BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Lance Oil & Gas Company Inc.
Augusta Unit Zeta
PLAN OF DEVELOPMENT
WY-070-08-154

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 and need of the proposed action is to determine how and under what conditions, to allow Lance Oil and Gas Company Inc. to exercise lease rights granted by the United States to develop the oil and gas resources on federal leaseholds.

Development of the Augusta Unit Zeta POD wells would return royalties to the federal Treasury as well as stimulate local economies.

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

This action responds to the goals and objectives outlined in the Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001 and the Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003. This action helps move the Project Area toward desired conditions for mineral development with appropriate mitigation consistent with the goals, objectives and decisions outlined in these two documents.

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

The proposed action 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: Lance Oil & Gas Company Inc.'s Augusta Unit Zeta Plan of Development (POD) for 134 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There were 134 wells proposed at 67 locations within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 2 wells per location. Each location will produce one well from Big George coal seam and one well from the Wall coal seam. Proposed well house dimensions are 6 ft wide x 6 ft length x 5 ft height with a 3 ft wide x 3 ft wide x 8 ft high production skid structure. Well house color is Covert Green, selected to blend with the surrounding vegetation. Proposed wells are located as follows:

Well Name	Well #	QTR	Sec	TWP	RNG	Lease
AUGUSTA UNIT ZETA AUGUSTA	11-4BG	NWNW	4	50N	76W	WYW154406
AUGUSTA UNIT ZETA AUGUSTA	11-4WA	NWNW	4	50N	76W	WYW154406
AUGUSTA UNIT ZETA AUGUSTA	14-4BG	SWSW	4	50N	76W	WYW132267
AUGUSTA UNIT ZETA AUGUSTA	14-4WA	SWSW	4	50N	76W	WYW132267
AUGUSTA UNIT ZETA AUGUSTA	31-4BG	NWNE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	31-4WA	NWNE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	33-4BG	NWSE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	33-4WA	NWSE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	34-4BG	SWSE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	34-4WA	SWSE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	41-4BG	NENE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	41-4WA	NENE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	43-4BG	NESE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	43-4WA	NESE	4	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	*R/21-4BG	NENW	4	50N	76W	WYW154406
AUGUSTA UNIT ZETA AUGUSTA	*R/21-4WA	NENW	4	50N	76W	WYW154406
AUGUSTA UNIT ZETA POWDER R	11-5BG	NWNW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	11-5WA	NWNW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	13-5BG	NWSW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	13-5WA	NWSW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	21-5BG	NENW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	21-5WA	NENW	5	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	12-6BG	SWNW	6	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	12-6WA	SWNW	6	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	14-6BG	SWSW	6	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	14-6WA	SWSW	6	50N	76W	WYW042305

Well Name	Well #	QTR	Sec	TWP	RNG	Lease
AUGUSTA UNIT ZETA POWDER R	43-6BG	NESE	6	50N	76W	WYW042305
AUGUSTA UNIT ZETA POWDER R	43-6WA	NESE	6	50N	76W	WYW042305
AUGUSTA UNIT ZETA AUGUSTA	11-9BG	NWNW	9	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	11-9WA	NWNW	9	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	12-9BG	SWNW	9	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	12-9WA	SWNW	9	50N	76W	WYW53240
AUGUSTA UNIT ZETA AUGUSTA	32-19BG	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	32-19WA	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	34-19BG	SWSE	19	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	34-19WA	SWSE	19	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	41-19BG	NENE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-19WA	NENE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	43-19BG	NESE	19	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	43-19WA	NESE	19	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	12-20BG	SWNW	20	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	12-20WA	SWNW	20	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	14-20BG	SWSW	20	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	14-20WA	SWSW	20	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	21-20BG	NENW	20	51N	76W	WYW162029
AUGUSTA UNIT ZETA AUGUSTA	21-20WA	NENW	20	51N	76W	WYW162029
AUGUSTA UNIT ZETA AUGUSTA	23-20BG	NESW	20	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	23-20WA	NESW	20	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	12-21BG	SWNW	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	12-21WA	SWNW	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	21-21BG	NENW	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	21-21WA	NENW	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	32-21BG	SWNE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	32-21WA	SWNE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	41-21BG	NENE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	41-21WA	NENE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	43-21BG	NESE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	43-21WA	NESE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	44-21BG	SESE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	44-21WA	SESE	21	51N	76W	WYW149361
AUGUSTA UNIT ZETA AUGUSTA	12-28BG	SWNW	28	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	12-28WA	SWNW	28	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	22-28BG	SENW	28	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	22-28WA	SENW	28	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	12-29BG	SWNW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	12-29WA	SWNW	29	51N	76W	WYW134236

Well Name	Well #	QTR	Sec	TWP	RNG	Lease
AUGUSTA UNIT ZETA AUGUSTA	21-29BG	NENW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	21-29WA	NENW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	23-29BG	NESW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	23-29WA	NESW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	24-29BG	SESW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	24-29WA	SESW	29	51N	76W	WYW134236
AUGUSTA UNIT ZETA AUGUSTA	23-30BG	NESW	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	23-30WA	NESW	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	34-30WA	SWSE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	41-30BG	NENE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	41-30WA	NENE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	43-30BG	NESE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	43-30WA	NESE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	44-30BG	SESE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	*R/34-30BG	SWSE	30	51N	76W	WYW149360
AUGUSTA UNIT ZETA AUGUSTA	12-31BG	SWNW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	12-31WA	SWNW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	14-31BG	SWSW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	14-31WA	SWSW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	21-31BG	NENW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	21-31WA	NENW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	23-31BG	NESW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	23-31WA	NESW	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	32-31BG	SWNE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	32-31WA	SWNE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	33-31BG	NWSE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	33-31WA	NWSE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-31BG	NENE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-31WA	NENE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	43-31BG	NESE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	43-31WA	NESE	31	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	12-32BG	SWNW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	12-32WA	SWNW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	14-32BG	SWSW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	14-32WA	SWSW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	21-32BG	NENW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	21-32WA	NENW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	23-32BG	NESW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	23-32WA	NESW	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	31-32BG	NWNE	32	51N	76W	WYW139108

Well Name	Well #	QTR	Sec	TWP	RNG	Lease
AUGUSTA UNIT ZETA AUGUSTA	31-32WA	NWNE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	32-32BG	SWNE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	32-32WA	SWNE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	34-32BG	SWSE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	34-32WA	SWSE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	44-32BG	SESE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	44-32WA	SESE	32	51N	76W	WYW139108
AUGUSTA UNIT ZETA AUGUSTA	13-33BG	NWSW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	13-33WA	NWSW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	23-33BG	NESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	23-33WA	NESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	24-33BG	SESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	24-33WA	SESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	44-33BG	SESE	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	44-33WA	SESE	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	*R/34-33BG	SESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	*R/34-33WA	SESW	33	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	12-34BG	SWNW	34	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	12-34WA	SWNW	34	51N	76W	WYW86735
AUGUSTA UNIT ZETA AUGUSTA	14-34BG	SWSW	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	14-34WA	SWSW	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	22-34BG	SENW	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	22-34WA	SENW	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	23-34BG	NESW	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	23-34WA	NESW	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	32-34BG	SWNE	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	32-34WA	SWNE	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	34-34BG	SWSE	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	34-34WA	SWSE	34	51N	76W	WYW139109
AUGUSTA UNIT ZETA AUGUSTA	41-34BG	NENE	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	41-34WA	NENE	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	42-34BG	SENE	34	51N	76W	WYW90975
AUGUSTA UNIT ZETA AUGUSTA	42-34WA	SENE	34	51N	76W	WYW90975

- Note: Well #'s preceded by *R/ designates those APD's that were replacements due to well locations changes as a result of the onsite. See Table 2.3.1 for changes as a result of the onsite.

Rights of Ways

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

The following Right-of-Way applications that are associated with this project have been received and are currently being processed:

Amend Grant	***ROW Action***	***SEC.***	**T.**	**R.**	**Length**	**Width**
WYW-161617	Road, Water & Electric	6,15,22,32	50/51	76	3290-add	45',30', 20'
WYW-163668	Gas	6,15,22,32	50/51	76	3290-add	30'

County: Campbell & Johnson

Applicant: Lance Oil & Gas Company Inc. (LOG)

Surface Owners: Hayden, Maycock, Powder River Ranch, BLM

Project Description:
The proposed action involves the following:

- Drilling of 134 total federal CBM wells, 67 the in Big George and 67 in the Wall coal zones with depths ranging from 1,640 feet for the Big George to 2,532 feet for the Wall. Multiple seams will be produced by co-locating wells (multiple wells at a single location each targeting a single formation). The operator plans to drill the wells into the Wall coal zone first and drill to the Big George coal zone if the thickness of the coal is such that it is economically feasible to produce the gas resource.

- 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 a combination of telemetry and well visitation. Metering would entail 2-3 visits per week during the summer and up to 4 visits per week during the winter to each well location.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy:
    - *Primary:* Piped approximately 11 miles west for treatment and discharge directly to the Upper Powder River via an existing pipeline, associated water pump station located NWNE section 22, T51N., R76W, Barber Creek West water treatment facility located NENW section 9, T50N, R77W and 3 outfalls located SENE section 8 T50N, R77W (outfall 012) and SWSW section 4, T50., R77W (outfalls 013 & 014). The Barber Creek East EMIT facility will be relocated to and within the disturbance footprint of the Barber Creek West water treatment facility.
    - *Secondary:* Direct discharge of treated water to Fortification Creek from the Camp John Augusta Emit facility located NWNE section 22, T51N, R76W via existing outfall 001 located SESW section 15, T51N, R76W.
    - *Tertiary:* Piped via existing infrastructure, County Line pump station and water pipeline to the Salt Creek Oil field located in Midwest, Wyoming for re-injection into the Madison aquifer.

- An existing and proposed improved road network.

- A buried power line network to be constructed by the operator. The proposed route has 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 20 power drops.

- A storage tank of 500 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 24 months. Fuel deliveries are anticipated to be 2-3 times per week during the summer months and 4 times per week during the winter. Duration of a delivery is expected to range between 30 and 60 minutes. Noise level is expected to be 100.5 decibels at 1 meter distance.

- A buried gas, water and power line network.

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 Mater Surface Use Plan, Drilling Program and Water Management Plan, in addition to the Standard Conditions of Approval contained in the PRB FEIS Record of Decision Appendix A, are incorporated and analyzed in this alternative.

Additionally, the Operator, in their Plan of Development, 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 – Incorporates Changes as a Result of the On-sites

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively. BLM made recommendations to reduce environmental impacts, some of which were incorporated into the plan. 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 regulations and standards. The BLM multiple use objectives are 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

Augusta Unit Zeta POD including 46 well relocations can be found in Appendix 1.
The mitigation that would be applied under this alternative is in Appendix 2.

2.4. Alternative D – Deferral of Locations

Alternative D would have all the same project components as Alternative B, use the locations and mitigation (COAs) of Alternative C with the exception of the 2 well locations, 32-19-5176 and 41-19-5176 and associated access roads and utility corridors within the NESW and NW section 19, Township 51 North, Range 76 West.

The following wells and associated access road and utility corridor are:

AUGUSTA UNIT ZETA AUGUSTA	32-19BG	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	32-19WA	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-19BG	NENE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-19WA	NENE	19	51N	76W	WYW134235

2.5. Alternative E – Sage-grouse Emphasis

Alternative E represents a modification of Alternative C based on the application of mitigating measures designed to reduce impacts to sage-grouse and sage-grouse habitat. Alternative E is the same as Alternative C with additional project modifications identified by BLM, guided by seven years of sage-grouse research in the project area. Alternative E represents BFO efforts to mitigate project-specific impacts to sage-grouse habitat, while maintaining proposed spacing and infrastructure requirements consistent with the purpose and need of the proposed action.

This alternative incorporates mitigating measures designed around site-specific habitat characteristics to minimize habitat fragmentation and accelerate return to habitat effectiveness at reclamation. In order to best meet this objective, the changes from Alternative C follow.

1. All proposed power would be buried.

2. All existing power that will service only the federal action would be buried.

3. All linear infrastructure with access roads would be consolidated.

4. Production visits would be limited to once per month.

5. There would be no surface-disturbing or disruptive activity from March 15 to July 15 for the life of the project.

6. Reclamation activities, including seeding, would take place in the fall.

7. If project construction continues for more than one year, the project will be phased to leave undisturbed habitat available to nesting sage-grouse during the season following the first year of construction.

8. Proposed wells and infrastructure would be planned to maintain open corridors for sage-grouse, provide contiguous habitat patches, and reduce disturbance in and adjacent to sage-grouse habitat. This includes the following.

- Well locations: 14-4-5076, 34-4-5076, 43-4-5076, 11-5-5076, 13-5-5076, 14-6-5076, 43-6-5076, 11-9-5076, 12-9-5076, 34-19-5176, 41-19-5176, 12-20-5176, 21-20-5176, 23-20-5176, 12-21-5176, 21-21-5176, 32-21-5176, 41-21-5176, 43-21-5176, 44-21-5176, 12-28-5176, 22-28-5176, 23-30-5176, 43-30-5176, 12-31-5176, 14-31-5176, 32-31-5176, 41-31-5176, 43-31-5176, 12-32-5176, 14-32-5176, 21-32-5176, 23-32-5176, 34-32-5176, 44-33-5176, 22-34-5176, 23-34-5176 and 34-34-5176.
- Associated access road and utility corridor within:
  - SESE &SWSE Section 16, T51N/R76W
  - NWNW Section 21, T51N/R76W
  - NESWSENW & NESESW Section 29, T51N/R76W
  - SESE Section 33, T51N/R76W
  - NESE Section 24, T51NR77W

2.6. Alternatives considered but not analyzed in detail

Several alternatives for managing produced CBNG water from the Augusta Unit Zeta POD were evaluated. The operator has chosen not to pursue the following water management alternatives: direct discharge of raw production water, land application and water containment impoundments.

