DECISION RECORD
FOR Lance Oil and Gas Company, Inc., Bear Draw Gamma POD
ENVIRONMENTAL ASSESSMENT (EA) –WY-070-EA11-172
Bureau of Land Management, Buffalo Field Office

DECISION:
I approve Lance Oil and Gas Company Inc., (Lance or Operator) Bear Draw Gamma coalbed natural gas (CBNG) plan of development (POD) as described in Alternative C of the environmental assessment (EA) WY-070-11-172. This approved POD includes: 71 CBNG applications for permit to drill (APDs), a water management plan (WMP), and associated infrastructure.

Compliance
This decision complies with:

- Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701).
- Mineral Leasing Act of 1920 (30 U.S.C. 181) and 43 CFR Part 3160 to include On Shore Order No. 1.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- Migratory Bird Treaty Act (MBTA) (16 USC 703).
- Bald and Golden Eagle Protection Act (16 USC 668).
- Buffalo Final Environmental Impact Statement (FEIS) (1985), and FEIS for the Powder River Basin (PRB) Oil and Gas Project, 2003.
- Buffalo Resource Management Plan (RMP), 1985, Amendments 2001, 2003.
- Bureau of Land Management (BLM), Wyoming, Sensitive Species List, (WY-IM-2010-027), Apr 2010.
- U.S. Department of Interior Order (USDI) 3310 (2010).

The Selected Alternative
BLM's decision approves Alternative C as described in the EA and the EA's mitigation measures and COAs. A summary of the approval follows. The detailed project description, including changes made at the onsites, and site-specific mitigation measures, is included in the EA.

Approvals:
I approve the following 71 CBNG APDs and associated infrastructure:

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
1	Bear Draw Gamma BDU	11-1	NWNW	1	79W	49N	WYW144808
2	Bear Draw Gamma BDU	12-1	SWNW	1	79W	49N	WYW141989
3	Bear Draw Gamma BDU	21-1	NENW	1	79W	49N	WYW144808
4	Bear Draw Gamma BDU	22-1	SENW	1	79W	49N	WYW141989
5	Bear Draw Gamma BDU	11-19	NWNW	19	78W	50N	WYW146920
6	Bear Draw Gamma BDU	12-19	SWNW	19	78W	50N	WYW146920
7	Bear Draw Gamma BDU	14-19	SWSW	19	78W	50N	WYW146920
8	Bear Draw Gamma BDU	21-19	NENW	19	78W	50N	WYW146920
9	Bear Draw Gamma BDU	32-19	SENE	19	78W	50N	WYW146920
10	Bear Draw Gamma BDU	41-19	NENE	19	78W	50N	WYW146920
11	Bear Draw Gamma BDU	42-19	SENE	19	78W	50N	WYW146920
12	Bear Draw Gamma BDU	12-30	SWNW	30	78W	50N	WYW146924
13	Bear Draw Gamma BDU	14-30	SWSW	30	78W	50N	WYW146924
14	Bear Draw Gamma BDU	21-30	NENW	30	78W	50N	WYW146924
15	Bear Draw Gamma BDU	23-30	NESW	30	78W	50N	WYW146924
16	Bear Draw Gamma BDU	34-30	SWSE	30	78W	50N	WYW146924
17	Bear Draw Gamma BDU	43-30	NESE	30	78W	50N	WYW146924

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
18	Bear Draw Gamma BDU	21-2	NENW	2	79W	50N	WYW140577
19	Bear Draw Gamma BDU	12-3	SWNW	3	79W	50N	WYW140577
20	Bear Draw Gamma BDU	14-3	SWSW	3	79W	50N	WYW140577
21	Bear Draw Gamma BDU	21-3	NENW	3	79W	50N	WYW140577
22	Bear Draw Gamma BDU	22-3	SENW	3	79W	50N	WYW140577
23	Bear Draw Gamma BDU	32-3	SWNE	3	79W	50N	WYW140577
24	Bear Draw Gamma BDU	33-3	NWSE	3	79W	50N	WYW140577
25	Bear Draw Gamma BDU	34-3	SWSE	3	79W	50N	WYW140577
26	Bear Draw Gamma BDU	43-3	NESE	3	79W	50N	WYW140577
27	Bear Draw Gamma BDU	12-22	SWNW	22	79W	50N	WYW147850
28	Bear Draw Gamma BDU	14-22	SWSW	22	79W	50N	WYW142845
29	Bear Draw Gamma BDU	23-22	NESW	22	79W	50N	WYW142845
30	Bear Draw Gamma BDU	32-22	SWNE	22	79W	50N	WYW147850
31	Bear Draw Gamma BDU	34-22	SWSE	22	79W	50N	WYW137036
32	Bear Draw Gamma BDU	41-22	NENE	22	79W	50N	WYW147850
33	Bear Draw Gamma BDU	12-25	SWNW	25	79W	50N	WYW139818
34	Bear Draw Gamma BDU	14-25	SWSW	25	79W	50N	WYW139818
35	Bear Draw Gamma BDU	21-25	NENW	25	79W	50N	WYW139818
36	Bear Draw Gamma BDU	22-25	SENW	25	79W	50N	WYW139818
37	Bear Draw Gamma BDU	24-25	SESW	25	79W	50N	WYW139818
38	Bear Draw Gamma BDU	34-25	SWSE	25	79W	50N	WYW137036
39	Bear Draw Gamma BDU	41-25	NENE	25	79W	50N	WYW137036
40	Bear Draw Gamma BDU	42-25	SENE	25	79W	50N	WYW137036
41	Bear Draw Gamma BDU	12-26	SWNW	26	79W	50N	WYW137036
42	Bear Draw Gamma BDU	13-26	NWSW	26	79W	50N	WYW142845
43	Bear Draw Gamma BDU	21-26	NENW	26	79W	50N	WYW137036
44	Bear Draw Gamma BDU	23-26	NESW	26	79W	50N	WYW142845
45	Bear Draw Gamma BDU	32-26	SWNE	26	79W	50N	WYW142845
46	Bear Draw Gamma BDU	34-26	SWSE	26	79W	50N	WYW142845
47	Bear Draw Gamma BDU	41-26	NENE	26	79W	50N	WYW142845
48	Bear Draw Gamma BDU	43-26	NESE	26	79W	50N	WYW142845
49	Bear Draw Gamma BDU	11-27	NWNW	27	79W	50N	WYW140577
50	Bear Draw Gamma BDU	14-27	SWSW	27	79W	50N	WYW140577
51	Bear Draw Gamma BDU	22-27	SENW	28	79W	50N	WYW140578
52	Bear Draw Gamma BDU	34-27	SWSE	27	79W	50N	WYW140577
53	Bear Draw Gamma BDU	42-27	SENE	27	79W	50N	WYW143128
54	Bear Draw Gamma BDU	43-27	NESE	27	79W	50N	WYW140577
55	Bear Draw Gamma BDU	44-27	SESE	27	79W	50N	WYW140577
56	Bear Draw Gamma BDU	12-34	SWNW	34	79W	50N	WYW140577
57	Bear Draw Gamma BDU	14-34	SWSW	34	79W	50N	WYW140577
58	Bear Draw Gamma BDU	22-34	SENW	34	79W	50N	WYW140577
59	Bear Draw Gamma BDU	34-34	SWSE	34	79W	50N	WYW140577
60	Bear Draw Gamma BDU	32-34	SWNE	34	79W	50N	WYW140577
61	Bear Draw Gamma BDU	42-34	SENE	34	79W	50N	WYW140577
62	Bear Draw Gamma BDU	43-34	NESE	34	79W	50N	WYW140577
63	Bear Draw Gamma BDU	44-34	SESE	34	79W	50N	WYW140577
64	Bear Draw Gamma BDU	12-35	SWNW	35	79W	50N	WYW137036

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
65	Bear Draw Gamma BDU	23-35	NESW	35	79W	50N	WYW140577
66	Bear Draw Gamma BDU	24-35	SESW	35	79W	50N	WYW140577
67	Bear Draw Gamma BDU	32-35	SWNE	35	79W	50N	WYW137036
68	Bear Draw Gamma BDU	42-35	SENE	35	79W	50N	WYW137036
69	Bear Draw Gamma BDU	43-35	NESE	35	79W	50N	WYW140577
70	Bear Draw Gamma BDU	44-35	SESE	35	79W	50N	WYW140577
71	Bear Draw Gamma Tear Drop	14-31	SWSW	31	78W	50N	WYW144232

Water Management:

The approved water management plan (WMP) includes 3 water management strategies:

1. Treatment of produced water at the Powder Valley Unit CBM Facility, located in the NWSE of Section 29, T50N R77W.
2. Containment of produced water in Western Gas Resource #8 Reservoir, at NENE of Section 25 T50N R78W.
3. Containment of produced water in 32-30-5078 Stock Reservoir, at SWNE of Section 30 T50N R78W.

Limitations: There are 2 CBNG APD deferrals and 1 APD denial.

Deferrals

I defer decision on the following 2 APDs and associated infrastructure.

#	Well Name	Environmental Issue/Justification
1	BDU Federal 44-19-5078	Pending further mitigation as an operator committed measure to reduce impacts to 2 active golden eagle nests (#s 6252 and 12592) to preclude an MBTA or BGEPA taking. Operator must propose acceptable mitigation or design features. BLM must work with Operator to craft mitigation or design features.
2	BDU Federal 22-30-5078	Pending further mitigation as an operator committed measure to reduce impacts to 2 active golden eagle nests (#s 6252 and 12592) to preclude an MBTA or BGEPA taking. Operator must propose acceptable mitigation or design features. BLM must work with Operator to craft mitigation or design features.

Denials

#	Well Name	Environmental Issue/Justification
1	BDU Federal 21-22- 5079	The well pad design shows impacts to slopes greater than 25% and highly erosive soils. The access to 21-22 5079 is proposed over topography with 25-45% slopes with highly erosive soils. Portions of the proposed road and pad have poor road suitability as the design shows load bearing portion of the road and pad cut and fill falling over slopes greater than 25%. A portion of the alignment lies over a large active head-cut and numerous drainages while the entire proposal portion lies parallel with to the drainage. The combination of steep slopes, severe erosion potential and shallow soil limit soil stability and promote pad and road failure and indicate that there is little or no reclamation potential - absent the presence of proposed adequate mitigating design features and/or mitigation.

Operator Committed Measures:
Lance incorporated several measures to alleviate resource impacts into their master surface use plan (MSUP). Refer to the MSUP, p. 4-7 and p. 8 of the EA section 2.4 for details of operator committed measures and design features.

Site-specific Mitigation Measures:
Lance and BLM applied site-specific conditions of approval (COAs) to this project, in addition to the programmatic and standard COAs identified in the PRB FEIS, to mitigate the site-specific impacts described in the EA's Section 4, Environmental Effects. For a complete description of all site-specific COA's associated with this approval (see Section 4 mitigation sections under soils, vegetation and wildlife in the EA).

FINDING OF NO SIGNIFICANT IMPACT (FONSI) and SCOPING:
The EA analyzed this project and found, along with the FONSI that the project had no significant impacts on the human environment so there is no requirement for an environmental impact statement. This EA received internal scoping by Lance and the BLM, as described on p. 3 of the EA section 1.4.

RATIONALE:
The decision to authorize Alternative C, as summarized above, is based on the following:

1. The denial of BDU Federal 21-22- 5079 APD and its infrastructure is outside the parameters found in the PRB RMP FEIS ROD to prevent unnecessary and undue degradation (p. 11-12, A-19 to A-20, A-24, A-31), On Shore Order Number 1, and the Wyoming BLM Reclamation Policy (see Appendix B of the EA) to avoid highly erodible areas and slopes greater than 25%. Here the Operator did not avoid an area with little-to-no reclamation potential and did not offer adequate mitigating design features and/or mitigation (see EA, p. 35-45, and the correspondence section of the administrative record).

2. The deferral of BDU Federal 44-19-5078 and BDU Federal 22-30-5078 APDs and their infrastructure is to allow Lance and BLM additional time to develop acceptable mitigation to reduce impacts to pair of golden eagles. In addition to the APD deferral language, justification, and remedy provided in the above table; the deferrals are proper under the standard lease terms, the rationale in the Buffalo RMP (pp.17 to 18) and PRB ROD (pp. 11 to 12, A-19 to A-20, A-24, and A-31) (as appropriate), 43 CFR 3101.1-2 (as to proposed APD BDU Federal 44-19-5078 and APD BDU Federal 22-30-5078), and the analysis provided in the EA.

3. The decision to allow, permit and improve the existing access roads through the 0.25 mile buffer in the 41-Upper Dry Creek I Lek and 41-Flying E Lek departs from the BLM's policy and practice and the Buffalo RMP ROD, is not precedent; rather it is a narrow exception based only on the narrow circumstances, analysis, and reasoning found in this EA, pp. 48-49, incorporated here by reference.

    a. These roads existed in 2006 (ROW grant WYW169461), prior to the Interior Department's and WY BLM's sage-grouse policy and this POD's application. BLM Instruction Memorandum (IM) WY-2010-012 restricts surface occupancy within 0.25 miles from the mapped perimeter of a lek. Lance proposed other alternatives which explored the idea of building new roads outside the 0.25 mile buffer, however, any alternative route would impact known nesting locations. WGFD, USFWS, BLM, and Lance all agreed that the existing access roads were the best alternative to access the POD's wells (see correspondence letter from WGFD in Appendix A, EA).

    b. 41-Upper Dry Creek II Lek and 41-Tear Drop Lek also have existing access roads within 0.25 miles and will receive additional traffic.

4. Lance may use the existing treatment facilities and existing reservoirs and existing outfalls for federally produced water (see p. 61 Water Resources of the EA).

5. Lance and BLM included mitigation measures to reduce environmental impacts while meeting the project's need. The environmental effects section of the EA addresses mitigation. For a complete description of all site-specific conditions of approval (COAs) associated with this approved project.

6. The selected alternative will not result in any undue or unnecessary environmental degradation.

7. The selected alternative will help meet the nation's energy need, revenues, and stimulate local economies by maintaining workforces (see the Economics of CBNG Resource Extraction in the EA).

8. The Operator, in their POD, shall:
   - Comply with all applicable federal, state, and local laws and regulations (43 CFR 3162.1) (see MSUP p 25).
   - Offer water well agreements to the owners of record for permitted water wells within 0.5 mile of a federal CBNG producing well in the POD (PRB FEIS ROD, p. 7; MSUP, p. 24).
   - Provide water analysis from a designated reference well in each coal zone (p. 27 of WMP).

9. Lance requested the following conditions of approval (COA) since they had already submitted their revised pages of the MSUP on July 19, 2011. Lance will follow their requested COAs: 1) No soil shall be cast over the north side of the proposed road due to steep slopes in that area. This applies to the beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W and is proposed in a short section of steep slopes at proposed APDs: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079; 2) The road through the 41-Flying E Lek mapped perimeter will have disturbance limited to 30 feet to minimize impacts to sandy soils (see Section 4, Soils Mitigation Measures, for discussion of these COAs applied as mitigation measures).

10. This decision does not foreclose the lessee or operator to propose a new or supplementary plan for developing the federal oil and gas lease(s) in this project area, including submission of additional APDs to drain minerals in accord with lease rights and law. This decision does not foreclose the lessee or operator to propose using external pumping units via a sundry application process.

11. Lance certified there is a surface use agreement with the landowners (see MSUP, Self-Certification).

12. This approval is subject to adherence with all of the operating plans, design features, and mitigation measures contained in the Master Surface Use Plan of Operations, Drilling Plan, Water Management Plan, and information in individual APDs. This approval is also subject to operator compliance with all mitigation and monitoring requirements contained in the PRB FEIS ROD, 2003.

ADMINISTRATIVE REVIEW AND APPEAL: This decision is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received. Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Field Manager: (acting) Date: 8/17/2011

FINDING OF NO SIGNIFICANT IMPACT
FOR Lance Oil and Gas Company, Inc., Bear Draw Gamma POD
ENVIRONMENTAL ASSESSMENT (EA) –WY-070-EA11-172
Bureau of Land Management, Buffalo Field Office

FINDING OF NO SIGNIFICANT IMPACT:

On the basis of the information in the EA, and all other information available to me, it is my determination that: (1) the implementation of Alternative C will not have significant environmental impacts beyond those already addressed in the Power River Basin Final Environmental Impact Statement (PRB FEIS) to which the EA is tiered; (2) Alternative C conforms to the Buffalo Field Office (BFO) Resource Management Plan (RMP) (1985, 2001, 2003) and DOI Order 3310. However, due to conservation concern to preclude a likely taking of a golden eagle(s), best available science for those golden eagles, for areas with limited reclamation potential, and the mineral leasing rules, BLM affords protection to nesting eagles on active nests and areas with limited reclamation potential; and (3) Alternative C does not constitute a major federal action having a significant effect on the human environment. Therefore an EIS is not required. This finding is based on my consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), both with regard to the context and to the intensity of the impacts described in the EA.

CONTEXT:

Mineral development (leasable, locatable, and saleable) is a long-standing land use in the PRB. More than 42% of the nation's coal production comes from the PRB. The PRB FEIS reasonably foreseeable development predicted and analyzed the development of 51,000 coalbed natural gas (CBNG) and 3,200 oil wells (PRB FEIS Record of Decision (ROD), p. 2). The CBNG development described in Alternative C is insignificant in the national, regional, and local context.

INTENSITY:

The implementation of Alternative C will result in beneficial effects in energy and revenue production however; there will also be adverse effects to the environment. Design features and mitigation measures were included in Alternative C to preclude significant adverse environmental effects.

The preferred alternative does not pose a significant risk to public health and safety. The geographic area of this plan of development (POD) does not contain unique characteristics identified in the RMP, 2003 PRB FEIS, or other legislative or regulatory processes or scientific documents, other highly erosive soils and soils with limited reclamation potential and a concentration of nesting raptors. This POD area is clearly lacking in wilderness characteristics due to existing infrastructure from CBNG development.

BFO used relevant scientific literature and professional expertise in preparing the EA. The scientific community is reasonably consistent with their conclusions on environmental effects relative to oil and gas development. Research findings on the nature of the environmental effects are not highly controversial, highly uncertain, or involve unique or unknown risks.

CBNG development of the nature proposed with this POD and similar PODs was predicted and analyzed in the PRB FEIS; the selected alternative does not establish a precedent for future actions with significant effects.

There are no cultural or historical resources present that will be adversely affected by the selected alternative. No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law or requirements imposed for environmental protection.

ADMINISTRATIVE REVIEW AND APPEAL: This finding is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received. Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Field Manager: _____ (acting) Date: 8/17/2011

ENVIRONMENTAL ASSESSMENT (EA), WY-070-11-172
Lance Oil & Gas Company, INC, Bear Draw Gamma
Coalbed Natural Gas Plan of Development
BUREAU OF LAND MANAGEMENT, BUFFALO FIELD OFFICE

1. INTRODUCTION

This site-specific analysis tiers into and incorporates by reference the information and analysis in the Powder River Basin (PRB) Oil and Gas Project Final Environmental Impact Statement (FEIS) (2003) and Resource Management Plan (RMP) Amendment (PRB FEIS), #WY-070-02-065 (2003), pursuant to 40 CFR 1508.28 and 1502.21. This EA also tiers to the Buffalo RMP, 1985, and amendments, 2001, and 2003. These documents are available for review at the BLM Buffalo Field Office (BFO) and on our website. This project environmental assessment (EA) addresses site-specific resources and impacts that the PRB FEIS could not cover.

1.1. Background

Lance Oil & Gas Company, Inc. (Lance or Operator) submitted the Bear Draw Gamma (BDG) plan of development (POD) on February 4, 2008 to the BFO with 78 federal applications for permit to drill (APDs) to develop and produce coalbed natural gas (CBNG) from coal formations of the PRB. (Subsequently Lance withdrew 2 APDs precluding tribal consultation, 2 APDs protecting sage-grouse habitat; then Lance and BLM agreed in deferring 2 APDs to develop mitigation for nesting eagles, and BLM's analysis eventually proposed denying 1 APD for extreme slopes and highly erodible soils.)

Much of the proposed project is in suitable sage-grouse nesting and wintering habitat, as verified at the onsite scoping. The Framework to Assist in Making Greater Sage-grouse Habitat Assessments for BLM-Administered Public Lands in Wyoming (Soehn et al. 2001) defines suitable habitat. The BLM found abundant sage-grouse sign throughout much of the project area. The project area is in one of several areas modeled as having the highest density of sage-grouse in the PRB, as determined by lek attendance. The proposed project is in the center of the largest, most contiguous, and least fragmented area, increasing its criticality for sage-grouse in the PRB. Habitat models indicate that 90% of project area is in high quality nesting habitat and 96% is in high quality winter habitat. Finally, telemetry data from Doherty (Doherty 2008) confirm that sage-grouse used a portion of the project area. Dougherty captured these sage-grouse near the core habitat / focus area around 41-Christian I Lek (SWNE Section 22 T51N:R80W), about 7 miles northwest of the proposed Bear Draw Gamma POD – leading to the strong presumption that project implementation will affect this sensitive species that leks inside a sage-grouse core habitat area.

The Natural Resources Conservation Service (NRCS) previously enrolled the Boot Jack Land Company, LLC into the Environmental Quality Incentives Program (EQIP). EQUIP is a grazing land initiative providing technical and financial assistance to agricultural producers for the purpose of implementation of conservation practices on eligible agricultural land. The program for Boot Jack Land Company, LLC developed grazing programs promoting sage-grouse habitat enhancement. BLM invited the NRCS to share the information about the enrollment of these private acres in the EQIP. NRCS identified these private acres to have either "high" or "very high" value to sage-grouse. The EQIP program expired and program specifics are confidential. It is unclear how the addition of the Bear Draw Gamma project in the vicinity of NRCS sage-grouse enhancement programs may delay or render ineffective previous federal efforts to enhance sage-grouse habitat.

The BFO outlined the evolving information on impacts to sage-grouse which could result from development activities on federal lands in Lazurite EA, WY-070-09-095 under the sage-grouse sub-section in Section 3.

The Bear Draw Gamma POD was one of the very few PODs that the BFO temporarily put on hold while the U.S. Fish and Wildlife Service (USFWS), Wyoming Governor's Implementation Team, and BLM settled on a policy for sage-grouse population and habitat management. After the June 28, 2010 Implementation Team recommendations were complete, the BFO determined that this project falls outside the focus, core, and connectivity habitat areas. Therefore BLM should process the POD in accordance with the Implementation Team recommendations.

Lance and the Buffalo Field Office (BFO) conducted onsite visits in 2009 on June 24 through July 22 to evaluate the proposal and modify it as necessary to alleviate environmental impacts. BLM sent a post-onsite deficiency letter on August 4, 2009. On November 12, 2009 Lance submitted a response to the post-onsite deficiency letter. In this submittal Lance reduced the number of APDs in Bear Draw Gamma from 78 to 76 due to tribal consultation requirement on proposed APDs 14-24 5079 and 23-24 5079. Lance also introduced the possible need for pump jacks in the Bear Draw Gamma POD.

BFO informed Lance on January 14, 2011 to use the more robust perimeter for the Flying E Lek perimeter which conformed to perimeter mapping protocols established by Wyoming Game and Fish Department (WGFD). BLM provided Lance with a map of the affected Bear Draw Gamma POD vicinity as well as a shape-file on compact disk. The Flying E Lek perimeter carried forward in the NEPA analysis for the Bear Draw Gamma POD is shown in the administrative record with a 0.25 mile buffer applied.

BLM sent a letter to Lance on April 5, 2011 via email. The letter outlined current resource conflicts which remained in the project proposal. The following meetings document Lance, BLM, and other agencies working together to refine the proposal:

- On May 17, 2011 Lance and BLM met at the BFO to discuss the resource conflicts and to plan a path forward. At this meeting Lance requested a 15-day extension to resolve remaining conflicts. See administrative record of the Bear Draw Gamma POD. Lance and BFO determined they needed an additional onsite day.

- On June 30, 2011 Lance and BLM met in the field to make revisions to well locations and roads proposed in the controlled surface use (CSU) mile mapped sage-grouse lek perimeters and wells proposed on soil with limited reclamation potential and/or steep slopes.

- On July 5, 2011 Lance, BLM and WGFD met in the field to make revisions to well locations and roads proposed in the CSU mapped sage-grouse lek perimeters. Lance realigned the beginning of the access road to the following 6 proposed APD locations: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079 in Sections 26 and 27 T50N R79W. This new access road remains proposed in the CSU of 41 Upper Dry Creek Road I Lek. Lance and BFO determined the main access proposed in the CSU of the Flying E Lek was the most feasible route as it uses existing access roads and would not require significant upgrading.

- On July 12, Lance and BLM met in the field to onsite 1 APD which was overlooked during the onsite process, 43-27 5079. Lance and BLM added a culvert to the road proposal in a small drainage and committed to a 35 foot wide road rather than 45 feet wide. Lance also added wing ditches to move water away from the road surface. Lance and BLM also re-routed a cross country pipeline route to avoid limited reclamation potential (LRP) areas north of the proposed 23-30 5078. They also moved power drop originally proposed in the drainage bottom at this well location to the proposed APD 12-30 5078 location.

