State wildlife agencies' ad hoc committee for consideration of oil and gas development effects to nesting habitat (WGFD 2008). The Remington Creek Lek is located approximately 4.7 miles southwest of the project area.

3.3.5.2.6.2. 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 Cabin Creek IV project area has the potential to support sharp-tailed grouse during most of the year. The mosaic of grasslands and sagebrush-grasslands could provide habitat from April through October. Cottonwoods and junipers could provide buds and berries, respectively, to sustain grouse through the winter. The nearest documented sharp-tailed grouse lek is the Fence Creek Road lek located approximately 8.5 miles west of the project area NESW Section 29, T58N, R77W.

3.3.5.2.7. Mountain plover

The mountain plover was proposed for listing in 1999 (USFWS). In 2003, the USFWS withdrew a proposal to list the Mountain Plover as a Threatened species, stating that the population was larger than had been thought and was no longer declining. Mountain plovers, which are a BLM sensitive species, are 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.

Although most of the terrain in the Cabin Creek IV POD is either too steep or covered with too dense or too tall of vegetation to be considered preferred habitat for mountain plovers, suitable mountain plover habitat is present within the project area. The areas of habitat within the project area which can be classified as potential suitable habitat for mountain plover are located in the identified prairie dog colonies (See Table 3.3.) No mountain plovers were identified during the surveys completed in 2008 by Western Lands Services. Ground surveys revealed poor vegetation conditions for mountain plover in 2007. Cheat grass and other native grasses were too tall during the survey season in the 3 prairie dog colonies listed in Table 2 (Western Lands Services 2008). Spring precipitation in 2007 and 2008 made for especially moist years and exceptional conditions for vegetation growth. These conditions may not be the normal habitat conditions.

3.3.5.2.8. Swift Fox

The swift fox is native to the grassland prairies of North America. The original range of the species was influenced primarily by the extent of the shortgrass prairie and midgrass prairie ecosystems. The swift fox range primarily follows the distribution of the black-tailed prairie dog. Swift fox populations have been reduced to about 40 percent of their former range. The swift fox was removed from the Federal list of candidate species in January 2001 due to the implementation of the Swift Fox Conservation Plan. It

remains a BLM sensitive species and as such, recommendations for mitigation contained within the Swift Fox Conservation Plan will be applied to the project in order to uphold the direction set forth in the BLM Manual 6840.

Swift foxes tend to have their dens on or within 0.8 kilometers of prairie dog colonies (Hillman and Sharps 1978). Breeding occurs from December to February depending on latitude (Kilgore 1969, Hines 1980, Covell 1992). Gestation is approximately 51 days (Kahn et al. 1997). Pups are reared in dens with den sites possibly being changed several times during the pup-rearing period (Kahn et al. 1997). Under certain circumstances, litters from different fox pairs might share the same natal dens. At four or five months, the young foxes are almost fully grown and difficult to distinguish from adults (Kahn et al. 1997). Though little is known about pup-dispersal, it begins during September and October (Kahn et al. 1997).

The major portions of the swift fox diet are prairie dogs (49%) and insects (27%) (Uresk and Sharps 1986). Suitable swift fox habitat exists throughout the project area with the prairie grasslands and prairie dog colonies. For prairie dog colony locations, refer to the prairie dog section of this document. No dens were identified within 0.5 mile of the project area by Western Lands Services or BLM.

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.

Since its discovery in 1999 in New York, WNv has become firmly established and spread across the United States. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. Though less than 1% of mosquitoes are infected with WNv, they still are very effective in transmitting the virus to humans, horses, and wildlife. *Culex tarsalis* appears to be the most common mosquito to vector, WNv.

The human health issues related to WNv are well documented and continue to escalate. Historic data collected by the CDC and published by the USGS at www.westnilemaps.usgs.gov are summarized below. Reported data from the Powder River Basin (PRB) includes Campbell, Sheridan and Johnson counties.

Table 3.4 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007*	155	22	Unk	1

*Wyoming Department of Health Records September 12, 2007.

Human cases of WNv in Wyoming occur primarily in the late summer or early fall. There is some evidence that the incidence of WNv tapers off over several years after a peak following initial outbreak (Litzel and Mooney, personal conversations). If this is the case, occurrences in Wyoming are likely to increase over the next few years, followed by a gradual decline in the number of reported cases.

Although most of the attention has been focused on human health issues, WNv has had an impact on vertebrate wildlife populations. At a recent conference at the Smithsonian Environmental Research Center, scientists disclosed WNv had been detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al 2003). In the eastern US, avian populations have incurred very high mortality, particularly crows, jays and related species. Raptor species also appear to be highly susceptible to WNv. During 2003, 36 raptors were documented to have died from WNv in Wyoming including golden eagle, red-tailed hawk, ferruginous hawk, American kestrel, Cooper's hawk, northern goshawk, great-horned owl, prairie falcon, and Swainson's hawk (Cornish et al. 2003). Actual mortality is likely to be greater. Population impacts of WNv on raptors are unknown at present. The Wyoming State Vet Lab determined 22 sage-grouse in one study project (90% of the study birds), succumbed to WNv in the PRB in 2003. While birds infected with WNv have many of the same symptoms as infected humans, they appear to be more sensitive to the virus (Rinkes 2003).

Mosquitoes can potentially breed in any standing water that lasts more than four days. In the Powder River Basin, there is generally increased surface water availability associated with CBNG development. This increase in potential mosquito breeding habitat provides opportunities for mosquito populations to increase. Preliminary research conducted in the Powder River Basin indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than two similar undeveloped sites (Walker et al. 2003). Reducing the population of mosquitoes, especially species that are apparently involved with bird-to-bird transmission of WNv, such as *Culex tarsalis*, can help to reduce or eliminate the presence of virus in a given geographical area (APHIS 2002). The most important step any property owner can take to control such mosquito populations is to remove all potential man-made sources of standing water in which mosquitoes might breed (APHIS 2002).

The most common pesticide treatment is to place larvicidal briquettes in small standing water pools along drainages or every 100 feet along the shoreline of reservoirs and ponds. It is generally accepted that it is not necessary to place the briquettes in the main water body because wave action prevents this environment from being optimum mosquito breeding habitat. Follow-up treatment of adult mosquitoes with malathion may be needed every 3 to 4 days to control adults following application of larvicide (Mooney, personal conversation). These treatment methods seem to be effective when focused on specific target areas, especially near communities, however they have not been applied over large areas nor have they been used to treat a wide range of potential mosquito breeding habitat such as that associated with CBNG development.

The WDEQ and the Wyoming Department of Health sent a letter to CBNG operators on June 30, 2004. The letter encouraged people employed in occupations that require extended periods of outdoor labor, be provided educational material by their employers about WNv to reduce the risk of WNv transmission. The letter encouraged companies to contact either local Weed and Pest Districts or the Wyoming Department of Health for surface water treatment options.

3.5. Water Resources

The project area is within the Middle Powder River drainage system. The majority of the project area lies within the Fence Creek Watershed. There are a number of small unnamed watersheds to the south and southeast that are tributaries to the Powder River.