Neither Lance Oil & Gas Company Inc. nor the BLM was able to develop an additional alternative that would meet the purpose and need while being technically and economically feasible. Alternatives considered, but eventually discarded included employing horizontal or directional drilling methods from locations outside the elk Yearlong range. These methods were eliminated from detailed analysis as non-vertical drilling has not been proven to be technically or economically feasible for Powder River Basin CBNG development; in addition a suitable non-vertical well location is not available as all of the leases within the Augusta Unit Zeta POD are located within the elk Yearlong range.

Consider incorporating this project proposal with the Fortification Creek Plan Amendment Phased Development environmental assessment.

The 134 proposed CBNG wells at 67 locations are located on private and federal surface within the elk Yearlong range along the southern border of the Fortification Creek Planning Area (FCPA). The area has been recognized to contain important resource values since the late 1970's when the BLM Buffalo Field Office established a Management Framework Plan for the Field Office area. This Alternative would have deferred the approval of the 134 proposed wells to coincide with the proposed phased development strategy recommended as the Environmentally Preferred Alternative in the RMP Amendment for the FCPA (described below). These wells would be approved when development is authorized in the FCPA. Exact timing for this approval is unknown but projected to be a year or more. Because there are producing CBNG wells in the area, there is the potential that drainage of the lease area and loss of the CBNG resource could occur prior to the time of approval.

Phased development is a principal component of the RMP Amendment's preferred alternative presented in the draft EA. The objective of phased development is to provide the elk with secure habitat in two-thirds of the FCPA while CBNG development is proceeding in the remaining third. Another principal component of the preferred alternative is a security habitat/road density standard which would limit construction of new roads in order to keep security habitat loss less than 20% of the 2005 base-line conditions. Approximately 90 miles of new road could be constructed within the FCPA without compromising this standard. To maximize CBNG development potential, the RMP amendment proposes that CBNG operators work together to coordinate and consolidate road corridors.

The phased development approach and the security habitat loss/road density standard were developed to allow for economic CBNG development while preventing significant impacts to the Fortification Creek elk.

The FCPA was recognized again in the 1980 Buffalo Resource Area Oil and Gas EA and the Fortification Creek Oil and Gas Surface Protection Plan completed in 1982. The 1985 Buffalo Resource Management Plan (RMP) incorporated decisions from both of those documents. Important resources in the area include elk crucial winter and calving habitat, high visual quality, a wilderness study area, steep slopes with erosive soils, and significant cultural, historic, and or paleontological values.

Though impacts to elk and other resources would be similar, this alternative was not considered in detail because the planning issues associated with the FCPA (previous RMP decisions) do not apply to this project area.

2.7. 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), the infrastructure within the BLM/operator modified proposal (Alternative C), and Alternative (D) are presented in Table 2.5. Alternative E would be the same as Alternative C.

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Proposed Action) Proposed Number or Miles	Alternative C (Modified Proposed Action) Revised Number or Miles	Alternative D (Preferred Alt.) Revised Number or Miles
Total CBNG Wells	56	134	134	130
Well Locations				
Nonconstructed	NA	0	0	0
Constructed	NA	66	57	55
Slotted	NA	1	10	10
Conventional Wells	12	0	0	
Gather/Metering Facilities	0	0	0	
Compressors	1	0	0	
Ancillary (Staging/Storage Areas)	0	1	0	
Template Roads				
	0	0	0.2	0.2
With Corridor	37	7.8	13.6	12.6
Engineered Roads				
With Corridor	NA	5.6	5.5	5.5
Primitive Roads				
No Corridor	16	0.2	0.3	0.3
With Corridor	0	6.7	1.3	1.3
Buried Utilities				
With Corridor	4.0	1.8	1.63	1.63
Electrical Power Meter Points				
Buried electrical with Corridor	NA	19	19	18
Buried electrical without Corridor	NA	1	1	1
Overhead Powerlines	7.2	0	0	0
Treatment Facilities	2	0	0	0
Water Discharge Points	4	0	0	0
Channel Disturbance				
Channel Modification	0.25	0	0	0
TOTAL ACRES DISTURBANCE	**415.9**	**192.8**	**192.9**	**186.5**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on April 28, 2008. The pre-approval onsite was conducted on August 25, 26, 27, 28, 29 & September 9, 10, 2008. The following personnel attended:
Representing BLM:

- Jim Verplancke, Natural Resource Specialist/Wildlife Biologist
- Ben Adams, Hydrologist
- Rafael Navarrette, Petroleum Engineer Tech.
- Wendy Sutton, Archeologist
- Ted Hamersma, Civil Engineer Tech.
- J Bunderson, Civil Engineer (conference phone)

Representing the operator:

- Mary Mondargon
- Ethan Jahnke
- Tammi Hitt
- Joy Kennedy
- Colt Rodeman
- Darrel Gentry
- Craig Klaahsen
- Anna Garman
- Naomi Knight, Knight Technologies
- Craig Knight, Knight Technologies

Representing the Landowners:

- Mr. & Mrs. William Maycock
- Delbert Jenkins
- Kerry Hayden

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.

3.1. Topographic Characteristics of Project Area

Topography in the area is extremely rugged with steep ridgelines and deeply incised draws. Elevations range from 1,250 to 1,410 meters above sea level. Much of the project area consist of dissected uplands with steep down-cut channels, created predominately by summer thunderstorms and spring runoff in ephemeral drainages with steep gradients and fine sediment substrate, which lead to Powder River. The northern portion of the area is drained by the Fortification Creek tributaries of Livingston Draw, Windmill Draw, and McLaughlin Draw and their tributaries. The southern portion is drained by an unnamed tributary to Barber Creek and Maycock Draw also tributary to Barber Creek. The riparian areas are dominated by tree and shrub species which consist mainly of cottonwood trees with scattered salt cedar shrubs and areas of greasewood. This area is managed as rangeland with livestock grazing the main use and some historic oil and gas exploration.

3.2. Vegetation & Soils

The project area contains shrubby grasslands with scattered to fairly dense dwarf shrubs, mostly big sagebrush and scattered ridge-top juniper stands. Characteristic vegetation is downy brome, Japanese

brome, western wheatgrass, big sagebrush, Junegrass, Sandberg bluegrass, bluebuuch wheat grass and cottonwood. Other typical species are threadleaf sedge, winterfat, thickspike wheatgrass, broom snakeweed, rubber rabbit brush, prickly pear, and saltbushes. Species typical of short grass prairie comprise the project area flora. Differences in dominant species within the project area vary with soil type, aspect and topography.

Sage brush is the dominant shrub interspersed with short native grasses. Cheatgrass is well established and extensive in many areas. Juniper is prevalent in many draws throughout the project area with scattered ponderosa pine occurring in the higher elevation individually as well as in groves. Galleries of mature cottonwood trees occur along both Fortification and Barber Creeks.

Soils have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams. Soils have surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges to 8+ inches in bottomland. Erosion potential varies from moderate to severe depending on the soil type, vegetative cover and slope.

Reclamation potential of soils also varies throughout the project area. The main soil limitations in the project area include: depth to bedrock, low organic matter content, and high erosion potential especially in areas of steep slopes. Many of the soils and landforms of this area present distinct challenges for development. Approximately 52 percent of the area within the boundary of the proposed action contains soil mapping units with a named component identified as being a highly susceptible water erosion and 27 percent of the area has slopes greater than 25% making stabilization of disturbance and reclamation challenging and possibly unachievable. The proponent planned their project and the BLM made further recommendations during the onsite to avoid those areas where possible. Disturbances approved within these areas require the programmatic/standard COA's be complimented with a site specific performance based reclamation related COA. Soils within the project area were identified from the *North Johnson County Survey Area, Wyoming (WY719), North Campbell County Survey Area, Wyoming (WY705) and South Campbell County Survey Area, Wyoming (WY605).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

The map unit symbols within this project area were filtered and map units representing 4.0% or greater in extent within the pod boundary are displayed. Dominant soil map units are listed in the table below with their individual acreage and percentage of the area within the POD boundary.

Table 3.1 - Soil Map Unit Types

Map Unit Symbol	Map Unit Name	Acres	%
684	Samday-Shingle-Badland complex, 10 to 45 percent slopes	1594.4	16%
708	Theedle-Kishona-Shingle loams, 3 to 30 percent slopes	1380.9	14%
204	Samday-Samday, cool-Shingle clay loams, 6 to 40 percent slopes	1323.8	13%
206	Samday-Shingle-Badland complex, 10 to 45 percent slopes	1281.4	13%
683	Samday-Samday, cool-Shingle clay loams, 6 to 40 percent slopes	955.8	10%
216	Theedle-Kishona-Shingle loams, 3 to 30 percent slopes	914.8	9%
718	Vonalee-Terro-Taluce fine sandy loams, 3 to 30 percent slopes	518.1	5%

Map Unit Symbol	Map Unit Name	Acres	%
147	Forkwood-Cushman loams, 6 to 15 percent slopes	446.1	4%
707	Theedle-Kishona loams, 6 to 20 percent slopes	387.5	4%

Note: Additional site specific soil information is included in the Ecological Site interpretations which follow in Section 3.3.

Table 3.2 – Percent Slope within the Augusta Unit Zeta POD

% Slope	Acres	% of Project Area
0-24%	7,321	63%
Greater than or Equal to 25%	2,670	27%

Table 3.3 – Water Erosion Potential within the Augusta Unit Zeta POD

Water Erosion Potential	Acres	% of Project Area
High	5,195.8	52%
Moderate	3,301.3	33%
Low	1,491.5	15%

3.3. Ecological Site Interpretations

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 reconnaissance and Natural Resources Conservation Service published soil survey soils information. The map unit symbols identified for the soils and the associated ecological sites found within the Augusta Unit Zeta POD boundary are listed in the table below.

Table 3.4 – Ecological Sites

Ecological site description	Acres	%
SHALLOW CLAYEY (10-14NP)	5,155.4	52%
LOAMY (10-14NP)	3,856.6	39%
SANDY (10-14NP)	736.8	7%
CLAYEY (10-14NP)	147.7	1%
BADLANDS	50.9	1%
SANDY (15-17NP)	50.4	1%

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure are Loamy and Shallow Clayey sites.

Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone. These soils are moderately deep to very deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from sandstone and shale. These soils have moderate permeability.

Shallow Clayey sites occur on slopes and ridge tops, but may occur on all slopes. Landforms include hill sides, ridges & escarpments. The soils of this site are shallow (less than 20"to bedrock) well-drained soils formed in alluvium or residuum. These soils have moderate to slow permeability. The bedrock is clay shale which is virtually impenetrable to plant roots. The soil textures included in this site are silty clay, clay, and the finer portions of sandy clay loam, clay loam, or silty clay loam. Thin ineffectual layers of other soil textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick. The main soil limitations include depth to bedrock, low organic matter content, and soil droughtiness. The low annual precipitation should be considered when planning a seeding.

Mixed sagebrush/grass plant community dominates the plant community throughout the area. The mixed sagebrush/grass 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 control. Big sagebrush is a significant component of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

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

When compared to the Historical Climax Plant Community, big sagebrush and blue grama have increased. Green needlegrass and bluebunch wheatgrass have decreased, often occurring only where protected from grazing by the big sagebrush canopy. Production of cool-season grasses has also been reduced. Cheatgrass (downy brome) has invaded the state. The overstory of big 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.

Undisturbed this state is stable and protected from excessive erosion. The biotic integrity of this plant community is usually intact. However, it can be at risk depending on how far a shift has occurred in plant composition toward blue grama, sagebrush, and/or cheatgrass. The watershed is usually functioning. However, it can become at risk when canopy cover of big sagebrush, blue grama sod, and/or bare ground increases.

3.4. Invasive Species

No 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.

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Additionally, the operator has consulted with both Johnson and Campbell County Weed & Pest Districts concerning treatments of the following WRIC identified infestations:

- leafy spurge
- Scotch thistle

BLM documented the following weed species during subsequent field investigations:

- salt cedar
- cheat grass
- Japanese brome

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.

3.5. 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 Big Horn Environmental Consultants (BHEC) (2008). BHEC 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 in2007 & 2008. Surveys were conducted along Fortification Creek for Ute ladies'-tresses orchid September 2007 and 2008. No formal surveys were conducted or required for black-footed ferrets. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits August 25-29, September 9-10 and November 4, 2008. During this time, the biologist verified 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.

3.5.1. Big Game

Big game species expected to be within the Augusta Unit Zeta POD project area include pronghorn antelope, mule deer, white-tailed deer and elk. Sign of the four listed big game species was found throughout the POD. Pronghorn antelope and mule deer were observed throughout the area. One bull elk was observed north of the project area November 4, 2008. The WGFD has determined that the project area contains Yearlong range for pronghorn antelope, Winter Yearlong range for mule deer, Yearlong range for white-tailed deer, and Yearlong, Crucial Winter and Parturition range for elk.

Crucial Range is any particular seasonal range or habitat component, but describes that component which has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level. **Winter** use is when a population or portion of a population of animals uses the documented suitable habitat sites within this range annually, in substantial numbers only during the winter period. **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. **Parturition Areas** are documented birthing areas commonly used by females. It includes calving areas, fawning areas, and lambing grounds. These areas may be used as nurseries by some big game species.

Populations of pronghorn antelope, mule deer, white-tailed deer and elk 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.

3.5.1.1. Elk

Currently there are an estimated 230 elk in the Fortification herd, down from an average of 272 in 2002. The current WYGF objective for the herd is 150 (BLM 2006).