- On July 19, 2011 Lance sent in interim reclamation plan for all wells in the project (see p. 3 of

Reclamation Plan). BKS Environmental Associates, Inc. prepared site specific interim reclamation plans based on field visits conducted on May 5 and 13, 2011. Site specific interim reclamation plans cover proposed APDs 23-30 5079, 43-30 5078, 21-3 5079, 22-3 5079, 21-22 5079, and engineered Section 10.

- On July 19, 2011 Lance sent BFO the following revisions: Well List, Master Geological Prognosis, Master Drilling Prognosis, Master Surface Use Plan p. 4,12,13,18, and 19, SUDS form p. 1, Maps A-D, Road Designs, WMP, All APD 3160's, plat and pad diagrams. This submittal also included the following new proposed components: Engineers Report, Self-certifications, APD 44-19-5078 - replacing APD 41-30-5078. BFO considered the project proposal and APDs complete with this submittal.

- On July 21, 2011 Lance removed the following APDs 14-35-5079, 23-27-5079, and 41-30-5078 to protect sage-grouse habitat. See Section 2, Design Features, for a summary of design features.

- On July 25, 2011 Lance requested the following conditions of approval (COA) since they submitted their final MSUP on July 19, 2011. Lance will follow their requested COAs: 1) No soil shall be cast over the north side of the proposed road due to steep slopes in that area. This applies to the beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W and is proposed in a short section of steep slopes at proposed APDs: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079; 2) The road through the Flying E Lek mapped perimeter will have disturbance limited to 30 feet to minimize impacts to sandy soils. See Section 4, Soils Mitigation Measures, for discussion of these COAs applied as mitigation measures.

- On July 27, 2011 BLM and Lance agreed on mitigation for access roads proposed through the 41-Upper Dry Creek 1 Lek and the Flying E Lek. See Section 4, Wildlife Sage-grouse Mitigation Measures, for these operator committed mitigation measures. Additionally, Lance and BLM are shown to be working together via email to develop acceptable mitigation for two deferred APDs: BDU Federal 44-19-5078 and BDU Federal 22-30-5078 and their infrastructure due to proximity to golden eagle nests (see email correspondence sent July 27, 2011.

- On July 28, 2011 BLM informed Lance that the APD 21-22 5079 is recommended for removal from the project due to impacts to steep slopes, LRP areas, and fragile soils. In the phone conversation Lance acknowledged they were aware of this and the Lance asset team currently does not see this decision as a problem as the well is surrounded by Lance wells and gas recovery in the area should occur. See Section 4, Soils, for discussion of the onsite process and lack of an alternate route or alternate well location.

- On August 3, 2011 Lance informed BLM via email the access to the proposed APD 43-30 5078 was not realigned as agreed to in the field on July 5, 2011 to avoid impacts to soils with LRP, rock outcrops, and slopes exceeding 25%. BLM instructed Lance to realign the road to the analyzed route.

- On August 9, 2011 Lance confirmed via email that Lance does not anticipate pumping units at this time (despite the fact they are mentioned in the MSUP p. 12) and Lance would apply for pumping units as needed through the sundry process (see email correspondence sent August 9, 2011).

BFO shared the proposed COAs with the operator on August 15, 2011.

1.2. Need for the Proposed Action

The need for the action is the requirement to obtain approval for the development of an oil and gas lease

through an APD on federal land managed by the Bureau of Land Management (BLM) under the Mineral Leasing Act (MLA), Onshore Order No. 1, the Federal Land Policy and Management Act (FLPMA), and complies with the National Environmental Policy Act (NEPA), National Historic Preservation Act, Endangered Species Act, and other applicable laws and regulations ensuring the proper handling, measurement, disposition, and site security of leasehold production which balances natural resource conservation while supporting conditional leasehold rights and the nation's goal of advancing energy development.

1.3. Decision to be Made

The BLM will decide whether or not to, or how to, or how it may approve the proposed development of oil and gas minerals on the federal leasehold, and if so, under what terms and conditions.

1.4. Scoping and Issues

BFO did not conduct external scoping for this EA. BFO conducted extensive external scoping for the PRB FEIS as noted on p. 2-1 of the PRB FEIS and on p. 15 of the PRB ROD. This project is generally similar in scope to other CBNG PODs that the BFO analyzed.

The BLM interdisciplinary team (ID team) conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resource and land uses. The administrative record notes the resources and land uses present and affected by the proposed project. Resources and land uses that are either not present, not affected, or were adequately covered by the PRB FEIS will not be discussed in this EA. The ID team identified important issues for the affected resources to further focus the analysis. This EA addresses the site-specific impacts that were not analyzed in the PRB FEIS and identifies potentially significant effects of the proposed project to help the decision maker come to a reasoned decision. Project issues include:

1. Soils and vegetation: erosion hazard, slope hazard, reclamation potential, riparian and wetland communities, and weed species;
2. Wildlife: raptor productivity, greater sage-grouse lek occupancy and persistency, swift fox productivity, and burrowing owl productivity;
3. Cultural resources: deep alluvial deposits; NRHP eligible sites ;
4. Water: groundwater depletion, quality and quantity of produced water, and;
5. Social and Economic: revenue potential.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

BFO evaluated 3 alternatives in this EA and their brief description follows, below. Programmatic mitigation measures as determined in PRB FEIS ROD apply to all alternatives, including the no action alternative (Alternative A), and are included in Standard Mitigation Measures. Operator-committed mitigation measures and site-specific COAs would apply only to action alternatives (a combination of Alternatives B and C).

2.1. Alternative A - No Action

The PRB FEIS considered a no action alternative, Volume 1, p. 2-54 to 2-62. This alternative must also consider and combine the PRB FEIS analysis with the subsequent analysis and development from the adjacent and intermingled PODs (by decision date, see Table 3.1): Ruby Expansion, WY-070-04-322; Ruby, WY-070-04-188: Bear Draw Alpha, WY-070-05-241; Nemesis, WY-070-05-157; Bear Draw Beta, WY-070-05-263; West Bear Draw, WY-070-06-292; Quarter Circle 9, WY-070-10-236; Tear Drop, WY-070-08-72; South Bear, WY-070-11-151; Meadow Draw, WY-070-11-225. These PODs (excluding Bear Draw Gamma POD) combined together account for approximately 12 pending APDs, 15 gas shut in wells, 1 monitor well, 5 plugged and abandoned wells, 75 producing gas wells and 8 unapproved APDs totaling 116 wells within Bear Draw Gamma POD boundary (Wyoming Oil and Gas Conservation

Commission (WYOGCC)). (See Table 2.5 for an approximation of the disturbance in the current situation.) This comports to the PRB FEIS which analyzed the reasonably foreseeable development rolling across the PRB of over 51,000 CBNG and 3,200 oil wells. The no action alternative would consist of no new federal wells. This alternative would deny the APDs and / or POD requiring the operator to resubmit APDs or a POD that complies with statutes and the reasonable measures in the PRB RMP Record of Decision (ROD) in order to lawfully exercise conditional lease rights. This alternative also could, through secretarial discretion suspend the leasehold, or could administratively cancel or withdraw the lease if improperly awarded, or seek to cancel the lease. It is not possible in the abstract to identify every interest and that is beyond the scope here.

2.2. Alternative B - Operator Proposed Action

Alternative B contains complete APDs and is a result of the operator and BLM working to reduce environmental impacts. This alternative summarizes the POD submitted to the BLM by Lance on July 19, 2011 – after site visits and the operator's design modifications. Alternative B includes the 2 APDs described in Section 1.1, Background, above, for which the operator's and BLM's analysis eventually proposed deferring in order to better develop mitigation,

Proposed Action Title/Type: Lance Oil & Gas Company, INC's Bear Draw Gamma CBNG POD.

Proposed Well Information: Lance proposed 74 CBNG wells in this POD. The proposed wells are vertical bores on an average of 80 acre spacing pattern with 1 well per location. Each well will produce from Big George coal seam. Proposed well house dimensions are 8.0 feet wide x 8.0 feet length x 8.0 feet height. Table 2.1 has a list of proposed wells.

County: Johnson

Applicant: Lance Oil & Gas Company, INC

Surface Owners: Tear Drop Cattle Company, Robert J. Ruby and Jean Anne Ruby, Lawrence E. Middaugh and Eva Jane Middaugh, Donald Middaugh, Gayle Ann Hahn, State of Wyoming, and BLM.

Table 2.1. Proposed Wells – Alternative B

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
1	Bear Draw Gamma BDU	11-1	NWNW	1	79W	49N	WYW144808
2	Bear Draw Gamma BDU	12-1	SWNW	1	79W	49N	WYW141989
3	Bear Draw Gamma BDU	21-1	NENW	1	79W	49N	WYW144808
4	Bear Draw Gamma BDU	22-1	SENW	1	79W	49N	WYW141989
5	Bear Draw Gamma BDU	11-19	NWNW	19	78W	50N	WYW146920
6	Bear Draw Gamma BDU	12-19	SWNW	19	78W	50N	WYW146920
7	Bear Draw Gamma BDU	14-19	SWSW	19	78W	50N	WYW146920
8	Bear Draw Gamma BDU	21-19	NENW	19	78W	50N	WYW146920
9	Bear Draw Gamma BDU	32-19	SENE	19	78W	50N	WYW146920
10	Bear Draw Gamma BDU	41-19	NENE	19	78W	50N	WYW146920
11	Bear Draw Gamma BDU	42-19	SENE	19	78W	50N	WYW146920
12	Bear Draw Gamma BDU	12-30	SWNW	30	78W	50N	WYW146924
13	Bear Draw Gamma BDU	14-30	SWSW	30	78W	50N	WYW146924
14	Bear Draw Gamma BDU	21-30	NENW	30	78W	50N	WYW146924

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
15	Bear Draw Gamma BDU	22-30	SENW	30	78W	50N	WYW146924
16	Bear Draw Gamma BDU	23-30	NESW	30	78W	50N	WYW146924
17	Bear Draw Gamma BDU	34-30	SWSE	30	78W	50N	WYW146924
18	Bear Draw Gamma BDU	44-19	SESE	19	78W	50N	WYW146920
19	Bear Draw Gamma BDU	43-30	NESE	30	78W	50N	WYW146924
20	Bear Draw Gamma BDU	21-2	NENW	2	79W	50N	WYW140577
21	Bear Draw Gamma BDU	12-3	SWNW	3	79W	50N	WYW140577
22	Bear Draw Gamma BDU	14-3	SWSW	3	79W	50N	WYW140577
23	Bear Draw Gamma BDU	21-3	NENW	3	79W	50N	WYW140577
24	Bear Draw Gamma BDU	22-3	SENW	3	79W	50N	WYW140577
25	Bear Draw Gamma BDU	32-3	SWNE	3	79W	50N	WYW140577
26	Bear Draw Gamma BDU	33-3	NWSE	3	79W	50N	WYW140577
27	Bear Draw Gamma BDU	34-3	SWSE	3	79W	50N	WYW140577
28	Bear Draw Gamma BDU	43-3	NESE	3	79W	50N	WYW140577
29	Bear Draw Gamma BDU	12-22	SWNW	22	79W	50N	WYW147850
30	Bear Draw Gamma BDU	14-22	SWSW	22	79W	50N	WYW142845
31	Bear Draw Gamma BDU	21-22	NENW	22	79W	50N	WYW147850
32	Bear Draw Gamma BDU	23-22	NESW	22	79W	50N	WYW142845
33	Bear Draw Gamma BDU	32-22	SWNE	22	79W	50N	WYW147850
34	Bear Draw Gamma BDU	34-22	SWSE	22	79W	50N	WYW137036
35	Bear Draw Gamma BDU	41-22	NENE	22	79W	50N	WYW147850
36	Bear Draw Gamma BDU	12-25	SWNW	25	79W	50N	WYW139818
37	Bear Draw Gamma BDU	14-25	SWSW	25	79W	50N	WYW139818
38	Bear Draw Gamma BDU	21-25	NENW	25	79W	50N	WYW139818
39	Bear Draw Gamma BDU	22-25	SENW	25	79W	50N	WYW139818
40	Bear Draw Gamma BDU	24-25	SESW	25	79W	50N	WYW139818
41	Bear Draw Gamma BDU	34-25	SWSE	25	79W	50N	WYW137036
42	Bear Draw Gamma BDU	41-25	NENE	25	79W	50N	WYW137036
43	Bear Draw Gamma BDU	42-25	SENE	25	79W	50N	WYW137036
44	Bear Draw Gamma BDU	12-26	SWNW	26	79W	50N	WYW137036
45	Bear Draw Gamma BDU	13-26	NWSW	26	79W	50N	WYW142845
46	Bear Draw Gamma BDU	21-26	NENW	26	79W	50N	WYW137036
47	Bear Draw Gamma BDU	23-26	NESW	26	79W	50N	WYW142845
48	Bear Draw Gamma BDU	32-26	SWNE	26	79W	50N	WYW142845
49	Bear Draw Gamma BDU	34-26	SWSE	26	79W	50N	WYW142845
50	Bear Draw Gamma BDU	41-26	NENE	26	79W	50N	WYW142845
51	Bear Draw Gamma BDU	43-26	NESE	26	79W	50N	WYW142845
52	Bear Draw Gamma BDU	11-27	NWNW	27	79W	50N	WYW140577
53	Bear Draw Gamma BDU	14-27	SWSW	27	79W	50N	WYW140577
54	Bear Draw Gamma BDU	22-27	SENW	28	79W	50N	WYW140578

#	Well name	Well #	Qtr/Qtr	Sec	RNG	TWP	Lease #
55	Bear Draw Gamma BDU	34-27	SWSE	27	79W	50N	WYW140577
56	Bear Draw Gamma BDU	42-27	SENE	27	79W	50N	WYW143128
57	Bear Draw Gamma BDU	43-27	NESE	27	79W	50N	WYW140577
58	Bear Draw Gamma BDU	44-27	SESE	27	79W	50N	WYW140577
59	Bear Draw Gamma BDU	12-34	SWNW	34	79W	50N	WYW140577
60	Bear Draw Gamma BDU	14-34	SWSW	34	79W	50N	WYW140577
61	Bear Draw Gamma BDU	22-34	SENW	34	79W	50N	WYW140577
62	Bear Draw Gamma BDU	34-34	SWSE	34	79W	50N	WYW140577
63	Bear Draw Gamma BDU	32-34	SWNE	34	79W	50N	WYW140577
64	Bear Draw Gamma BDU	42-34	SENE	34	79W	50N	WYW140577
65	Bear Draw Gamma BDU	43-34	NESE	34	79W	50N	WYW140577
66	Bear Draw Gamma BDU	44-34	SESE	34	79W	50N	WYW140577
67	Bear Draw Gamma BDU	12-35	SWNW	35	79W	50N	WYW137036
68	Bear Draw Gamma BDU	23-35	NESW	35	79W	50N	WYW140577
69	Bear Draw Gamma BDU	24-35	SESW	35	79W	50N	WYW140577
70	Bear Draw Gamma BDU	32-35	SWNE	35	79W	50N	WYW137036
71	Bear Draw Gamma BDU	42-35	SENE	35	79W	50N	WYW137036
72	Bear Draw Gamma BDU	43-35	NESE	35	79W	50N	WYW140577
73	Bear Draw Gamma BDU	44-35	SESE	35	79W	50N	WYW140577
74	Bear Draw Gamma Tear Drop	14-31	SWSW	31	78W	50N	WYW144232

Water Management Proposal: The water management plan (WMP) for this POD describes 3 water management strategies:

1. Treatment of produced water at the Powder Valley Unit CBM Facility, located in the NWSE of Section 29, T50N R77W.
2. Containment of produced water in Western Gas Resource #8 Reservoir, at NENE of Section 25 T50N R78W.
3. Containment of produced water in 32-30-5078 Stock Reservoir, at SWNE of Section 30 T50N R78W.

Table 2.2. Proposed Water Management Facilities

Facility Name	NEPA Document	WYPDES Permit	Facilities Included in WYPDES Permit and Locations
River Road CBM Facility	Powder Valley Unit POD WY-070-04-072	WY0056081	All assimilative capacity discharge locations, PVU EMIT, and direct discharge outfalls. River Road CBM Facility is located in the SENW of Section 20, T48N R77W and includes 26 outfalls and irrigation compliance points listed on p. 18 of the WYPDES Permit
Bear Draw Facility	Bear Draw Beta WY-070-05-263	WY0052639	32-30-5078 Stock Reservoir. Bear Draw Facility is located in the NENE of Section 12, T50N R79W and includes 4 outfalls and irrigation compliance points listed on p. 12 of the WYPDES Permit

Facility Name	NEPA Document	WYPDES Permit	Facilities Included in WYPDES Permit and Locations
Powder Valley Unit	Powder Valley Unit Additions WY-070-05-060	WY0047317	Western Gas Resources #8 reservoir. Powder Valley Unit is located in the NESE of Section 29, T50N R77W and includes 11 outfalls and irrigation compliance points listed on p. 21 of the WYPDES Permit

For complete legal locations of these facilities see Bear Draw Gamma WMP, Attachment C, WYPDES Permits.

As part of a future water management strategy for this POD, Lance is proposing to transport produced water to an area near Midwest, WY where water will be injected into the Madison aquifer. Conveyance of water to this facility will require the construction of a pipeline from the project area to the County Line Pump Station. If this option becomes the preferred water management strategy, Lance will submit a sundry notice of intent.

Drilling and Construction:

- Drilling of 74 federal CBNG wells in Big George coal zone is to depths of approximately 2,400 feet. 33 locations not use constructed pads; 41 well locations will use constructed pads.

- Lance anticipates completing drilling and construction within 2 years, the term of an approved 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 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 road network consisting of 17.6 miles of improved road and 5.6 miles of primitive road.

- A below ground power line network to be constructed by Lance or a contractor hired by Lance. If the power line network is not completed before the wells are in production, then temporary diesel generators may be placed at the 30 power drops.

- Lance may locate fuel storage tanks of 500 gallon capacity at 30 power drops along with each diesel generator. Generators may operate for 24 months. The analysis anticipates that fuel deliveries may be 2-3 times per week during the summer and 4 times per week during the winter. Fuel delivery duration should be from 30 to 60 minutes. The generator noise level is about 100.5 decibels at 3-feet distance.

Lance will install a buried gas and water line network along existing or proposed disturbances. 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 POD for maps showing the proposed well locations and the associated facilities described above. More information on CBNG well drilling, production and standard practices also is available in the PRB FEIS, Volume 1, pp. 2-9 to 2-40.

This alternative also incorporates and analyzes the implementation of committed mitigation measures

contained in the MSUP, drilling plan, and WMP, in addition to the Standard COAs found in the PRB FEIS ROD, Appendix A.

2.3. Alternative C – Modified Action

Alternative C is a modification of Alternative B based on BLM removing 1 APD, 21-22 5079, from the project proposal. This APD would likely have large, direct impacts to an area with greater than 25% slope, slope stability issues, and have little or no reclamation potential.

This alternative specifically represents BFO efforts to reduce project-specific impacts to highly erosive soils while trying to maintain proposed spacing and infrastructure requirements consistent with the need for the proposed action. BLM recommended the 1 APD and associated infrastructure removal from the project; therefore it is not considered in Alternative C (see Table 2.3 and 2.4).

Table 2.3. Project Components Recommended for Removal

#	Well Name	Environmental Issue/Justification
1	21-22-5079	The well pad design shows impacts to slopes greater than 25% and highly erosive soils. The access to well 21-22 5079 is proposed over topography with 25-45% slopes with highly erosive soils. Portions of the proposed road and pad have poor road suitability as the design shows load bearing portion of the road and pad cut and fill falling over slopes greater than 25%. A portion of the alignment lies over a large active head-cut and numerous drainages while the entire proposal portion lies parallel with the drainage. The combination of steep slopes, severe erosion potential and shallow soil limit soil stability and promote pad and road failure and indicate that there is little or no reclamation potential - absent the presence of proposed adequate mitigating design features and/or mitigation.

2.4. Design Features

Lance submitted the original Bear Draw Gamma POD on February 4, 2008 with 78 federal APDs to develop and produce CBNG. Subsequently Lance withdrew 2 APDs to preclude tribal consultation, 2 APDs to protect sage-grouse habitat; then Lance and BLM agreed to defer 2 APDs to develop mitigation for nesting eagles.) BLM summarized the adjustments made to the initially proposed project, below.

- All wells were moved to remain outside of sage-grouse leks mapped perimeters.
- Lance creatively designed 41 engineered well pads with rounded corners and innovative shapes to best fit the topography.
- Lance reduced 33 well locations to a slot design or did not require pads construction.
- Lance and BFO moved a total of 26 well locations to reduce surface disturbance or reduce impacts to wildlife.
- The project included 4 low water crossings and 44 culverts to control surface run-off.
- Lance will reclaim 1 primitive ranch road in Section 18 and 19 T50N R78W as it is not needed.
- Lance will reclaim 1 primitive ranch road in Section 3 and 10 T50N R79W since it is not needed.
- Lance removed 1 engineered road in Section 27 T50N R7W due to significant impacts to soils with steep slopes and limited reclamation suitability.
- Lance sent in interim reclamation plan for all wells in the project (see p. 3 of Reclamation Plan). BKS Environmental Associates, Inc. prepared site specific interim reclamation plans based on field visits conducted on May 5 and 13. Site specific interim reclamation plans cover APDs 23-30 5079, 43-30 5078, 21-3 5079, 22-3 5079, 21-22 5079, and engineered Section 10.
- Lance removed the following wells 14-35-5079 and 23-27-5079 to reduce impacts to sage-grouse habitat. Lance removed APD 41-30-5078 but replaced it with APD 44-19-5078 to reduce impacts to

soils with steep slopes and limited reclamation suitability. See email confirmation of these changes in the administrative record of the Bear Draw Gamma POD book.

2.5. Summary of Alternatives

A summary of the existing disturbance in the project area (Alternative A), modified infrastructure proposed by the Operator (Alternative B), and the infrastructure recommended by BLM (Alternative C) is in Table 2.4.

Table 2.4. Summary of Alternatives

Acres or mileage in the Alternatives B and C represent additional facilities and do not include the existing facilities.

	Alternative A	**Alternative B**	**Alternative C**
Facility	No Action Existing miles (acres)	Operator Proposed After Onsites miles (acres)	BLM Preferred Alternative miles (acres)
Number of CBNG Wells	116(81.2 ac)	74 (53.9)	73 (51.2)
Engineered Pads		41	40
Slots		19	19
No Pad No Slot		15	15
Engineered or Template Roads	27.2 miles (164.5)	17.7 miles (107.1)	17.6 miles (104.4)
Primitive Roads		5.7 miles (24.0)	5.7 miles (24.0)
Stand alone Utilities (gas, water, electric)		2.3 miles (9.8)	2.3 miles (9.8)
Stock Tanks		5	5
Power Drops		30	30
Overhead Power	4.8miles (8.8)	0	0
Impoundments	3	0	0
Total Acre Disturbance	**254.5**	**194.8**	**191.4**

2.6. Alternatives Considered but not Analyzed in Detail

The future method of managing produced water would be to transport the water for eventual injection into the Madison Formation near Midwest in Natrona County, Wyoming, as authorized by an existing WDEQ permit(s). This disposal method would require construction of approximately 23 miles of pipeline and associated infrastructure under a separate permit to interconnect with the County Line water pump station located at the SESE Qtr/Qtr of Section 7, T47N, R77W, and associated pipeline currently used for the injection wells. The County Line pump station is on private lands, therefore permitting and construction of this water pump station was not directly regulated by any federal process.

BLM and Lance considered several options for road routes throughout the APD staffing process. The access to APD 41-30 5078 presented distinct reclamation challenges. Most notably Lance proposed approximately 2,850 feet of engineered access road on a narrow ridge impacting soils rated as having severe water erosion hazard, poor reclamation suitability, is identified as having LRP, rock outcrops, and slopes exceeding 25%. The beginning of the access road would impact a coal fines blow out (LRP) area near the Yates reservoir. The pipeline is proposed along the western edge of the road where slopes are 60% or greater. Fill slopes along the road are proposed on slopes that exceed 25%. BLM and Lance worked together to eliminate the road all together and thus the proposal was not analyzed in detail.

Alternate access routes were explored for APD 21-22 5079 - most notably due to the entire length (1,300 feet) of the proposed engineered access road will impact slopes ranging from 25% to greater than 45%

slope. Numerous drainages intersect the road proposal. The access road is proposed on soils rated as having severe erosion hazard, LRP areas, steep slopes and poor reclamation suitability. No suitable alternate routes were found.