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).

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.

As stated in the MMRP, an Interagency Working Group was established to implement an adaptive management approach. BLM is working with the WDEQ and the Interagency Working Group regarding the monitoring information being collected and assessed to determine if changes in mitigation are warranted.

The BLM has installed shallow groundwater monitoring wells at five impoundment locations throughout the PRB to assess ground-water quality changes due to infiltration of CBNG produced water. The most intensively monitored site has a battery of nineteen wells which have been installed and monitored jointly by the BLM and USGS since August, 2003. Water quality data has been sampled from these wells on a regular basis. That impoundment lies atop approximately 30 feet of unconsolidated deposits (silts and sands) which overlie non-uniform bedrock on a side ephemeral tributary to Beaver Creek and is approximately one and one-half miles from the Powder River. Baseline investigations showed water in two sand zones, the first was at a depth of 55 feet and the second was at a depth of 110 feet. The two water bearing zones were separated by a fifty-foot thick shale layer. The water quality of the two water bearing zones fell in the WDEQ Class III and Class I classifications respectively. Preliminary results from this sampling indicate increasing levels of TDS and other inorganic constituents over a six month period resulting in changes from the initial WDEQ classifications.

The on-going shallow groundwater impoundment monitoring at four other impoundment locations are less intensive and consist of batteries of between 4 and 6 wells. Preliminary data from two of these other sites also are showing an increasing TDS level as water infiltrates while two other sites are not.

The WDEQ implemented requirements for monitoring shallow groundwater of Class III or better quality under unlined CBNG water impoundments effective August 1, 2004. The intent is to identify locations where the impoundment of water could potentially degrade any existing shallow groundwater aquifers. These investigations are conducted where discharged water will be detained in existing or proposed impoundments. If shallow groundwater is detected and the water quality is determined to fall within the Class III or better class of use (WDEQ Chapter 8 classifications for livestock use), operators are required to install batteries of 1 to 3 wells, develop a monitoring plan and monitor water levels and quality. The results of these investigations have yet to be analyzed and interpreted.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 26 registered stock and domestic water wells within 1 mile of this federal plan of development with depths ranging from 20 to 8000 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).

3.5.2. Surface Water

The project area is within the Fence Creek drainage which is tributary to the Middle Powder River primary watershed. The drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt). Fence Creek is ephemeral, but could exhibit some characteristics of intermittent systems (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 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, the EC ranges from 1421 at Maximum monthly flow to 2154 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).

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

3.6. Cultural Resources

A Class III inventory was conducted for the Cabin Creek IV project prior to on-the-ground project work (BFO project # 70070083). Western Land Services, Inc., conducted the Class III inventory following the Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48FR190) for the proposed project. Clint Crago, BFO archaeologist, reviewed the reports for technical adequacy and for compliance with BLM and Wyoming State Historic Preservation Office standards, and determined them to be adequate. The following resources are located within or near the Area of Potential Effect (APE).

Table 3.4 Cultural Resource Sites Identified within or near the Cabin Creek IV project area

Site Number	Site Type	Eligibility
48CA274	Historic Homestead – LX Bar Ranch	Eligible
484CA691	Prehistoric Lithic Scatter	Not Eligible
48CA2444	Historic Homestead	Not Eligible
48CA2624	Prehistoric Lithic Scatter	Not Eligible
48CA3809	Prehistoric Lithic Scatter	Not Eligible
48CA3810	Prehistoric Lithic Scatter	Not Eligible
48CA3811	Prehistoric Lithic Scatter	Not Eligible
48CA3812	Prehistoric Lithic Scatter	Not Eligible
48CA3813	Prehistoric Lithic Scatter	Not Eligible

Site Number	Site Type	Eligibility
48CA3814	Prehistoric Lithic Scatter	Not Eligible
48CA3815	Prehistoric Lithic Scatter	Not Eligible
48CA3816	Prehistoric Lithic Scatter	Not Eligible
48CA3817	Prehistoric Lithic Scatter	Not Eligible
48CA3818	Prehistoric Lithic Scatter	Not Eligible
48CA3819	Prehistoric Lithic Scatter	Not Eligible
48CA3820	Prehistoric Lithic Scatter	Not Eligible
48CA6383	Prehistoric Lithic Scatter	Not Eligible
48CA6384	Prehistoric Lithic Scatter	Not Eligible
48CA6385	Prehistoric Open Camp	Not Eligible
48CA6386	Prehistoric Lithic Scatter	Not Eligible
48CA6387	Prehistoric Lithic Scatter	Eligible
48CA6388	Prehistoric Lithic Scatter	Not Eligible
48CA6389	Prehistoric Open Camp	Eligible
48CA6390	Prehistoric Lithic Scatter	Not Eligible
48CA6391	Prehistoric Lithic Scatter	Not Eligible
48CA6392	Prehistoric Lithic Scatter	Not Eligible
48CA6393	Prehistoric Lithic Scatter	Not Eligible
48CA6394	Prehistoric Lithic Scatter	Not Eligible
48CA6395	Prehistoric Lithic Scatter	Not Eligible
48CA6396	Historic Log Cabin and Trash Scatter	Not Eligible
48CA6397	Prehistoric Lithic Scatter	Eligible
48CA6398	Prehistoric Lithic Scatter	Eligible
48CA6399	Prehistoric Lithic Scatter	Not Eligible
48CA6400	Historic Cabin and Corral	Not Eligible
48CA6401	Prehistoric Lithic Scatter	Eligible
48CA6402	Prehistoric Lithic Scatter	Eligible

3.7. 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 Alternative C as the preferred alternative. The changes have reduced impacts to the environment which will result from this action. The environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 31 proposed well locations, 1 is on a reclaimed conventional well pad, 27 can be drilled without a well pad being constructed and 3 will require a slotted pad (30' wide X 120' long X 4' deep). Surface disturbance associated with the drilling of the (28) wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 12 x 30 feet, and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 28 wells would involve approximately 0.2 acre/well for 5.6 total acres. The estimated disturbance associated with the 3 wells requiring a slotted well pad would involve approximately 0.08 acre/well for 0.2 acre. The total estimated disturbance for all 31 wells would be 5.8 acres.

The project area varies in topography from relatively flat, broad grassy areas to narrow fingers on ridges within ponderosa pine and juniper trees. Due to this variability, it can be difficult to find suitable well locations that have sufficient area to conduct construction and drilling operations in a safe manner. To complicate the issue further typically at the onsite investigation, the operator does not have specific information relative to rig size, the amount of water needed for drilling or enhancement, and other support equipment needed for drilling and completion activities. In addition time of year, soil conditions, rig availability etc also play into whether a non-constructed pad can be utilized vs. a slot or constructed pad being used to ensure that operations are done in a safe manner. The operator is confident that the majority of the wells in this project can be drilled without some type of constructed pad, however previous phases approved that were located in similar topography, those wells required either a slotted pad or a constructed pad. In some of those instances, these changes were done post approval either at the pre-construction meeting or via sundry notice. A condition of approval is being applied that the BLM be notified prior to start of construction activities and for site specific locations the BLM and the drilling contractor will inspect these locations to determine the best way to prepare the location for drilling at that

time.