The elk population occupying the Fortification Creek area is both locally and regionally important (Jahnke, 2006). As measured by hunting use, elk hunts in this area are destination hunts and this area is a highly sought after elk hunting area with relatively few licenses issued annually, although access is largely limited by the land ownership pattern. The effect of CBNG development on elk in the Fortification Creek area has a high public interest as gauged by the response to recent Resource Management Plan amendment scoping sessions (BLM, 2006).

In 1992, a 2.5 year study of the Fortification elk herd was initiated by the WGFD in cooperation with the Bureau of Land Management and area landowners, with the collaring of 17 cow elk. Data from this study allowed the Wyoming Game and Fish Department to better delineate crucial elk winter range, elk summer/yearlong range and elk parturition range (BLM 2006).

The Augusta Unit Zeta POD is divided in half by Kinney Divide passing from the SE corner to the NW corner of the project area. Table 3.6 displays a breakdown of the number of proposed and existing wells within each elk seasonal range delineation of this herd unit. Based on data from the Wyoming Oil and Gas Commission, as of February 23, 2009, there were approximately 61 existing wells and associated infrastructure within the Augusta Unit Zeta project area of 15.6 square miles. In the project area boundary the existing well density is approximately 3.9 wells/section.

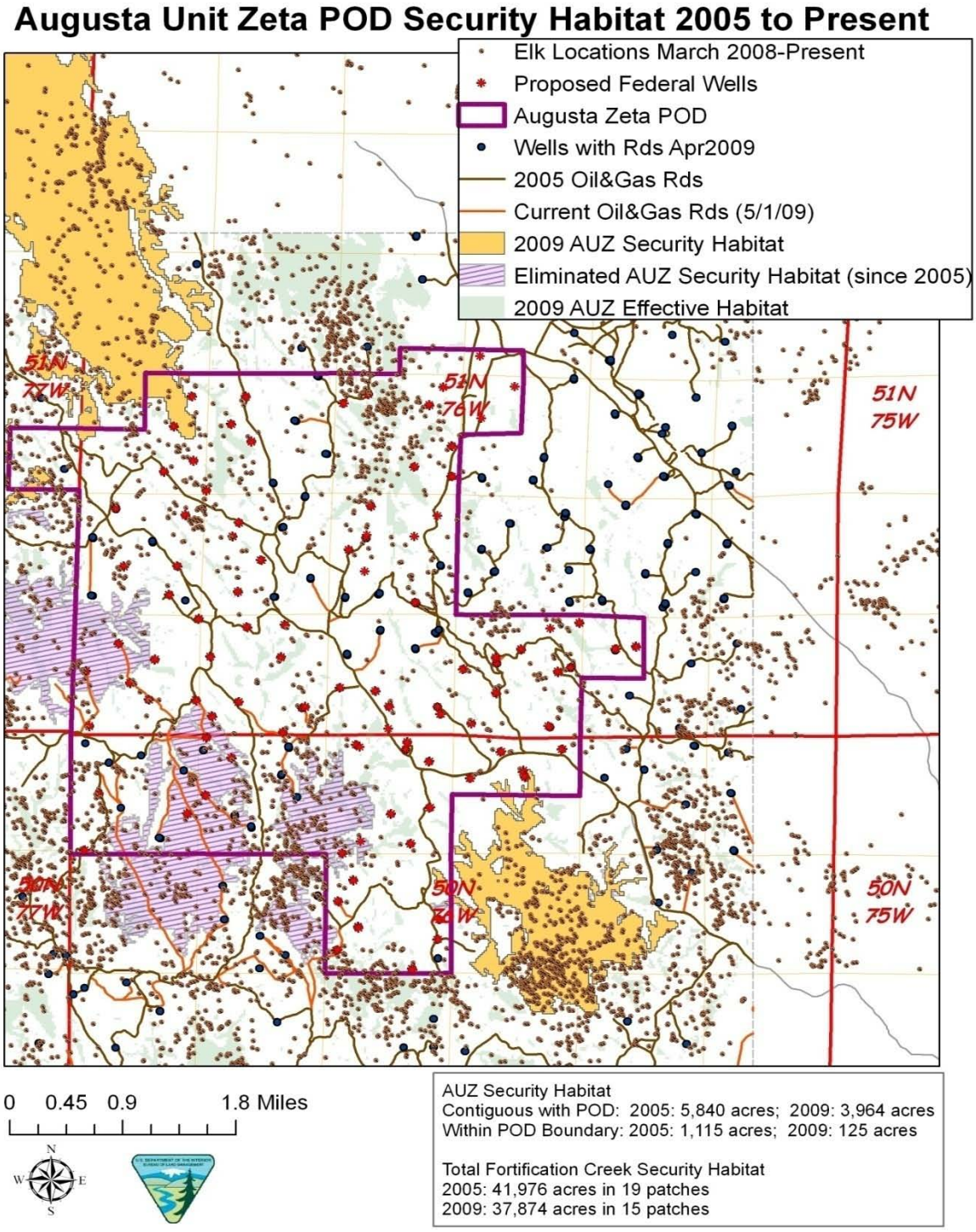
Crucial elk range (crucial winter range and parturition areas) acreage within the Augusta Unit Zeta POD includes the entire project area or 9,994 acres. Approximately 79.6% (7,958 acres) of the Augusta Unit Zeta POD is within crucial winter range. Elk parturition range covers 75.4% (7,537 acres) of the project boundary.

An analysis of elk habitat indicates that in 2005 approximately 41,976 acres of security habitat (19 patches) existed within the elk Yearlong range; 5,840 contiguous acres within the vicinity of the Augusta Unit Zeta POD and 1,115 acres within the project area boundary.

Studies of radio telemetered elk from the Fortification Creek herd in the early 1990's showed some elk ranging out of the Fortification Creek elk herd unit as far north as Montana. More recent studies of radio telemetered elk (26 of a herd roughly 230) from the Fortification Creek herd have shown that some animals (between 15-20% of the collared animals) have been at least seasonally observed east of Wild Horse Creek and the FCPA, on the west side of the Powder River, south along the Kinney Divide, and occasionally as far north as Sonnette, Montana, although the Fortification Creek Planning Area itself remains the core use area for the vast majority of this herd (Laird 2005). Some elk from this population have moved out of the Fortification Creek herd unit and pioneered new, small, local populations in surrounding areas in recent years, although these bands are currently not officially recognized as "herds" by the Wyoming Game and Fish Department. The long distance range use extensions to Montana in the north are probably reflective of relative habitat continuity along the Powder River Breaks. All of these observations support the fact that elk are a wide ranging species, and will naturally move around to some degree from their core habitat at least seasonally, and in some instances, on a permanent basis (BLM 2006). Data collected in 2008-2009 have shown similar trends with 3 of 38 collared from the Fortification Creek herd being located outside of the herd unit for periods of 5 to 12 month. Two of these elk left the herd unit in May 2008 and the other left December 2008. They have not returned to the herd as of the writing of this document.

Prairie elk herds, such as the Fortification Creek herd, while not uncommon, are somewhat unique in the sense that this type of non-mountainous range does not provide a great deal of security for the animals, and these populations are generally quite vulnerable to disturbance. There are other prairie elk herds in this region (e.g., Tisdale Mtn. portion of the Powder River herd, Pine Ridge herd, Rochelle Hills herd, Custer N.F. herd across the Montana border, etc.), but wherever these prairie elk herds are found they are usually locally prized and often protected by the local and regional residents (BLM, 2006).

Figure_3.1



3.6. Aquatics

The project area is drained by historically ephemeral tributaries of Upper Powder River. Fortification and Barber Creeks are the main tributaries in the area. Both Fortification and Barber Creeks receive discharge

of CBNG produced water creating perennial flow to portions of the streams connecting with the Upper Powder River. Kinney Divide lies between the two systems with Fortification Creek draining the area to the north, Barber Creek draining to the south and Turner Draw draining to the west. Fish that have been identified in the Powder River watershed are listed in the PRB FEIS (3-156-159).

Two natural springs are documented within one mile of the project area according to Wyoming State Engineers Office database.

Table 3.5 - Natural Springs within one mile of the Augusta Unit Zeta project area

Spring	Location	Estimated Flow	Distance to Proposed Disturbance
Christmas Spring #1	SWSW Sec. 32, T51N/R76W	1.0 gpm	0.04 mile from well 14-31-5176
Upper Spring	NWSW Sec. 13, T51N/R77W	1.0 gpm	1.25 miles from Road M

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 Wyoming 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.

3.7. 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 the BLM biologist include western blue bird and western meadow lark.

3.8. 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 and long-eared 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.

Thirty-five raptor nest sites were identified by Big Horn Environmental Consultants (2008) and BLM within 0.5 mile of the project area. Of these, 19 nests were active in 2008.

Table 3.6 - Documented raptor nests within the Augusta Unit Zeta POD project area

BLM ID	Species	UTMs	Legal	Substrate	Year	Status	Condition
622	Red-tailed Hawk	418214E 4915085N	SENW Sec.20, T51N/R76W	Cottonwood tree	2008 2007	Inactive Inactive	Fair
2657	Red-tailed Hawk	422233E 4915609N	SESE Sec.15, T51N/R76W	Cottonwood tree	2008	Active	Excellent
2658	Red-tailed Hawk	421346E 4916175N	NESW Sec. 15, T51N/R76W	Cottonwood tree	2008 2007 2006 2005 2004	Active Active Active Active Active	Excellent
2659	Great Horned Owl	420893E 4916504N	SWNW Sec. 15, T51N/R76W	Cliff	2008 2007 2006 2005 2004	Inactive Active Inactive Active Active/Failed	Unknown
3350	Red-tailed Hawk	421385E 4916067N	NESW Sec. 15, T51N/R76W	Cottonwood tree	2008 2007 2006 2005	Inactive Inactive Active Inactive	Poor
3724	Red-tailed Hawk	420043E 4908002N	NWSW Sec. 9, T51N/R76W	Ponderosa	2008 2007 2006 2005	Active Active Active Inactive	Excellent

BLM ID	Species	UTMs	Legal	Substrate	Year	Status	Condition
3807	Great Horned Owl	420232E 4917471N	SWSE Sec. 9, T51N/R76W	Cottonwood tree	2008 2006	Active Active	Excellent
3808	Red-tailed Hawk	419791E 4917890N	SENW Sec. 9, T51N/R76W	Cottonwood tree	2008 2006	Active Active	Excellent
5098	Great Horned Owl	422205E 4915689N	SESE Sec. 15, T51N/R76W	Cottonwood tree	2008 2007 2006	Active Active Inactive	Excellent
5099	American Kestrel	422299E 4915655N	SESE Sec. 15, T51N/R76W	Cottonwood tree	2008 2007 2006	Inactive Occupied Occupied	Unknown
5101	Unknown Raptor	421234E 4916124N	NESW Sec. 15, T51N/R76W	Cottonwood tree	2008 2007 2006	Did Not Locate Unknown Inactive	Gone
5123	Red-tailed Hawk	419434E 4912492N	SESW Sec. 28, T51N/R76W	Ponderosa	2008 2007	Inactive Active	Good
5125	Unknown Raptor	421390E 4914695N	SENW Sec. 22, T51N/R76W	Juniper	2008 2007	Active Inactive	Excellent
5126	Red-tailed Hawk	420154E 4913542N	NWNE Sec. 28, T51N/R76W	Juniper	2008 2007	Active Active	Excellent
5128	Great Horned Owl	420774E 4917190N	SESE Sec. 9, T51N/R76W	Cottonwood tree	2008 2007	Active Active	Excellent
5201	Red-tailed Hawk	415666E 4908409N	SWNW Sec. 7, T51N/R76W	Ponderosa	2008 2007	Active Inactive	Good
5202	Unknown Raptor	417754E 4908606N	NENW Sec. 7, T51N/R76W	Ponderosa	2008	Inactive	Good
5847	Unknown Raptor	416659E 4909244N	SWSE Sec. 6, T51N/R76W	Ponderosa	2008	Inactive	Good
5848	Red-tailed Hawk	418117E 4907042N	SWSE Sec. 17, T51N/R76W	Cottonwood tree	2008	Active	Good
5849	Red-tailed Hawk	420619E 4917275N	NESE Sec. 9, T51N/R76W	Cottonwood tree	2008	Active	Excellent
5850	Red-tailed Hawk	415315E 4908498N	SENE Sec. 12, T50N/R77W	Ponderosa	2008	Active	Good
5851	Red-tailed Hawk	415123E 4909666N	NWSE Sec. 1, T50N/R77W	Ponderosa	2008	Active	Good
5852	Unknown Raptor	418065E 4908897N	NENW Sec. 8, T50N/R76W	Juniper	2008	Inactive	Good
5853	Unknown Raptor	419120E 4910798N	SWSW Sec. 33, T51N/R76W	Ponderosa	2008	Inactive	Fair
5854	Unknown Raptor	419535E 4910157N	NENW Sec. 4, T52N/R76W	Rock	2008	Inactive	Poor

BLM ID	Species	UTMs	Legal	Substrate	Year	Status	Condition
5855	Red-tailed Hawk	416400E 4920519N	SESW Sec. 31, T51N/R76W	Cottonwood tree	2008	Active	Excellent
5856	Red-tailed Hawk	418434E 4913909N	SWSE Sec. 20, T51N/R76W	Juniper	2008	Active	Excellent
5857	Red-tailed Hawk	416836E 4908924N	NENE Sec. 7, T50N/R76W	Ponderosa	2008	Active	Excellent
5858	Red-tailed Hawk	418699E 4918417N	SWSE Sec. 8, T51N/R76W	Cottonwood tree	2008	Active	Excellent
5859	Unknown Raptor	419114E 4910886N	SWSW Sec. 33, T51N/R76W	Ponderosa	2008 2007	Did Not Locate Inactive	Gone
5860	Great Horned Owl	416512E 4916281N	SENW Sec. 18, T51N/R76W	Juniper	2008	Active	Excellent
5861	Unknown Raptor	417090E 4919479N	NWSE Sec. 6, T51N/R76W	Cottonwood tree	2008	Inactive	Fair
5862	Unknown Raptor	416795E 4919545N	NWSE Sec. 6, T51N/R76W	Cottonwood tree	2008	Inactive	Fair

3.8.1. Threatened and Endangered and Sensitive Species

3.8.1.1. Threatened and Endangered Species

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

3.8.1.1.1. 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); therefore, no ferret surveys were required or conducted.