Alternate access routes were explored for routes around 2 sage-grouse leks: 41-Upper Dry Creek Road I and Flying E. BFO conducted extensive internal scoping and external with WGFD regarding the proposed routes around and through these leks (see Appendix A for WGFD response).
The above changes in subsections 2.3 and 2.4 documented in a revised project description provided as Lance's response to BLM's deficiency letter, resulted in a refined proposed project, which is discussed in this document as Alternative B. The initial POD, the post-onsite deficiency letter, and the company's response to the deficiency letter are in the Project Administrative Record, available for review at the BFO.

2.7. Conformance with Land Use Plan and Other Applicable Laws, Regulations, and Policies

The proposed project generally conforms to the terms and the conditions of the 1985 BFO RMP (BLM 1985), the amendments, (BLM 2001), (BLM 2003), and the PRB FEIS (including the PRB Record of Decision (ROD) (BLM 2003a, b). The proposal complies with all federal laws, regulations, and policies. This includes, but is not limited to, the following: FLPMA, MLA, National Historic Preservation Act (1966), Endangered Species Act (ESA) (1973), Clean Water Act (1972), Clean Air Act (1970), National Environmental Policy Act (NEPA) (1969), and USDOI Order 3310.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Section 3 describes and analyzes the physical and regulatory environment existing and trends of issue-related items for the project area described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. The reader may find a screening of all resources and land uses potentially affected in the administrative record. This EA does not discuss or analyze resources that would be unaffected, or not affected beyond the level analyzed in the PRB FEIS.

3.1. Project Area Description

The Bear Draw Gamma project is approximately 15 miles east of Buffalo, Johnson County, Wyoming (see Table 2.1 for legal descriptions). Lance would develop the POD in an area of approximately 16,155 acres. The area topography is relatively rugged terrain, with more moderate to level topography located between numerous ridges. Elevations are about 4,265 to 4,727 feet above sea level.

Topography ranges from moderate to rugged with steep ridgelines and deeply incised draws. Much of the project area has 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 the Powder River. The Flying E Creek and numerous intermittent tributaries of the Powder River drain the area to the east. Tree and shrub species which consist mainly of sparse cottonwood trees with scattered juniper and dense sage brush dominate the riparian areas. Rangeland is the predominant management with livestock grazing and recreational hunting as the main uses. The area experienced historic conventional oil and gas exploration and production, and recent CBNG development. The area is in a 10-14 inch precipitation zone, with most of the precipitation falling during late winter and spring.

The Bear Draw Gamma project area is adjacent to the boundaries of 9 approved CBNG PODs that include 440 wells, 116 of which are in the Bear Draw POD boundary, see Table 3.1. It's worth noting: There are 2 pending PODs adjacent to the Bear Draw Gamma project namely Meadow Draw and Ursa Minor. There are 831 approved wells within the 4 mile-consideration of cumulative effects area for this proposal (WOGCC) as of July 7, 2011. The Bear Draw Gamma POD area is clearly lacking wilderness characteristics because of CBNG infrastructure development.

Table 3.1. Adjacent or Overlapping CBNG POD Development Sorted by Decision Date

#	POD Name	Environmental Assessment #	Decision Date
1	Ruby Expansion	WY-070-04-322	1/20/2004
2	Ruby	WY-070-04-188	9/27/2004
3	Bear Draw Alpha	WY-070-05-241	6/3/2005
4	Nemesis	WY-070-05-157	9/13/2005
5	Bear Draw Beta	WY-070-05-263	9/29/2005
6	West Bear Draw	WY-070-06-292	9/25/2006
7	Quarter Circle 9	WY-070-10-236	5/31/2007
8	Tear Drop	WY-070-08-72	4/4/2008
9	South Bear	WY-070-11-151	3/31/2011
10	Meadow Draw	WY-070-11-225	8/3/2011
11	Ursa Minor	Pending	To be determined

BFO analyzed, in part, Bear Draw Gamma's existing main access road and utility corridors traveling north south through numerous section along the western edge of the POD under the Ruby POD and Ruby POD Expansion in 2004.

The existing roads in the project area (excluding Interstate 90) are primitive ranch roads, primitive oil and gas roads, (both also known in the lexicon of BLM Travel and Transportation Management, Handbook 1626, as two-track routes) and improved oil and gas roads. The existing primitive roads on private and federal surface are deteriorating from lack of drainage control on erosional soils, minimal maintenance and steep slopes and are no longer or never were suitable for oil and gas traffic.

3.2. Soils and Ecological Sites

3.2.1. Soils

Soils developed in alluvium and residuum derived mainly from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams resulting in a wide variety of surface and subsurface textures. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Differences in lithology produced topographic and geomorphic variations in the area. Ridges and hills are often protected by an erosion resistant cap of clinker, terrace gravels or sandstone. Parent material chemistry may result in local concentration of salts.

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 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.

Detailed soils identification and data for the project area were obtained from the North Johnson County Survey Area, Wyoming Soil Survey Geographic (SSURGO) Database (WY719). The soil survey was performed by the NRCS according to National Cooperative Soil Survey standards. The BLM uses county soil survey information to predict soil behavior, limitations, or suitability for a given activity or action. The agency's long term goal for soil resource management is to maintain, improve, or restore soil health and productivity, and to prevent or minimize soil erosion and compaction. Soil management objectives are to ensure that adequate soil protection is consistent with the resource capabilities. Many of the soils and landforms of this area present distinct challenges for development, and /or eventual site reclamation.

A tabulated summary of the dominant and important soil map units follows, along with their individual acreage and percentage of the area within the POD boundary.

Table 3.2. Dominant or Important Soils

Map Unit Symbol	Map Unit Name	Acres	Percent
684	Samday-Shingle-Badland complex, 10 to 45 percent slopes	4767.6	29%
708	Theedle-Kishona-Shingle loams, 3 to 30 percent slopes	4226.7	26%
709	Theedle-Shingle loams, 3 to 30 percent slopes	3284.5	20%
640	Forkwood-Cushman loams, 6 to 15 percent slopes	1614.0	10%
659	Hiland-Vonalee fine sandy loams, 6 to 15 percent slopes	410.0	3%

Source: NRCS 2010.

See the NRCS Soil Survey 719 – North Johnson County (SSURGO) data. Additional site-specific soil information is included in the Ecological Site interpretations.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils. Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called non-contrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components were perhaps unobserved, and consequently are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

The soils section of this EA addresses the site-specific impacts that were not analyzed in the PRB FEIS and identifies potentially significant effects of the proposed project to help the decision maker come to a reasoned decision. Project issues related to soils and vegetation are further refined to address: soils susceptible to sever erosion, LRP areas (miscellaneous areas), slopes in excess of 25% water erosion, and reclamation suitability.

3.2.1.1. Soils Susceptible to Erosion

Loss in productivity is likely to occur on most soils if erosion continues unchecked. Because soil formation is a very slow process, most soils cannot renew their eroded surface while erosion continues. The development of a favorable rooting zone by the weathering of parent rock is much slower than development of the surface horizon. One estimate of this renewal rate is 0.5 ton per acre per year for unconsolidated parent materials and much less for consolidated materials. These very slow renewal rates support the philosophy that any soil erosion is too much. Loss of organic matter, resulting from erosion

and tillage, is one of the primary causes for reduction in production yields. When organic matter decreases, soil aggregate stability, the soil's ability to hold moisture, and the cation exchange capacity decline. (Soil Quality-Agronomy Technical Note #7, USDA, Aug 1998)

Soil scientists determined the project area soils are susceptible to erosion in varying degrees. A sandy ecological site with the map symbol 659 and map name(s) Hiland and Vonalee is in the SESW extending north to SWNW Section 11 T50N R79W. This sandy ecological site has sand ranging from 52-80% in the top few inches and clays ranging from 10-18%. This sandy ecological site was found on a ridge top with topsoil depths averaging 2-4 inches and is susceptible to wind and water erosion due to relatively small amounts of clay and little water holding capacity. Table 3.3 shows the relative erosion potential.

Table 3.3. Relative Erosion Potential

Erosion Potential (wind & water)	Acres	% of Project Area
Slight/Moderate	11,387	71
Severe	4,767	29

Source: NRCS 2010

3.2.1.2. Limited Reclamation Potential (LRP)

Scientists identify LRP soils using NRCS SSURGO Data and onsite investigation. For preliminary analysis BLM filters the SSURGO data soil mapping units by the "most limiting" aggregation method. Thus any soil mapping unit containing a named component described as a miscellaneous area would be designated as an LRP area. BLM used the SSURGO Data to determine that 29% of the soils in the project area contain LRP areas. The area consisting of the miscellaneous component (LRP area) would be substantially less; and then BLM verifies and describes these areas during the onsite investigation.

3.2.1.3. Miscellaneous Areas

Miscellaneous areas have essentially no soil and support little or no vegetation. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities. Some miscellaneous areas can be made productive, but only after major reclamation efforts. (430-VI-NSSH, 1996)

Badlands: A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such gypsum or halite. (430-VI-NSSH, 1996)

Rock outcrop: Consists of exposures of bare bedrock. Most rock outcrops are hard rock, but some are soft. (430-VI-NSSH, 1996)

3.2.1.4. Slopes in Excess of 25 Percent

A soil's stability is greatly affected by the slope on which it occurs. Greater slopes usually increase the potential for slumping, landslides and water erosion. Approximately 3,146 acres (19%) in the project area have slopes of 25% or more.

Soils with slopes of less than 25% may also be prone to high erosion because of the soil type, particle size, texture, or amount of organic matter. Soil types in the POD area with severe erosion potential and slopes 25% or greater, as defined by the NRCS; (USDA NRCS 2007), are in Tables 3.2 and 3.3, respectively along with the number of acres and percentage of the project area.

Other contributing factors to slope stability include slope length, slope aspect and colluvium. Slope length has considerable control over runoff and potential accelerated water erosion. Slope aspect is the direction

which the surface of the soil faces. Slope aspect may affect soil temperature, evapotranspiration, wind contact and soil moisture. Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash. It consists largely of material that has rolled, slid or fallen down the slope under the influence of gravity. The rock fragments in colluvium are usually angular, in contrast to the rounded, water-worn cobbles and stones in alluvium and glacial outwash. These factors in combination with slope determine soil stability and the potential for mass soil movement.

Current BLM policy is to avoid development on natural topography with 25% or greater slopes due to their limited reclamation potential, increased risk of soil slumping or mass failure, and high probability of irrecoverable soil losses. BLM's onsite reconnaissance found slopes exceeding 25% in the project area.

Table 3.4. Percent Slope

% Slope	Acres	% of Project Area
0-24%	13,011	81
Greater than or Equal to 25%	3,146	19

Source: NRCS 2010

3.2.1.5. Reclamation Suitability

Currently soil conditions in the project area are impacted by CBNG development as well as traditional activities, including livestock grazing and wildlife use. Much of the area is covered with soils that are easily damaged by use or disturbance or are difficult to re-vegetate or otherwise reclaim. Soil impacts (e.g., roads, linear pipeline scars, and artificial wet areas) can be readily observed in the area.

In the absence of recoverable topsoil as is common throughout the project area, the surface organic matter in the form of vegetation, litter and biological crust are critical to maintaining the integrity and viability of the soil.

Reclamation potential of soils 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 34% of the area within the boundary of the proposed action contains soil mapping units having poor reclamation suitability. The remaining soils have slight or moderate reclamation suitability.

3.2.2. Vegetation and Ecological Sites

BLM staff identified the dominant vegetation community types in the project area are mixed-grass prairie and sagebrush shrubland. Species typical of the mixed-grass prairie community type are western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), and Wyoming big sagebrush (*Artemisia tridentate* var. *wyomingensis*), while species typical of the sagebrush shrubland include Artemisia spp. (*Chrysothamnus* spp.), western wheatgrass, prairie junegrass (*Koeleria macrantha*), and plains pricklypear (*Opuntia* spp.)

In addition, bluebunch wheatgrass (*Pseudoroegneria spicata*), green needlegrass (*Nassella viridula*). Additional forb and shrub species observed during the site visit included yucca (*Yucca glauca*), common yarrow (*Achillea millefolium*), penstemons (*penstemon* spp.), American vetch (*Vicia americana*), and milkvetch (*Astragalus* spp.). Non-native graminoids present included cheatgrass (*Bromus tectorum*), which is quite extensive in the project area. Cheatgrass is the dominant species present in some locations.

The site visits confirmed the presence of tree species in draws, along the creeks. Cottonwoods (*Populus* spp.) are present in many of the drainage bottoms.

Ecological site descriptions provide site and vegetation information needed for resource identification, management and reclamation recommendations. BLM specialists used NRCS published soil survey information, verified through onsite field reconnaissance, to determine the appropriate ecological sites for this POD area. Table 3.5 summarizes the project area's ecological sites.

Table 3.5. Summary of Ecological Sites

Ecological Site	Approximate Acres	Project Area (%)
Loamy (Ly) 10-14 NP	9909.6	61%
Shallow Clayey (SwCy) 10-14 NP	4767.6	30%
Sandy (Sy) 10-14 NP	630.2	4%
Clayey (CY) 10-14 NP	559.5	3%
Shallow Loamy (SwLy) 10-14 NP	194.2	1%
Lowland (LL) 10-14 NP	93.6	1%

Source NRCS 2010

Dominant or important ecological sites and plant communities identified in the project area are Loamy (10-14NP), Shallow Clayey (10-14NP), and Sandy (10-14NP). Refer to ecological site narrative sections below for description of vegetation species observed during onsite field visits.

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. The present plant community is a mixed sagebrush/grass. Wyoming big sagebrush is a significant component of this mixed sagebrush/grass plant community. Cool-season mid-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 vegetation includes needle and thread, western wheatgrass, green needlegrass, blue grama, prairie junegrass and Sandberg bluegrass. Other grasses occurring include Cusick's and prairie junegrass. Cheatgrass invaded the state. Other vegetative species identified at onsite include prickly pear and fringed sagewort.

Shallow Clayey Sites occur on nearly level to steep slopes on landforms which include hill sides, ridges and escarpments in the 10-14 inch precipitation zone. These soils are shallow (less than 20 inches to bedrock), well-drained soils that formed in alluvium or alluvium over residuum derived from unspecified shale. These soils have moderate to slow permeability. The bedrock is clay shale which is virtually impenetrable to plant roots. The present plant community is the similar to the Loamy site listed above.

Sandy Sites occur on nearly level to steep slopes on landforms which include alluvial fans, hillsides, plateaus, ridges and stream terraces in the 10-14 inch precipitation zone. The soils of this site are moderately deep to very deep (greater than 20 inches to bedrock), well drained soils that formed in eolian deposits or residuum derived from unspecified sandstone. These soils have moderate, moderately rapid or rapid permeability. The main soil limitations include low available water holding capacity, and high wind erosion potential. The present plant community is the similar to the Loamy site listed above with the following exception: Wyoming big sagebrush not as dominant.

3.2.2.1. Wetlands/Riparian

The project areas are primarily upland environments. Upper ephemeral drainages flow into the larger ephemeral creeks namely: Flying E Creek. The ephemeral swales and side drainages consist of upland and limited wetland vegetation, while the Flying E Creek drainage has greater amounts of wetland vegetation. There are some cottonwoods along Flying E Drainage. Based on National Wetland Inventory

data available for the project area (USFWS 2009) there are 26 herbaceous wetlands in the project area for a total of 15.6 acres or 0.09% of the project area. Currently there are 3 existing reservoirs that are permitted through the Wyoming State Engineers Office (WSEO) which currently receive water flow from CBNG operations. Lance proposes using the 32-30-5078 Stock Reservoir (P17525S) and the Western Gas Resources #8 (P11510R) as total containment structures, while treated CBNG water will pass through the 29-1 Stock Reservoir (P18845S) prior to reaching the Powder River. For more information on wetland and riparian environments refer to the PRB FEIS, pp. 3-36 to 3-56.

3.2.2.2. Invasive Species

The Wyoming Energy Resource Information Clearinghouse (WERIC) maintains a database listing invasive species locations and other data. The University of Wyoming, BLM, and county Weed and Pest offices cooperatively created the WERIC database. BFO found the following state-listed noxious weeds and/or weed species of infestation concern for the project area in the WERIC database (www.weric.info):

- Spotted knapweed along Interstate 90
- Leafy spurge in the north sections 2 and 3 T50 R79

Lance and BLM confirmed the infestation and/or documented the presence of cheat grass during field investigations. The state-listed noxious weeds are in the PRB FEIS, Table 3-21 (p. 3-104); and the Weed Species of Concern are in Table 3-22 (p. 3-105). The BLM documented the presence of bull thistle at Section 22 T 50N R79W (UTM 393226.7654 4905512.9336) on private surface.

3.3. Wildlife

BFO and Lance consulted several resources to identify wildlife species that may occur in the proposed project area. Resources included the wildlife database compiled and managed by the 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).

Big Horn Environmental Consultants (BHEC) performed a habitat assessment and wildlife inventory surveys. BHEC surveyed for mountain plover, sharp-tailed grouse, greater sage-grouse, bald eagles, raptor nests, and prairie dog colonies in 2008, 2009 and 2010, (BHEC 2008, BHEC 2009, BHEC 2010). Surveys for bald eagle winter roosts occurred in the winter of 2007/2008, 2008/2009, 2009/2010, and 2010/2011 (BHEC 2008, BHEC 2009, BHEC 2010, BHEC 2011). A habitat assessment occurred in 2008, 2009, and 2010 (BHEC 2008, BHEC 2009, BHEC 2010, BHEC 2011). Ute ladies'-tresses orchid surveys occurred from 2008, 2009, and 2010 (BHEC 2008, BHEC 2009, BHEC 2010, BHEC 2011), as were surveys for blowout penstemon during 2009 and 2010 (BHEC 2010, BHEC 2011/2010). There were no formal surveys done for any species not mentioned above; however, BHEC biologists documented any sightings of BLM sensitive species and reported those observations to BFO. BHEC conducted all surveys according to the PRB Interagency Working Group's protocols, available on the BFO internet website at: http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html.

BLM wildlife biologists conducted field visits in 2009 on June 24 through July 22, June 30, and July 5, 2011. The biologists reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided modification recommendations where wildlife issues arose.

WGFD is responsible for management of wildlife populations in the state of Wyoming. WGFD developed several guidance documents that BLM BFO wildlife staff relies upon in evaluating impacts to wildlife and wildlife habitats. WGFD documents used to analyze the proposed project under the current analysis are referenced in this section.

3.3.1. Habitat Types

Habitats occurring in the Bear Draw Gamma project area are mostly sagebrush grassland and grassland

types - conducive for sagebrush obligate species. Some riparian, woodlands, and rock outcrop areas also occur and therefore provide habitat for raptors. For a more detailed description see the above sections; 1.1 Background (second paragraph), 3.1 Area description, and 3.3.1.4 Vegetation Ecological Sites.

Large-scale development of energy reserves underlying sagebrush ecosystems is placing sagebrush communities and wildlife increasingly at risk (WGFD 2009a). Sagebrush ecosystems support a variety of species, including migratory birds, raptors, big game, reptiles, and small mammals. Several Wyoming BLM sensitive species are associated with sagebrush ecosystems. Sagebrush shrublands and grasslands are one of the most imperiled ecosystems in North America (Samson and Knopf 1996, USFWS 2010). Sagebrush recovery after disturbance depends on the availability of an adjacent seed source and may take decades to occur (USFWS 2010).

3.3.2. Threatened, Endangered, Proposed, and Candidate Species

3.3.2.1. Threatened and Endangered Species

Threatened, endangered, candidate and proposed species that will be impacted beyond the level analyzed in the PRB FEIS are described below.

3.3.2.1.1. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is threatened under the ESA. The PRB FEIS discusses the affected environment for ULT on pg. 3-175. The area below the dam in Sec 26 T50N:R75N is dominated by upland vegetation including sagebrush and cheatgrass. Cattails (*Typha spp*.) were found in the drainage however there was little vegetation surrounding the pond. The soils are primarily clay based. The ephemeral drainages (e.g., Bear Draw) have heavy clay soils and immediately rise to upland vegetation, reducing potential for this species to exist. Therefore, it is unlikely that Ute ladies'-tresses orchid habitat occurs in the Bear Draw Gamma.

3.3.2.2. Candidate Species

3.3.2.2.1. Greater Sage-grouse

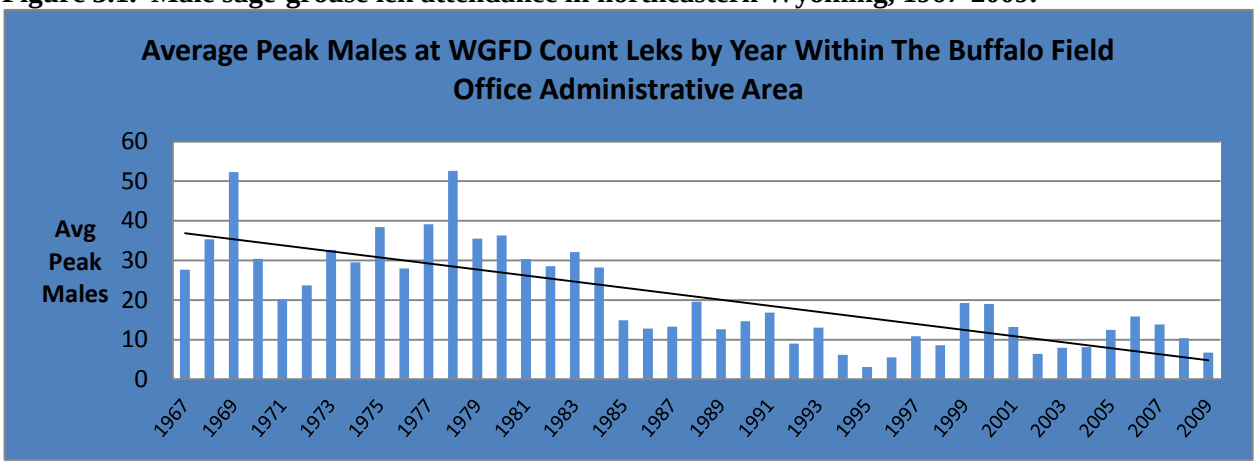
USFWS warranted but precluded for higher priorities, the sage-grouse for federal listing across its range in 2010. In addition to being a Wyoming BLM sensitive species, sage-grouse are a WGFD species of greatest conservation need because populations are declining and they are experiencing ongoing habitat loss. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. USFWS also lists them as a BCC for Region 17. The Bear Draw Gamma POD area includes 12,277 acres of high quality nesting habitat and 5,297 acres of high quality winter habit (some of which overlap each habitat use).

Powder River Basin

The PRB serves as a link between the Wyoming Basin and central Montana grouse populations. The PRB is in sage-grouse Management Zone 1, which is predominantly grasslands and approaches the periphery of sage-grouse distribution that extends into the Dakotas and southern Saskatchewan. In the PRB sagebrush is more heterogeneously distributed, and where found, is at lower densities (less canopy cover), than it is in other management zones. In the context of habitat structural quality within the PRB, the project area contains quality habitat.

The sage-grouse population in northeast Wyoming is exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2008b). The following figure illustrates a 10-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that these declines may be a result, in part, of CBNG development in this region of Wyoming and that the leks in the project area are experiencing similar declines (USFWS 2010).

Figure 3.1. Male sage-grouse lek attendance in northeastern Wyoming, 1967-2009.



Declines in lek attendance correlate with oil and gas development according to biologists. In a typical landscape in the PRB, energy development within 2 miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007). Several studies show that well density is useful as a metric for evaluating impacts to sage-grouse, as measured by declines in lek attendance (Braun et al. 2002, Holloran et al. 2005, and Walker et al. 2007). These studies indicate that oil or gas development exceeding approximately 1 well pad per square mile, resulted in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development 2008).

Declines in lek attendance associated with oil and gas development may be a result of a suite of factors; however, fragmentation of habitat is the predominant issue (USFWS 2010). Wyoming adopted a "core area" habitat concept that protects the largest populations of sage-grouse. The BLM adopted this concept and added "focus area" habitat in the PRB area to supplement the core concept. Sage-grouse core/focus areas assume those sufficient amounts of good quality sage-grouse habitat remains un-fragmented by energy or other man-made infrastructure. 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.

Statewide, core population areas are probably sufficient since they encompass approximately 70% of the sage-grouse population; however, in the PRB area the core population / focus areas capture approximately 25% of the PRB area's sage-grouse population. To address this inadequacy of core/focus areas in the PRB, the BLM, in coordination with the State of Wyoming, identified areas (between core areas in Wyoming and Montana) as "connectivity" habitat in an effort to maintain a viable greater sage-grouse population in the PRB area.

The Bear Draw Gamma project area met the criteria based on habitat qualities and population density for inclusion as an interim sage-grouse management area for the PRB, habitat fragmentation is a problem (Naugle, 2006). Fragmentation is, and has been, caused by the area being bisected by Interstate 90 and by an extensive road network consisting of improved and un-improved roads supporting fee and federal mineral development. The western edge of the project area is 2 miles east of a focus area and is in a high sage-grouse population density area (Doherty 2008). High density sagebrush is present in patches throughout the project area as depicted by the BLM sage-grouse nesting habitat model. Much of the project area contains large stands of sagebrush and moderate topography. All of the project area meets year round seasonal habitat requirements and is large enough to meet the landscape scale requirements of the bird (BLM 2008).