Approximately 3.3 miles of improved roads would be constructed to provide access to various well locations. Approximately 8.9 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and environmental impacts. Approximately 1.63 miles of new overhead electric lines would be constructed by the operator to provide power to the project area. 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, silt logs, erosion matting etc.) would ensure land productivity/stability is regained and maximized.

Proposed stream crossings, including culverts and fords (low water crossings) are shown on the MSUP and the WMP maps (see the POD). These structures would be constructed in accordance with sound, engineering practices and BLM standards.

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).

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	28	0.2/acre	5.6	Long Term
Constructed Pad		Site Specific		
Slotted Pad	3	30' x 120'	0.2	
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments	2		12.22	Long Term
On-channel		Site Specific	0.0	
Off-channel	2	Site Specific	12.22	
Water Discharge Points	2	Site Specific or 0.01 ac/WDP	0.5	
Channel Disturbance				
Headcut Mitigation		Site Specific	0.0	
Channel Modification		Site Specific	0.0	
Improved Roads				Long Term
No Corridor	0	50' Width or Site Specific	0	
With Corridor	3.3		20	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
2-Track Roads No Corridor With Corridor	 0.70 8.2	30' Width or Site Specific 40' Width or Site Specific	 2.5 39.8	Long Term
Pipelines No Corridor With Corridor	 0 0	20' Width or Site Specific	 0 0	Short Term
Buried Power Cable No Corridor	 0	12' Width or Site Specific	 0	Short Term
Overhead Powerlines	1.63	30' Width	5.9	Long Term
Additional Disturbance	2 Staging Areas	Site Specific	2	Short Term

The designation of the duration of disturbance is defined in the PRB FEIS (pg 4-1 and 4-151). "For this EIS, short-term effects are defined as occurring during the construction and drilling/completion phases. Long-term effects are caused by construction and operations that would remain longer".

4.1.1. Wetland/Riparian

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).

As Fence Creek dissects the project area, some of the infrastructure is situated within its floodplain and is situated mostly on the western side of the POD. Large runoff events have a very high probability of disturbing the project area.

4.1.2. 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 Cultural, Physical/Mechanical, Chemical and Biological
2. Preventive practices
3. Education

The Integrated Pest Management Plan (IPM) identified leafy spurge, Russian knapweed and salt cedar as species of concern within the Cabin Creek Phase IV Project area. The proponent submitted an Integrated

Pest Management Plan (IPM) to the BLM which outlined the treatment of approximately 11.72 acres of BLM administered lands that would be treated on an annual basis for Leafy Spurge, Russian Knapweed, and Salt Cedar. It is unclear at this time how much of the fee surface is infested with noxious weeds. At this time a Pesticide Use Plan to obtain approval to apply chemical or biological treatments of invasive species has not been submitted. Treatments would primarily take place in the spring but fall treatments are also another opportunity for treatment. Although no Leafy Spurge, Salt Cedar or Russian Knapweed was observed during the pre-approval onsite inspections conducted in the spring of 2008, this is an area of known infestation. In order to prevent the further spread of Leafy Spurge, Salt Cedar or other noxious weeds with the onset of CBNG development on BLM administered lands, 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 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.

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.

4.1.3. Cumulative Effects

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 and the total amount that was predicted in the PRB FEIS, which is only approximately 45% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permits that are designed to protect irrigation downstream.
- The WMP for the Cabin Creek Phase IV proposes that produced water will not contribute significantly to flows downstream.
- The commitment by the operator to monitor the volume of water flowing into Cabin Creek and prevent significant volumes of water from flowing into the Middle Powder River Watershed.

Additional mitigation measures may be required and added as this and other PODs are developed in the Fence Creek area.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, Yearlong range for pronghorn antelope and white-tailed deer and Winter-Yearlong for mule deer would be directly disturbed with the construction of wells, impoundments, pipelines and roads. Table 4.1 summarized the proposed activities; items identified as long term disturbance would be direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they should provide some habitat value as these areas are reclaimed and native vegetation becomes established.

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD indicates a well density of eight wells per section creates a high level of impact for big game and that avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). A multi-year study on the Pinedale Anticline suggests not only do mule deer avoid mineral activities, but after three years of drilling activity the deer have not become accustomed to the disturbance (Madson 2005).

Big game animals are expected to return to the project area following construction; however, populations will likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not readily habituate. A study in North Dakota stated "Although the population (mule deer) had over seven years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer have even been documented to avoid dirt roads that were used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997).

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. Survival below the maintenance level requires behavior that emphasizes energy conservation. Canfield et al. (1999) pointed out that forced activity caused by human disturbance exacts an energetic disadvantage, while inactivity provides an energetic advantage for animals. Geist (1978) further defined effects of human disturbance in terms of increased metabolism, which could result in illness, decreased reproduction, and even death.

Reclamation and other CBNG activities that occur within big game habitats during the spring will likely displace does and fawns due to the human presence in the area. This may cause reduced survival rate of does and fawns that must expend increased energies to avoid such activities.

4.2.1.1. Big Game 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-211.

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be managed by the three following methods: treated and discharged to the Powder River, storage at 2 proposed off-channel impoundments and re-injected a 1 proposed water reinjection wells locations. The effects discussed below primarily relates to the discharge to the Powder River. Reinjection of water should not have an effect on aquatics. Additionally there should be no impact to aquatics with the use of the off-channel impoundments.

The Wyoming Department of Environmental Quality (DEQ) regulates effluent discharge through the

National Pollution Discharge Elimination System in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The Wyoming DEQ has established effluent limits for the protection of game and non-game, aquatic life other than fish, wildlife, and other water uses.
Altering water temperatures, flow timing and magnitude, turbidity and chemical composition of the Powder River could harm native fish species that inhabit the Powder River. Alterations could also allow for non native species to become established. Any water development that alters discharge patterns, reduces turbidity, changes water quality, modifies sediment transport, or blocks migratory routes for fish is likely to result in changes in the fish community. Additionally, altering of tributaries may have adverse effects to aquatic species. Tributaries provide spawning and nursery habitat for riverine fishes and support unique fish assemblages. Seasonal movements of riverine fishes into tributaries may be essential to the continued maintenance of several species found in the Powder River (Hubert 1993).

Change in Water Quality
Fish and amphibian species have evolved and adapted to existing conditions. Changes in water quality may have detrimental impacts on the native aquatic fauna. Major information gaps for these species include feeding habits, reproduction, specific habitat preference (pools, riffles, runs, backwaters, side channels, or a combination), and seasonal habitat use, therefore, it is difficult to fully understand how changes in water quality may affect native aquatic fauna.

The WGFD initiated a detailed fish and amphibian survey of the main-stem Powder River in 2004 to determine baseline species composition and distribution in the Basin. In accordance with the PRB FEIS, a monitoring plan was establish by the PRB Interagency Working Group. The plan calls for baseline data collection over a three year period which is intended to provide information relative to the effects upon the aquatic biota of CBNG water.