One black-tailed prairie dog colony was identified during site visits by Big Horn Environmental Consultants within the project area. There is one 0.7 acre black-tailed prairie dog colony in the NE if section 33 T51N, R76W. The colonies reported by WGFD in sections 22 of T51N, R76W and Section 16 of T51N, R76W were surveyed on the ground on August 14, 2008 and aerially on August 18, 2008. There are no black-tailed prairie dog colonies in these sections (BHEC 2008).

The project area is located approximately 1.8 miles from the Pleasantdale complex, the nearest potential reintroduction area. Black-footed ferret habitat is not present within the Augusta Unit Zeta POD project area.

3.8.1.1.2. 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.

Fortification and Barber Creeks and their tributaries are historically ephemeral. Both Fortification and Barber Creeks receive discharge of CBNG produced water creating perennial flow to portions of the streams connecting with the Upper Powder River.

The well locations and other infrastructure within the POD are primarily located in dry upland vegetation with no source of perennial water. No populations of ULT are known within the project area. The ephemeral drainages have heavy clay soils and immediately rise to upland vegetation, reducing the potential for ULT.

One natural spring is documented within ½ mile of the proposed federal wells according to Wyoming State Engineers Office database with an estimated flow rate of 1 gpm (Augusta Unit Zeta Water Management Plan, 2008). The location of the spring is listed in Table 3.7. Big Horn Environmental Consultants did not identify the spring nor did they survey the spring for suitable ULT habitat at the spring location. Well pad for the 14-32-5176 location is 0.04 mile from the Christmas #1 spring. Big Horn Environmental Consultants conducted a ULT habitat suitability survey June 2006 and presence/absence survey Augusta 2007 focusing only on the main tributary Fortification Creek prior to the water discharge currently occurring.

In May 2009, the BLM biologist visited the Christmas #1 Spring and confirmed constant flow approximately 1 gpm. The channel below the spring is deeply incised and predominantly a shallow sandy soil type. Vegetation cover is predominantly grasses with juniper over story on the western slope. Suitable orchid habitat is present within the Augusta Unit Zeta POD project area.

3.8.1.2. 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.

3.8.1.2.1. 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 reported as observed by Big Horn Environmental Consultants nor were they observed by the BLM biologist.

3.8.1.2.2. 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. Species observed by the BLM biologist include pronghorn antelope, western blue bird and meadow lark.

3.8.1.2.3. 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.

Bald eagle nesting winter roosting habitat does exist within and surrounding the project area. Positive habitat attributes in the area are limited to galleries of mature cottonwood trees along Fortification and Barber Creeks as well as scattered mature ponderosa pine trees in the uplands. The Augusta Unit Zeta project area was included in aerial surveys for wintering bald eagles during winter 2007-2008. The number of observations and concentration of bald eagles observed during the 2007-2008 winter roosting surveys displayed below in Table 3.9 indicate communal and consistent use within one mile of the project area. No bald eagle nests have been documented within one mile of the project area (BHEC 2008). Both Fortification and Barber Creeks receive discharge of CBNG produced water creating perennial flow to portions of the streams connecting with the Upper Powder River.

Table 3.7 2007-2008 Bald Eagle Winter Roost observations within one mile of the Augusta Unit Zeta project area.

Location (UTMs)	Date	Time	Bald Eagle(s)/Behavior
414858E/4911073N	12/5/2007	1521	1 adult perched on ridge top
418536E/4906359N	12/14/2007	0707	2 adults & 5 immature perched in cottonwood tree
418866E/4906408N	12/15/2007	0738	5 immature & 2 adults perched
415878E/4908916N	12/15/2007	0758	1 adult perched
415525E/4907418N	1/9/2008	0828	1 adult perched on a fence post

3.8.1.2.4. 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).

One black-tailed prairie dog colony was identified during site visits by Big Horn Environmental Consultants within the project area. There is one 0.7 acre black-tailed prairie dog colony in the NE of section 33 T51N, R76W. Big Horn Environmental Consultants surveyed colonies identified by WGFD NW Sections 22 of T51N, R76W (4.9 acres) and SENE Section 16 of T51N, R76W (5.0 acres) were surveyed on the ground on August 14, 2008 and aerially on August 18, 2008. There are no black-tailed prairie dog colonies in these sections (BHEC 2008). However, Jones & Stokes conducted ground surveys in 2008 of both colonies and found them 1.2 acres and 0.9 acres respectively.

3.8.1.2.5. Burrowing owl

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

The western burrowing owl has declined significantly throughout its North American range. Current population estimates for the United States are not well known but trend data suggest significant declines (McDonald et al. 2004). The last official population estimate placed them at less than 10,000 breeding pairs. The majority of the states within the owl's range have recognized that western burrowing owl populations are declining. It is listed as a sensitive species by the BLM throughout the west and by the USDAFS. Primary threats across the North American range of the burrowing owl are habitat loss and fragmentation primarily due to intensive agricultural and urban development, and habitat degradation due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

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).

The BLM BFO databases and the survey information provided by Big Horn Environmental Consultants do not indicate any burrowing owl nests within the project area or within 0.25 mile of the Augusta Unit Zeta POD in 2008. Burrowing owl nesting habitat does exist within the project area defined by the identified prairie dog colonies.

3.8.1.2.6. Grouse

3.8.1.2.6.1. 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).

The 2003 PRB EIS significance threshold and population viability assumptions are based on the analysis that sufficient functioning habitat for sage grouse will remain to support population viability within the project area. In early 2008, BFO staff identified, based on the recent studies, sage-grouse protection in the 2003 Powder River Basin Final Environmental Impact Statement (PRB FEIS) and the 1985 Buffalo RMP may not be adequate to protect the species in the Basin.

Recently the BFO has taken several steps to consider the evolving information on impacts to sage-grouse which could result from development activities on federal lands. These steps include the following:

- February 2008: BFO consolidates research and data to identify high-quality sage-grouse habitat in the basin. BFO, in conjunction with the University of Montana, developed models indicating "high-quality" habitat using topographic, vegetative and energy development criteria validated through habitat selection data from radio-collared birds (Doherty et al. , in press)to identify areas with high potential for use by nesting/wintering birds. The models are divided into habitat categories of 1 through 5, with 5 being "excellent" habitat. Categories 1 & 2 are not considered suitable habitat. Category 3 may have the vegetative components necessary for suitable habitat. Categories 4 & 5 have the vegetative components for suitable habitat, and meet criteria for topography, slope and other landscape level characteristics that were indicated through analysis of radio-collared sage-grouse. . The 4 and 5 categories of habitats are considered "high-quality".

- March, 2008: BFO, Wyoming State Office (WYSO) and WO establish the need for a Resource Management Plan (RMP) approach to evaluate impacts to sage-grouse and habitat; RMP amendment or revision discussed. Decision to begin a RMP revision is approved two years ahead of original schedule.

- May 28, 2008: BFO conducts public meeting to present habitat information developed through research in the Powder River Basin. BFO solicits additional information from the public and interested energy development companies to refine sage-grouse habitat maps. Objective is to establish areas of interim management for sage-grouse to preserve “decision space” during the RMP process.

- August 13, 2008: BFO releases “Guidance for general management actions during BFO Resource Management Plan Revision” and a map identifying the “focus areas”. The guidance contains criteria for any proposed development in focus areas (Appendix 1). For fluid minerals, this guidance includes the following requirement; “The proponent will be asked to demonstrate that the proposal can be managed in a manner that effectively conserves sage-grouse habitats (in focus areas) affected by the proposal.” The guidance also states that “Efforts will be made to assure that the impacts of surface disturbing projects will be consistent with a well pad density of 640 acres.”

  Efforts to minimize impacts to high-quality sage-grouse habitats outside the focus areas will be far less restrictive, with well densities up to 80-acre spacing, but may include site-specific mitigating measures suggested by the best available science.

- Concurrent with BFO efforts, on August 1, 2008, the Governor of the State of Wyoming issued an Executive Order (EO 2008-2) mandating special management for all lands within sage-grouse “core population areas.” Lands for special management were identified by the Wyoming Governor’s Sage-Grouse Implementation Team, and generally follow the boundaries of the majority of the focus areas identified by the BFO. This team also recommended stipulations to be placed on development activities on state lands to ensure existing habitat function is maintained within those areas. EO 2008-2 also identifies objectives outside of core areas, “…development scenarios should be designed and managed to maintain populations, habitats and essential migration routes outside core population areas.”

- August 13, 2008 – Present: BFO crafts updated impacts assessment to be included in all project analysis affecting sage-grouse habitat. This analysis includes research conducted in the Powder River Basin and other sage-grouse research published since the 2003 PRB EIS ROD. Analysis explicitly tied impacts to the impacts accepted under the 2003 ROD.

- October 1, 2008: BFO officially begins the RMP revision. This process was accelerated by two years to more rapidly assess impacts to sage-grouse.

- April 14, 2009: BFO/WYSO enters into agreement with University of Montana and the Miles City FO to conduct a population viability analysis in the PRB. Emphasis will be on the adequacy of BFO focus areas for maintenance of a persistent sage-grouse population. Information gathered will be used in developing alternatives for the RMP revision.

- May, 2009: The Wyoming Game and Fish Department releases, " Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats", which further describes management objectives for sage-grouse outside core areas; "Non-core areas should not be construed as "sacrifice areas" since this conservation strategy requires habitat connectivity and movement between populations in core areas. The goal in non-core areas is to maintain habitat conditions that will sustain at least a 50% probability of lek persistence over the long term."

During the revision of the Resource Management Plan, BFO has combined the "Core Population Area" strategy with locally developed scientific information, establishing rigorous protections inside BFO focus areas and appropriate, site-specific mitigation measures for high-quality sage-grouse habitat outside of focus areas.

The six areas identified as BFO sage-grouse Focus Areas assume that sufficient amounts of good quality sage-grouse habitat remains unfragmented by energy or other man-made infrastructure; it is also assumed that the fragmented portions in the "energy areas" of sage-grouse habitat provide for the necessary breeding, feeding and sheltering components to sustain sage-grouse habitat connectivity between the six Focus Areas.

These basic concepts for management are based on the assumptions that sufficient "islands" of undisturbed (by human infrastructure) sage-grouse habitat would remain to sustain a large enough sage-grouse population for the long-term, and be surrounded by the planned major management activities (MMAs) in the PRB (for sage-grouse in the PRB, the MMA are livestock grazing and energy development)[1]. Research on sage-grouse in the PRB was initiated to determine what direct, indirect and cumulative impacts energy development would have on both sage-grouse habitat and its constituent resident population.

Doherty et al. (in press) modeled sage-grouse habitat (Nesting/Brood Rearing and Wintering) in the PRB, based on telemetry from individual sage-grouse. The Focus Areas were developed to encompass approximately 75% of PRB habitat, based on the 95% kernel estimates from Doherty et al.'s research, as well as total population estimates (based on male lek attendance) in PRB from 2005-2007 (Doherty, unpublished data 2008).

The state of WY has also designated sage-grouse Core Areas, which were drawn to encompass approximately ⅔ of the Wyoming sage-grouse *population (not habitat)*, based on male attendance at lek sites (WYG&F data 2007). Thus, the BFO Focus Area management strategy was refined to utilize this new management strategy, new PRB research data sets and the conservation biology ideas that: 1) larger areas of unfragmented habitat are superior for long-term population sustainability than smaller habitat areas; 2) there would be some high quality habitat remaining in energy developed areas between the designated PRB sage-grouse Focus/Core Areas; 3) Although somewhat fragmented by the CBM

[1] Given homogeneous habitats, the average population size and species diversity per unit will increase as the unit size increases. This mathematical relationship for populations tend to follow a logistical regression (i.e., nonlinear) relationship.

development, the habitat remaining functional between sage-grouse Focus/Core Areas would provide population connectivity in spite of some local PRB leks being extirpated in the short-term (10-15 yrs), and; 4) the CBM developed areas within the PRB would "play-out" fairly quickly (5-15 yrs), and the following required reclamation would regain most of the sage-grouse habitat carrying capacity in the PRB (i.e., almost equal to the PRB SG habitat quantity and quality prior to intensive energy development), which existed prior to the 2003 EIS.

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). Although the POD is not within either the Core or the Focus areas, suitable sage-grouse habitat is present throughout the project area. Moderately dense to dense sagebrush is present in patches throughout the project area. Sections 15, 19, 20, 21, 22, 23, 29, 30, 31, 32, 33 & 34 in T51N, R76W as well as sections 5, 6 & 9 in T50N, R76W contain large stands of sagebrush and moderate topography. Approximately 42 percent of the project area meets seasonal habitat requirements and are large enough to meet the landscape scale requirements of the bird (BLM 2008). Sage-grouse habitat models indicate that 4,225 acres of the project area contains high quality sage-grouse nesting habitat and high quality sage-grouse wintering habitat (Doherty et al. in press). During the onsite, BLM biologists found sage-grouse sign in SENW section 6 T50N, R76W but no individual birds were observed. BLM records identified two 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). These two lek sites are identified below (Table 3.8).