A BLM biologist observed extensive sage-grouse sign throughout the project area. The sagebrush community in this POD has an average canopy closure of 8 to 12% (BHEC 2011). This provides both nesting habitat and year round food resources for sage-grouse. Data from radio-marked sage-grouse from both the University of Montana study and BHEC monitoring indicate that sage-grouse use this area year round (BHEC 2011).

Existing infrastructure near leks:
A county road travels within 0.25 miles of two leks (41-Upper Dry Creek I and 41-Upper Dry Creek II) within the Bear Draw Gamma. Currently a two-track road within 0.25 miles of the 41-Flying E Lek is used for accessing wells in another CBNG POD. Outside the Bear Draw Gamma boundary, an existing two-track road travels through the middle of 41-Tear Drop II lek and there are 3 producing CBNG wells within a 0.25 mile of the lek as well. The road is used for accessing wells in other CBNG PODs. All of these roads within 0.25 miles of leks predated the advent of the BLM's current sage-grouse policy.

The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008) recommends that BLM consider impacts for leks within 4 miles of oil and gas developments. WGFD records indicate that 16 sage-grouse leks occur within 4 miles of the project area. BLM identified these 16 lek sites in Table 3.6.

Table 3.6. Sage-grouse Leks within 4 Miles of the Bear Draw Gamma Project Area

#	Lek ID	Legal Location	Distance from project miles	Occupied	WGFD Impact Category*	Within WGFD Core Area
1	41-Upper Dry Creek Road I	NWSW S14 T50N R79W	Within	YES	Moderate	No
2	41-Upper Dry Creek Road II	NENW S27 T50N R79W	Within	YES	Extreme	No
3	41-Tear Drop I	SENW S32 T50N R78W	0.1	YES	Extreme	No
4	41-Tear Drop II	NESE S33 T50N R78W	0.7	YES	Extreme	No
5	41-Stranahan II	NWNE S24 T50N R80W	3.3	YES	Low	Yes
6	41-Stranahan I	NESW S12 T50N R80W	3.3	YES	Low	Yes
7	41-South Grub Draw	SESW S29 T50N R79W	1.7	YES	Moderate	No
8	41-North Grub Draw	SESW S29 T50N R79W	1.5	YES	Moderate	No
9	41-Flying E Creek	SENE S11 T49N R79W	Within	YES	Extreme	No
10	41-Fleetwood Draw	SENE S23 T51N R79W	2.3	YES	Extreme	No
11	41-Coal Gulch	SENE S5 T50N R78W	2.4	YES	Extreme	No
12	41-Christian III	NENE S1 T50N R80W	3.3	YES	Moderate	Yes
13	41-BLM	SWSE S36 T5N R79W	Within	YES	Extreme	No

#	Lek ID	Legal Location	Distance from project miles	Occupied	WGFD Impact Category*	Within WGFD Core Area
14	41-Bear Draw	SWSE S16 T50N R78W	1.7	YES	Extreme	No
15	38-Ploessers Dry Lake	SWSE S35 T49N R79W	2.9	YES	Extreme	No
16	38-Indian Creek II	SESE S32 T49N R78W	3.4	YES	Extreme	No

There are currently 1,289 wells WYOGCC (as of July 2011) within 4 miles of the 16 leks listed above, an area of 280 square miles. This amounts to a density of approximately 4.6 wells per square mile, which exceeds the effects threshold of 1 well pad per square mile described by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat.

*In, *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (2009), WGFD categorized impacts to sage-grouse by number of well pad locations per square mile within 2 miles of a lek and within identified nesting/brood-rearing habitats greater than 2 miles from a lek. Moderate impacts occur when well density is between 1 and 2 well pad locations per square mile or where there is less than 20 acres of disturbance per square mile. High impacts occur when well density is between 2 and 3 well pad locations per square mile or when there are between 20 and 60 acres of disturbance per square mile. Extreme impacts occur when well density exceeds 3 well pad locations per square mile or when there are greater than 60 acres of disturbance per square mile. Ten of the 16 leks in the project area are at the extreme impact level as of July 15, 2011.

3.3.3. BLM Sensitive Species

Wyoming BLM list of sensitive species are those which focus management efforts towards maintaining habitats under a multiple use mandate. The goals of the policy are:

- Maintaining vulnerable species and habitat components in functional BLM ecosystems
- Ensuring sensitive species are considered in land management decisions
- Preventing a need for species listing under the ESA
- Prioritizing needed conservation work with an emphasis on habitat

The authority for the sensitive species policy and guidance comes from the Endangered Species Act of 1973; Title II of the Sikes Act, FLPMA; the Department Manual 235.1.1A, and BLM policy. BLM Wyoming sensitive species impacted beyond the level analyzed in the PRB FEIS are below.

3.3.3.1. Bald Eagle

The PRB FEIS discusses the affected environment for bald eagles on p. 3-175. The bald eagle was a threatened species under the ESA when the PRB FEIS was written. Recovery efforts allowed removal of the eagle from threatened status on 8 August 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, the BLM continues complying with all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (PRB Oil & Gas Project BO, #WY07F0075) (USFWS 2007).

In addition to being a Wyoming BLM sensitive species, bald eagles are a WGFD SGCN with a NSS2 rating, due to populations being restricted in numbers and distribution, ongoing loss of habitat, and

sensitivity to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are alsoa USFWS BCC for Region17.

Bald eagle roosting and nesting habitat does not occur within one-mile of the Bear Draw Gamma project. Few large trees capable of supporting bald eagles are in the area and most are in deep, narrow upland draws. BHEC biologists included the entire POD and one-mile buffer in aerial winter roost surveys on 3 December, 2010, 14 January, 9 February of 2011 and spring nesting surveys. The surveys found no bald eagles within the one-mile buffer during flights in 2010-11. The surveys found no bald eagle nests in the area. However, foraging opportunities are available from road-killed animals along Interstate 90.

3.3.3.2. Brewer's Sparrow

The PRB FEIS discusses the affected environment for Brewer's sparrow in the PRB FEIS on p. 3-200. In addition to being a BLM Wyoming sensitive species, Brewer's sparrows are a WGFD SGCN, with a rating of NSS4 because populations are declining, habitat is vulnerable with no ongoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also a USFWS BCC for Region 17.Brewer's sparrow habitat exists and the species occurs in the project area. Refer to Sections 3.3.1. Habitat Types, and 3.3.2.2.1. Greater sage-grouse, for a detailed description of the sagebrush type habitats in the project area.

3.3.3.3. Loggerhead Shrike

The PRB FEIS discusses the affected environment for loggerhead shrike on p. 3-187. In addition to being listed as a Wyoming BLM sensitive species; loggerhead shrikes are a USFWS BCC for Region 17. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating they need monitoring. Loggerhead shrike habitat exists and biologists suspect shrikes occur in the project area. Refer to Sections 3.3.1., Habitat Types, and 3.3.2.2.1., Greater sage-grouse, for a detailed description of the sagebrush type habitats also used by loggerhead shrikes in the project area.

3.3.3.4. Mountain Plover

The PRB FEIS discussed the affected environment for mountain plover on pp. 3-177 to 3-178. USFWS proposed the mountain plover as a threatened species under the ESA when the PRB FEIS was written. In 2003, USFWS withdrew the proposal, finding that the population was larger than thought and was no longer declining. In addition to being a Wyoming BLM sensitive species, mountain plovers are a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected stable, habitat is vulnerable without ongoing loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also a USFWS BCC for Region 17.

BHEC conducted surveys for mountain plover on 17 and 23 May and 2 June, 2010 in conjunction with surveys for other sensitive species in the POD and adjacent areas. BHEC surveyed the entire POD and surrounding one-quarter mile buffer, paying particular attention to areas with flat terrain, short grass and black-tailed prairie dog colonies. These colonies, while not ideal breeding sites according to Knopf, may be large enough to support breeding pairs of mountain plover. Otherwise, the varied terrain and lack of flat areas within the project area does not provide optimal habitat for this species (Knopf 1996). The vegetation was greater than 6 inches in height and there was minimal bare ground encountered in 2010. BHEC determined that there was no suitable habitat for nesting mountain plover and they saw no mountain plover in 2010 or during surveys in previous seasons dating back to 2004 (BHEC 2011).

3.3.3.5. Sage Sparrow

The PRB FEIS discusses the affected environment for sage sparrow on pp. 3-200 to 3-201. Sage sparrows are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, habitat is

restricted but not undergoing substantial loss, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also a USFWS BCC for Region 17. Sage sparrow habitat exists and biologists suspect the species occurs in the project area. Please refer to Sections 3.3.1., Habitat Types, and 3.3.2.2.1., Greater sage-grouse, for a detailed description of the sagebrush type habitats also used by sage sparrows in the project area.

3.3.3.6. Sage Thrasher

The PRB FEIS discusses the affected environment for sage thrasher on pp. 3-199 to 3-200. In addition to beings a Wyoming BLM sensitive species, sage thrashers are a WGFD SGCN, with a rating of NSS4, because populations are declining, habitat is vulnerable but not undergoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating the action and focus should be on monitoring and because Wyoming has a high percentage of and responsibility for the breeding population. They are also a USFWS BCC for Region 17. Sage thrasher habitat exists and the species occurs in the project area. Refer to Sections 3.3.1. Habitat Types, and 3.3.2.2.1. Greater sage-grouse, for a detailed description of the sagebrush type habitats also used by sage thrashers in the project area.

3.3.3.7. Black-tailed Prairie Dogs

The USFWS had the black-tailed prairie dog on the list of candidate species for federal listing in 2000 (USFWS 2000). USFWS removed it from the list in 2004. BLM Wyoming considers black-tailed prairie dogs a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a WGFD SGCN, with a rating of NSS3, because populations are declining, and habitat is vulnerable but not undergoing significant loss. Eight prairie dog colonies occur in the Bear Draw Gamma POD (see Table 3.7 below).

Table 3.7. Black-tailed Prairie Dog Colony locations Bear Draw Gamma.

Reference #	QQ	Section(s)	Twp N	Rng W	Size (in acres)	Status 2011
1	NWSW	1	50	79	5	Inactive
2	SWSW	3	50	79	7.3	Active
3	SWSW	13	50	79	6	Active
4	NENE	26	50	79	0.65	Active
5	NWSE	36	50	79	11.7	Active
6	NESW	14	50	79	268	Active
7	SWSE	2	49	79	48	Inactive
	NENE	11	49	79	Contiguous with above	
8	NESE	10	50	79	26	Active
	SWNW	11	50	79	Contiguous with above	

3.3.3.8. Western Burrowing Owl

The PRB FEIS discusses the affected environment for western burrowing owl (burrowing owl) on p. 3-186. In addition to being a Wyoming BLM sensitive species, they are a WGFD SGCN, with a rating of NSS4 because the species is widely distributed, population status and trends are unknown but suspected to be stable, habitat is restricted or vulnerable without substantial recent or on-going loss, and it may be sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action, and they are also a USFWS BCC in Region 17. Burrowing owl habitat exists in the Bear Draw Gamma project area (see Table 3.7 for locations of prairie dog colonies) and 3 known burrowing owl burrows occur within the POD (see Table 3.8). During 2009, a gravel road was constructed through the prairie dog colony where burrow # 10717 is located.

Table 3.8. Burrowing owl burrow locations Bear Draw Gamma.

Nest ID #	Legal location	2008	2009	2010
5557	S 14 T50N R79W	Inactive	Active	Inactive
6082	S 26 T50N R79W	Active	Inactive	Inactive
10717	S 24 T49N R79W	Inactive	Inactive	Inactive

3.3.3.9. Swift Fox

The PRB FEIS discusses the affected environment for swift fox on p. 3-189. In addition to being a BLM WY sensitive species, swift fox is also a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but suspected to be stable, and habitat is vulnerable but is not undergoing substantial loss. Swift foxes prefer flat, shortgrass habitats and are often associated with black-tailed prairie dog colonies. Suitable swift fox habitat exists in portions of the Bear Draw Gamma project area (see Section 3.3.1 Habitat Types for a more descriptive location), however, no known dens are located within the project area. Swift foxes are known to prey on prairie dogs; therefore, the species are more than likely to occur near active prairie dog colonies (see Table 3.6.).

3.3.4. Big Game

Biologists observed both pronghorn and mule deer during field visits to the project area. WGFD data indicate that the Bear Draw Gamma project POD contains yearlong habitat for both species as well as and winter-yearlong for mule deer. The PRB FEIS discussed the affected environment for pronghorn on pp. 3-117 to 3-122, and for mule deer on pp. 3-127 to 3-132. The project area intersects two WGFD hunt areas for pronghorn (353) and mule deer (319). Populations of pronghorn antelope and mule deer in their respective hunt areas are above WGFD objectives.

Yearlon*g* 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. 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. Big game range maps are available in the PRB FEIS (pp. 3-119 to 3-143), the project file, and from the WGFD. The current big game range maps are available from WGFD.

3.3.5. Upland Game Birds

3.3.5.1. Plains Sharp-tailed Grouse

The PRB FEIS discusses the affected environment for plains sharp-tailed grouse on pp. 3-148 to 3-150. 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 (see Section 3.3.1. Habitat Types for a description of habitats in the Bear Draw Gamma project).

Habitats in the Bear Draw Gamma project have potential to support sharp-tailed grouse during most of the year. The mosaic pattern of grasslands and sagebrush-grassland could provide habitat from April through October, while some of the woody vegetation located in Flying E Creek (South 1/2 Sec 19, and Sec 30 T50N, R78W, and West 1/2 half of Sec 12 T49N,R79W) has the potential to support sharp-tailed grouse throughout winter months.

The recent WGFD records reveal 2 sharp-tailed leks on or within 1 mile of the Bear Draw Gamma POD. The 41 Bear Draw I Lek is in NENW section 1 T50N, R79W and 41-Bear Draw II Lek is in SESW section 12 T50N, R79W. Biologists documented no sign of sharp-tailed grouse during spring surveys at these 2 leks since 2008 (BHEC 2008-2011).

Table 3.9 includes 3 locations provided by the BLM where sharp-tailed grouse reportedly displayed in recent years. BLM and BHEC checked for displaying grouse and field sign with negative results. BLM and BHEC discovered no new leks in the survey area.

Table 3.9. Sharp-tailed Grouse Lek Locations Near the Bear Draw Gamma POD.

LEK_NAME	STATUS	PEAK MALES	QQ	Q	SEC	TWN	RNG	UTM_E	UTM_N
Kosic STGR	INAC	0	NW	NE	50	79	34	392435	4902635
ST00307	INAC	0	SE	SW	12	50	79	395476	4907585
ST00407	INAC	0	NE	NW	1	50	79	395513	4910411

3.3.6. Aquatic Species

The Flying E Creek is the most significant drainage in the project area. It flows east to the Powder River, which is approximately 7 miles from the Bear Draw Gamma. The PRB FEIS discusses the PRB ecosystem and fishery, (pp. 3-153 to 3-166). The U.S. Geological Survey (USGS) sampled northeast Wyoming perennial streams between 1980 and 1981 that generally supported invertebrate communities which included taxa adapted to flowing water. Ephemeral stream communities generally hosted taxa adapted to standing water (Peterson 1990).

Table 3.10 lists the fish found in the Upper Powder River sub-basin and their WGFD NSS designation, if applicable. WGFD identified SGCN in the state, all of which are given NSS designations. Seven of the species that may occur in the Upper Powder River sub-basin have designations as either NSS 1, 2, or 3 species. Species in these designations are species of concern, in need of more immediate management attention, and more likely subject to future petitioning under the ESA. For these species WGFD recommends that no loss of habitat function occur. WGFD allows for some modification of the habitat, provided retention of that habitat function (i.e., the location, essential features, and species supported are unchanged). NSS 4-7 refers to populations that are widely distributed throughout their native range and are stable or expanding. Habitats also are stable. There is no special concern for these species.

Table 3.10. Fish Occurring in the Upper Powder River Sub-basin

Wyoming Native Species Status	Species	Wyoming BLM Sensitive?
NSS1	Sturgeon chub	No
NSS2	Goldeye	No
	Sauger	No
NSS3	Black bullhead	No
	Flathead chub	No
	Mountain sucker	No
	Plains minnow	No
NSS4	Channel catfish	No
	Northern redhorse	No
	Quillback	No
	River carpsucker	No
	Stonecat	No
NSS6	Fathead minnow	No
	Plains killifish	No

Table 3.10. Fish Occurring in the Upper Powder River Sub-basin

Wyoming Native Species Status	Species	Wyoming BLM Sensitive?
NSS7	Longnose dace	No
	Sand shiner	No
	White sucker	No
None	Common carp	No
	Rock bass	No
	Shovelnose sturgeon	No

Source: BLM 2010c.

Amphibian and reptile species (herpetiles) occur throughout the Basin. WGFD conducted a baseline inventory of herpetiles along the Powder River and its major tributaries from 2004-2006 (Turner 2007).

WYNDD completed the first year of a 3-year herpetile study in the PRB in order to detect impacts from CBNG development (Griscom et al. 2009). Herpetiles expected to occur in the PRB, according to these studies, are in Table 3.11 (Turner 2007; Griscom et al. 2009). WGFD classified 8 of the species as SGCNs, all with a rating of NSS4, indicating that they have wide distribution throughout their native ranges, and populations are stable. Of the species listed in Table 3.7, WYNDD reported that, for 2008 surveys, boreal chorus frogs were the most abundant amphibian in the PRB and were in a variety of habitats. The second most abundant amphibian was Woodhouse's toad, which occurred along rivers, temporary ponds, and in CBNG reservoirs. Plains spadefoot and Great Basin toads were the least common species, occurring primarily in temporary ponds fed by rainstorms. Relatively few observations were made for reptile species. Bullsnakes and sagebrush lizards were most commonly seen. Turtles were rarely observed, due to their almost exclusive occurrence in deep backwaters.

Two of the herpetiles in Table 3.11, northern leopard frog and Columbia spotted frog, are Wyoming BLM sensitive species. In 2008, the Wyoming Natural Diversity Database (WYNDD) began a 3-year study of amphibians and reptiles in the PRB under the guidance of the ATG. The ATG is an inter-agency and inter-state working group focused on studying and mitigating impacts of energy development on aquatic ecosystems in northeastern Wyoming and southeastern Montana. Northern Leopard Frogs were estimated to occupy 42% of water bodies surveyed in 2010 in the PRB.

Table 3.11. Herpetile Species Expected to Occur in the Powder River Basin

Species	Verified by Survey[1]	WGFD Status	Wyoming BLM Sensitive?
Tiger salamander	Yes	NSS4	No
Northern leopard frog	Yes	NSS4	Yes
Milk Snake	No	NA	No
Columbia spotted frog	Yes	NSS4	Yes
Bullfrog	Maybe	NSS4	No
Spiny softshell	Yes	NA	No
Northern prairie lizard	No	NA	No
Boreal chorus frog	Yes	NSS4	No
Great plains toad	Yes	NSS4	No
Woodhouse's toad	Yes	NSS4	No
Plains spadefoot toad	Yes	NSS4	No

Table 3.11. Herpetile Species Expected to Occur in the Powder River Basin

Species	Verified by Survey[1]	WGFD Status	Wyoming BLM Sensitive?
Short-horned lizard	Yes	NA	No
Sagebrush lizard	Yes	NA	No
Eastern yellowbelly racer	Yes	NA	No
Prairie rattlesnake	Yes	NA	No
Western hog-nosed snake	Yes	NA	No
Bullsnake	Yes	NA	No
Terrestrial garter snake	Yes	NA	No
Plains garter snake	Yes	NA	No
Common garter snake	Yes	NA	No
Snapping turtle	Yes	NA	No
Painted turtle	Yes	NA	No

[1] As reported in Turner (2007) and Griscom et al. (2009). Source: BLM 2010c.

3.3.7. Migratory Birds

The PRB FEIS discusses the affected environment for migratory birds on pp. 3-150 to 3-153. Migratory birds are birds that migrate for breeding and foraging at some point in the year. The BLM-USFWS MOU (2010) promotes the conservation of migratory birds, as directed through Executive Order 13186 (Federal Register V. 66, No. 11). BLM must include migratory birds in every NEPA analysis of actions that have potential to affect migratory bird species of concern to fulfill obligations under the MBTA. The MBTA (and BGEPA) are strict liability statutes so no intent is required to protect migratory birds through prosecuting a taking. Recent prosecutions or settlements cost companies millions in fines and restitution (which was usually retrofitting powerlines to discourage perching to minimize electrocution or shielding ponds holding toxic substances): U.S. v. Moon Lake Electric Ass'n, 45 F. Supp. 2d 1070 (D. Colo. 1999); U.S. v. Phelps Dodge (D. NM. 2004) ($15,000 fine and restitution and undisclosed costs for retrofitting); U. S. v. PacifiCorp (D. Wyo. 2009) (settled for $10.5 million in fines, restitution, and retrofitting); U.S. v. Exxon Mobile (Colo. 2009) settled for $600,000 in fines and restitution); and U.S. v. Apollo Energies, Inc. 611 F3d 679 (10th Cir. 2010). BLM encourages voluntary design features and conservation measures that comport with those in the programmatic mitigation in Appendix A of the PRB ROD (2003).

A wide variety of migratory birds may be found in the proposed project area at some time throughout the year. Migratory birds are those that migrate for the purpose of breeding or foraging at some point in the 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). Nationally, grassland and shrubland birds declined more consistently than any other ecological association of birds over the last 30 years (WGFD 2009).

3.3.8. Raptors

The PRB FEIS discusses the affected environment for raptors on pp. 3-141 to 3-148. BHEC biologists conducted ground surveys to monitor known raptor nests and to search for new nests on several dates throughout the peak raptor-breeding season in 2010. Twenty-three known raptor nests are within the one-half mile buffer of the Bear Draw Gamma project of which 12 are active (see Table 3.12). *The BFO RMP (1985, 2001 Amendment) defines an active nest as, "one that has been used at least once during the previous three years." BLM documented 4 species using these nests: red-tailed hawk, golden eagle, long-eared owl, and great horned owl.

Table 3.12. Known Raptor Nests Within the 0.5 mile Buffer of Bear Draw Gamma POD

#	BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
1	2234	398951E 4904679N	S20 T50N R78W	CTD	2010	Good	INAC	n/a
					2009	Good	INAC	n/a
					2008	Good	INAC	n/a
2	2235	394964E 4907629N	S12 T50N R79W	BOX	2011	Poor	INAC	n/a
					2010	Good	INAC	UNRA
					2009	Good	INAC	n/a
3*	2651	392985E 4904736N	S22 T50N R79W	CTL	2010	Good	INAC	n/a
					2009	Excellent	ACTF	RETA
					2008	Excellent	ACTI	RETA
4	3381	396199E 4905697N	S24 T50N R79W	CTL	2011	Good	INAC	n/a
					2010	Good	INAC	n/a
					2009	Good	INAC	n/a
5*	3563	399480E 4902884N	S29 T50N R78W	CTL	2010	Good	INAC	n/a
					2009	Good	INAC	n/a
					2008	Good	ACTI	GRHO
6*	3789	394029E 4911475N	S35 T51N R79W	JUN	2010	Fair	INAC	n/a
					2009	Unknown	ACTF	LOOW
					2008	Good	INAC	n/a
7*	3790	393952E 4911915N	S35 T51N R79W	CTL	2010	Fair	INAC	n/a
					2009	Good	ACTI	LOOW
					2008	Good	INAC	n/a
8*	4439	397371E 4903825N	S30 T50N R78W	JUN	2010	Good	INAC	n/a
					2009	Good	INAC	n/a
					2008	Good	ACTI	LOOW
9	5007	397427E 4904102N	S30 T50N R78W	CKB	2010	Unknown	INAC	n/a
					2009	Unknown	INAC	n/a
					2008	Good	INAC	n/a
10	5120	395995E 4907357N	S13 T50N R79W	JUN	2011	Poor	INAC	n/a
					2010	Poor	INAC	UNRA
					2009	Good	INAC	n/a
11	5137	398041E 4907519N	S17 T50N R78W	CTL	2011	Good	INAC	UNRA
					2010	Poor	INAC	n/a
					2009	Good	INAC	n/a
12	5140	398051E 4907451N	S17 T50N R78W	CTL	2011	Good	INAC	n/a
					2010	Fair	INAC	UNRA
					2009	Good	INAC	n/a
13*	5141	398532E 4906910N	S17 T50N R78W	JUN	2011	Good	INAC	n/a
					2010	Good	INAC	UNRA
					2009	Good	ACTI	RETA

#	BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
14*	6251	399012E 4904679N	S20 T50N R78W	CTL	2010	Good	INAC	UNRA
					2009	Good	INAC	n/a
					2008	Good	ACTF	GRHO
15*	6252	397366E 4904068N	S30 T50N R78W	CTL	2010	Good	ACTI	GOEA
					2009	Good	INAC	n/a
					2008	Good	ACTI	GOEA
16*	6615	393503E 4900432N	S2 T49N R79W	CTL	2010	Good	ACTF	GOEA
					2009	Good	INAC	n/a
					2008	Good	ACTI	GOEA
17*	10716	395378E 4898621N	S12 T49N R79W	CTD	2010	Fair	INAC	n/a
					2009	Fair	INAC	n/a
					2008	Good	ACTI	RETA
18	11202	395955E 4907489N	S13 T50N R79W	CTL	2011	Poor	INAC	n/a
					2010	Poor	INAC	n/a
19	11203	397983E 4907425N	S18 T50N R78W	GHS	2011	Good	INAC	GOEA
					2010	Good	INAC	n/a
20	12259	395675E 4899177N	S12 T49N R79W	GHS	2010	Unknown	INAC	n/a
					2009	Nest Gone	DNLO	n/a
					2008	Unknown	DNLO	n/a
21	12591	397397E 4904009N	S30 T50N R78W	CLF	2011	Poor	INAC	n/a
22*	12592	397400E 4904006N	S30 T50N R78W	CLF	2011	Excellent	ACTI	GOEA
23	12604	396856E 4903840N	S30 T50N R78W	CTL	2011	Good	INAC	n/a

3.3.9. 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 is now 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 appear to have leveled off. Historic data collected by the CDC and published by the USGS at www.westnilemaps.usgs.gov are summarized in Table 3.13. Reported data from the PRB includes Campbell, Sheridan and Johnson counties.