Changes in the conductivity and sodium absorption ratio may occur as increased flows move sediment from channel bottoms and potentially increase erosion of floodplains. Confluence Consulting, Inc. reported high salinities and electrical conductivities, possibly due to CBNG water, for the Spotted Horse drainage in their report on the Powder River (2004). This report indicated that CBNG discharges could affect native species in the drainage. See Section 3.5.2 of this EA for water quality information associated with this project.

Change in Water Quantity
Native fauna in the Powder River drainage have evolved and adapted to a dynamic hydrography with high sediment loads. Changes in this flow regime (i.e., perennial flows) may seriously impact native fauna by altering their use of historical habitats for spawning, rearing, and reproduction. Alterations that impact channel morphology is an issue, and may have impacts to the aquatic biota due to changes in sediment loads, loss of habitat, and possible disruption of migration movements due to barriers created by culverts and/or head cuts.

It is difficult to assess, due to limited information, what effects this discharge may have upon the aquatic biota in the Powder River system. The increase in flow resulting from the discharge of project CBNG water would be more noticeable during the late summer months or winter months when the mean monthly flow is smaller than during the remainder of the year. The flow attributable to project produced water is very small relative to storm flows. Peak flow estimates for the river range from 3,560 cfs for a two year storm event to 18,065 cfs for a 100-year storm event. Addition of the produced water would facilitate beneficial uses such as livestock supply and irrigation supply during the late summer and winter months when the naturally occurring flow is diminished.

The volume of water permitted for direct discharge is based upon the water quality effects related to irrigation downstream in Montana. The flow rate is permitted to mimic seasonal highs and lows and

adjusted accordingly.

4.2.2.1. Aquatics Cumulative effects

WDEQ is aware of the concerns about the effects of water quality and flows relative to discharge of water directly into the Powder River. They are taking a conservative approach to permitting until more information can be obtained. Long term water quality and flow monitoring, that would be required in the NPDES permit, would ensure that effluent limitations are met. Under permitted conditions, it is not anticipated that existing downstream water uses would be affected.

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, page 4-247. No additional mitigation measures are required.

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area is likely to impact migratory birds. Native habitats are being lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Human activities likely displace migratory birds farther than simply the physical habitat 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 results in more than just a quantitative loss in the total area of habitat available; the remaining habitat area is also 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 (displacement) were much greater than the direct physical habitat losses.

Reclamation and other CBNG activities that occur in the spring may be detrimental to migratory bird survival. 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~~s~~ 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 will lead 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.

The use of the proposed water treatment facilities can increase the potential for migratory bird mortality in the evaporation ponds that receive a backwash stream from the conditioning ponds. This evaporation pond will contain a concentrated brine solution. Birds entering this pond can ingest the brine and die from sodium toxicity. Salt toxicosis has been reported in ponds with sodium concentrations over 17,000 mg/L. Ingestion of water containing high sodium levels can chronically affect aquatic birds, especially if a source of fresh water is not available nearby. Aquatic birds ingesting hypersaline water can be more susceptible to avian botulism. During cooler temperatures, sodium in the hypersaline water can crystallize on the feathers', affecting thermoregulatory and buoyancy functions, and causing the bird to die of hypothermia or drowning (Windingstad et al.2004). Effective wildlife exclusionary devices, such as netting, will be required to prevent access by migratory birds, or other options should be utilized to contain and dispose of the brine solution should sodium concentrations rise over 17,000 mg/L.

Overhead power lines may affect migratory birds in several ways.

Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation. Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same affects 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. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235). There are approximately 4.4 miles of existing overhead power lines within the project area owned by PRECorp. Many of these existing lines are not constructed to 2006 APLIC standards. PRECorp, in consultation with USFWS, has developed an avian protection plan to prioritize the upgrading of existing overhead power lines within the PRB. These lines are scheduled for upgrade in 2010.

4.2.3.1. 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235. A condition of approval will be applied to this project to require that each existing transformer pole designated as a metering point for the Cabin Creek IV POD will be upgraded to meet 2006 APLIC standards at the time of power installation this project.

4.2.4. Raptors Direct and Indirect Effects

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. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation.

The presence of overhead power lines may impact foraging raptors. Raptors forage opportunistically throughout the Powder River Basin. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a one-half mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation to be located greater than one-quarter mile from occupied raptor nests.
The following mitigation measures were applied to minimize impacts to raptor nests within line of sight of proposed wells and/or infrastructure:

- Well location 14-36-5876 was withdrawn by the operator at the request of BLM due to line of sight of a golden eagle nest at a distance of 0.23 mile.

- Well location 12-35-5876 was moved east approximately 500 feet to an abandoned well location and out of line to sight of an unknown raptor nest documented by BLM during the onsite inspection.

Table 4.2. Proposed infrastructure within close proximity (0.5 mile) to documented raptor nests within the Cabin Creek IV project area.

BLM ID#	AMOUNT AND TYPE OF INFRASTRUCTURE	
	Within 0.25 mile	*Within 0.25 to 0.5 mile*
4269	**NONE**	**Wells:** 15-01-5776 & 07-01-5776 **Access roads:** 0.88 miles **Overhead power:** 0.16 miles & 1 meter drop
4270	**NONE**	**Wells:** 01-01-5776 & 03-01-5776 **Access roads:** 0.72 miles
4271	**Well:** 07-01-5776 **Access roads:** 0.8 miles **Overhead power:** 0.15 miles & 1 meter drop	**Wells:** 11-01-5776 & 15-01-5776 **Access roads:** 1.6 miles **Overhead power:** 0.36 miles & 2 meter drops
4272	**Access roads:** 0.67 miles **Overhead power:** 0.45 miles	**Wells:** 03-34-5876, 11-27-5876, 13-27-5876 & 15-27-5876 **Access roads:** 1.8 miles **Overhead power:** 0.85 miles & 2 meter drops
4273 & 4037	**NONE**	**Well:** 05-03-5776 **Access roads:** 0.05 mile
5379	**Well:** 12-35-5876 **Access roads:** 0.45 miles	**Well:** 10-34-5876 **Access roads:** 0.9 miles **Impoundment:** Creswell #4 (7.47 acres)

The effects to raptor nests with wells and or infrastructure within 0.5 miles have been minimized by locating the surface related structure(s) out of line of sight of the nest. If the above ground structures could not be located out of line of sight a minimum of 0.25 mile no surface occupancy buffer was adopted by the operator in their planning. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

4.2.4.1. Raptors 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-221. No additional mitigation measures are required.

4.2.5. Threatened and Endangered and Sensitive Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.3. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered Species

Table 4.3 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.	NP	NE	Suitable habitat not within proximity of reintroduction areas will be affected.
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 effect individuals or habitat.

4.2.5.1.1. Black-Footed Ferret Direct and Indirect Effects

Suitable habitat is of sufficient size to support a black-footed ferret population however the project area is 9.6 miles from the nearest identified reintroduction area, the Arvada complex. No surveys for ferrets were required or conducted. It is extremely unlikely that any black-footed ferret is present in the project area. However, if any become present, the proposed action will most likely make portions of the project area unsuitable for ferret inhabitance. Implementation of the proposed development should have ***"No Effect"*** to black-footed ferrets.