Table 3.8 Sage-grouse leks surrounding the Augusta Unit Zeta POD project area

Lek Name	Legal Location	Occupancy	Distance From Project Area
Fortification	NWSW Sec. 25, T51N.,R76W	2008 – 2006 - 0 2005 – 1 1993 – 2004 -0 1992 – 8 1990 – 9 1987 - 14	0.8 miles
Hayden II	SESW Sec. 31, T51N.,R75W	2008 – 0 2007- 2 2006 – 2 2005 – 0 2004 – 2 2003 – 2 2002 – 3 2001 – 7 1993-2000 – 0 1992 – 7 1991 – 13 1988 – 8 1983 – 8 1980 – 18 1979 - 39	1.9 miles

3.8.1.2.6.2. 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 Augusta Unit Zeta POD 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 Wyoming Game and Fish Department has not documented a sharp-tailed grouse lek within the vicinity of the Augusta Unit Zeta POD. The nearest sharp-tailed grouse lek, Fortification I, is over 5 miles north of the project area. Big Horn Environmental Consultants biologist has observed sharp-tailed grouse in the Augusta Unit Zeta area beginning in 2004 (BHEC 2008). No new sharp-tailed leks were located during surveys in 2007 or 2008.

3.8.1.2.7. 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.

Suitable mountain plover habitat is present within the project area. There is one 0.7 acre black-tailed prairie dog colony in the NE if section 33 T51N, R76W. However, most of the project area consists of moderate to dense sagebrush flats and slopes, steep ridges and draws and heavily vegetated bottomland and may be considered unsuitable habitat for plover (Knopf 1996). No mountain plover have been observed in the area during surveys dating back to 2004 (BHEC 2008).

3.9. 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 3.9 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
2008*	10	0	0	0

*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.

3.10. Water Resources

3.10.1. 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.

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.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 22 registered water wells and 1 natural spring within ½ mile of the proposed federal CBNG wells in the POD with depths ranging from 1,640 to 2,532 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).

3.10.2. Surface Water

The project area is within the Fortification Creek, Barber Creek and Turner Draw drainage systems, tributaries of the Upper Powder River. The area drains north and east to Fortification Creek, South to Barber Creek and west to Turner Draw. The drainages in the area are historically ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). Currently, Fortification and Barber Creeks receive perennial flow from CBNG produced water discharge. The flood plains are primarily well vegetated, with incised channels prone to erosion and sediment transport.

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 Upper Powder River, the EC ranges from 1,797 at Maximum monthly flow to 3,400 at Low monthly flow and the SAR ranges from 4.76 at Maximum monthly flow to 7.83 at Low monthly flow. These values were determined at the USGS station located at Arvada, WY (PRB FEIS page 3-49).

The operator has identified one natural spring within ½ mile of the proposed wells at the location included in Table 3.10. The operator has failed to provide water flow and water quality for the Christmas Spring #1.

Table 3.10 Natural Springs within ½ mile of the Augusta Unit Zeta Proposed Wells

Spring	Location	Estimated Flow	Distance to Proposed Disturbance
Christmas Spring #1	SWSW Sec. 32, T51N/R76W	1.0 gpm	0.04 mile from well 14-31-5176

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

3.11. Economics and Recovery of CBNG Resources

Development of this project would have effects on the local, state, and national economies. Based on the estimates in the PRBEIS, the drilling of the 134 proposed wells in the AUZ POD will generate approximately 2.5 billion cubic feet of gas (BCFG) per well, over the life of the project. Actual revenue from this amount of gas is difficult to calculate, as there are several variables contributing to the price of gas at any given time. Regardless of the actual dollar amount, the royalties from the gas produced in the AUZ POD would have wide-ranging benefit. The federal government collects 12.5% of the royalties from all federal wells, which helps offset the costs of maintaining the federal agencies that oversee permitting. In addition to generating federal income, approximately 49% of the royalties from the AUZ wells would return to the State of Wyoming. This revenue from mineral development has contributed to Wyoming's strong economy for the past several years, allowing for improvements in state funded programs such as infrastructure and education. The development of the AUZ project would also provide revenue locally by employing an array of workers, both directly and indirectly. People would be employed to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area. The large pool of individuals employed to work on the AUZ project would also have the secondary effect of increased demand for goods and services from nearby communities, primarily those of Gillette and Buffalo.

Table 3.11 - Existing and Proposed Oil and Gas Wells in the Augusta Unit Zeta POD

	Existing Wells non-Federal (Conventional and CBNG) in Vicinity (A)	Industry Proposed CBNG Wells in Vicinity (B)	AUZ CBNG Wells (C)	Total Proposed CBNG Wells in Vicinity (B+C=D)	Total Wells in the Vicinity (A+D=E)
Well Sites (Total)	61	6	134	140	201

3.12. Cultural Resources

A Class III cultural resource inventory was conducted for the Augusta Zeta POD, following the Secretary of the Interior's Guidelines and Standards. A Class III inventory specifically for the project was conducted by North Platte Archaeological Services (BLM project no. 70080138). The inventory covered approximately 5727 acres. Additional Class III inventories cover portions of the project (BLM/WYCRO #s 70050075, 70060250, 61850216, 61840313, 61840314, 61830253, 61830247, 82-275, and 90-689). Sites and isolates are defined as specified by the *2006 State Protocol Between the Wyoming Bureau of Land Management State Director and the Wyoming State Historic Preservation Officer*. The following cultural resources are located in or near the APE (area of potential effect).

Table 3.12 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48CA5813	Site	NE
48JO3771	Site	E
48JO3772	Site	E
48JO3773	Site	E
48JO3774	Site	NE
48JO3775	Site	NE
48JO4038	Site	NE
48JO4106	Site	NE
IR1*	Isolate	NE
IR2*	Isolate	NE
IR3	Isolate	NE
IR4	Isolate	NE
IR7	Isolate	NE
IR10	Isolate	NE
IR11	Isolate	NE
IR14	Isolate	NE
IR15	Isolate	NE
IR16	Isolate	NE
IR17	Isolate	NE
IR18	Isolate	NE

*IR# from BLM Report 70060250

3.13. 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

Alternative C – Incorporates Changes as a Result of the On-sites

The changes to the proposed action (Alternative B) resulted in development of Alternative C. 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 67 proposed twin well locations, 3 are on abandoned conventional well pads, 7 can be drilled without a well pad being constructed and 57 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 20 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 16 x 42 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 20 wells would involve approximately 0.69 acre/location for 6.9 total acres. The other 57 twin well locations requiring cut & fill pad construction would disturb approximately 0.96 acres/location for a total of 54.8 acres. The operator's average constructed pad disturbance exceeds the 0.7 acre footprint analyzed under the 2003 PRB-FEIS for single or multi-well pads. The operator contests that this does not provide for adequate work space for the twin well drilling and completion. A minimum constructed well pad proposed exceeded 150' x 200' with the typical dimensions proposed 250' x 250'. Lance Oil and Gas Company Inc. would not entertain multi-completion of a single well bore as recommended by BLM but did not make a convincing agreement why the recommendation was not feasible. In order minimize impacts to the soil resource, BLM required the operator to reduce the pad dimensions where safe operations could be maintained. The total estimated disturbance for all 134 wells at 67 locations would be 61.7 acres.

Approximately 19.8 miles of improved roads would be constructed to provide access to various well locations. Approximately 6.82 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 overall environmental impacts. No pipelines would be constructed outside of disturbance corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

Proposed stream crossings, including culverts and low water crossings (LWC's) are shown on the MSUP and the WMP maps (see the Augusta Unit Zeta 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
Non-constructed Pad	10	0.69/acre	6.9	Long Term
Constructed Pad	57	or Site Specific	54.8	
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	0 0		0.0	Long Term
On-channel	0	Site Specific	0.0	
Off-channel	0	Site Specific	0.0	
Water Discharge Points	3	Site Specific or 0.01 ac/WDP	0.3	
Channel Disturbance				
Headcut Mitigation*		Site Specific	0.0	
Channel Modification		Site Specific	0.0	
Improved Roads		50' Width or Site Specific		Long Term
No Corridor	0.7		4.2	
With Corridor	19.1		115.8	
2-Track Roads		35' Width or Site Specific		Long Term
No Corridor	1.3		7.2	
With Corridor	1.3	35' Width or Site Specific	7.2	
Pipelines		35' Width or Site Specific		Short Term
No Corridor				
With Corridor	1.5		6.3	

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. Soils

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

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it

would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the success of the recommended seed mix.

- Loss of soil vegetation cover, biologic crusts, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Modification of hill slope hydrology.
- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are predominantly composed of cyanobacteria, green and brown algae, mosses and lichens. They are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

There are road sections that, due to the lack of reclamation potential, the BLM recommended relocating to more desirable locations, or would have denied. However, the landowner(s) insisted that the routes be permitted as proposed. Some of the proposed roads follow existing primitive roadways used for ranch access. The following 16 well locations and associated 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 for the following well locations and the associated access roads:

Table 4.2 Locations and Infrastructure with Limited Reclamation Potential

14-4-5076	21-4-5076	34-4-5076	13-5-5076
12-6-5076	43-6-5076	32-19-5176	41-19-5176
43-19-5176	21-20-5176	23-30-5176	32-31-5176
41-31-5176	22-34-5176	32-34-5176	41-34-5176

BLM required all engineered well pad design redesigned to incorporate a minimum1% slope to provide drainage from the well pad. The operator was required to add a note for each pad design that specifies the working pad dimensions once the pad has been "pulled back" to initiate interim reclamation. A typical "working pad" diagram will be included in the MSUP with each note added to the well pad designs referencing this typical diagram. The well pad designs will include a note for expedient reclamation to be completed within 30 days of construction site specifically as agreed to during the onsite inspection. The road designs and descriptions will include a note for expedient reclamation to be completed within 30 days of construction site specifically as agreed to during the onsite inspection.

The primitive roads being utilized for this development are in disrepair and eroding, and will require substantial upgrading to accommodate CBNG development. The amount of disturbance created by road construction depends upon its design standard, steepness of slope, and total length of road. These sections of roads cross steep topography of varying degrees of stability, and will be a major source of erosion. On steep topography, roads undercut upslope soils and may alter the natural drainage from the hillside. By exposing formerly buried material to weathering, roads may also change slope strength. Road fills place additional weight on the underlying soil mass and are frequently over-steepened and are prone to failure. On unstable geological formations, roads can trigger mass movements even on less steep topography.

In order to stabilize currently eroding road ways, BLM requires that these access ways be improved by crowning and ditching to establish drainage control. Site specific cases require road design engineering to ensure conformance with BLM road standards and specifically calls out the placement of stabilization and drainage control structures to minimize sediment transport.

Geomorphic effects of roads range from chronic and long-term contributions of sediment into waters of the state to catastrophic effects associated with mass failures of road fill material during large storms. Roads affect geomorphic processes primarily by: accelerating erosion from the road surface and prism itself by both mass failures and surface erosion processes; directly affecting stream channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and debris at road-stream crossings. These impacts, singly or in combination, would increase the potential for valuable soil loss due to increased water and wind erosion, invasive/noxious/poisonous plant spread, invasion and establishment, and increased sedimentation and salt loads to the watershed system.

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. Weed Spraying – Spot Spraying – Spring & Fall
    a. Identify all noxious weeds within disturbed areas
    b. Application rates as per Johnson County and Campbell County Weed & Pest District's recommendations:
        i. Chemicals/application rates applied species specific; See Augusta Unit Zeta Weed and Pest Plan for specifics.
        ii. Spring applications – May 15-July 30
        iii. Fall applications – Sept. 1-Sept. 30
        iv. Residual effects of the chemical combination(s) will control weeds annually.
        v. Domestic animals or approved biological agents may be used in areas most suited for the type of control.
2. Preventive practices
    a. Washing the undercarriage of vehicles may be implemented to minimize seed transport and dispersal.
    b. Disturbance areas will be promptly re-seeded with certified weed free seed mix.
    c. Certified weed free mulch will be used in necessary locations.
    d. Surface disturbance will be minimized to the extent consistent with the MSUP.
3. Education of personnel:
    a. LOG will provide periodic weed education and awareness programs for its employees and contractors.
    b. Employees and contractors will be encouraged to report any new noxious weed infestations.
    c. Field employees and contractors will be notified of known noxious weed infestations of concern in the project area.

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. The operator has an approved Pesticide Use Plan for the application fo herbicides on federal surface within the Augusta Unit Aera project area. Mitigation as required by BLM applied COAs will further 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 Upper Powder River drainage, which is approximately 18.5% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The WMP for the Augusta Unit Zeta proposes that produced water will not contribute significantly to flows downstream.
- The commitment by the operator to monitor the volume of water flowing into Upper Powder River and prevent significant volumes of water from flowing into the Upper Powder River Watershed.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

General

Big game in the area includ*i*ng; elk, mule deer, and pronghorn antelope, can be expected to respond in similar fashion. However, deer and pronghorn do not move as easily as elk through deep snow, so winter disturbance could impact these smaller individuals more severely. The most important difference between the elk herd and deer or antelope herds is that the Fortification Creek elk are a relatively isolated herd residing primarily within the Yearlong range. Under the environmentally preferred alternative, Yearlong range for elk and pronghorn antelope and Winter/Yearlong range for mule deer, will be directly disturbed by the construction of wells, pipelines, and roads resulting in habitat loss. Table 2.5 summarized the proposed activities associated with the development of the Augusta Unit Zeta POD; items identified as long term disturbance would result in direct habitat loss. Short-term disturbances will also result in direct habitat loss as vegetative cover is removed. Short term disturbances may provide some habitat value as these areas are reclaimed and native vegetation becomes established. However, they may also increase vehicular collision when adjacent to roads.