Table 3.13. Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Equine Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3

Year	Total WY Human Cases	Human Cases PRB	Equine Cases PRB	Bird Cases PRB
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
2009	10	1	1	No record
2010	6	0	0	0

Source: Wyoming Department of Health, http://diseasemaps.usgs.gov/wnv_wy_human.html

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 focused on human health issues, WNv had an impact on vertebrate wildlife populations. At a recent conference at the Smithsonian Environmental Research Center, scientists disclosed WNv was detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al 2003). In the eastern US, avian populations incurred very high mortality, particularly crows, jays and related species. Raptor species also appear to be highly susceptible to WNv.

Researchers documented that 36 raptors died from WNv in Wyoming in 2003. These included 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 4 days. In the PRB 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 PRB indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than 2 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 treatments seem effective when focused on specific target areas, especially near communities, however they were not applied over large areas nor 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.

3.4. Water Resources

Bear Draw Gamma POD is in the Flying E Creek drainage - a tributary of the Upper Powder River. Ephemeral drainages, which flow into intermittent Flying E Creek, dissect the area. The ephemeral drainages have gentle slope with well vegetated bottoms with numerous small head-cut features.

The Wyoming Department of Environmental Quality (WDEQ) assumed primacy from U.S. Environmental Protection Agency for maintaining the State's water quality. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of the State's surface waters. The Wyoming Oil and Gas Conservation Commission (WYOGCC) has authority for permitting and bonding off channel pits located over state and fee minerals.

3.4.1. Groundwater

The historical use for groundwater in this project area was for stock water or domestic purposes. A search of the WSEO Ground Water Rights Database for this area showed 12 registered stock and domestic water wells within 1 mile of a federal CBNG producing well in the POD with depths ranging from 90 to 500 feet. For additional information on water, refer to the PRB FEIS (2003), Chapter 3, Affected Environment pp. 3-1 to 3-36 (groundwater).

WDEQ water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following general limits for total dissolved solids (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). For additional water quality limits for groundwater, please refer to the WDEQ web site.

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.

Specific to groundwater, the plan identified the following, (PRB FEIS ROD, p. E-4):

- The effects of infiltrated waters on the water quality of existing shallow groundwater aquifers are not well documented at this time [in 2003];
- Potential impacts will be highly variable depending upon local geologic and hydrologic conditions;
- It may be necessary to conduct investigations at representative sites in the basin to quantify impacts;
- Provide site specific guidance on the placement and design of CBM impoundments, and
- Shallow groundwater wells would be installed and monitored where necessary.

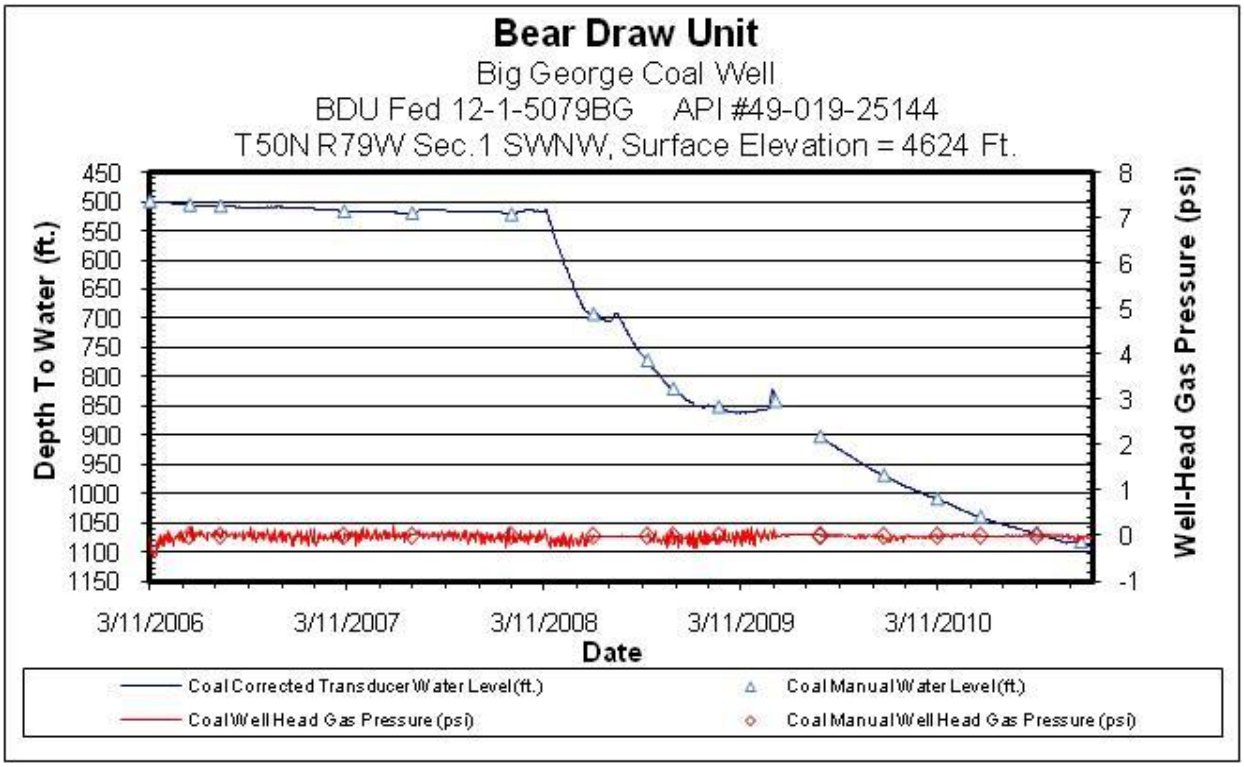
The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. BFO monitors coal zone pressures as expressed in depth to water from surface since the early 1990s in the PRB, Figure 3.3.

The BFO monitored coal zone pressures as expressed in depth to water from surface since the early 1990s in the PRB. The Bear Draw Unit groundwater monitoring well, found at T50N R79W Section 1, is within the Bear Gamma POD boundary and was installed by Anadarko as a part of the BLM deep groundwater monitoring program. The initial water level of the Big George Coal, measured in March 2006, which is

indicative of the pressure in the target coal zone, was recorded at 499 feet below ground level. The most recent measurement, from February 2011, recorded the water level at 1,111 feet below ground level, for a decline of 612 feet since the well was completed.

This level of depressurization is within the potential predicted in the PRB FEIS; which was determined through the Regional Groundwater Model for that document. For additional information, refer to the PRB FEIS, Chapter 4, Groundwater, and the Wyoming State Geological Survey's Open File Report 2009-10 titled, "1993-2006 Coalbed Natural Gas (CBNG) Regional Groundwater Monitoring Report: Powder River Basin, Wyoming," which is available at: http://www.wsgs.uwyo.edu.

Figure 3.3. Depth to Static Water Level from the Ground Surface



3.4.2. Surface Water

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

The PRB FEIS presents the historic mean electrical conductivity (EC, in µmhos/cm) and sodium adsorption ratio (SAR) by watershed at selected USGS Gauging Stations in Table 3-11 (PRB FEIS, p. 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams in the Project Area. The representative stream water quality is used in the impact analysis presented in Section 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, p. 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 4.7 at maximum monthly flow to 7.8 at low monthly flow. The USGS station at Arvada, WY determined these values (PRB FEIS, p. 3-49).

Lance identified 2 natural springs within a 1 mile radius of Bear Draw Gamma POD. Grandpa Spring is at SWNE Sec 2 T50N, R79W. Ludock Spring is at NWNE Sec 10 T50N, R79W. The estimated flow of Grandpa Spring is 5 gallons per minute (gpm) with a water quality of 4790 µmhos/ cm conductivity, 4230 mg/l TDS and 6 Sodium Adsorption Ratio (SAR). Ludock Spring was inactive so is unsampled. For more information on surface water refer to the PRB FEIS, Chapter 3, Affected Environment pp. 3-36 to 3-56.

3.5. Economics and Recovery of CBNG Resources

Three types of fluid minerals are known in the Bear Draw Gamma project area: conventional natural gas, oil, and CBNG. Natural gas and oil production are declining in the project area and the PRB in general. (BLM-Wyoming Reservoir Management Group) Wyoming's annual oil production peaked at 160 million barrels in the early 1970's and declined since (WYOGCC 1998). Three hundred thirty-six fields were producing nearly 25 million barrels of oil and 60 MMCF of conventional natural gas in Wyoming in 2000 (WYOGCC 2001). PRB production comes from upper and lower Cretaceous sediments and from upper Paleozoic sediment in the northeastern part of the basin (Lageson and Spearing 1991). Data represented in graphs below were obtained from IHS Inc.

Debruin et al. 2001 estimated that about 28 trillion cubic feet (tcf) of CBNG may be recoverable from the coal beds in Wyoming's PRB. CBNG in the PRB is almost entirely methane (CH_4) and nitrogen (N). A large percentage of the CBNG escapes to the surface or migrates into nearby rocks during the coalification process. Some of the gas is trapped and stored in coal beds in 1 of the following 4 ways:

- As free gas in tiny pores in the coal;
- As adsorbed gas on the coal surfaces; or
- As dissolved gas in water with the coal;
- As adsorbed gas with coal molecules

3.5.1. Current Conditions and Trends

This project's development will affect the local, state, and national economies. Based on the estimates in the BLM's 2009 reasonably foreseeable development (RFD) scenario, the drilling of the CBNG wells in the PRB will generate approximately 0.23 billion cubic feet of gas (BCFG) per well, over the life of the well. Actual revenue from this amount of gas is difficult to calculate, as there are several variables contributing to the price of gas at any given time. Regardless of the actual dollar amount, the royalties from the gas produced would have several benefits. The federal government collects 12.5% of the royalties from all federal wells, which offsets the costs of maintaining the federal agencies that oversee permitting. In addition to generating federal revenue, approximately 49% of the royalties from the federal wells would return to the State of Wyoming. Mineral development revenue contributes to Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. Federal wells also contribute to local economic development by employing workers in the area to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area.

There are 116 existing CBNG, and conventional gas, on federal mineral estate and non-federal mineral estate within Bear Draw Gamma POD boundary. Assuming an 80 acres spacing pattern (8 wells per square mile), the 76 proposed Bear Draw Gamma CBNG wells would bring the total to 189 wells which is not fully developed according to WOGCC. It is RFD that this POD and those adjacent may eventually add wells to the 80-acre spacing industry convention.

3.6. Cultural Resources

Lance performed a Class III cultural resource inventory for the Bear Draw Gamma POD prior to on-the-ground project work (BFO project no. 70080104). Lance provided a class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports to BFO. Ardeth Hahn, BLM Archaeologist, reviewed the report for technical adequacy and compliance with BLM standards and determined its adequacy. The following resources are in or near the project area.

Site Number	Site Type	Eligibility
Chapter 1 48JO665	Historic Site	Not Eligible
48JO2149	Historic Site	Not Eligible
48JO2150	Prehistoric Site	Not Eligible
48JO2153	Historic Site	Not Eligible
48JO2578	Historic Site	Not Eligible
48JO2756	Historic and Prehistoric Site	Not Eligible
48JO2943	Historic Site	Not Eligible
48JO3008	Historic and Prehistoric Site	Not Eligible
48JO3009	Historic and Prehistoric Site	Not Eligible
48JO3011	Historic and Prehistoric Site	Not Eligible
48JO3015	Historic Site	Not Eligible
48JO3021	Historic Site	Not Eligible
48JO3022	Historic Site	Not Eligible
48JO3081	Historic Site	Not Eligible
48JO3921	Prehistoric Site	Eligible
48JO3922	Prehistoric Site	Eligible
48JO3924	Historic and Prehistoric Site	Not Eligible
48JO3925	Historic Site	Not Eligible
48JO3926	Prehistoric Site	Not Eligible
48JO3927	Historic and Prehistoric Site	Unevaluated
48JO3928	Historic and Prehistoric Site	Not Eligible
48JO3929	Historic Site	Not Eligible
48JO4141	Historic Site	Not Eligible
48JO4180	Historic Site	Not Eligible

Some of the project area analyzed in this EA occurs on deep alluvial deposits. Alluvial deposits typically have a high potential for buried cultural resources, which are nearly impossible to locate during a Class III inventory (Ebert & Kohler 1988:123; Eckerle 2005:43).

4. ENVIRONMENTAL EFFECTS

This section describes and analyzes the environmental effects of Alternatives B and C on the affected environment described in Section 3. This section analyzes Alternative B in total and only then in turn, analyzes Alternative C. This is because Alternative C comprises changes from Alternative B. This effects analysis addresses the direct and indirect effects of implementing the proposed action, the cumulative effect of the proposed action, combined with reasonably foreseeable federal and non-federal actions, identifies and analyzes mitigation measures (COAs), and discloses residual effects after mitigation.

4.1. Alternative A

The PRB FEIS analyzed the No Action Alternative as Alternative 3. Additionally the recent analyses and approved CBNG developments listed in Table 3.1, in and around this POD, and shown in Table 2.5 under Alternative A, updated the baseline present circumstances and collectively, cumulatively comprise the No Action Alternative. Those analyses are incorporated by reference into this EA. Information specific to

resources for this alternative is included in the PRB Final EIS on pages listed in Table 4.1, combined with the analysis in the EAs found in Table 3.1.

Table 4.1. Location of Discussion of the No Action Alternative in the PRB FEIS

Resource		Type of Effect	Page(s) of PRB FEIS
Project Area Description	Geologic Features and Mineral Resources	Direct and Indirect Effects	4-164 and 4-134
		Cumulative Effects	4-164 and 4-134
Soils, Vegetation, and Ecological Sites	Soils	Direct and Indirect Effects	4-150
		Cumulative Effects	4-152
	Vegetation	Direct and Indirect Effects	4-163
		Cumulative Effects	4-164
	Wetlands/Riparian	Direct and Indirect Effects	4-178
		Cumulative Effects	4-178
Wildlife	Sensitive Species - Greater Sage-Grouse	Direct and Indirect Effects	4-271
		Cumulative Effects	4-271
	Aquatic Species	Direct and Indirect Effects	4-246
		Cumulative Effects	4-249
	Migratory Birds	Direct and Indirect Effects	4-234
		Cumulative Effects	4-235
	Waterfowl	Direct and Indirect Effects	4-230
		Cumulative Effects	4-230
	Big Game	Direct and Indirect Effects	4-186
		Cumulative Effects	4-211
	Raptors	Direct and Indirect Effects	4-224
		Cumulative Effects	4-225
Water	Ground Water	Direct and Indirect Effects	4-63
		Cumulative Effects	4-69
	Surface Water	Direct and Indirect Effects	4-77
		Cumulative Effects	4-69
Economics and Recovery of CBNG Resources		Direct and Indirect Effects	4-362
		Cumulative Effects	4-370
Cultural Resources		Direct and Indirect Effects	4-286
Air Quality		Direct and Indirect Effects	4-386
		Cumulative Effects	4-386

4.2. Alternative B: The Operator's Proposed Action

Alternative B contains 74 CBNG APDs along with their infrastructure and is a result of the operator and BLM working to reduce environmental impacts.

4.2.1. Soils, Vegetation, and Ecological Sites

4.2.1.1. Soils

4.2.1.1.1. Direct and Indirect Effects

Impacts anticipated to occur include soil rutting and mixing, compaction, increased erosion potential, and loss of soil productivity. The most notable impacts to soils would occur in association with the construction of well pads, staging areas, and roads. Grading and leveling would be required to construct these facilities with the greatest level of effort required on more steeply sloping areas. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. Mixing may result in removal, dilution, or relocation of organic matter and nutrients to depths where it would be

unavailable for vegetative use. Less desirable inorganic compounds such as carbonates, salts, or weathered materials could be relocated and have a negative impact on revegetation.

Construction of wells with no pad and no slot would result in less soil disturbance to the soil resource. No soil would be removed or graded. Where reserve pits are constructed for these wells, soil productivity and soil quality would be altered if top soil is not salvaged and segregated or if subsoil is spread on the surface of the soil.

Soils compaction results the construction of wells and associated facilities, with compaction maintained, at least in part, by continued vehicle and foot traffic as well as operational activities. 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 leads to a loss of soil structure; decreased infiltration, permeability, and soil aeration; as well as increased runoff and erosion.

Increased erosion can lead to a decrease in soil fertility and an increase in sedimentation. The duration and intensity of these impacts would vary according to the type of construction activity to be completed and the inherent characteristics of the soils to be impacted.

The potential for erosion would increase through the loss of vegetation cover and soil structure as compared to an undisturbed state. Soil productivity would decrease, primarily as a result of profile mixing and compaction along with the loss in vegetative cover. These impacts would begin immediately as the soils would be subjected to grading and construction activities and impacts would continue for the term of operations. The impacts on soils would move to a steady state as construction activities were completed and well production/maintenance operations begin.

An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (Belnap et al. 2001). They adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily damaged or destroyed by surface disturbances associated with construction activities.

Rutting affects the surface hydrology of a site as well as the rooting environment. The process of rutting physically severs roots, thus reducing soil aeration and infiltration thereby degrading the rooting environment. Rutting may result in topsoil and subsoil mixing, thereby reducing soil productivity. Rutting also disrupts natural surface water hydrology by diverting and concentrating water flow thus accelerating erosion. Soil mixing typically results in a decrease in soil fertility and a disruption of soil structure.

The access road in Section 2 T50N R79W which provides access to wells 43-3 5079 and 32-3 5079 follows a previously approved road to Bear Draw Unit wells. This existing access has minimal design and was done so deliberately by BLM and Lance in 2005 to minimize disturbance and therefore may not meet current standards for the additional wells listed above. BLM Inter-Disciplinary (ID) Team decided not to pursue upgrades to the narrow road segment in NENE and NWNW of Section 2.

Though not requested or required by BLM, Lance submitted an interim reclamation plan for all wells in the project (see p. 3 of Reclamation Plan). BKS Environmental Associates, Inc. prepared site specific interim reclamation plans based on field visits on May 5 and 13, 2011. Site specific interim reclamation plans cover APDs 23-30 5079, 43-30 5078, 21-3 5079, 22-3 5079, 21-22 5079, and engineered Section 10. This document addresses the reclamation concerns associated with the development of Bear Draw Gamma POD in areas of Samday-Shingle-Badland complex which has 10-45% slopes.

Lance proposed engineered sections of road to gain access to the wells due to steep slopes, with cuts/fills exceeding 5 feet. The operator is responsible for having the licensed professional engineer(s) certify that the construction of those roads meet the design criteria and are built to Bureau standards. These engineered road segments should be completed, including any culverts, low water crossings and required surfacing, before the drilling rig or other drilling equipment moves onto the pad in order to protect erodible soils.

Low water crossings (LWC) are a BLM approved construction technique to allow all weather access though drainages where culverts are not appropriate or desired. BLM recommends specific design criteria for a typical LWC as shown in Road Design Tab Sheet 9 of Bear Draw Gamma MSUP. This will mitigate the effects of inappropriately constructed structure in drainages. Construction completed to BLM approvable standards will reduce down drainage sedimentation, erosion and scouring caused by frequent failure of in-channel structures.

Lance and BLM recommended a loamy and sandy seed mixes for the Bear Draw Gamma POD based on soil map unit types, the dominant ecological sites found within the project area, and the mixing of soil horizons in disturbed areas.

The BLM will evaluate reclamation success using the requirements set forth in Appendix B, Reclamation Policy, and the BLM State Wide Reclamation Policy revised 2011.

Expanded gas, water, and electric ROW infrastructure linking POD support facilities are part of reasonably foreseeable development (RFD) additions to the proposed action (PRB ROD, p. 2). These include trends toward 80 acre spacing (8 wells per section) and changes in associated infrastructure. Such is the case with Bear Draw Gamma. A foreseeable addition may be a request for a ROW to connect roads, gas and water utility lines, and third party compression sites of Bear Draw Gamma to other Bear Draw PODs and other Lance PODs. A main water truck line corridor may link the Bear Draw Gamma and all Bear Draw PODs east through Coal Gulch and Flying E drainages. A reasonable foreseeable development also includes the addition of wells withdrawn by the operator due to sage-grouse lek perimeter mapping and wells removed due to active raptor nests.

4.2.1.1.2. Soils Susceptible to Erosion

Sandy Ecological Sites Susceptible to Wind Erosion: Access/pipeline corridors in the SESW extending north to SWNW Section 11 T50N R79W will impact 0.85 miles or 4,488 feet of sandy ecological sites (map symbol 659 map name Hiland and Vonalee) and will require expedient reclamation. This sandy soil was found on a ridge top with topsoil depths averaging 2-4 inches. The dominant vegetation included; big sagebrush, rubber rabbit brush, needle and thread, prairie sandreed, blue grama, and cheat grasses. Without proper and timely re-vegetation practices the sands readily erode due to wind action. The invasion of prickly pear and cheat grass indicates some deterioration from identified transition state. Wind and water erosion could be high since there is little to no depth or organic matter in the soil. Reclamation will be difficult without extra mitigation. A site specific seed mix was chosen for these locations to expedite re-vegetation and a COA will be applied to insure that the surface is stabilized to protect from wind/water erosion within 30 days.

Steep Ecological Sites Susceptible to Water Erosion: APD 21-22-5079, the engineered Section 1Access/pipeline corridor, and engineered pad are proposed in the soil map unit Samday-Shingle-Badland complex which has 10-45% slopes.

4.2.1.1.3. Limited Reclamation Potential (LRP)

4.2.1.1.3.1. Miscellaneous Areas

Badlands and Rock outcrops: The following wells and/or associated infrastructure will have impacts to

LRP areas, namely badlands and rock outcrop components, and receive an analysis in turn:

1. 21-22 5079
2. 12-30 5078
3. 23-30 5078
4. 12-34 5079
5. The beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of LRP area: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079

1) 21-22 5079 Engineered Section 1 (crown and ditched) had 1,300 linear feet of cuts and fills proposed in mixed ecological types including LRP areas including: minor badland components. Total cut and fill will be approximately 5,086 cubic yards of material. Engineered pad from edge of disturbance to edge of disturbance is 230 feet long by 200 feet wide. To minimize disturbance cut slopes will be at 1.5:1, cut slopes will daylight 15 feet on the other side of a narrow ridge. This road section and engineered pad will disturb 3.6 acres through these LRP areas. Top of ridge disturbance will impact sodium sealed soils with areas of high clay content. Total cut and fill is 12,179 cubic yards of material (also see slopes in excess of 25%).

2) 12-30 5078 Cross country utility corridor had 792 linear feet of utility pipeline work proposed on LRP areas including: thin soils and badland components (also see slopes in excess of 25%).

3) 23-30 5078 Engineered Section 4 had 800 linear feet of cuts and fills proposed in LRP areas including: badlands and rock outcrop components. Cross country utility corridor had 800 linear feet of utility pipeline work proposed on LRP areas including: thin soils and badland components (also see slopes in excess of 25%).

4) 12-34 5079 Template Section 32 (crown and ditch and out slope) had 3,800 linear feet of cuts and fills proposed in LRP areas including: thin soils, badlands, and rock outcrop components. Engineered pad had cut slopes at 1.5:1 to minimize disturbance (also see slopes in excess of 25%).

5) The beginning of the access road to 6 wells will impact minimal LRP areas and follows and exiting ranch road.