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

The Ute ladies'-tresses orchid is threatened by energy developments, noxious weeds, and water developments. Prolonged idle conditions in the absence of disturbance (flooding, grazing, mowing) may be a threat just as repeated mowing and grazing during flowering may lead to decline (Hazlett 1996, 1997, Heidel 2007). Heavy equipment used in energy development construction could dig up plants. Invasive weeds transplanted by vehicle and foot traffic in habitat could out compete this fragile species. Restricting work from areas of Ute ladies'-tresses orchid habitat reduces these impacts.

The 2 proposed off-channel pits are located in upland habitats. No natural springs or surface hydrology has been identified within the project area. Suitable habitat is not present within the Cabin Creek IV project area. Implementation of the proposed coal bed natural gas project will have "***no effect***" on the Ute ladies'- tresses orchid.

4.2.5.2. Sensitive Species Direct and Indirect Effects

BLM will take necessary actions to meet the policies set forth in sensitive species policy (BLM Manual 6840). BLM Manual 6840.22Astates: "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."

4.2.5.2.1. Prairie dog colony obligates

Wells, roads, pipelines and other infrastructure associated with energy development constructed within prairie dog colonies will directly remove habitat for prairie dog colony obligate species. Activities that disturb these species could lead to temporary or even long-term or permanent abandonment. Direct loss of species may also occur from vehicle traffic. Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

4.2.5.2.2. Sagebrush obligates

Shrubland and grassland birds are declining faster than any other group of species in North America (Knick et al. 2003). 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 also influence vegetation dynamics by fragmenting habitats or by creating soil conditions facilitating the spread of invasive species (Braun 1998, Gelbard and Belnap 2003). Density of sagebrush-obligate birds within 100 m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001). Increased numbers of corvids and raptors associated with powerlines (Steenhof et al. 1993, Knight and Kawashima 1993, Vander Haegen et al. 2002) increases the potential predation impact on sage-grouse and other sagebrush-breeding birds (Knick et al. 2003).

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable habitat area remains only as a remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Populations of sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), because of lower reproduction, and/or because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect the conservation of shrub-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Due to this, sagebrush obligate species may not return until after habitat reestablishment.

Table 4.4 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, permanent water in plains and foothills	S	MIIH	Additional water will affect existing waterways.
Spotted frog (Ranus pretiosa)	Ponds, sloughs, small streams	NP	NI	Prairie not mountain habitat.
Birds				
Baird's sparrow (Ammodramus bairdii)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Bald eagle (Haliaeetus leucocephalus)	Mature forest cover often within one mile of large water body.	S	MIIH	Project includes overhead power.
Brewer's sparrow (Spizella breweri)	Basin-prairie shrub	S	MIIH	Sagebrush cover will be affected.
Burrowing owl (Athene cunicularia)	Grasslands, basin-prairie shrub	S	MIIH	Prairie dog colony present.
Ferruginous hawk (Buteo regalis)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	No active nest present or identified.
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	K	MIIH	Sagebrush cover will be affected.
Long-billed curlew (Numenius americanus)	Grasslands, plains, foothills, wet meadows	NP	NI	Habitat not present.
Mountain plover (Charadrius montanus)	Short-grass prairie with slopes < 5%	NS	MIIH	Habitat present at identified prairie dog colonies.
Northern goshawk (Accipiter gentilis)	Conifer and deciduous forests	NP	NI	No forest habitat present.
Peregrine falcon (Falco peregrinus)	cliffs	NP	NI	No nesting habitat present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
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	K	MIIH	Sagebrush cover will be affected.
Trumpeter swan (Cygnus buccinator)	Lakes, ponds, rivers	S	MIIH	Reservoirs may provide migratory habitat.
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
Fish				
Yellowstone cutthroat trout (Oncoryhynchus clarki bouvieri)	Mountain streams and rivers in Tongue River drainage	NP	NI	Outside species range.
Mammals				
Black-tailed prairie dog (Cynomys ludovicianus)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Prairie dog towns will be affected.
Fringed myotis (Myotis thysanodes)	Conifer forests, woodland chaparral, caves and mines	NS	NI	Habitat not present.
Long-eared myotis (Myotis evotis)	Conifer and deciduous forest, caves and mines	NS	NI	Habitat not present.
Spotted bat (Euderma maculatum)	Cliffs over perennial water.	NP	NI	Cliffs & perennial water not present.
Swift fox (Vulpes velox)	Grasslands	NP	NI	Habitat not present.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Plants				
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	Habitat not 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
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

4.2.5.2.3. Bald eagle Direct and Indirect Effects

Drilling and construction activities associated with the installation of CBNG wells and associated roads and infrastructure may displace bald eagle from potential nesting sites and/or winter roosting sites. To reduce the risk of decreased productivity or nest failure, BLM BFO requires a 0.5 mile no surface occupancy radius and a one mile radius timing limitation of all activity during the breeding season around active bald eagle nests. To reduce the risk of disruption to the winter roosting activities of bald eagles, the BLM BFO requires a 0.5 mile no surface occupancy radius and a one mile radius timing limitation of all winter roosts (either communal or consistent use).

There are 4.4 miles of existing overhead three-phase distribution lines within the project area. The wire spacing is not likely in compliance with the Avian Power Line Interaction Committee's (2006) suggested practices and with the Service's standards (USFWS 2002); moreover other features were identified at complex poles to not be in compliance. Pinnacle Gas Resources is proposing an additional 1.6 miles of overhead three-phase distribution lines. A condition of approval will be applied to this project to require that each existing transformer poles designated to supply electrical power for the Cabin Creek IV POD will be upgraded to meet 2006 APLIC standards at the time of power installation for this project.

There are currently 0.21 miles of improved roads within the project area, with no additional improved roads proposed.

The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the Powder River Basin particularly during the winter when migrant eagles join the small number of resident eagles. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

Typically two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses the BLM Buffalo Field Office 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; eagles (bald and golden) 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.

Produced water will be stored in 2 proposed off-channel pits which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the impoundments on eagles is unknown. The impoundments could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of the impoundments should be reported to determine the need for any future management.

A condition of approval will be applied to this project to require that each existing transformer poles designated to supply electrical power for the Cabin Creek IV POD will be upgraded to meet 2006 APLIC standards at the time of power installation for this project.

4.2.5.2.4. Black-tailed prairie dog Direct and Indirect Effects

There are proposed facilities in prairie dog towns associated with the Cabin Creek IV POD. Two CBM well locations including 1 constructed well pad as well as 1 water injection well facility, 1 pipe yard, 2 off-channel pits, 1.78 miles of new access road with utility corridor and 0.55 miles of overhead power lines are proposed within prairie dog colonies within the project area. Approximately 25.6 acres of surface disturbance is proposed within the 3 prairie dog colonies indentified within the project area. The surface is privately owned where the 3 prairie dog colonies lie within the Cabin Creek IV POD and recommendations by BLM to locate these facilities outside of the prairie dog colonies were not accepted by the operator or the landowners.