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).

Big game animals are expected to return to the project area following drilling and construction activities; 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. Elk and Mule deer are more sensitive to operation and maintenance activities than pronghorn.

The Pinedale Anticline study (Sawyer, H., R. Nielson, D. Strickland and L. McDonald. 2005) 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 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.

Timing limitation stipulations for drilling, construction and other activities with the exception of well monitoring will be applied to protect elk during critical winter and calving periods for those portions of the project area within the identified ranges. However, it is anticipated that big game will continue to avoid those areas frequented by human disturbance during the production phase of the CBNG development.

Elk
Wyoming Game & Fish Department has verbally commented to the BLM that the security habitat thresholds proposed in the RMP amendment should not necessarily apply to the entire yearlong range. Population viability of the Fortification Creek elk herd will not be threatened by the projected impacts of the Augusta Unit Zeta POD.

Direct Habitat Loss
From a habitat standpoint, the water drawdown for gas production could conceivably dry up some of the existing springs and seeps in the area that the elk currently depend on as a free water source, thereby degrading the existing habitat. The Wyoming State Engineers Office and the operator's WMP shows one permitted spring and 3 free flowing wells that could be affected.

Security Habitat/Habitat Effectiveness
Indirect disturbance from human activity is probably the largest potential impact from the proposed action. The PRB FEIS used "habitat effectiveness" - the degree to which habitat features fulfill specific habitat functions; the degree to which a species or population is able to continue using a habitat for a specific function, to assess the effect of human disturbance on elk populations. For elk, the habitat effectiveness of areas within 0.5 miles of an active area such as a road or well would be reduced. In Powell's study on elk response to oil and gas development in the Jack Morrow Hills area of southwestern Wyoming, elk avoided areas within 2 kilometers (1.25 miles) of active roads (Powell, 2003).

Lance Oil & Gas Company Inc. has proceeded with non-federal oil and gas development within the Augusta Unit area. As of May, 2009, 37,874 acres of security habitat (15 patches) remained in the Yearlong range; 3,964 contiguous acres within the vicinity of the POD and only 125 acres within the project area boundary. From 2005 to 2009, 1,831 acres (3 patches) of elk security habitat has been lost within the vicinity of the Augusta Unit Zeta POD and 89% of the elk security within the POD has been lost due to non-federal oil and gas development. See Figure 3.1.

In an attempt to quantify the loss, both actual and functional, of crucial elk habitat (i.e., crucial winter range and parturition areas) in the Fortification Creek area resulting from CBNG development, a geographic information system (GIS) model was prepared to portray the physiographic and elk habitat data. Key assumptions were used in the development of the model:

1. The ability of elk to see CBNG development activities within a certain distance (0.5 mile and 1.25 mile) resulted in the non-use/lost functionality (i.e., lack of security) of the intervening habitat;
2. Secure elk habitat was defined as those blocks of contiguous habitat >250 acres in size that would be unaffected by CBNG activities (Christensen et al. 1991, Leege 1984); and
3. The presence of gas field roads and well pads (excluding the WSA) would be the parameter of measurement for development.

It can be assumed that similar effects would occur from the activities associated with the federal development. In order to monitor the effects, a Condition of Approval will be applied requiring the operator to submit a monthly work report that, in conjunction with monitoring the collared elk, will enable elk responses to be evaluated for possible adaptive management alternatives development.

CBNG development fragments habitats through placement of linear facilities such as roads and pipelines. The impacts from fragmentation can vary depending on the use of the feature. For example, a road used daily would displace elk by reducing habitat effectiveness as well as fragmenting habitat. The placement of linear elements can also act as vectors routes for the establishment of invasive plant species (e.g., Japanese brome and leafy spurge) that can reduce the forage value of the area by out competing native plants, and in the case of brome, increase the potential for wildfire (BLM 2006).

Lance Oil and Gas Company Inc. mobilized drilling and construction equipment within the project area (Augusta Unit) for non-federal CBNG development beginning May, 2008 with the pace of activities decreasing October, 2008. Data collected from collard elk indicate that elk were displaced from Augusta Unit during Lance's CBNG activities. Elk use during the development period was approximately 25 percent of their predevelopment use. Following development elk used the Augusta Unit 50 to 75% less than before Lance's activities.

The foreseeable development within the Augusta Unit Zeta includes an additional 134 wells resulting in a well density of 12.5 wells/section. Proposed project elements that are anticipated to impact the Fortification elk herd: 134 CBNG wells on 67 locations, 20.81 miles of new roads, 1.52 miles of new pipelines, increased vehicle traffic on established roads and increased noise from compressor stations. There are 57 of the proposed well locations within the elk crucial winter range and approximately 164 acres of surface disturbance associated with the well pads, access roads and ancillary infrastructure. The operator proposes 55 of the well locations within the elk parturition range and approximately 158 acres of surface disturbance associated with the well pads, access roads and ancillary infrastructure.

A view shed analysis utilizing the geographic information system (GIS) model was conducted to determine habitat effectiveness within the Augusta Unit Zeta project boundary following the field visits confirming the existing oil and gas roads. The following statistics summarize the outcome of the habitat effectiveness analysis:

1. Effective habitat existing prior to initiating non-federal CBNG development was approximately 1,676 acres or 16.8%% of the Augusta Unit Zeta project area within 3 parcels in excess of 250 acres.
2. Security habitat (250 contiguous acres of effective habitat) existing prior to CBNG development was approximately 1,115 acres or 11.2% of the project area.
3. Effective habitat remaining following non-federal CBNG development near (or in) the project area is approximately 686 acres (38.5% direct loss) with the habitat fragmented and isolated. The largest parcel being 63 acres.
4. Prior to the proposed federal CBNG development the habitat effectiveness within the project area had been compromised by wells and access roads that have fragmented the security habitat and reduced connectivity.
5. Since the completion of the Environmental Report, 3 elk security patches (4.4%) within the Augusta Unit Zeta POD and its immediate vicinity have been lost due to impacts associated with non-federal CBNG development. A total 9.8% of the elk security habitat (4,102 acres) has been lost to date.

The results modeled indicate a 100% reduction of effective elk habitat within the project area as a result of the operator's non-federal CBNG development. Loss of effective habitat anticipated with the implementation of the operator's federal CBNG development is 100% within the Augusta Unit Zeta POD. The BLM's ability to minimize effects to crucial elk habitat was affected by the existing fee development.

The Augusta Unit Zeta POD is expected to affect elk occupying the Fortification Creek area and the immediate surrounding habitat. There is likely to be a larger amount of habitat effectiveness loss due to avoidance and displacement of animals and their altered behavior reacting to the CBNG activities with most of this occurring during the actual development stages.

Movement patterns of the elk differ for those elk captured north of Fortification Creek versus those elk captured south of Fortification Creek. Typically, those elk captured in the northern portion of the elk Yearlong range stay north of Fortification Creek where as the elk captured in the southern portion of the Yearlong range tend to roam more between the north and south halves of the Yearlong range. Nine

(50%) of the 18 elk collared south of Fortification Creek spent considerable time north of Fortification Creek (April 1, 2008 - July 17, 2009), with 37% of the locations from these 'southern' elk being north of Fortification Creek. While of 37 elk collared north of Fortification Creek only three (8%) spent much time south of Fortification Creek; only 4% of the locations from the 'northern' elk were south of Fortification Creek. Effective elk habitat along the southern boundary of the FCPA provides connectivity for these elk between the north and south halves of the elk Yearlong range. The Augusta Unit Zeta project area lies at the southern boundary of the FCPA. Following nonfederal CBVNG development was initiated within the Augusta Unit in May of 2008, more than half the collared elk that had been located within the Augusta Unit Zeta project areas left the area.

It is likely that connectivity of the effective habitat within the Augusta Unit Zeta POD would be compromised further. It is likely that elk will be displaced from the area by human disturbance for prolonged periods of time or may be avoided altogether.

Population

The effects of the proposed project on elk populations are difficult to predict because of the many unknown factors associated with each of the potential effects and the potential for a synergistic or countervailing relationship among the individual effects. Because determining the reaction of elk in the Fortification Creek area is difficult, it may be more appropriate to frame the potential cumulative effects of CBNG development to this species in terms of a likelihood, or probability. For this reason, the Environmental Report identified 3 scenarios; 1) mass abandonment of the entire Fortification Creek area (least probable), 2) complete habituation of CBNG activities (possible, but unlikely) and 3) reduced herd residing in Fortification Creek (most probable).

Because of their affinity for the Fortification Creek area and their wary nature, the most probable scenario for elk response to the proposed CBNG development is for the herd to seek out security patches within the Fortification Creek herd unit and attempt to avoid the CBNG activities, at least during the development stage. During the peak of development as proposed, road and facility construction and human activity is apt to be taking place on most of the ridges and drainages in the Augusta Unit Zeta POD. The elk population is necessarily expected to be stressed and impacted almost continuously during the development phase. This level of impact will likely ease during the field production phase (BLM 2006).

While some habituation may occur over time, regardless, a reduction in the elk population through displacement should be expected. This disturbance is usually temporary in nature, however, and some studies have shown that elk returned to the area of disturbance once the source of disturbance and human presence was gone (Gussey 1986, WGFD 2000), albeit at 50% of the previous levels in forested environments (Hayden-Wing Associates 1990). It is also very likely the elk will shift their centers of distribution to the least impacted sites, such as the Wilderness Study Area (WSA). This trend is supported by data collected from 39 GPS collared elk within the Fortification Creek herd unit and the response to ongoing non-federal CBNG development. In an attempt to quantify this actual impact to the elk population, the recent and current collared elk studies were examined as a "benchmark reference" for gauging impacts. Of 26 collared elk in the 2005 elk monitoring study, four (4) of these animals (about 15%) have been observed to routinely venture outside the Fortification Creek area on sorties of one type or another, though most of them (3 of 4 = 75%) seasonally return. Expanded to the whole herd population, we would expect about 35 of the existing 230 head to venture outside the Fortification Creek area, at least occasionally. When monitoring the impacts of development on the elk population, it would be a concern if:

1. The current population trend, about 3% population decrease per year, were to precipitously decline (i.e., rapid rate increase)

2. The overall total herd population were to drop below an estimated 120 animals (about 52% of the current population)
3. The rate of elk ventures outside the Fortification Creek area were to drastically increase above 15% of the herd, and/or …
4. The nature (i.e., longevity) of elk ventures outside the Fortification Creek area were to shift from mostly seasonal to mostly permanent

Another factor must be considered - when populations are reduced to near viability threshold levels, their small size can be an impact in itself. Small populations are subject to genetic inbreeding, and stochastic events such as fires, severe winter, disease, drought, etc. that make them intrinsically more vulnerable to extirpation (Soule 1986). Populations that are isolated, like the Fortification elk herd, are more sensitive to these internal (genetic) and external (stochastic) elements. In isolated populations, due to a closed gene pool with no gene immigration, deleterious genes can become more prevalent through time. While gene pool isolation may be a possibility in the Fortification Creek herd, it is currently thought that there is enough interbreeding and genetic interchange with surrounding elk herds that this occurrence is a low likelihood (Jahnke, 2006). Stochastic events such as fires or severe winter storms can remove individuals from populations. In populations that are small in number and isolated, such events are magnified because there are proportionally fewer animals left with no potential for immigration into the population (BLM 2006).

There will be some additional mortality due to vehicular collisions and poaching (Jahnke, 2006), as has already been seen in other parts of the Powder River Basin (BLM 2006).

Mitigation
To minimize impacts to elk utilizing habitat affected by the proposed action, surface disturbing activities will be restricted within identified elk critical winter range November 15 to April 30 and elk parturition range May 1 to June 30 for the life of the project.

The operator will be required to submit a monthly work report that in conjunction with monitoring the collared elk will enable elk responses to be evaluated for possible adaptive management alternatives development.

BLM's goal is to minimize impacts to wildlife and their habitat. Through management decisions we become more conscious of the mechanisms driving shifts in wildlife behavior and habitat selection, and further understand the resulting effects of these behavioral shifts on fitness. Consequently, to properly mitigate the impacts of energy development on wildlife we must accrue knowledge of direct and indirect disturbances associated with energy development. These understandings will assist in creating more efficient conservation and management plans while still meeting energy demands. Beginning June 2009, the BLM in conjunction with the University of Wyoming has initiated a study to identify levels of direct and indirect disturbances that influence habitat selection by elk in the Fortification Creek Area (FCA). These findings will be documented in quarterly reports and along with the monthly work reports will facilitate adaptive management to minimize direct and indirect impacts on elk habitat selection.

4.2.1.1. Big Game Cumulative effects

Bromley (1985) provides a good overview of the type and nature of environmental impacts of conventional petroleum exploration and development on wildlife in general, as well as the implications of wildlife management in this kind of an industrial setting. An annotated bibliography was also provided in this synopsis. While the focus of this document was on conventional petroleum field activities, the nature of the environmental impacts is essentially the same for CBNG development and production, though the pace and duration of the impacts could vary significantly in the FCPA.

Southerland (1993) characterizes the type of impacts to habitat based on general effects categories, as follows: 1.) Habitat loss / destruction; 2.) Habitat fragmentation; 3.) Habitat simplification; and 4.) Habitat degradation. These general effects categories are further defined as follows:

- ***Habitat Loss / Destruction*** – the destruction of a natural ecosystem through its "conversion" to another land use. In each conversion, the original natural characteristics of the land are eliminated, while the associated habitat values are modified to varying degrees, or totally lost. Physical alterations of many kinds can cause destruction.
- ***Habitat Fragmentation*** – the breaking of larger blocks of habitat into smaller blocks in a fashion that destroys the unit integrity and functionality of the habitat for "area sensitive" species.
- ***Habitat Simplification*** – the removal of ecosystem components (e.g., standing dead trees, cover logs, stream debris, sensitive submerged plants, etc.) and the loss of microhabitats (e.g., nests and dens, etc.) that are rendered unusable by human intrusion.
- ***Habitat Degradation*** – the decrease in the health or ecological integrity of "intact" habitats (e.g., chemical contamination, drawdown of aquifers, invasion of exotic plants and animals, etc.).