4.2.1.1.3.2. Slopes In Excess of 25 Percent

Slopes in Excess of 25 Percent: The following wells and/or associated infrastructure will have impacts to topography in excess of 25% slope:

1. 21-22 5079
2. 12-30 5078 cross country pipeline only
3. 23-30 5078
4. Cross country pipeline north of 32-30-5078 Stock Reservoir beginning in SWNW to SENW Section 30 T50N R78W
5. 12-34 5079
6. 22-34 5079
7. 12-35 5079 cross country pipeline only
8. The beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of LRP area: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079.

1A) Engineered road 21-22 5079 Engineered Section 1 at 4+50 begins traverse on 35% slope with fills of 20.5 feet in drainage; at station 5+00 fill is 11.9 feet on top of a knob; at station 6+00 slopes are 40% with 19.0 feet of fill in drainage. Most of the road at this point is 35% also at this point road appears

to daylight on the other side of a narrow ridge. At station 8+00 road remains on 30% slopes with fill of 3.5 feet on 45% slope. At station 9+00 the first culvert is placed and will concentrate flow into 45% slope drainage. At station 12+50 slopes are 35%. This road section will disturb 2.78 acres on slopes greater than 25%. These issues were noted at the onsite and were shared with the operator at that time and also shared with the operator formally on April 12, 2011 via deficiency letter (see background section). Most notably BLM's concern was that the entire length (1,300 feet) of the proposed engineered access road (station 0+00 to the well location approximately 13+ 00 will impact slopes ranging from 25% to greater than 45% slope.

1B) Engineered pad for the 21-22 5079 is approximately 290 feet by 210 feet (1.40 acres measured to toe of fill). The engineered pad had cuts in excess of 22.6 feet. Cuts will daylight on other side of a narrow ridge where slopes are 50%. This pad will disturb 0.96 acres on slopes greater than 25%. These issues with the engineered pad were noted at the onsite and were shared with the operator at that time and also formally on April 12, 2011 via deficiency letter (see background section). Most notably BLM's concern was that this proposal would place a facility on slopes 25% and greater.

BLM did not evaluate an alternate road or location for APD 21-22 5079 because Lance could not find and did not present an alternate proposal for BLM to analyze. Lance did not adjust the engineered design to prevent daylight and did not adequately address steep slope/slope stability issues. BLM and Lance recognize that there were no feasible alternatives. See EA Section 1.1 for a complete description.

2) 12-30 5078 Cross country utility corridor had 792 linear feet of utility pipeline work proposed on slopes in excess of 25%.

3) 23-30 5078 Engineered Section 4 had 800 linear feet of cuts and fills proposed on slopes in excess of 25%. Cross country utility corridor had 800 linear feet of utility pipeline work proposed on LRP areas including: thin soils and badland components.

4) Cross country pipeline north of 32-30 5078 Stock Reservoir had 4,329 feet of utility pipeline work proposed on slopes in excess of 25%.

5) 12-34 5079 Template Section 32 (crown and ditch and out slope) and portions of the cut slope on the engineered pad had cuts and fills proposed on slopes in excess of 25%.

6) 22-34 5079 Template Section 32 (crown and ditch and out slope) and portions of the cut slope on the engineered pad had cuts and fills proposed on slopes in excess of 25%.

7) 12-35 5079 Cross country utility corridor had 1,214 linear feet of utility pipeline work proposed on slopes in excess of 25%.

8) The beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of steep slopes: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079

4.2.1.1.4. Cumulative Effects

The cumulative effects associated with Alternative B are very likely outside analysis parameters and impacts described in the PRB FEIS with the approval of APD 21-22 5079. For details on expected cumulative impacts, refer to the referenced PRB FEIS, Volume 2, Chapter 4.

The PRB FEIS defines the designation of the duration of disturbance (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization.

However the soil disturbances associated with the 21-22 5079 as proposed would result in long term, severe detrimental impacts.

4.2.1.1.5. Mitigation Measures

COAs, mitigation measures, surface upgrades, applicant committed measures, and Reclamation Policy in Appendix B would help to mitigate or reduce the impacts described above. In areas of steep topography, erosive soils and/or poor reclamation potential, BLM will consider requesting a plan to stabilize topsoil within a 30 day period from the start of construction in those areas.

Lance and BLM should apply the following mitigation to reduce impacts to soils and vegetation from surface disturbance.

1. LRP Areas: A 30 day stabilization requirement should apply to wells and access/pipelines which will have impacts to LRP areas namely badlands, blown-out lands, and rock outcrop components. The following wells and roads should be stabilized within 30 days of the start of construction: 21-22 5079, 12-34 5079, 23-30 5078 and the beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of steep slopes: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079.

2. Slopes in excess of 25%: BLM will consider applying a 30 day stabilization requirement to wells and access/pipelines that were unable to be moved away from or off of slopes in excess of 25%. The following wells and roads may receive this measure within 30 days of the start of construction: 21-22 5079, 12-30 5078 cross country pipeline only 23-30 5078, Cross country pipeline north of 32-30-5078 Stock Reservoir beginning in SWNW to SENW Section 30 T50N R78W, 12-34 5079, 22-34 5079,12-35 5079 cross country pipeline only and the beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of steep slopes: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079.

3. A 30 day stabilization requirement is applied to wells and access/pipelines which impact sands and sandy ecological sites (map unit symbol 659 map name Hiland and Vonalee). This seed mix should be applied to access/pipeline corridors in the SESW extending north to SWNW Section 11 T50N R79W. A 30-day stabilization requirement is considered for the road through the Flying E Lek mapped perimeter; applied from the start of construction..

4. The sandy seed mix is applied to wells and access/pipelines which impact sands and sandy ecological sites (map unit symbol 659 map name Hiland and Vonalee). This seed mix should be applied to access/pipeline corridors in the SESW extending north to SWNW Section 11 T50N R79W and to the road through the Flying E lek mapped perimeter.

5. Place a minimum average of 4” of aggregate on road segments where grades exceed 8%.

6. To protect erodible soils all engineered road segments should be completed, including any culverts, low water crossings and required surfacing, before the drilling rig or other drilling equipment moves onto the pad. The operator should have the licensed professional engineer(s) certify that the actual construction of engineered roads meet the design criteria(s) and are constructed to Bureau standards.

7. Provide erosion control along all pipeline routes to help achieve successful reclamation. Erosion control is defined as water bars, mulching, straw crimping, or erosion blankets, etc.

8. Cross country pipeline routes will not become roads after construction is complete. All sections of pipeline will be fully reclaimed to blend with the surrounding topography. Pipeline inspections should be conducted by ATV, foot, or air.

9. The BLM will evaluate reclamation success using the requirements set forth in the State Wide Reclamation Policy revised 2011, see Appendix B of this EA and incorporated herein.

10. No soil shall be cast over the north side of the proposed road due to steep slopes present in that area. This will apply to the beginning of the access road to the following 6 well locations in Section 26 and 27 T50N R79W is proposed in a short section of steep slopes: 12-26 5079, 13-26 5079, 23-26 5079, 34-26 5079, 41-27 5079, and 43-27 5079.

11. The road through the Flying E Lek mapped perimeter will have disturbance limited to 30 feet to minimize impacts to sandy soils.

4.2.1.1.6. Residual Effects

Residual effects across the POD would include a long-term loss of soil productivity associated with well pads and roads. The PRB FEIS identified residual effects (p. 4-408) such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

<u>21-22 5079:</u> Identified residual effects associated with the approval of APD 21-22 5079 are as follows:

1. The BLM ID Team has reviewed the engineered design and site specific reclamation plan and found it did not adequately address BLMs main concern, that of steep slopes impacted by the proposed road and pad. The engineered design was not adjusted to prevent the catch point of the cut line from day lighting on the other side of a narrow ridge. The engineer design did not address the suitability of the material used for fill on the road and pad. The engineered did state fill will be placed in shallow lifts and will be compacted, but the level of compaction is not stated. The site specific reclamation plan did not adequately address cut and/or fill slope stabilization. Steep slopes were not identified as a soil limiting factor and therefore were not mitigated. The BLM ID Team considers this proposal to have little to no reclamation potential with final reclamation bordering on difficult if not impossible to achieve.

2. The surrounding area which would be impacted by well 21-22 5079 includes drainages with steep side slopes and fragile soils. These impacts would initiate long term site instability and likely would not be able to be reclaimed meeting the requirements of the Wyoming BLM Reclamation Policy, see Appendix B of this EA.

3. The BLM ID Team identified that surface disturbance should be avoided on well 21-22 5079 location and/or the related project components cannot be authorized due to high potential for well site or road failure (listed by well in the limitations table below). In addition, the BLM ID team thinks that reclamation at this site in accordance with the BLM-WY reclamation policy is unachievable or likely uneconomically so based on their professional knowledge and experience; i.e. to facilitate eventual ecosystem reconstruction to maintain a safe and stable landscape and meet the desired outcomes of the land use plan.
   - Re-establish slope stability, surface stability, and desired topographic diversity.
   - Reconstruct the landscape to the approximate original contour or consistent with the land use plan.
   - Maximize geomorphic stability and topographic diversity of the reclaimed topography.
   - Eliminate highwalls, cut slopes, and/or topographic depressions on site, unless otherwise approved.

- Minimize sheet and rill erosion on/or adjacent to the reclaimed area. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area.

The BLM ID team has identified 1 engineered road and 1 utility corridor with poor site suitability and/or no reclamation potential within the Bear Draw Gamma POD which are denied under alternative C including:

1. Roads: Engineered Section 1

The combination of these residual effects and inadequate mitigation measures listed above the BLM ID Team considers that Alternative B as proposed with proposed well 21-22 5079 is likely outside the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS ROD and On Shore Order Number 1.

23-30 5078: The identified residual effects associated with the approval of proposed well 23-30 5078 are as follows:

1. The BLM ID Team considers this proposal to have somewhat limited reclamation potential with final reclamation bordering on difficult to achieve.

2. The surrounding area which would be impacted by proposed well 23-30 5078 includes the Flying E drainage. This section of Flying E drainage upstream from the 32-30-5078 Stock Reservoir is relatively broad bottomed and well vegetated. Sediment that does reach the drainage bottom should be kept in check by relatively stable grassy bottoms.

3. BLM also considered the following factors when considering the evaluation of proposed well 23-30 5078: 1) The cross country pipeline into the drainage is a critical piece of infrastructure, 2) The access road to well 23-30 5078 followed an existing, actively eroding abandoned ranch road which would be stabilized by the proposal, 3) Lance was willing and committed to reroute the cross country pipeline away from LRP areas. 4) Lance was willing and committed to moving the power drop originally proposed in the drainage bottom up to proposed well 12-30 5078 which would eliminate the need to ever drive the pipeline route.

With the combination of these residual effects (listed above) the BLM ID Team considers that Alternative B with proposed well 23-30 5078 is likely within the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS ROD.

Limitations

BLM specialists recommend denial of the following well due to impacts to the soil resource:

#	Well Name	Environmental Issue/Justification
1	21-22 5079	The well pad design shows impacts to slopes greater than 25% and highly erosive soils. The access to well 21-22 5079 is proposed over topography with slopes 25-45% with highly erosive soils. Portions of the proposed road and pad have poor road suitability as the design shows load bearing portion of the road and pad cut and fill falling over slopes greater than 25%. A portion of the alignment lies over a large active head-cut and numerous drainages while the entire proposal portion lies parallel with to drainage. The combination of steep slopes, severe erosion potential and shallow soil limit soil stability and promote pad and road failure and indicate that there is little or no reclamation potential.

4.2.1.2. Vegetation and Ecological Sites

4.2.1.2.1. Direct and Indirect Effects

The PRB FEIS discusses most direct and indirect effects to ecological sites and vegetation (p. 4-153 to 4-164). The proposed action would impact the common plant communities that occur on the site and the transition between the communities.

Other impacts anticipated to occur include those in the direct and indirect effects listed above under soils section. Direct effects to ecological sites would occur from ground disturbance caused by construction of well pads, compressor stations, ancillary facilities, associated pipelines and roads. Short term effects would occur where vegetated areas are disturbed but later reclaimed within 1 to 3 years of the initial disturbance. Long-term effects would occur where well pads, compressor stations, roads, water-handling facilities or other semi-permanent facilities would result in loss of vegetation and prevent reclamation for the life of the project.

Cross country pipeline crossing locations are in intermittent channels and in areas with good reclamation potential. However, many of the slopes to the bottom of the channels have steep slopes, thin soils and limited reclamation potential (See Section 4, Soils Direct and Indirect LRP and Steep Slopes).

Sagebrush does not regenerate easily after human disturbance such as urban or agricultural development, or even after natural occurrences such as wildfire. It takes years, even generations, for sagebrush to fully grow back. Sagebrush still has not returned to some areas of the Columbia Basin burned by a large fire 40 years ago (Pacific Northwest National Laboratory Shrub Steppe Ecology Series May 2010).

<u>Fragile Soils and Biological Crusts</u>

Vegetation impacted by the proposed well 21-22 5079 Engineered Section 1including the engineered pad is thin and susceptible to wind and water erosion. This is primarily due to unstable soils and physical and chemical properties that limit plant growth along the access route. This location has thin (less than 1 inch) fragile topsoil with fragile root systems used to stabilize the surface and allow plant growth, in many cases biological soil crusts and sulfur caps are the primary stabilization mechanism. BLM calculated the entire road disturbance would amount to a total of 0.24 miles (1,300 feet) of road constructed to reach the 21-22 5079 well. The entire length of the access road and engineered pad are constructed through very thin top soil, badlands, blown-out lands and rock outcrops. This road section and engineered pad will disturb 3.6 acres through these features where there is 1-2 inches of topsoil and in other areas where there is no topsoil. Authorizations for surface disturbing actions are based upon the assumptions that a disturbance can ultimately be successfully reclaimed. BLM has evaluated the operator's proposal and determined the disturbance should be avoided for the following reasons:

1. The amount of quality topsoil salvaged along this access road will be inadequate to prepare the seed bed for interim and final reclamation. The soils at this location will not provide suitable surface and subsurface physical, chemical, and biological properties to support the long term establishment and viability of the desired plant community.

2. Blade work along this route would remove root zones which have held in place a fragile and naturally unstable landform, a disturbance in this landform would create an erosional condition that will preclude BLM and the operator from reaching goals set forth the in the Wyoming Reclamation policy. The fragile plant communities will along this route will be difficult if not impossible to restore, which is why these land form are commonly recommended to be avoided.

3. Cut slopes proposed along the access road and at the well location will impact biotic crusts and sulfur caps.

4. Cut slopes are proposed to daylight on the other side to the narrow ridge at the well location.

Vegetation impacted by the proposed well 23-30 5078 engineered pad and Engineered Section 4 had 800 linear feet of cuts and fills proposed on soils which are thin and susceptible to wind and water erosion. This is primarily due to unstable soils and physical and chemical properties that limit plant growth along the access route. BLM evaluated the operator's proposal and determined the disturbance should be acceptable for the same reasons listed under Soils Residual Effects on p. 35 and p. 36.

4.2.1.2.2. Cumulative Effects

The PRB FEIS discusses the cumulative effects to ecological sites (pp. 4-153 to 4-172). Cumulative effects to ecological sites include the further alteration of disturbance regimes from the increased disturbance, increase in noxious weeds, and alterations in vegetation community's diversity and cover.

4.2.1.2.3. Mitigation Measures

Impacts to ecological sites and vegetation from surface disturbance would be reduced through the implementation of the mitigation measures in the COAs, Bear Draw Gamma POD, and its associated plans including the Integrated Weed and Pest Management Plan, the WMP, and the MSUP (specifically Section 10, Plans for Reclamation of the Surface). Some of these documents are in the administrative record for the Bear Draw Gamma POD at the BFO.

1. If applied correctly, BLM selected seed mixes which contain native grasses and forbs could restore disturbed areas to properly functioning vegetation communities with the exception of sage-brush since it's not in the current seed mixes. BLM offers the same protections to privately owned surfaces as those administered by the BLM and therefore BLM developed a site specific seed mix for the access/pipeline corridors in the SESW extending north to SWNW Section 11 T50N R79W. These mitigation measures will be applied to 0.84 mile or 4,435 feet of sandy ecological sites (map unit symbol 659 map name Hiland and Vonalee) which will require expedient reclamation. BLM can only require their use on BLM surface. The seed mix for private land is selected by the surface owner and may be more beneficial to cattle grazing.

2. The operator will follow Lance's Reclamation Plan and adapt to changing conditions and technologies (see p. 1 of Reclamation Plan submitted July 19, 2011).

3. The Operator should follow the reclamation requirements in Appendix B. See mitigation section in the soils section above for full description of the policy as it applies equally to ecological sites.

4.2.1.2.4. Residual Effects

Residual effects were also identified in the PRB FEIS, p. 4-408 such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

The alteration of biodiversity of ecological sites could result from changes in disturbance regimes, alterations in vegetation in reclaimed areas, and the spread and establishment of weed species.

BLM developed a site specific sandy seed mix for the for the access/pipeline corridors in the SESW extending north to SWNW Section 11 T50N R79W. BLM can only require their use on BLM surface. The seed mix selected on private land is selected by the surface owner and may be more beneficial to cattle grazing than it is to soil stabilization. The result may be long term wind and water erosion on the sandy soils with little or no re-vegetation success.

<u>21-22 5079:</u> Identified residual effects associated with the approval of APD 21-22 5079 are as follows:

1. The BLM ID Team considers this proposal to have little to no reclamation potential with final reclamation bordering on difficult if not impossible to achieve.

2. The proposed 21-22 5079 well location and access road would impact thin minimally protective surface vegetation, biologic soil crusts, and physical soil crusts. This would likely result in a significant increase in soil erosion into surrounding ecosystems. This increased erosion would affect stability and functionality of these sites, making mitigation of these environmental impacts impractical or unfeasible.

3. Proposed well 21-22 5079 and its associated access road would present a long term challenge for BLM and the operator to reclaim and stabilize according to guidance provided in the Wyoming Reclamation Policy – particularly with the likely loss of biological soil crusts due to the proposed construction and maintenance required for the proposed well.

The combination of these residual effects listed above the BLM ID Team considers that Alternative B with 21-22 5079 is likely outside the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS ROD and On Shore Order Number 1.

23-30 5078: The identified residual effects associated with the approval of the 23-30 5078 are as follows:

1. The BLM ID Team considers this proposal to have somewhat limited reclamation potential with final reclamation bordering on difficult but not impossible to achieve.

2. The proposed 23-30 5078 well location and access road would impact thin minimally protective surface vegetation, biologic soil crusts, and physical soil crusts. This would likely result in a significant increase in soil erosion into surrounding ecosystems. This increased erosion would affect stability and functionality of these sites. However, Engineered Section 4 with 800 linear feet of cuts and fills proposed in LRP areas and on steep slopes is short enough that with timely (within 30 days) stabilization measures applied and strict adherence to WYDEQ guidelines the is proposal is practical.

The combination of these residual effects (listed above) the BLM ID Team considers that Alternative B with proposed well 23-30 5078 is likely within the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS ROD and Onshore Order Number 1.

Limitations

BLM specialists recommend denial of the well, below, due to vegetation and ecological site impacts:

#	Well Name	Environmental Issue/Justification/Resolution
1	21-22 5079	Impacts to thin (less than 1 inch) fragile topsoil with fragile root systems used to stabilize the surface and allow plant growth: absent adequate final reclamation plan.

4.2.1.2.5. Wetlands/Riparian

4.2.1.2.5.1. Direct and Indirect Effects

The PRB FEIS identified direct and indirect effects to wet lands and riparian areas, p. 4-175. Additionally, the PRB FEIS identified effects to gallery forests of mature cottonwood trees (ROD, p. A-30). The Bear Draw Gamma POD pipeline infrastructure will have direct impacts to ephemeral drainages in the form of pipeline construction activities. These pipeline crossings will occur in the North half of Section 30 T50N R78W and will impact the Flying E drainage. The pipeline crossing in SWNW and NESW of Section 30 T50N R79W will impact an unnamed drainage.

The Bear Draw Gamma POD will use 3 water management strategies. Lance will manage produced water

from the CBNG wells through a combination of the following: 1) Treatment of produced water at the Powder Valley Unit CBM Facility, 2) Containment of produced water within Western Gas Resource #8 Reservoir, 3) Containment of produced water within 32-30 5078 Stock Reservoir. (See Section 4, Water Resources for explanation of strategies) Lance will discharge all effluent to outfalls permitted through the Wyoming Pollutant Discharge Elimination System (WYPDES), administered by the WDEQ.

4.2.1.2.5.2. Cumulative Effects

The PRB FEIS adequately covered the potential cumulative effects to the wetland and riparian areas in Chapter 4, pp. 4-178 to 179.

4.2.1.2.5.3. Mitigation Measures

Mitigation measures that will help to protect the riparian and wetland habitat potentially affected by the activities described in this EA include, but are not limited to, the control of noxious weeds, adherence to the WYPDES permit requirements for the water quality and quantity monitoring of the discharges tied to this POD development, road crossing maintenance, and enforcement of the COA's and BMP's associated with this CBNG development. Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.

4.2.1.2.5.4. Residual Effects

There will be changes to wetland and riparian areas through alterations in volume, velocity, timing, and quality of the stream flow due to direct discharge. Turbidity and solids loading in the streams would probably increase due to erosion of project disturbed areas and sediment transport to the associated drainages. These impacts would be mitigated by expediently stabilizing the disturbance and reducing the amount of sediment reaching the streams.

4.2.1.2.6. Invasive Species

4.2.1.2.6.1. Direct and Indirect Effects

The use of existing facilities along with the surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread.

4.2.1.2.6.2. Cumulative Effects

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.

4.2.1.2.6.3. Mitigation Measures

BFO identified no additional mitigation measures.

4.2.1.2.6.4. Residual Effects

It is reasonable to limit the operator's control efforts to the surface disturbance associated the implementation of the project. Cheat grass and other invasive species that are present within non-physically disturbed areas of the project area are anticipated to continue to spread unless control efforts are expanded. Cheatgrass and to a lesser extent, Japanese brome (*B. japonicus*) are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time; these annual bromes would continue to be found in the project area.

4.2.2. Wildlife

4.2.2.1. Habitat Types

4.2.2.1.1. Direct and Indirect Effects

The Bear Draw Gamma project will result in direct loss of sagebrush shrublands. Fragmentation would increase, as measured by smaller and more frequent patches with an increased amount of edge. Fragmentation of habitats is one of the primary threats to wildlife (USFWS 2010, Nicholoff 2003, Hebblewhite 2008). Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate species (Braun et al. 1976; Rotenberry & Wiens 1980). In fragmented]habitats, suitable habitat area remains only as remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig and Paloheimo 1988).

When there is loss or fragmentation of sagebrush habitats, sagebrush-obligate species decline through several mechanisms: areas of suitable habitat decreases (Temple & Cary 1988), lower reproduction rates ensue, and/or higher mortality occurs in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Density of sagebrush-obligate birds within 100 meters (328 ft) of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001). Fragmentation of shrubsteppe has the further potential to affect the conservation of sagebrush-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning, mature sagebrush communities. Thus sagebrush obligate species may not return for many years after completion of reclamation activities.

The development of the 41 CBNG well pads, 18 slots, and 15 sites with no pads or slots will remove approximately 49 acres of sagebrush habitat. The associated proposed and upgrades to existing access roads to the wells will remove approximately 295 acres. Several cross-country utility pipelines will remove approximately 4 acres of sagebrush habitat.

4.2.2.1.2. Cumulative Effects

Cumulative effects would include impacts associated with additional fee development and ongoing livestock grazing. Fee development in the vicinity would further exacerbate loss of sagebrush habitat through direct loss and effects of additional fragmentation and degradation of habitat quality. Appropriate levels of livestock grazing would not contribute to loss of sagebrush habitat, but inappropriate grazing can cause detrimental impacts to sagebrush habitats through alterations in understory communities, relative abundance of species, and changes in structure of the sagebrush canopy. Areas treated to eliminate sagebrush in order to favor herbaceous growth for livestock can result in direct loss of sagebrush habitat.

4.2.2.1.3. Mitigation Measures

BLM will consider expedient reclamation with appropriate seed mixes as a mitigation measure for restoring habitats.

4.2.2.1.4. Residual Effects

The residual effect of diminished sagebrush habitat will continue since by sagebrush's very nature, and the limits of modern plant science, it may take years and even generations to promote sagebrush re-population.

4.2.2.2. Threatened, Endangered, Proposed, and Candidate Species

4.2.2.2.1. Threatened and Endangered Species

Table 4.2. Summary of Threatened and Endangered Species Habitat and Project Effects

Common Name (scientific name)	Habitat	Project Effects	Rationale
Threatened			
Ute ladies'-tresses orchid	Riparian areas with permanent water	NE	No suitable habitat present. No flowers observed during survey. Project more than 50 miles from known populations.
Candidate			
Greater Sage-grouse	Basin-prairie shrub, mountain-foothill shrub	MIIH	Sagebrush cover will be affected.
Project Effects **LAA** - Likely to adversely affect **NE** - No effect		**NLAA** - May effect, not likely to adversely affect individuals or habitat. **MIIH** – May impact individuals and health	

4.2.2.2.1.1. Ute Ladies'-Tresses Orchid

4.2.2.2.1.1.1. Direct and Indirect Effects

The proposed project is more than 40 miles from known populations. The survey observed no flowers during the flowering period. Implementation of the proposed CBNG project will have "***no effect***" on ULT individuals or habitat.