Individuals that survive the excavation process but whose burrows were destroyed will be displaced. Dispersing prairie dogs have increased stress levels, higher exposure to predators, and are unlikely to be accepted by other colonies if they even encounter one. Both males and females actively protect their coterie territories from invading males and females (Hoogland 1995).

Unlike roads and pipelines, the construction and operation of reservoirs will permanently remove habitat. By the time the reservoirs are no longer needed, the reservoirs may become hard-pan, soil that has hardened due to mineral deposits and evaporation. Prairie dogs may be unable to burrow in this type of soil compaction. The presence of a reservoir will limit colony expansion. Well houses and power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent roads may result in prairie dog road mortalities. During construction of these facilities, there is the possibility that prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

4.2.5.2.5. Burrowing owl Direct and Indirect Effects

Although no burrowing owl nests were identified within the vicinity of proposed wells, off-channel pits roads or associated infrastructure within the project area, the habitat does exist. Impacts to burrowing owls will be similar to impacts to prairie dog colonies.

The dramatic reduction of prairie habitat in the United States has been linked to reduction of burrowing owl populations (Klute et al. 2003). Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. Overhead power lines provide perch sites for larger raptors that could potentially result in increased burrowing owl predation. CBNG infrastructure such as roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USDAFS Thunder Basin National Grasslands in Campbell County, WY, whom cooperated with the BLM in the creation of the 2003 PRB EIS, recommends a 0.25 mile timing restriction buffer zone for burrowing 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 (See Chapter 3 for breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

Burrowing owl nesting surveys shall be conducted by a biologist between April 15 and June 15 annually for the life of the project. All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.

4.2.5.2.6. Grouse

4.2.5.2.6.1. Greater sage-grouse Direct and Indirect Effects

The proposed action will adversely impact nesting, brood rearing, late summer and winter habitat. Proposed project elements that are anticipated to negatively impact grouse are approximately: 30 CBNG wells on 30 locations, 5 miles of new roads, 8.41 miles of new pipelines along existing access roads, 1.63 miles of new overhead power, 2 new off-channel pits, 2 staging areas and increased vehicle traffic on established roads and increased noise from compressor stations. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse habitat loss will be 625.9 acres from overhead power, 9,369.6 acres from roads, 913.6 acres from 2 off-channel pits, 42 acres from 2 staging areas and 4.11 acres from 30 well locations. An additional 3,229.4 acres associated with proposed utility corridors with existing roads recently upgraded but not historically utilized for oil & gas development will likely be avoided by sage-grouse. These numbers are not additive since each well location has an associated road and power and in many cases wells are closer than 0.6 miles to each other. Therefore, the above numbers over-represent anticipated impacts within the project area if totaled, however since most well locations are within 0.6 miles of each other the entire project area (approximately 3,572 acres within the POD boundaries) can be considered affected.

Based on the best available science, which is summarized below, the proposed action will most likely contribute to the extirpation of the local grouse population within the project area.

4.2.5.2.6.2. Greater sage-grouse Cumulative Effects

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development.

CBNG is a recent development, with the first well drilled in 1987 (Braun et al. 2002). In February 1998 there were 420 producing wells primarily restricted to eastern Campbell County (BFO 1999). By May 2003 there were 26,718 CBNG wells permitted within the BFO area (WGFD 2004). The PRB FEIS estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003).

The Powder River Basin Oil and Gas Project FEIS (BLM 2003) concluded that "Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: (1) increased direct mortality (including legal hunting, poaching, and collision with power lines and vehicles); (2) the introduction of new perches for raptors and thus the potential change in rate of predation; (3) direct loss or degradation of habitats; (4) indirect disturbance resulting from human activity (including harassment, displacement, and noise); (5) habitat fragmentation (particularly through construction of roads); and (6) changes in population (pg. 4-257)." The FEIS goes on to state that "implementation of several mitigation measures would reduce the extent of each impact addressed by those measures. Despite these measures, 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)."

The Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) included a Mitigation Monitoring and Reporting Plan (MMRP). The uncertainties as to where and at what level development was to proceed as well as the uncertainties associated with the assumptions that were used to predict impacts suggests that one-time determination of impacts that is included in the EIS may not occur as projected. The MMRP helps to continually assess the effects of the project and the adequacy of the mitigation. Such a plan/process provides a mechanism to continuously modify management practices in order to allow development while continuing to protect the environment (E-1)." In other words, development pace and patterns may not occur as predicted, and so the BLM may use the adaptive management process provided for in the BFO RMP.

Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (WGFD 2004). Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, powerlines, reservoirs and other infrastructure in the Powder River Basin (WGFD 2005, WGFD 2004). Sage-grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. In southwestern Wyoming, yearling female greater sage-grouse avoid nesting in areas within 0.6 miles of producing well pads (Holloran et al. 2007), and in southern Alberta, brood-rearing females avoid areas within 0.6 miles of producing wells (Aldridge and Boyce 2007). Doherty et al. (2008) demonstrated that sage-grouse in the Powder River Basin avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied. The WGFD feels a well density of eight wells per section creates a high level of impact for sage-grouse and that sage-grouse avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004). As interpreted by coordinated effort with state fish and wildlife agencies from Montana, Colorado, Utah, South Dakota, North Dakota and Wyoming, (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008), research indicates that oil or gas development exceeding approximately 1 well pad per square mile with the associated infrastructure, results in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (Holloran 2005, Walker et al. 2007)

Noise can affect sage-grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). In a study of greater sage-grouse population response to natural gas field development in western Wyoming, Holloran (2005) concluded that increased noise intensity, associated with active drilling rigs within 5 km (3.1 miles) of leks, negatively influenced male lek attendance. In 2002, Braun et al. documented approximately 200 CBNG facilities within one mile of sage-grouse leks. Sage-grouse numbers were found to be consistently lower for these leks than for leks without this disturbance. Direct habitat losses from the facilities themselves, roads and traffic, and the associated noise were found to be the likely reason for this finding.