Any or all of these various forms of impacts may play out, either singularly, additively, or with multiplicity in the Fortification Creek area.

The Powder River Basin FEIS thoroughly addresses the regional impacts of CBNG development and production on wildlife species and their habitat surrounding the Fortification Creek area however the PBR-FEIS did not analyze in detail the potential effects from these activities to the Fortification elk herd and their habitat. The discussion presented in this evaluation leans heavily on the Report entitled "Environmental Report: Coalbed Natural Gas Effects on the Fortification Creek Area Elk Herd" (BLM 2007).

4.2.2. Aquatics Direct and Indirect Effects

The operator proposes the potential 5.97 cfs of produced water is to be managed by the following water management strategies:

Primary: Piped approximately 11 miles west for treatment and discharge directly to the Upper Powder River via an existing pipeline, associated water pump station located NWNE section 22, T51N., R76W, Barber Creek West water treatment facility located NENW section 9, T50N, R77W and 3 outfalls located SENE section 8 T50N, R77W and SWSW section 4, T50., R77W. The Barber Creek East EMIT facility will be relocated to and within the disturbance footprint of the Barber Creek West water treatment facility.
The following NEPA documents have analyzed the treatment and discharge of 1.0 cfs CBNG produced waterat the Baber Creek East and West facilities: Williams Draw Unit Alpha POD Environmental AssessmentWY-070-05-134 and Williams Draw Unit Alpha, Water Management Change to EMITS Treatment Sundry - CX06-1-022.

The 11 miles of water pipeline, pump station and 3 new outfalls have not been analyzed by any pervious NEPA document. This system has not yet been thoroughly tested at this time and there is the potential that modification will be needed that does not fall under this analysis.

Secondary: Direct discharge of treated water to Fortification Creek from the Camp John & Augusta EMITS facility located NWNE section 22, T51N, R76W via an existing outfall located SESW section 15, T51N, R76W.

The Camp John & Augusta POD environmental assessment WY-07-05-373 analyzed the treatment and discharge of 3.1 cfs to Fortification Creek.

Tertiary: Piped via existing infrastructure, County Line pump station and water pipeline to the Salt Creek Oil field located in Midwest, Wyoming for re-injection into the Madison aquifer.

4.2.2.1. Aquatics Cumulative Effects

The anticipated effects were analyzed under previous environmental assessments listed above.

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 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 consequences 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.

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).

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. No additional mitigation measures are required.

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.

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 in such a way as to provide an adequate biologic buffer for nesting raptors.

Although the operator proposes wells and infrastructure within 0.25 miles of multiple raptor nests, BLM did not make recommendations to move wells locations or facilities. The operator had planned accordingly to keep wells and facilities requiring surface occupancy out of line of sight of raptor nests. The available topography should provide the biological buffer needed to minimize effects to the nesting raptors.

Lance Oil & Gas Company began March 2008 installing approximately 11 miles of water pipeline and 3 water discharge outfalls prior to the federal action being submitted therefore the BLM was not presented the opportunity to make recommendations that may have minimized effects to 22 raptor nests that fall within 0.5 mile of that existing disturbance. The raptor species known to occupy the nests within 0.5 mile are those species that are known to typically be more tolerant of human activity. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

Table 4.3 Infrastructure within close proximity (0.5 mile) to documented raptor nests within the Augusta Unit Zeta POD project area.

BLM ID#	AMOUNT AND TYPE OF INFRASTRUCTURE
	Within 0.5 mile
622	Well(s): 21-29-5176, 12-20-5176 & 23-20-5176
2029	Facility: 0.36 mile of Outfall 012
2348	Associated infrastructure: 0.10 mile of water pipeline
2349	Associated infrastructure: 0.31 mile of water pipeline
2658	Associated infrastructure: 0.47 mile of access w/ corridor
3350	Associated infrastructure: 0.50 mile of access w/ corridor
5101	Associated infrastructure: 0.14 mile of access w/ corridor
5123	Well(s): 22-28-5176 & 12-28-5176 Associated infrastructure: 0.48 mile of access w/ corridor and 0.16 mile of utility corridor
5125	Associated infrastructure: 0.08 mile of access w/ corridor & 0.85 mile water pipeline Facility: 0.30 mile of the Camp John & Augusta water treatment facility & pump station.
5126	Well(s): 22-28-5176
5156	Facilities: 0.48 mile of Outfall 014

BLM ID#	AMOUNT AND TYPE OF INFRASTRUCTURE
	Within 0.5 mile
5157	Facilities: 0.30 mile of Outfall 012
5158	Facilities: 0.34 mile of Outfall 012
5159	Facility: 0.40 mile of Outfall 014
5202	Well(s): 14-6-5076 Associated infrastructure: 0.22 mile of access w/ corridor
5847	Well(s): 43-6-5076
5850	Well(s): 14-6-5076 Associated infrastructure: 0.05 mile of access w/ corridor
5853	Well(s): 13-33-5176 & 44-32-5176
5854	Well(s): 11-4-5076, 31-4-5076, 33-4-5076 & 41-4-5076
5856	Well(s): 21-29-5176
5857	Well(s): 43-6-5076 Associated infrastructure: 0.60 mile of access w/ corridor
5859	Well(s): 13-33-5176 & 44-32-5176

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 4.4. 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 4.4 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 of insufficient size.
Threatened				
Ute ladies'-tresses orchid (Spiranthes diluvialis)	Riparian areas with permanent water	NS	NLAA	Suitable habitat present, no known population in the area. Insufficient survey completed.

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

Because the black-tailed prairie dog colony within and adjacent to the Augusta Unit Zeta POD project area is of insufficient size for supporting ferrets and is isolated from any prairie dog complexes, implementation of the proposed development will have "***no effect***" on the black-footed ferret.

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

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 outcompete this fragile species. Restricting work from areas of Ute ladies'-tresses orchid habitat reduces these impacts.
Two natural springs have been identified within and one mile of the project area. Suitable habitat is present within the Augusta Unit Zeta POD project area. The 14-32-5176 well pad is proposed 0.04 miles from and upslope from the Christmas #1 free flowing spring.

See Table 3.5 on page 33 for the 2 natural springs within the project area and the perennial flow established from the discharge of produced water to Fortification and Barber Creeks may create suitable habitat by historically ephemeral drainages becoming perennial, however no historic seed source is present within the project area. Implementation of the proposed coal bed natural gas project "***may affect, but is not likely to adversely affect***" the Ute ladies'- tresses orchid as suitable habitat is present. However an insufficient ULT survey has been completed at the 2 spring locations to discount them as suitable habitat or whether the species is present. A condition of approval has been applied restricting any surface disturbing activities that would impact the Christmas #1spring until ULT survey is completed and the results submitted to BLM.

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 colony 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 even after habitat reestablishment.

Table 4.5 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 will be impacted.
Ferruginous hawk (Buteo regalis)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	No active nest present.
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	NI	Habitat not present.
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	NP	NI	Habitat not present.
Long-eared myotis (Myotis evotis)	Conifer and deciduous forest, caves and mines	NP	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

Removal of mature ponderosa pine trees and other related construction disturbance within a mile of the uplands will likely deter bald eagles from nesting there. There are no known nests located within the project area. The perennial flow of water down Fortification and Barber Creeks connecting to the Upper Powder River has to potential to attract bald eagles as it provides habitat for prey species such as fish, water fowl and small mammals. 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 6.86 miles of existing overhead three-phase distribution lines within the project area. The wire spacing is likely in compliance with the Avian Power Line Interaction Committee's (1996) suggested practices and with the Service's standards (USFWS 2002); however other features may not be in compliance. There are currently in excess of 17 miles of existing roads and 28 miles of utility corridors and pipeline right of ways being utilized for oil and gas operations within the project area. The operator proposes an additional 20.8 miles of roads and 1.5 miles of utility corridor with this project.

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.

4.2.5.2.4. Black-tailed prairie dog Direct and Indirect Effects

The operator proposes 2 well locations within 0.25 miles of the black-tailed prairie dog colony located NE if section 33 T51N, R76W. The colony lies over private surface estate and State mineral estate. The surface owner prefers to utilize the operator's proposed locations as the access roads exist to access fee wells at this time. Lance Oil & Gas Company proposes to construct an engineered access road to the 41-21-5176 well location that lies within 0.21 miles of a colony identified by WGFD NW Sections 22 of T51N , R76W (4.9 acres). Jones & Stokes conducted ground surveys of the colony in 2008 and surveyed it at 1.2 acres.

No recommendations by BLM to minimize impacts to prairie dogs where accepted.
Well houses 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

Impacts to burrowing owl habitat will be the same as for 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.

4.2.5.2.6. Grouse

4.2.5.2.6.1. Greater sage-grouse Direct and Indirect Effects

There are 2 active and occupied sage-grouse leks within 4 miles of the Augusta Unit Zeta project area. The proposed action will impact breeding, nesting, brood rearing, late summer and winter habitat.

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. For standardization, the BLM adopted the two-mile recommendation in 1990, and instructed the field offices to incorporate the measure into their land use plans (Bennett 2004, Murkin 1990).

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).

Proposed project elements that are anticipated to negatively impact grouse are approximately: 134 CBNG wells on 67 locations, 20.8 miles of new roads, 1.5 miles of new pipelines, 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 4,795 acres from roads, and 723.5 acres from 67 well locations. 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 9,560 acres within the POD boundaries) can be considered affected.

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.

Greater sage-grouse habitat will be 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 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 finds a well density of eight wells per section creates an extreme 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)

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).

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 and subsequent abandonment of the 2 leks within 2 miles of the project area.

During the on-sites, changes were made throughout the project area to minimize impacts to sage-grouse habitat. The operator's plan includes buried electrical lines to corridor buried gas and water pipelines.

During the on-site, the BLM biologist negotiated modifications to the proposed action to minimize impacts to sage-grouse resulting from habitat loss. Nearly 30 acres of sage-grouse habitat were conserved from the operator's original proposal. The changes associated with the well locations are as follows:

- The 14-4-5076 well pad size was reduced.
- The 34-4-5076 well pad size was reduced.
- The 43-4-5076 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 11-5-5076 well pad size was reduced.
- The 13-5-5076 well pad size was reduced.
- The 21-5-5076 well pad size was reduced.
- The 14-6-5076 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 43-6-5076 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 11-9-5076 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 12-9-5076 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 34-19-5176 well pad size was reduced.
- The 41-19-5176 well pad size was reduced.
- The 12-20-5176 well pad size was reduced.
- The 21-20-5176 well pad size was reduced.
- The 23-20-5176 well pad size was reduced.
- The 12-21-5176 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 21-21-5176 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 44-21-5176 well pad size was reduced and the access & corridor width minimized to 35feet.
- The 23-30-5176 well pad size was reduced.
- The 43-30-5176 well pad size was reduced.
- The 12-31-5176 well pad size was reduced.
- The 14-31-5176 well pad size was reduced.
- The 32-31-5176 well pad size was reduced.
- The 41-31-5176 well pad size was reduced.
- The 43-31-5176 well pad withdrawn for at rig slot.
- The 12-32-5176 well pad size was reduced.
- The 14-32-5176 well pad size was reduced.
- The 21-32-5176 well pad withdrawn for at rig slot.
- The 23-32-5176 well pad size was reduced.
- The 44-33-5176 well pad size was reduced.
- The 22-34-5176 well pad size was reduced.

To further minimize impacts to sage-grouse utilizing habitat affected by the proposed action, surface disturbing activities will be restricted within identified nesting habitat within the project area during sage-

grouse breeding and nesting periods (March 1 – June 15) for project components located in sage-grouse habitat for the life of the project.

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. The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from the Hayden II and Fortification sage-grouse leks.

As of February 23, 2009, there are approximately 393 existing wells and associated infrastructure within four miles of the 2 leks - an area of 61.7 square miles. The existing well density in this area is approximately 6.4 wells/section. Due to this level of development there is strong potential that the population(s) breeding at these leks may become extirpated without the federal development.

There are 210 proposed wells (134 are the wells from this project) within four miles of the 2 leks. With the addition of the 76 proposed wells that are not associated with this proposed action, the well density within four miles of the 2 leks increases to7.6 wells/section. With approval of alternative C (134 proposed well locations) the well density increases to 9.8 wells/section.

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)."