4.2.2.2.1.1.2. Cumulative Effects

The proposed project will have no effect on ULT individuals or habitat.

4.2.2.2.1.1.3. Mitigation Measures

BFO proposes no mitigation measures.

4.2.2.2.1.1.4. Residual Effects

None identified.

4.2.2.2.2. Candidate Species

4.2.2.2.2.1. Greater Sage-grouse

4.2.2.2.2.1.1. Direct and Indirect Effects

Impacts to sage-grouse associated with energy development are discussed in detail in the *12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (USFWS 2010). Impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Research indicates that sage-grouse hens also avoid nesting in developed areas.

Implementation of the Bear Draw Gamma project will adversely impact nesting and winter habitat through direct loss, fragmentation, and avoidance of habitats. The development of the 41 CBNG well pads, 18 slots, and 15 sites with no pads or slots will remove approximately 49 acres of sagebrush habitat. The associated proposed and upgrade to existing access roads to the wells will remove approximately 195 acres. Several cross-country utility pipelines will remove approximately 4 acres of sagebrush habitat.
The existing roads within 0.25 mile of the Upper Dry Creek I Lek, Upper Dry Creek II Lek, Tear Drop Lek, and Flying E Lek will receive additional traffic throughout the year to access portion of the Bear Draw Gamma POD. Lance proposed several alternatives to provide an access road to 6 wells in sections 26 and 27 T50N, R79W. An existing two-track road travels through the 41-Upper Dry Creek I Lek.

According to the BLM Instruction Memorandum (IM) WY-2010-012, surface occupancy within 0.25 miles from the mapped perimeter of a lek is restricted. Lance proposed other alternatives which explored the idea of building new roads outside the 0.25 mile buffer, however, known nesting locations would be impacted by the alternative route. WGFD, BLM, and Lance all agreed that the existing access road was the best alternative to access the 6 wells in sections 26 and 27 T50N, R79W (see correspondence letter from WGFD in Appendix A). The same situation occurs at the 41-Flying E Lek where an existing road travels through the 0.25 mile buffer on the mapped perimeter of the lek. The best alternative is to use the existing road rather than construct a new access road (fragment habitat) through quality nesting habitat (see correspondence letter from WGFD in Appendix A).

During onsites, Lance representative moved 26 proposed well locations to reduce impacts to sagebrush obligate species and to reduce fragmentation of sage grouse habitats. See Section 2.4 Design Features (p. 9) for a complete list.

On August 9, 2011 Lance confirmed via email that Lance does not anticipate using pumping units at this time (despite the fact they are mentioned in the MSUP p. 12) and Lance would apply for pumping units as needed through the sundry process (see email correspondence sent August 9, 2011 and background section). Therefore, the direct and indirect effects pumping units may or may not have on sage-grouse populations and sage-grouse habitat suitability will be considered at the time of the sundry application.

4.2.2.2.2.1.2. Cumulative Effects

Recent research suggests that the cumulative and synergistic effects of current and foreseeable CBNG development within the vicinity of the project area are likely to impact the local sage-grouse population, cause declines in lek attendance, and may result in local extirpation. The cumulative impact assessment area for this project encompasses the project area and the area that is encompassed by a 4 mile radius around the 4sage-grouse leks that occur within 4 miles of the project boundary. Analysis of impacts up to 4 miles was recommended by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008).

The sage-grouse population within northeast Wyoming exhibited a steady long term downward trend, as measured by lek attendance (WGFD 2008b). Figure 3.1 illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that these declines may be a result, in part, of CBNG development, as discussed in detail in USFWS (2010).

Excluding the Bear Draw Gamma project, there are approximately 472 proposed wells (Automated Fluid Minerals Support System [AFMSS] July, 2011) within the cumulative effects analysis area. With the addition of these wells, well density would increase to 6.3 wells per square mile. With approval of Alternative B (76 proposed well locations) well density would increases to 6.6 wells per square mile, well above the one well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development. The existing roads within 0.25 mile of the Flying E Lek will receive additional traffic throughout the year to access a part of the proposed Ursa Minor POD.

Based on the summary of research describing the impacts of energy development on sage-grouse, efforts to reduce habitat loss and fragmentation are likely to be the most effective in ensuring long-term lek persistence.

The PRB FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area [PRB] or the entire range of the species is not likely to be compromised (p. 4-270)." Based on the impacts described in the Powder River Basin Oil and Gas Project

FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the 4 leks that occur within 4 miles of the project area, and, potentially, extirpation of the local grouse population.

4.2.2.2.2.1.3. Mitigation Measures

BFO will consider adoption of a conditions of approval that were incorporated into the BFO RMP as a maintenance action on September 17, 2010 resultant from IM-WY-2010-012. They read, "Disruptive activity is restricted on or within on quarter (0.25) mile radius of the perimeter of occupied or undetermined sage-grouse leks from 6 pm to 8 am from March 15-May 15;" and "Surface disturbing activities are prohibited from March 15 – June 30 in suitable sage-grouse nesting and early brood-rearing habitat within mapped habitat important for connectivity or within 2 miles of any occupied or undetermined sage-grouse lek." Additionally BFO recommends the application of other sage-grouse mitigation measures, found in Appendix A of the 2003 ROD, to this POD.

Additional operator design features specifically included in the proposed action under Alternative B to minimize impacts to sage-grouse include: buried power, piping produced water to a treatment facility and the following:

Mitigations for 41-Upper Dry Creek 1 Lek:

- Lance would construct a new out-slope template road along the alignment agreed to at the on-site.
- Lance would stake both edges of the route to limit disturbance.
- Utilities would be installed within the space of the road.
- Total disturbance width would be limited to 35 feet.
- Lance would reclaim the existing two-track road from the Ruby Road east to the existing stock tank.
- Lance would abide by timing restrictions of 9 am to 3 pm for disruptive activities during sage grouse timing March 15 – June 30.
- Lance would also apply 30-day stabilization requirements to this location to improve reclamation potential.

Mitigations for Flying E Lek:

- Lance would construct the road with minimal upgrades and gravel where necessary.
- In some places, additional work would be required to level out the shoulders of the existing road and provide adequate drainage.
- Lance would stake both edges of the route to limit disturbance.
- Utilities would be installed within the space of the road.
- Gates would be installed at each end of the lek segment to keep out unauthorized traffic during stips.
- Lance would abide by timing restrictions of 9 am to 3 pm for disruptive activities during sage grouse timing March 15 – June 30.
- Lance would also apply 30-day stabilization requirements to this location to improve reclamation potential.
- Total width of disturbance would be limited to 30 feet.

4.2.2.2.2.1.4. Residual Effects

A timing limitation does not mitigate loss and fragmentation of habitat or changes in disease mechanisms, nor does a timing limitation preclude maintenance activities (such as a work over rig, well enhancement, etc.) during breeding and nesting season. Suitability of the project area for sage-grouse will be negatively affected due to habitat loss and fragmentation and proximity of unrestricted human activities associated with CBNG operations and maintenance activities.

4.2.2.3. BLM-Sensitive Species

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

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-265

4.2.2.3.1. Baird's Sparrow

4.2.2.3.1.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. BFO expects the project impacts to Brewer's sparrow habitat to be similar to those described for and discussed in the greater sage-grouse section and the Loss or Degradation of Habitats and Habitat Fragmentation paragraphs for the sparrow is also a sage-brush obligate species.

4.2.2.3.1.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.1.3. Mitigation Measures

BFO recommends applying no further mitigation measures.

4.2.2.3.1.4. Residual Effects

None identified.

4.2.2.3.2. Bald Eagle

4.2.2.3.2.1. Direct and Indirect Effects

The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the PRB, particularly during the winter when migrant eagles join the small number of resident eagles. Power lines not built to Avian Power Line Interaction Committee (APLIC) standards pose an electrocution hazard for eagles and other raptors perching on them especially when overhead power is near roosting and nesting habitats. The USFWS developed additional specifications improving on the APLIC suggestions. Constructing power lines to the APLIC suggestions and USFWS standards minimizes but does not eliminate electrocution potential.

Typically two-tracks and improved project roads pose minimal eagle and vehicle collision risk while moving vehicles travel the road. In one year of monitoring road-side carcasses the BLM BFO reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and one along an improved CBNG road (less than 1%) (Bills 2004). No road-killed eagles were reported. BFO observed eagles (bald and golden) feeding on 16 of the reported road-side carcasses (less than 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.

4.2.2.3.2.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive bald eagles on pp. 4-251 to 4-253.

4.2.2.3.2.3. Mitigation Measures

BFO proposes no mitigation measures.

4.2.2.3.2.4. Residual Effects

None identified.

4.2.2.3.3. Brewer's Sparrow

4.2.2.3.3.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. BFO expects the project impacts to Brewer's sparrow habitat to be similar to those described for and discussed in the greater sage-grouse section and the Loss or Degradation of Habitats and Habitat Fragmentation paragraphs for the sparrow is also a sage-brush obligate species.

4.2.2.3.3.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.3.3. Mitigation Measures

BFO proposes no mitigation measures.

4.2.2.3.3.4. Residual Effects

None identified.

4.2.2.3.4. Loggerhead Shrike

4.2.2.3.4.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts to loggerhead shrike habitat are expected similar to those described for and discussed in the greater sage-grouse and the Loss or Degradation of Habitats and Habitat Fragmentation paragraphs, for the shrike is also a sage-brush obligate species.

4.2.2.3.4.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.4.3. Mitigation Measures

BFO proposes no mitigation measures.

4.2.2.3.4.4. Residual Effects

None identified.

4.2.2.3.5. Mountain Plover

4.2.2.3.5.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to mountain plover, pp. 4-254 to 4-255. See black-tailed prairie dog section for site specific direct and indirect effects to mountain plover habitat. In addition to impacts discussed in the PRB FEIS, mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may provide suitable nesting habitat for mountain plovers. On the other hand, increased traffic, construction, and human activities within 0.25 mile may be disruptive to nesting.

4.2.2.3.5.2. Cumulative Effects

The PRB FEIS discusses cumulative impacts to mountain plovers.

4.2.2.3.5.3. Mitigation Measures

BLM biologists recommend the application of the programmatic mitigation measures found in the PRB ROD, p. A-35 to A-37 to reduce impacts to nesting mountain plovers.

4.2.2.3.5.4. Residual Effects

Even with timing limitations on surface-disturbing activities, mountain plovers may be displaced by other activities associated with development. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some mountain plovers. BLM discloses that timing limitations do not mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still likely result in habitat loss for this species. The timing limitation will result in some decrease in direct mortalities that would occur with increased drilling traffic during the breeding season. Mortalities associated with maintenance and non-surface-disturbing activities will still occur.

4.2.2.3.6. Sage Sparrow

4.2.2.3.6.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts to sage sparrow habitat are expected to be similar to those described for and discussed in the greater sage-grouse section and the Loss or Degradation of Habitats and Habitat Fragmentation paragraphs for the sparrow is also a sage-brush obligate species.

4.2.2.3.6.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.6.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.6.4. Residual Effects

None identified.

4.2.2.3.7. Sage Thrasher

4.2.2.3.7.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts to sage thrasher habitat are expected to be similar to those described for and discussed in the greater sage-grouse section and the Loss or Degradation of Habitats and Habitat Fragmentation paragraphs for the sage thrasher is also a sage-brush obligate species.

4.2.2.3.7.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.2.3.7.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.3.7.4. Residual Effects

None identified.

4.2.2.3.8. Black-tailed Prairie Dog

4.2.2.3.8.1. Direct and Indirect Effects

Within the Bear Draw Gamma POD, there are 6 active prairie dog colonies. Table 3.7 will be used to reference prairie dog colonies by number (1-8). Colony #2 is next to an existing two track ranch road and the BDU Federal 14-3-5079 well is proposed in the prairie dog colony. Colony #4 is between 2 two-track

roads. The project has the BDU Federal 41-26 5079 proposed in the colony. Colony #5 is next to a CBNG access road that serves another POD. Lance will use the road for access to wells in the POD. Colony #7 is the largest in size and has a loop two-track road traveling through the colony; however the project does not have any infrastructure located in or within 1,000 feet (0.17 mile) of the colony.

4.2.2.3.8.2. Cumulative Effects

The PRB FEIS discusses the cumulative effects for black-tailed prairie dogs associated with circumstances similar with those in Alternative B, (pp. 4-255 to 4-256).

4.2.2.3.8.3. Mitigation Measures

No mitigation measures are required.

4.2.2.3.8.4. Residual Effects

BLM anticipates no residual impacts if overhead power is not built in active prairie dog colonies.

4.2.2.3.9. Western Burrowing Owl

4.2.2.3.9.1. Direct and Indirect Effects

The PRB FEIS discussed impacts to burrowing owls on p. 4-263. Burrow #5557 (S 14 T50N R79W) is an inactive burrowing owl nest located between 2 CBNG access roads. One road is approximately 500 feet (0.12 mile) north of the burrow and the other road is approximately 350 feet (0.09 mile) south of the burrow. An existing well is 800 feet (0.15 mile) south of the burrow. The Bear Draw Gamma project will not have any infrastructure within 0.25 mile from the burrow. Burrow #6082 is within 100 feet from the Bear Draw Gamma proposed access road and well 41-26-5079.

Annual surveys should continue for nest activity at burrow #6082. If the nest should become active then mitigation measures will apply (see mitigation section below) to reduce impacts toward the breeding/nesting pair of burrowing owls.

4.2.2.3.9.2. Cumulative Effects

In addition to the federal development, there will be fee development associated with the project that will have similar impacts on burrowing owls as those discussed in the PRB FEIS. Practices such as poisoning or shooting of prairie dogs or other intentional methods of extermination in order to increase forage for livestock can potentially affect burrowing owl productivity through a reduction in nest site availability.

4.2.2.3.9.3. Mitigation Measures

The Thunder Basin National Grasslands (TBNG) in Campbell County, WY, who 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 Section 3 for breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

4.2.2.3.9.4. Residual Effects

The timing limitation will not mitigate loss of nesting habitat. Wells, pipelines, and roads that are built in prairie dog colonies will directly impact nesting habitat and may reduce the quality of adjacent habitats for burrowing owls, regardless of the timing of their construction. Nor does a timing limitation preclude maintenance activities (work over rig, well enhancement, etc.) during breeding and nesting season. Suitability of the project area for burrowing owls will be negatively affected due to habitat loss and

fragmentation and proximity of unrestricted human activities associated with CBNG operations and maintenance activities.

4.2.2.3.10. Swift Fox

4.2.2.3.10.1. Direct and Indirect Effects

The project will impact swift fox habitat. The construction of well pads, roads, and pipelines in and adjacent to prairie dog colonies and grasslands will cause direct habitat loss. During construction of these facilities, there is the possibility that swift foxes may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and is likely to cause an increase in swift fox mortalities. Individuals are exposed more frequently to predators and have less protective cover. Mineral related traffic on the adjacent roads may result in swift fox road mortalities. Swift fox productivity will likely persist within the POD because the entire POD will have a sage-grouse Condition of Approval timing limitation for surface disturbing activities during periods important to swift fox breeding activities (see the Bear Draw Gamma Conditions of Approval). Additional impacts to swift fox are discussed in the PRB FEIS on p. 4-265.

4.2.2.3.10.2. Cumulative Effects

In addition to the federal development, there is existing fee development associated with the project that will have similar impacts on swift fox. Activities associated with livestock grazing may harass or disturb swift fox, but these activities are often transient in nature and occur at low enough frequencies that disturbance will be minimal. Practices such as poisoning or shooting of prairie dogs or other intentional methods of extermination in order to increase forage for livestock can potentially affect swift fox through a reduction in prey availability.

4.2.2.3.10.3. Mitigation Measures

Swift fox productivity will likely persist within the POD because the entire POD will have a sage-grouse Condition of Approval timing limitation for surface disturbing activities during periods important to swift fox breeding activities (see the Bear Draw Gamma Conditions of Approval)

4.2.2.3.10.4. Residual Effects

BLM discloses that timing limitation will not mitigate habitat loss. Loss of prairie dog colonies will impact swift fox dens and their prey availability despite the restriction on the timing of construction.

4.2.2.4. Big Game

4.2.2.4.1. Direct and Indirect Effects

BLM discloses that the construction of wells, pipelines and roads will disturb yearlong range for pronghorn and winter-yearlong range for mule deer. Table 2.5summarizes the proposed activities. Items identified as long term disturbance would cause direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they may provide some habitat value as they are reclaimed and native vegetation becomes established.

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD indicates a well density of 8 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 2009.

Big game animals are expected to return to the project area following construction; however, populations will likely be reduced lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not

readily habituate. A study in North Dakota stated, "Although the population (mule deer) had over seven years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer have even been documented to avoid dirt roads that were used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997).

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

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

4.2.2.4.2. Cumulative Effects

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

4.2.2.4.3. Mitigation Measures

BLM recommends no further mitigation measures.

4.2.2.4.4. Residual Impacts

While big game animals often return to the project area following construction, likely in reduced numbers, the continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to the new disturbances (Lustig 2003). BLM biologists anticipate reduced habitat effectiveness for big game in the project area.

4.2.2.5. Upland Game Birds

4.2.2.5.1. Plains Sharp-tailed Grouse

4.2.2.5.1.1. Direct and Indirect Effects

BFO is analyzing plains sharp-tailed grouse in this EA because the scoping process for the PRB FEIS identified specific concerns for this species. The PRB FEIS discusses the affected environment for plains sharp-tailed grouse on pp. 3-148 to 3-150. Habitats in the POD are limited to support sharp-tailed grouse throughout the year. This area has marginal habitat for sharp-tailed grouse because of the absence of fruit producing woody shrubs. Food resources here are limited to seasonally available forbs and insects and juniper berry production.

4.2.2.5.1.2. Cumulative Effects

Increased traffic from this project may cause mortality along access roads and increase predation. Surveys will identify known leks, however activity outside of leks will not have stipulations that will reduce human activity, ground disturbing activity (plowing and mowing), and design feature that reduce predation. The cumulative effects associated with Alternatives Bare within the analysis parameters and impacts described in the PRB FEIS, p. 4-225.

4.2.2.5.1.3. Mitigation Measures

No mitigation measures are required.

4.2.2.5.1.4. Residual Impacts

None identified.

4.2.2.6. Aquatic Species

4.2.2.6.1. Direct and Indirect Effects

Produced water from the project will be piped off of location to a treatment facility. The WDEQ regulates effluent discharge through the Wyoming Pollution Discharge Elimination System in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The WDEQ has established effluent limits for the protection of game and non-game, aquatic life other than fish, wildlife, and other water uses.

4.2.2.6.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, (pp. 4-247 to 4-249).

4.2.2.6.3. Mitigation Measures

No mitigation measures are required.

4.2.2.6.4. Residual Impacts

None identified.

4.2.2.7. Migratory Birds

4.2.2.7.1. Direct and Indirect Effects

The PRB FEIS discusses the direct and indirect effects to migratory birds (pp. 4-231 to 4-235). Disturbance of habitat in the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of wells, roads, and pipelines. Reclamation and other activities that occur in the spring may be detrimental to migratory bird survival. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Activities will likely displace migratory birds farther than the immediate area of physical disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

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

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

Migratory bird species in the PRB nest in the spring and early summer and are vulnerable to the same

effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable.

4.2.2.7.2. Cumulative Effects

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

4.2.2.7.3. Mitigation Measures

Where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds will also receive protection. A COA requiring all stock tanks include effective wildlife escape devices will reduce potential bird mortality from drowning. No additional mitigation measures are required.

4.2.2.7.4. Residual Effects

Those species and individuals that are nesting in areas unprotected by sage-grouse timing limitations or raptor timing limitations may have nests destroyed, or be disturbed, by construction activities. This is also the case for migratory birds that are still nesting after sage-grouse timing limitations are over (after June 30). Protections around active raptor nests (Feb 1- July 31) extend past most migratory bird nesting seasons, but only a small portion of known nests are active in any given year, so the protections for migratory birds from June 30 - July 31 will only be in place for those that are nesting within 0.5 miles of that small portion of active nests.

4.2.2.8. Raptors

4.2.2.8.1. 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 and can result in egg or chick mortality. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Routine human activities near these nests can also draw increased predator activity to the area and resulting in increased nest predation.

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation be located in such a way as to provide adequate biologic buffer for nesting raptors. A biologic buffer is a combination of distance and visual screening that provides nesting raptors with security such that they will not be flushed by routine activities. A list of documented raptor nests within 0.5 mile of project components is shown in Table 4.3.

On August 9, 2011 Lance confirmed via email that Lance does not anticipate using pumping units at this time (despite the fact they are mentioned in the MSUP p. 12) and Lance would apply for pumping units as needed through the sundry process (see email correspondence sent August 9, 2011 and background section). Therefore, the direct and indirect effects pumping units may have on raptor populations and raptor habitat suitability are not considered in this EA.

Table 4.3. Proposed and Existing Infrastructure within 0.5 mile of Documented Raptor Nests with the Bear Draw Gamma Project Area

#	BLM ID	Roads and/or Infrastructure
1	2651	BDU Federal 32-22-5079, BDU Federal 34-22-5079 and associated infrastructure (access road and buried utility)
2	3563	None
3	3789	BDU Federal 21-2-5079 and associated infrastructure(access road and buried utility)
4	3790	None
5	4439	BDU Federal 12-30-5078, BDU Federal 21-30-5078, BDU Federal 22-30-5078, BDU Federal 23-30-5078, BDU Federal 44-19-5078, associated infrastructure (access road and buried utility)
6	5141	None
7	6251	None
8	6252	BDU Federal 12-30-5078, BDU Federal 21-30-5078, BDU Federal 22-30-5078, BDU Federal 23-30-5078, BDU Federal 44-19-5078, associated infrastructure(access road and buried utility)
9	6615	None
10	10716	Existing access road W ½ Section 12 T49N, R79W
11	12592	BDU Federal 12-30-5078, BDU Federal 21-30-5078, BDU Federal 22-30-5078, BDU Federal 23-30-5078, BDU Federal 44-19-5078, associated infrastructure(access road and buried utility)

Analysis of the active nests having roads or infrastructure adjacent, follows:

Nest #2651

Red-tailed hawks used the nest since 2004 (except for 2008 and 2010). There are two existing CBNG wells near the nest. One well is 730feet (0.14 mile) and the other is 1,300feet (0.24 miles) from the nest. The proposed BDU Federal 32-22-5079 and BDU Federal 34-22-5079 wells are farther away than the two existing wells; therefore the impacts will be less than current conditions.

Nest#3789

Long-eared owls used the nest during the 2009 breeding season. The USFWS recommends a 1/8 mile (660 feet) biological buffer around long-eared owl nests. The BDU Federal 21-2-5079 is proposed 1,400 feet (0.26 mile), more than twice the distance suggested by the USFWS, therefore it is more than likely the proposed well will not impact the nesting pair.

Nest #4439

Long-eared owls used the nest during the 2008 breeding season. The USFWS recommends a 1/8 mile (660 feet) biological buffer around long-eared owl nests. The proposed BDU Federal 12-30-5078, BDU Federal 21-30-5078, BDU Federal 22-30-5078, BDU Federal 23-30-5078, and BDU Federal 44-19-5078 wells are all outside of the distance (biological buffer) suggested by the USFWS, therefore it is more than likely the proposed well will not impact the nesting pair.

Nest #10716

Unknown raptors used the nest during the 2009 breeding season. BLM biologist recommends a timing limitation during breeding and nesting season, per the programmatic mitigation measures. There is a proposed access road for another project within 0.25 mile of the nest. There are 2 access roads that pass within 0.5 mile of the nest. There are no present or proposed wells, impoundments or production infrastructure within 0.5 mile of the nest. Impacts from moving vehicles are minimal.

Nest #s 6252 and 12592

BDU Federal 22-30-5078 well location is approximately 0.29-miles from active golden eagle nest #6252 and 0.28-mile from active golden eagle nest #12592. The proposed well is within the biological buffer therefore impacts associated with noise, additional traffic, human presence, and equipment disruption associated with maintenance actions from well operations will more than likely cause nest abandonment during breeding/nesting season. Without the operator proposing mitigation measures that would elevate impacts to the nesting pair during breeding season, the USFWS does not recommend the approval of the BDU Federal 22-30-5078 well because of the high likelihood of violations of the MBTA and/or BGEPA (see USFWS letter in Appendix A).