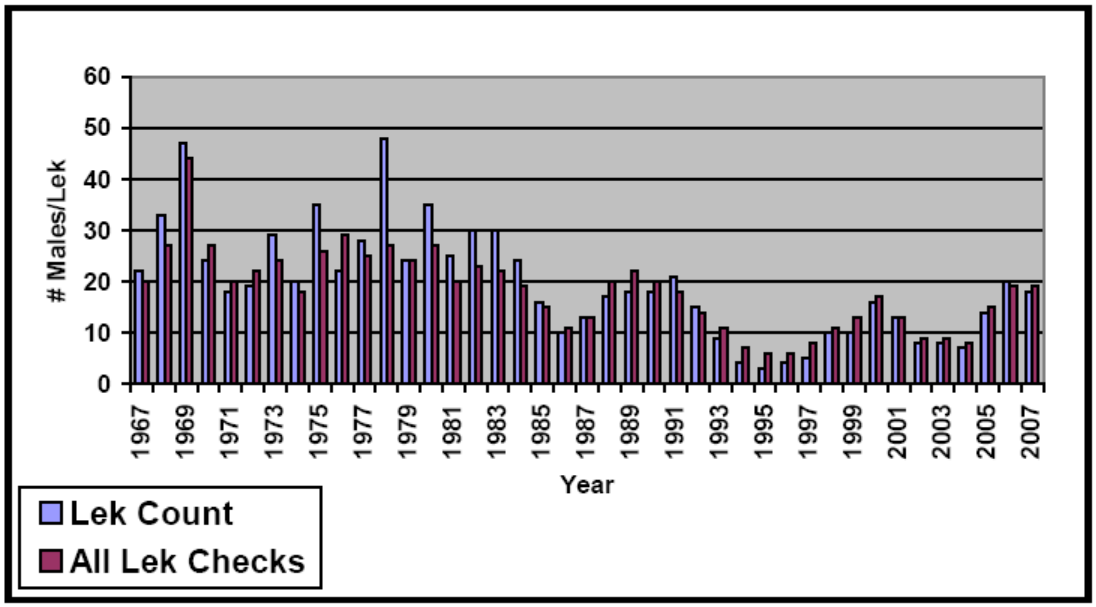
Vegetation communities within the Powder River Basin are naturally fragmented, as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. A sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within the Powder River Basin to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size has decreased by more than 63% in the past forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005). The existing development within the cumulative impacts assessment area has further fragmented the sage-grouse habitat. Disturbance created by this project will contribute to additional fragmentation.

Another concern with CBNG development is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (WGFD 2004). West Nile virus represents a significant new stressor, which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). In northeastern Wyoming and

southeastern Montana, West Nile virus-related mortality during the summer resulted in an average decline in annual female survival of 5% from 2003 to 2006 (Walker et al. 2007). Powder River Basin sage-grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. comm.).

The sage-grouse population within northeast Wyoming is exhibiting a steady long term downward trend (Figure 1) (WGFD 2005). The figure illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Long-term harvest trends are similar to that of lek attendance (WGFD 2005).

Figure 4.1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2007.



The BFO Resource Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). BLM Wyoming adopted the two-mile recommendation in 1990 (BLM 1990). The two-mile recommendation was based on early research which indicated between 59 and 87 percent of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho's Snake River plain.

Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the breeding lek (BLM 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage-grouse hens nested within 3 km (1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found only 36% of their grouse nesting within 3 km of the capture lek. Moynahan's study area was north-central Montana in an area of mixed-grass prairie and sagebrush steppe, with Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) being the dominant shrub species (Moynahan et al. 2007). Habitat conditions and sage-grouse biology within the Buffalo Field Office are more similar to Moynahan's north-central Montana study area than the Upper Green River area.

A two-mile timing limitation, given the long-term population decline and that less than 50% of sage-grouse are expected to nest within the limitation area, is insufficient to reverse the population decline.

Moynahan and Lindberg (2004) like WAFWA (Connelly et al. 2000), recommend increasing the protective distance around sage-grouse leks. The BLM and University of Montana are currently researching nest location and other sage-grouse questions and relationships between grouse and coalbed natural gas development. Thus far, this research 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 (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008). Even with a timing limitation on construction activities, sage-grouse may avoid nesting within CBNG fields because of the activities associated with operation and production. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007).
Walker et al, 2007 indicates the size of a no-development buffer sufficient to protect leks would depend on the amount of suitable habitat around the lek and the population impact deemed acceptable. Also, rather than limiting mitigation to only timing restrictions, research suggests more effective mitigation strategies include, at a minimum, burying power lines (Connelly et al. 2000 b); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and Anderson 2003, Holloran 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector West Nile Virus in sage grouse habitat (Walker et al 2007).

The multi-state recommendations presented to the WGFD for identification of core sage grouse areas acknowledges there may be times when development in important sage grouse breeding, summer, and winter habitats cannot be avoided. In those instances they recommend, "…infrastructure should be minimized and the area should be managed in a manner that effectively conserves sagebrush habitats (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008).
A survey is required for sage-grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.

4.2.5.2.7. Sharp-tailed grouse Direct and Indirect Effects

Effects to sharp-tailed-grouse will be similar to those effects to sage-grouse.
A survey is required for sharp-tailed grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.

4.2.5.2.8. Mountain plover Direct and Indirect Effects

Suitable mountain plover habitat is present within the project area prairie dog colonies.

Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may be attractive to plovers, while human activities within one-quarter mile may be disruptive. 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.

Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. Limiting travel speed 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. Overhead power lines provide perch sites for raptors that could result in increased mountain plover predation. CBNG infrastructure such as well houses, roads, pipeline corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

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 (predominately 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 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995). An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).
No surface disturbing activities are permitted in the suitable habitat area within the 3 prairie dog colonies identified in Table 3.3 above from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season.

4.2.5.2.9. Swift Fox Direct and Indirect Effects

The construction of well pads, roads, pipelines and reservoirs causes direct habitat loss (i.e. loss of prairie dogs and prairie dog burrows). During construction of these facilities, there is the possibility that swift foxes may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and is likely to cause an increase in swift fox mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover. Mineral related traffic on the adjacent roads may result in swift fox road mortalities.

The BLM BFO has very little data on swift fox occurrence within the PRB associated with oil and gas PODs. The TBNG in Campbell County, WY, whom cooperated with the BLM in the creation of the 2003 PRB EIS, has applied a standard condition to oil and gas activities in association with swift fox dens. Therefore, in order to adequately protect the species, the BLM BFO incorporated the following condition from the TBNG Land Resource Management Plan into this project: "To reduce disturbances to swift fox during the breeding and whelping seasons, prohibit the following activities within 0.25 miles of their dens from March 1 to August 31: Construction (e.g. roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling." This timing restriction, based on the best available science, will reduce direct impacts to swift foxes within the project area.

4.2.5.3. Sensitive 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-271.

4.3. West Nile Virus Direct and Indirect Effects

This project is likely to result in standing surface water which 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.

4.4. 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 a 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 management strategy to be utilized is as follows:

- Treatment of water at a treatment facility located in Cabin Creek Phase I with discharge to the Powder River
- The use of 2 off-channel impoundments
- Re-injection

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 Wyoming Oil and Gas Conservation Commission (WOGCC) authorizes the construction of off-channel impoundments under most circumstances.

The maximum water production is predicted to be 20.0 gpm per well or 600 gpm (1.3 cfs or 967.7 acre-feet per year) for 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 9,689 acre-feet in 2008 (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 10% of the total volume projected for 2008. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate from impoundments of 37% to groundwater aquifers and coal zones in the Middle Powder River drainage area (PRB FEIS pg 4-5). 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). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

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 20 to 8000 feet compared to 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 (½ 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.

As of April of 2008, approximately 1774 impoundment sites have been investigated with more than 1988 borings. Of these impoundments, 259 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 109 impoundments requiring monitoring are presently being used. As of the first quarter of 2008, only 16 of those monitored impoundments caused a change in the "Class of Use" of the underlying aquifer water.

4.4.1.1. 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.