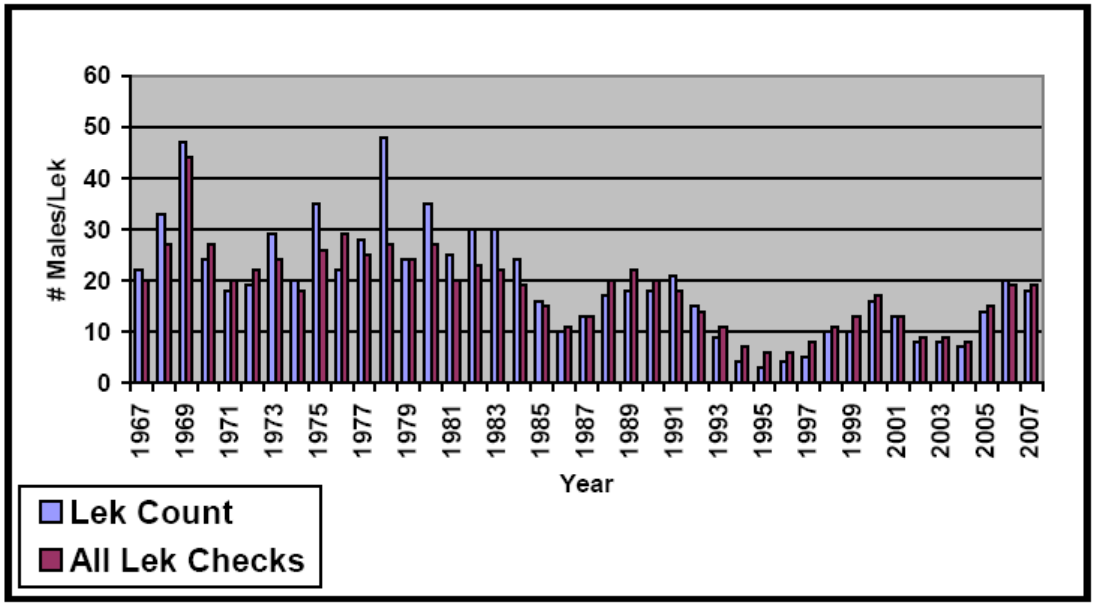
The Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) included a Mitigation Monitoring and Reporting Plan (MMRP). The uncertainties as to where and at what level development was to proceed as well as the uncertainties associated with the assumptions that were used to predict impacts 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.

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.

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 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).

In January 2008, BFO staff identified that sage-grouse protections in the 2003 PRB EIS may not be adequate to preserve sage-grouse population viability in the Powder River Basin. BFO consolidated research and data to identify high-quality sage-grouse habitat in the basin and developed a map of sage-grouse "focus areas". These areas encompass approximately 1 million acres of habitat, and are managed under criteria established in "Guidance for general management actions during BFO Resource Management Plan Revision" (Appendix 1). This general guidance includes the following requirement; "The proponent will be asked to demonstrate that the proposal can be managed in a manner that effectively conserves sage-grouse habitats affected by the proposal."

Based on the best available science presented above, the proposed action will most likely contribute to the abandonment of the two leks within four miles of the project area. However, given the ongoing planning actions specific to sage-grouse, changes to the proposed action identified, and timing limitations applied, the proposed action should not affect population viability across the project area or the species' range.

4.2.5.2.7. Sharp-tailed grouse Direct and Indirect Effects

The Wyoming Game and Fish Department has not documented a sharp-tailed grouse lek within the vicinity of the Augusta Unit Zeta POD. The nearest sharp-tailed grouse lek, Fortification I, is over 5 miles north of the project area. Big Horn Environmental Consultants biologist has observed sharp-tailed grouse in the Augusta Unit Zeta area beginning in 2004 (BHEC 2008). No new sharp-tailed leks were located during surveys in 2007 or 2008. Because of the above, effects to sharp-tailed grouse are expected to be minimal.

4.2.5.2.8. Mountain plover Direct and Indirect Effects

Suitable mountain plover habitat is present within the project area. The project has the potential to impact mountain plovers.

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.

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 within 0.25 miles of the black-tailed prairie dog colony located NE if section 33 T51N.,R76W, 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 annually to determine the present of absence of plovers.

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

Construction from 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 Upper Powder River primary watershed and the secondary watershed and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies.

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

The maximum water production is predicted to be 20.0 gpm per well or 2680.0 gpm (5.98cfs or 4322.2 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 Upper Powder River drainage, the projected volume produced within the watershed area was 147,481acre-feet in 2008 (maximum production is estimated in 2006 at 171,423 acre-feet). As such, the volume of water resulting from the production of these wells is 2.5% of the total volume projected for 2006. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

No containment of produced water is proposed.

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 2 to 1,376 feet compared to 2,500 feet to the Wall and 2,013 to the Big George. 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.

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 4.6 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		2	1,000
Least Restrictive Proposed Limit		10	3,200
Primary Watershed at Arvada, WY Gauging station			
Historic Data Average at Maximum Flow		7.83	3,400
Historic Data Average at Minimum Flow		4.76	1,797
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # WY0052809			
At discharge points 001-026	*Calculated	*Calculated	*Calculated
At Irrigation Compliance point			
Predicted Produced Water Quality			
Wall Coal Zone	1,260	30.9	2,040
Big George Coal Zone	2,070	33.3	3,240

*Calculated in accordance with the Powder River Assimilated Capacity Policy – See permit for specific information.

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 1260.0 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 Wall & Big George target coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 20.0 gallons per minute (gpm) is projected is to be produced from these 134 wells, for a total of 2,680.0 gpm for the POD. See Table 4.5.

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

There were 3 new discharge points outside the project area were constructed by the operator prior to the federal action for this project. These outfalls have been sited and utilize water erosion dissipation that meets the minimum requirements of the WPDES permit issued by WY-DEQ. Existing and facilities proposed to handle the disposal of water produced during CBNG development were evaluated to ensure compliance with best management practices during the onsite.

To manage the produced water, the operator will utilize the existing Camp John & Augusta and Barber Creek West EMITS water treatment facilities. All water management facilities were evaluated for compliance during the onsite.

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 2006 at a total contribution to the mainstem of the Upper Powder River of 68 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 134 wells is anticipated to be a total of 2,680.0 gpm or 6.0 cfs. Discharge may add a maximum 6 cfs to the Upper Powder River flows, or 8.8% of the predicted total CBNG produced water contribution. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP page 3). Based on the area of the Fortification Creek watershed above the POD (77.4 sq mi) and an assumed density of 2 wells per location every 80 acres, the potential exists for the development of 1,240 wells which could produce a maximum flow rate of 24,800 gpm (55.3 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, 55.3 cfs, is much less than the volume of runoff estimated from the 2-year storm event for Fortification Creek drainage (348 cfs).

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 from the WDEQ (WY005280) to discharge water produced from this project to Fortification Creek.

Permit effluent limits were set at (WYPDES page 2-4):

pH	6.5 to 9.0
TDS	5000 mg/l max
Specific Conductance	2,445mg/l max
Sulfates	3000 mg/l max
Dissolved iron	1000 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	8.4 µg/l max
Chlorides	150 mg/l max

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is 001.

The operator has obtained a Wyoming Pollutant Discharge Elimination System (WYPDES) permit from the WDEQ (WY0056081) to discharge water produced from this project to the Powder River.
Permit effluent limits were set at (WYPDES page 2-4):

pH	6.5 to 9.0
TDS	5000 mg/l max
Specific Conductance	7,500mg/l max
Sulfates	3000 mg/l max
Dissolved iron	300 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	8.4 µg/l max
Chlorides	150 mg/l
Copper	6 µg/l max
Radium 226 + 228	1 pCi/l max

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated points of compliance identified for this permit are at the outfalls 001-026.

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, to protect water wells users in and near the project area the operator has committed to offering water well agreements to properly permitted domestic and stock water wells within the circle of influence of the proposed CBNG wells.

The development of coal bed natural gas and the production and discharge of water in the area surrounding the existing natural spring may affect the flow rate or water quality of the spring. A condition of approval has been applied that requires Lance Oil and Gas Company Inc. to provide this information prior to any surface disturbing activities that could have an impact to the Christmas Spring #1, and to continue monitoring twice per year for the life of the project.
In-channel downstream impacts are addressed in the WMP for the Augusta Unit Zeta POD prepared by WWC Engineering for Lance Oil & Gas Company, Inc.

4.4.2.1. Surface Water Cumulative Effects

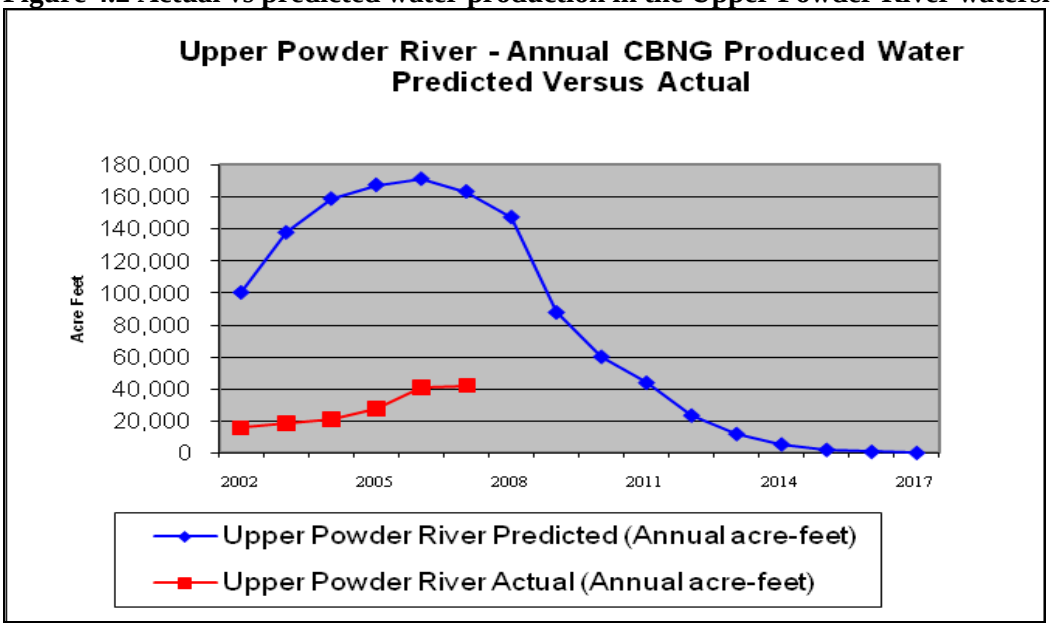
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2007, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 166,096 acre-ft of water compared to the predicted 900,040 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.2 and Table 4.7 following. This volume is 18.5% of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

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

Year	Upper Powder River Predicted (Annual acre-feet)	Upper Powder River Predicted (Cumulative acre-feet from 2002)	Upper Powder River Actual (Annual acre-feet)		Upper Powder River Actual (Cumulative acre-feet from 2002)	
			A-ft	% of Predicted	A-Ft	% of Predicted
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521				
2009	88,046	1,135,567				
2010	60,319	1,195,886				
2011	44,169	1,240,055				
2012	23,697	1,263,752				
2013	12,169	1,275,921				
2014	5,672	1,281,593				
2015	2,242	1,283,835				
2016	1,032	1,284,867				
2017	366	1,285,233				
Total	**1,285,233**		**166,096**			

Figure 4.2 Actual vs predicted water production in the Upper 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 Upper Powder River drainage, which is approximately 18.5% 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.

A Condition of Approval has been applied requiring the operator to monitor natural spring(s) with ½ mile of the proposed wells.

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

4.5. Economics and Recovery of CBNG Resources

All the proposed wells and infrastructure would be drilled and produced. Production and economic effects would be the same as those described in section 3.6.

4.6. Cultural Resources

BLM review, conducted by Wendy Sutton, has determined that three (3) sites and three (3) isolated resources will be impacted by the current project. The impacted sites (48CA5813, 48JO3774, and 48JO4106) and isolates (IR7, IR14 & IR18) have been recommended as not eligible to the National Register of Historic Places. As such, these resources are not considered historic properties; therefore, the impact to these resource result in *no historic properties affected*. Following the Wyoming State Protocol, Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 03/11/09 that the proposed project would result in *no historic properties affected/no effect* (DBU_WY_2008_2533).

Eligible site 48JO3771 is traversed by an existing ranch road (two-track). The initial proposal for this project involved utilizing and adding additional infrastructure across this site; use of this route was withdrawn by Lance at BLM request. To mitigate the potential for oil and gas traffic to impact the site by using the road a condition of approval will prohibit oil and gas traffic on the two-track road. No oil and gas traffic will be permitted along the two track road running west and southwest from the main crown and ditch road (junction in T50N R76W, Section 6 SSWNENW). A sign prohibiting oil and gas traffic associated with the Augusta Unit Zeta POD shall be placed at the junction of two-track road and the crown and ditch road.

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).

4.7. 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.

Alternative D – Deferral of Locations

The only difference in effects between Alternative C and D relate to the impact associated with elk and recovery of CBNG.

The following wells are in line of sight and less than 1/2 mile from the remaining undisturbed elk security habitat. BLM estimates that 10% of the elk security habitat has been lost to date within the Yearlong elk range of Fortification Creek. These locations and associated access roads would impact approximately 50 acres of identified elk security habitat.

AUGUSTA UNIT ZETA AUGUSTA	32-19BG	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	32-19WA	SWNE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-19BG	NENE	19	51N	76W	WYW134235
AUGUSTA UNIT ZETA AUGUSTA	41-19WA	NENE	19	51N	76W	WYW134235

By removing the 4 proposed wells, Lance Oil & Gas Company Inc. will lose 165 acres of CBNG drainage potential from the Augusta Unit. Since Lance is the lease holder for all the adjacent leases in the surrounding area, no other operator can drill wells that can drain this acreage. The fluid mineral resource could be extracted at a later time as drilling technology grows to allow for the effects on the surface to be avoided; i.e. directional drilling.

Alternative E – Sage-grouse Emphasis

Alternative E, as described would use findings from the best available science to maintain open corridors for sage-grouse, provide contiguous habitat patches, and reduce disturbance in and adjacent to sage-grouse habitat. The measures described would also accelerate the return of habitat effectiveness upon project reclamation. Components of Alternative E may not meet the purpose and need of the proposed action relative to development of the fluid minerals resource, nor meet the objectives for project design expressed by the surface owner. Effects to other resources would be similar to those described in alternative C.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Mary Hopkins	Interim SHPO	WY SHPO	No

6. OTHER PERMITS REQUIRED

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

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