4.4.2. 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 4.5 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** µmhos/cm
Powder River at Moorhead, MT Gauging station Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 3.92 4.62	 1421 2154
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
WDEQ Water Quality Requirement for WYPDES Permit # WY0056332 (to impoundments) At discharge point	NS**	NS**	7500
WDEQ Water Quality Requirement for WYPDES Permit # WY0051934 (EMIT) At discharge point	NS**	NS**	2000-2500
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 1820.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the co-mingled Canyon, Cook, Wall and Pawnee 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 20.0 gallons per minute (gpm) is projected is to be produced from these 30 wells, for a total of 600 gpm for the POD.

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

There are 2 proposed and one existing discharge points associated with this project. The existing discharge point is associated with the treatment facility located at T57N R76W Section 29, SENW. The treatment facility was approved under Cabin Creek Phase I POD. 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.

To manage the produced water, 2 impoundments (68.5 acre-feet of total storage) would potentially be constructed within the project area. These impoundments will disturb approximately 12.22 acres

including the dam structures. All of these impoundments would be off-channel. The off-channel impoundments would result in evaporation and infiltration of CBNG water. 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). 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 0.2 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from unintentional discharge.
No outlet structures are planned for these impoundments. Sedimentation will not occur except from rill erosion of the inside embankments during major precipitation events. 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 4-102). The predicted maximum discharge rate from these 30 wells is anticipated to be a total of 600.0 gpm or 1.3 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in Fence Creek from this action (0.2 cfs) may add a maximum 0.16 cfs to the Middle Powder River flows, or 0.2% 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).

Based on the area of the Fence Creek watershed above the POD (44 sq mi) and an assumed density of one well per location every 80 acres, the potential exists for the development of 352 wells which could produce a maximum flow rate of 7040 gpm (15.7 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, 15.7 cfs, is much less than the volume of runoff estimated from the 2-year storm event for Fence Creek.

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.

The operator has obtained a Wyoming Pollutant Discharge Elimination System (WYPDES) permit for the discharge of water through the EMIT facility and a permit to discharge into the off-channel impoundments.

WY0051934 Discharge from EMIT to Powder River	Daily Max	Monthly Avg
Outfall 012	at the outfall	at the outfall

Chlorides, mg/l	150	
Dissolved Iron, µg/l	250	
Dissolved Manganese, µg/l	630	
Dissolved Copper, µg/l	14.6	
Dissolved Lead, µg/l	7.7	
pH, standard units	6.5 - 9.0	
Dissolved Sodium, mg/l, March-October	270	
Dissolved Sodium, mg/l, November-February	350	
Specific Conductance, µS/cm, March thru Oct	2500	2000
Specific Conductance, µS/cm, Nov thru Feb	2500	2500
Sulfates, mg/l	3000	
Total Recoverable Arsenic, µg/l	8.4	
Total Recoverable Barium, µg/l	1800	
Total Recoverable Radium 226, pCi/l	1	
Total Flow, MGD, outfalls 012 & 013 (SUM 4)	4.2	

WY0056332 Discharge to Off-Channel Impoundments	Daily Max
Outfalls 001, 005, 008, and 011	
----------	at the outfall
Chlorides, mg/l	2000
Dissolved Iron, µg/l	1000
pH, standard units	6.5 - 9.0
Specific Conductance µS/cm	7500

and

WY0056332 Discharge to Off-Channel Impoundments	Daily Max
Outfall 006, 007, 009, 010	
----------	at the outfall
Chlorides, mg/l	2000
Specific Conductance µS/cm	7500
pH, standard units	6.5 - 9.0

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 IV POD prepared by Western Land Services for Pinnacle Gas Resources, Inc.

4.4.2.1. Surface Water Cumulative Effects

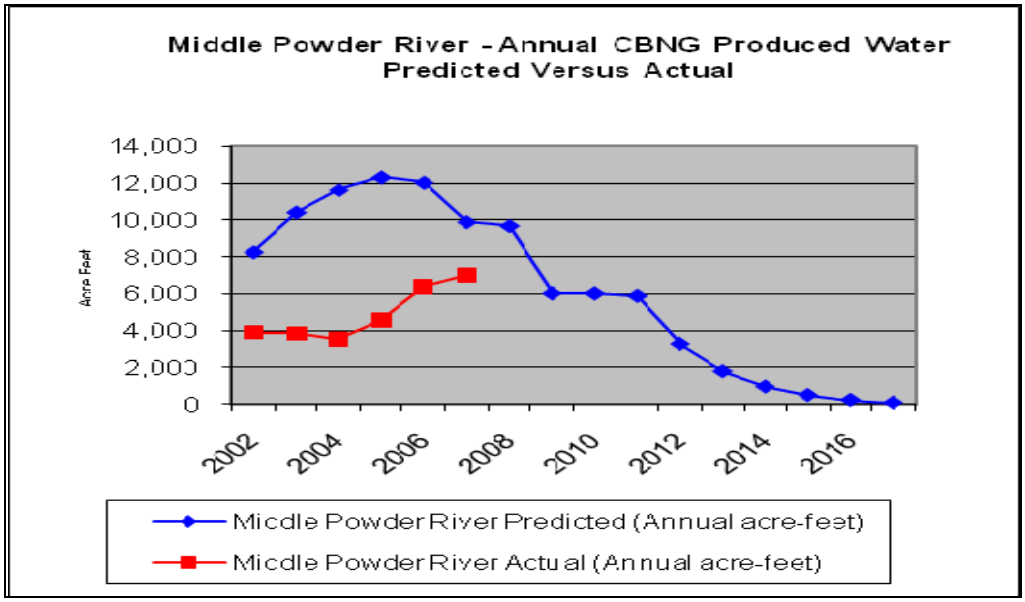
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Middle Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

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 page 2-26). These figures are presented graphically in Figure 4.2 and Table 4.6 following. This volume is 45% of the total predicted produced water analyzed in the PRB FEIS for the Middle Powder River watershed.

Table 4.6 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, "Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ's (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. However, this MOC has expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR and as such the WDEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117)

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, which is approximately 45% of the total predicted in the PRB FEIS.
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 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.

4.5. Cultural Resources

48CA6390 and 48CA6945 will be impacted by the project as proposed, however both are considered not eligible to the National Register of Historic Places. Eligible historic property, 48CA6402 will be impacted in a non-contributing portion of the site. A COA will be required stating that all surface disturbing activities, within the boundaries of site 48CA6402, must be limited to the west side of the Fence Creek road, to avoid impacting contributing portions of the site. Additionally, the COA will require a construction monitor of any surface disturbing activities with the boundaries of 48CA6402, in order to ensure that contributing portions of the site are not impacted. On 12/19/2008, the Bureau electronically notified the Wyoming State Historic Preservation Office (SHPO), following section VI(B)(2) of the Wyoming State Protocol, of a finding of no adverse effect to historic properties for the proposed project.

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).

4.6. 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.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	Wyoming SHPO	Wyoming State Historic Preservation Office	No
Brad Rogers	Wildlife Biologist	US Fish and Wildlife Service	Yes
Scott Covington	Wildlife Biologist	US Fish and Wildlife Service	Yes

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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