BDUG 44-19-5078 is approximately 0.12 mile from active golden eagle nest #6252 and 0.14-mile from active golden eagle nest #12592. This alternate location is out of line-of-sight yet within the biological buffer therefore impacts associated with noise, additional traffic, human presence, and equipment disruptions associated with maintenance actions from well operations will more than likely cause nest abandonment during breeding/nesting season. Without the operator proposing mitigation measures that would elevate impacts to the nesting pair during breeding season, the USFWS does not recommend the approval of the BDUG 44-19-5078 well because of the high likelihood of violations of the MBTA and /or BGEPA (see USFWS letter in Appendix A). [Aside and apart from the analysis in this paragraph it is noteworthy the access route to the well would be within 800-feet and in direct line-of-sight of another golden eagle nest, #2234, in section 20, T50N R78W (which was last active during 2005-2007)].

BLM, Lance, and USFWS are working together to develop acceptable mitigation measures for the following nests, #s 12591, 12592. The PRB FEIS discussed additional direct and indirect impact to raptors from oil and gas development (pp. 4-216 to 4-221).

4.2.2.8.2. Cumulative Effects

The cumulative effects associated with Alternatives B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, p. 4-221.

4.2.2.8.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure (PRB FEIS, p. 4-218), the PRB FEIS analyzed a 0.5 mile radius timing limitation during the breeding season around active raptor nests. In order to further understand the degree of potential population effects to raptor species (PRB FEIS, p. 4-219 to 4-220), BLM recommends that annual surveys for new raptor nests and nest occupancy checks shall be completed, see also PRB 2003 ROD, A-12, #38.

4.2.2.8.4. Residual Impacts

The timing restrictions analyzed in the PRB ROD can only be applied to surface disturbing activities. These restrictions do not protect nesting raptors from human disturbance or maintenance actions (disruptive activity that can last from several days to weeks) associated with later phases of CBNG operations at well locations during breeding/nesting season. Impacts associated with noise, additional traffic, human presence, and equipment disruption associated with maintenance actions from well operations remain.

BLM specialist recommends the following wells to be deferred due to the proposed infrastructure near active golden eagle nest:

#	Well Name	Environmental Issue/Justification/Resolution
1	22-30-5079	Impacts to breeding pair of golden eagle at nests #s 6252 and 12592. Proposed well location associated with human activity may cause abandonment and violation of MBTA and BGEPA. Lance, BLM, and USFWS are still working together to resolve appropriate mitigation to reduce impacts to breeding pair of eagles.
2	44-19-5078	Impacts to breeding pair of golden eagle at nests #s 6252 and 12592. Proposed well location associated with human activity may cause abandonment and violation of MBTA and BGEPA. Lance, BLM, and USFWS are still working together to resolve appropriate mitigation to reduce impacts to breeding pair of eagles.

4.2.2.9. West Nile Virus

4.2.2.9.1. Direct and Indirect Effects

This project is likely to result in standing surface water which may potentially increase mosquito breeding habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD, p. 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.

4.2.2.9.2. Cumulative Effects

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.

4.2.2.9.3. Mitigation Measures

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.

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.

4.2.2.9.4. Residual Effects

None identified.

4.2.3. Water Resources

The operator 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 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 Bear Draw Gamma POD will use 3 water management (WMP) strategies. Lance proposes managing

produced water from the CBNG wells through a combination of: 1) treatment of produced water at the Powder Valley Unit CBM Facility; 2) containment of produced water in Western Gas Resource #8 Reservoir; and 3) containment of produced water in 32-30-5078 Stock Reservoir. All effluent discharged from the Powder Valley Unit CBM Facility or contained in listed reservoirs will be via outfalls permitted through the WYPDES, administered by the WDEQ. (See WYPDES Permit WY0056081, WY0052639, and WY0047317.)

The maximum water production is predicted to be 20.0 gpm per well or 1500 gpm (3.34 cubic feet per second (cfs) or 2419.5 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that anticipated from CBNG development per year, (Table 2-8, Projected Amount of Water Produced from CBM[NG] Wells under Alternatives 1, 2A, and 2B p. 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 44,169 acre-feet in 2011 (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 5.5% of the total volume projected for 2011. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.2.3.1. Groundwater

4.2.3.1.1. Direct and Indirect Effects

The PRB FEIS predicts an infiltration rate of 40% to groundwater aquifers and coal zones in the Upper Powder River drainage area (PRB FEIS, p. 4-5). For this action it may be assumed that a maximum of 600 gpm will infiltrate at or near the discharge points and impoundments (967 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, “the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater.” (PRB FEIS, p. 4-54) Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of CBNG production is possible impacts to the groundwater. “The effects of development of CB[NG] 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, p. 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 CBNG wells produce from depths which average 2,400 feet compared to 90 and 500 feet deep Wasatch sands in the water wells. The operator committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (0.5 mile of a federal CBNG producing well) of the proposed wells.

The PRB FEIS anticipated that recovery of the coal bed aquifer should “. . . resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater stored within the Wasatch - Tongue River sand and coals, and sands units above and below the coals is almost 750 million acre-feet of recoverable groundwater are [found in 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, p. 4-38)

4.2.3.1.2. 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, p. 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, p. 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, p. 4-65)

4.2.3.1.3. Mitigation Measures

Adherence to the drilling COAs, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and using proper cementing procedures should protect any 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.

The Wyoming DEQ developed a guidance document to address the potential impacts from infiltration on shallow ground water, "Compliance Monitoring and Siting Requirements for Unlined Impoundments Receiving Coalbed Methane Produced Water" (November, 2008). For all new WYPDES permits, the WDEQ requires that the proponent investigate the shallow groundwater at the proposed impoundment locations. Drilling at proposed impoundments began in the spring of 2004. Based on information received from the WDEQ, as of December, 2010, over 2016 impoundment sites were investigated with more than 2305 borings. Of these impoundments, 257 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 132 impoundments requiring monitoring are presently used. As of the fourth quarter of 2010 only 24 of those monitored impoundments (13.6%), caused a change in the "Class of Use" of any parameter in the underlying aquifer water.

4.2.3.1.4. Residual Effects

As described in Section 3.4.1, the production of CBNG in this project area may cause groundwater levels to drop due to the CBNG dewatering. The PRB FEIS analyzed groundwater recharge post-CBNG development. An estimated 40% of the groundwater removed would infiltrate the surface and recharge the shallow aquifers above the coal, PRB FEIS, p. 4-68.

4.2.3.2. Surface Water

4.2.3.2.1. Direct and Indirect Effects

Produced Water Quality

Average values of EC and SAR as measured at selected USGS gauging stations at high and low monthly flows as well as the Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water (there is no current standard for EC) are shown in Table 4.4. It also shows constituent limits for TDS, SAR and EC detailed in the project area WYPDES permit, and the concentrations found in the POD's representative water sample.

Table 4.4. Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Primary Watershed at Arvada, WY Gauging Station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
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 # WY0056081(River Road CBM Facility), and WY0052639 (32-30-5078 Stock Reservoir), Permit # WY0047317 (Western Gas Resources #8 Reservoir)			
At discharge point	AC	AC	AC
Predicted Produced Water Quality from the Big George coal zone			
Big George Coal Zone	2430	36.3	3220

AC = Assimilative Capacity Requirements (values vary per month)

The total assimilative capacity allocated to the permittee is based on PRB lease holding information provided to the WYDEQ by the permittee. Ambient concentration values are set by the WDEQ using USGS data. It is expected TDS concentrations discharged to the Powder River be at their lowest in the months of May and June (956 mg/l, 860 mg/l respectively) and at their highest in August and September (1,524 mg/l). For complete description of the calculations and parameters set by WDEQ see the individual WYPDES permits contained in the WMP.

A reference well from a nearby well (SENW Section 30 T50N R78W) in the Bear Draw Unit was sampled and analyzed. The TDS for the sample was 2,430 mg/l. The water quality for the water produced from the Big George target coal zone from these wells is predicted to be similar to the sample water quality collected. For complete analysis and results see the Energy Laboratories, Inc, laboratory analytical report in the WMP Attachment I.

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the PRB is the irrigation of crops, (p. 4-69). However, irrigation use is not proposed in the WMP, rather the water will be stored in on channel reservoirs or disposed of in the Powder River.

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 proposes existing WYPDES permits (WYPDES Permit WY0056081, p. 2, WY0052639, p. 8, WY0047317 p. 8) for the discharge of water produced from this project from the WDEQ. Those permits' maximum effluent limits are described in Table 4.5.

Table 4.5. Applicable WYPDES Permit Limits

Effluent Characteristic	Daily Maximum WY0056081, WY0052639, and WY0047317
pH	6.5 to 9.0
Specific Conductance (µS/cm)	7,500
Sulfates (mg/l)	3,000
Radium 226 + 228 (pCi/l)	1
Dissolved Iron (µg/l)	300
Dissolved Copper (µg/l)	6
Total Barium (µg/l)	1,800
Total Arsenic (µg/l)	8.4
Chlorides (mg/l)	150

Source: WYPDES Permit WY0056081, WY0052639, and WY0047317

The WYPDES permits also address irrigation compliance points, in the COA for the permit. The number of compliance points and locations in the WYPDES permit are below:

1. 20 designated points of compliance identified for this permit are shown in WMP WYPDES Permit Number WY0056081, Table 1, p. 18.
2. 2 designated points of compliance identified for this permit are shown in WMP WYPDES Permit Number WY0052639, Table 1, p. 18.
3. 2 designated points of compliance identified for this permit are shown in WMP WYPDES Permit Number WY0047317, Table 1, p. 21.

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 committed to designate a reference well to each coal zone within the POD boundary. BLM will consider having sample the reference well at the wellhead for analysis within 60 days of initial production and submit a copy of the water analysis to the BLM Authorized Officer. For more information refer to this POD's WMP.

Produced Water Control

There are no new discharge points proposed for this project. Existing water management facilities were evaluated for compliance with best management practices during the onsite.

Produced Water Quantity

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow, p. 4-74. Consequently, the volume of water produced from these wells may result in the addition of a maximum of 0.9 cfs below the lowest reservoir if all the water were discharged to the surface (after infiltration and evapotranspiration losses). The operator committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. BFO recommends that the Operator submit phased reclamation plans for the impoundments and that BFO approve these on a site-specific, case-by-case basis as the impoundment(s) are no longer needed for disposal of CBNG water, see BLM applied COAs.

Alternative (2A) of 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 main-stem of the Upper Powder River of 68 cfs, p. 4-86). The predicted maximum discharge rate from these wells is anticipated to be a total of 1500 gpm or 3.34 cfs to impoundments. . Using an assumed conveyance loss of 20% (PRB FEIS, p. 4-74) and full containment, the produced water re-surfacing in Flying E Creek from this action (0.9 cfs) may add a maximum 0.7 cfs to the Upper Powder River flows, or 1.0% 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, p. 4-85).

The Operator provided an analysis of the potential development in the watershed above the project area in the WMP, p. 5. Based on the area of the Flying E Creek watershed above the POD (41.6 sq mi) and an assumed density of 1 well per location every 80 acres, the potential exists for the development of 332 wells which could produce a maximum flow rate of 6,640 gpm (14.8 cfs) of water. The BLM agrees with the Operator that this is not expected to occur because:

1. Some of these wells are drilled and are producing.
2. The phasing in of new wells takes several years;
3. A decline in well water discharge generally occurs after several months of operation, and
4. The Bear Draw Gamma POD is a unit and not expected to reach 80 acres spacing.

The potential maximum flow rate of produced water within the watershed upstream of the project area, 14.8 cfs, is much less than the volume of runoff estimated from the 2-year storm event 12,273 cfs of the drainage (WMP, p. 8).

The WMP for the Bear Draw Gamma POD addressed in-channel downstream impacts. Potential downstream impacts are briefly summarized here: 1) continuous flow produced from the CBNG wells could create continuous discharge to the Powder River and Flying E Creek. This could change vegetation characteristics which could in turn affect the erosional stability of natural channels. 2) CBNG discharges may also disrupt surface activities as normally dry ephemeral drainages become perennially wet due to constant discharge of CBNG water. 3) CBNG discharges may produce increased erosion around the discharge point. For complete description and operator committed measures to mitigate these effects, see the WMP, p. 21-25. WWC Engineering addressed the in-channel downstream impacts in the WMP for the POD on behalf of Lance Oil & Gas Company, Inc.

Springs

There were 2 natural springs identified by the operator for the Bear Draw Gamma POD within 0.5 mile radius of the POD boundary. BLM will consider having the operator monitor the springs for water quality and quantity for the life of the project.

4.2.3.2.2. Cumulative Effects

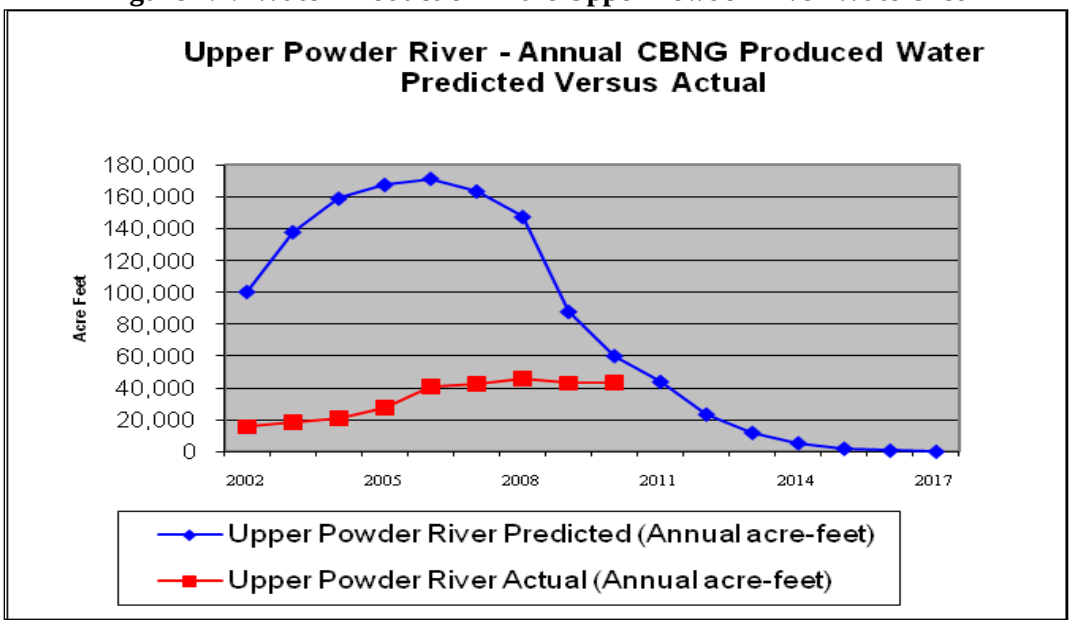
This analysis includes cumulative data from fee, state and federal CBNG development in the Upper Powder River watershed. BLM obtained these data from the WYOGCC.

As of December 2009, all producing CBNG wells in the Upper Powder River watershed discharged a cumulative volume of 298,864 acre-feet of water compared to the predicted 1,195,886 acre-feet disclosed in the PRB FEIS (Table 2-8, p. 2-26). These figures are presented graphically in Figure 4.2 and Table 4.6., following. This volume is 25.0% of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.6. Actual vs Predicted Water Production in the Upper Powder River Watershed
2010 Data Update 04-06-11

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	45,936	31.1	212,522	20.3
2009	88,046	1,135,567	43,079	48.9	255,601	22.5
2010	60,319	1,195,886	43,263	71.7	298,864	25.0
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**		**298,864**			

Figure 4.2. 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 PRB FEIS water quality analysis used produced water quality data, where available, from existing wells within each of the 10 primary watersheds in the PRB. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

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 25.0% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit is to protect downstream irrigation.
3. The commitment by the operator to manage the volume of water discharged.

Refer to the PRB FEIS, Volume 2, pp. 4-115 – 117 and Table 4-13 for cumulative effects relative to the watershed and p. 117 for cumulative effects common to all sub-watersheds.

4.2.3.2.3. Mitigation Measures

Mitigation measures the BFO should consider include the following. Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112, Bridges and Major Culverts and Manual 9113, Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM. Channel crossings by pipelines will be constructed so that the pipe is buried at least 4 feet below the channel bottom.

The operator committed to monitor the water discharge points and the channels downstream for stability. If erosion is noted, the operator will be required to repair and stabilize the area using selected mitigation techniques. The operator also committed to expediently stabilize and revegetate disturbance within channel and floodplain associated with this project.

BLM will consider having Lance sample the active spring(s) listed below once each in the spring and fall for the duration of production to ascertain changes in water quality or quantity. Analysis will follow the WYPDES Permit initial quality criteria suite. Sampling should ascertain flow rate. Lance should send copies of water quality and quantity data to the BLM BFO. This COA is considered for Grandpa Spring in SWNE of Section 2 T50N R79W and Ludock Spring in NWNE of Section 10 T50N R79W.

4.2.3.2.4. Residual Effects

"Streams enhanced by large volumes of CBNG produced water may begin to establish meander patterns on longer wavelengths in response to increased flows. Stream drainages would readjust to their existing natural flows at the end of the project's life. Down cutting (stream erosion) and sediment deposition (aggradation) are natural processes that occur as stream drainages age through time. Down cutting occurs within the upper reaches of a drainage system as the stream channel becomes incised through erosion, until the slope of the stream and its velocity are reduced and further erosion is limited. Sediment is deposited within the lower, slower reaches of a stream.

Surface drainages could be degraded from erosion caused by increased surface flow, unless rates of CBNG produced water discharge and outfall locations are carefully controlled. Increased flows could cause down cutting in fluvial environments, resulting in increased channel capacity over time within the upper and middle reaches of surface drainages." (PRB FEIS, p. 4-118)

4.2.4. Economics of CBNG Extraction

4.2.4.1. Direct and Indirect Effects

Alternative B includes the proposed roads and pipeline networks needed to support the proposed gas wells. Under Alternative B 74 wells (including the 2 deferred wells with timing limitations, COA's applied) may be approved. The project would potentially produce (in the course of project life span approximately 10-15 years) 750,000,000 MCF of CBNG and would generate about $222.0 million measured in the present value (PV) of the revenue stream. Payments in the form of the PV of the royalty stream would amount to nearly $26.1 million paid to the US Government general treasury. Of those federal royalties, the State of Wyoming would receive a little over $12.8 million.

BLM discussed the estimated production with Lance Reservoir Group and determined the average well in Bear Draw Gamma could produce. BLM and Lance Reservoir Group findings estimate the average well in the Bear Draw Gamma area will produce about 750,000 MCF with total gas estimated at about 55,500,000 MCF for the project.

Table 4.7. Prediction of Total Revenue

Number of Wells	Total Gas (MCF)	Total Revenue @ $4.00/MCF	PV of Total Revenue Stream Discounted @ 3.00%	Federal Royalties @ 12.5%	PV of Federal Royalties Discounted @ 3.00%	State of Wyoming - (49% of PV of Federal Royalty)
74	55,500,000	$222,000,000	$215,340,000	$26,917,500	$26,109,975	$12,793,887

4.2.4.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the referenced PRB FEIS, Volume 2, Chapter 4, p. 4-336.

4.2.4.3. Mitigation Measures

Management actions specific to Alternative B require that drilling and construction activities are subject to timing restrictions and limitations for wildlife values such as timing limitations for special status species: raptors, and sage-grouse. Additionally, COAs and BMPs for exploration, development, production, and reclamation will be applied to ensure that activities would not impact other resource values in the project area.

4.2.4.4. Residual Effects

The PRB FEIS described residual effects that fall within the analysis parameters for Alternative B.

4.2.5. Cultural Resources

4.2.5.1. Direct and Indirect Effects

Non eligible site(s) 48JO665, 48JO2149, 48JO2150, 48JO2153, 48JO2578, 48JO2756, 48JO2943, 48JO3008, 48JO3009, 48JO3011, 48JO3015, 48JO3021, 48JO3022, 48JO3081, 48JO3924, 48JO3925, 48JO3929, and 48JO4180 will be impacted by the proposed project. No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 7/28/2011 that no historic properties exist within the APE. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the Standard COA (General)(A)(1).

4.2.5.2. Cumulative Effects

Construction and development of oil and gas resources impacts cultural resources through ground disturbance, unauthorized collection, and visual intrusion of the setting of historic properties. This results in fewer archaeological resources available for study of past human life-ways, changes in human behavior through time, and interpreting the past to the public. Additionally, these impacts may compromise the aspects of integrity that make a historic property eligible for the National Register of Historic Places. Recording and archiving basic information about archaeological sites and the potential for subsurface cultural materials in the proposed project area serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Construction of large plans of coalbed natural gas development on split estate often include associated infrastructure that is not permitted through BLM. Project applicants may connect wells draining fee minerals, or previously constructed pipelines on fee surface with a federal plan of development. BLM has no authority over such development which can impact historic properties. BLM has the authority to modify or deny approval of federal undertakings on private surface, but that authority is limited to the extent of the federal approval. Historic properties on private surface belong to the surface owner and they are not obligated to preserve or protect them. The BLM may go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally impacted by the landowner at any time. The cumulative effect of numerous federal approvals can result in impacts to historic properties. Archeological inventories reveal the location of sites and although the BLM goes to great lengths to protect site location data, information can potentially get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public.

4.2.5.3. Mitigation Measures

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).

Archaeological monitoring is frequently a condition of approval for projects proposed in an area with a high potential for buried cultural material. A qualified archeologist performs construction monitoring by working in unison with construction crews. If the archeologist finds or confirms a buried cultural resource then construction stops while the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance. Due to the presence of alluvial deposits identified by the BLM Archaeologist during onsite inspections, as well as the NRCS soil survey (NRCS n.d.), and areas Very High Sensitivity Zones per the PUMP III Model (Eckerle 2005), the operator must have an archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COAs.

4.2.5.4. Residual Effects

During the construction phase, there will be numerous crews working across the project area using heavy construction equipment without the presence of archaeological monitors. Due to the extent of work and the surface disturbance caused by large vehicles, it is possible that unidentified cultural resources can be damaged by construction activities. The increased human presence associated with the construction phase can also lead to unauthorized collection of artifacts or vandalism of historic properties.

4.3. Alternative C – Modified Action

Alternative C is a modification of Alternative B based on BLM removing 1 APD: 21-22 5079 and its infrastructure and mitigation from the project proposal; as that APD would have exceptional direct and residual impacts to surface disturbance in an area which has little or no reclamation suitability. Alternative C also analyzes economic projections of CBNG extraction based on the denial of the above APD. Alternative C incorporates by reference all the mitigation measures and their analysis from

Alternative B – except that for 1 denied APD and the changes inherent in Alternative C's economic analysis. Alternative C also incorporates by reference the proposal by Lance and BLM to defer 2 APDs, as found in Alternative B.

4.3.1. Soils

4.3.1.1. Direct and Indirect Effects

The impacts to soils under Alternative C will be the within the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS and ROD.

4.3.1.1.1. Soils Susceptible to Erosion

Construction impacts discussed specific to proposed well 21-22 5079 (See Section 4, Soils Direct and Indirect Effects, Alternative B) will be avoided with the denial of this APD. Thus impacts under Alternate C to soils susceptible to erosion have reasonable likelihood of minimizing adverse effects from surface disturbance and are likely to receive successful reclamation.

4.3.1.1.2. Slopes in Excess of 25%

Construction impacts discussed specific to 21-22 5079 (See Section 4, Soils Direct and Indirect Effects, Alternative B) will be avoided with the denial of this APD. Thus impacts under Alternate C to slopes in excess of 25% have reasonable likelihood of minimizing adverse effects from surface disturbance and are likely to receive successful reclamation.

<u>Slopes in Excess of 25%</u>

Most landscapes can be reclaimed using established conventional reclamation methods. However, some areas have unique characteristics that make achieving all the reclamation requirements unrealistic. Areas posing the most extreme reclamation challenges will be identified as having steep slopes. Such is the case with access road to and well location 21-22 5079; this location has highly sensitive and erosive soils, extremely sensitive vegetation types, soils with severe physical or chemical limitations (See WY Reclamation Policy, Appendix B of this EA). Steep slopes ranging from 25% to 45% created these conditions. Alternatives considered throughout the process were avoidance or unconventional site specific reclamation; however avoidance was not possible due to the APD location and surrounding topography. BLM did evaluate an unconventional site specific reclamation plan and found steep slopes could not be avoided and impacts were not adequately addressed by a combination of soil stabilization products/hydro-mulch and erosion control blankets as well as organic amendments additions (i.e. Biosol/Sustane) to increase soil fertility. The engineer design did not address the suitability of the material used for fill on the road and pad. Surface occupancy or use within slopes in excess of 25% is restricted or prohibited unless the operator and BLM arrive at an acceptable plan for mitigation of anticipated impacts. BLM will continue to strongly consider avoidance in order to retain the project within the parameters of the PRB ROD and the Wyoming Reclamation Policy. This is in line with BFOs current policy to avoid impacts to slopes in excess of 25%.

4.3.1.1.3. Limited Reclamation Potential (LRP)

4.3.1.1.3.1. Miscellaneous Areas

Construction impacts discussed specific to proposed well 21-22 5079 (See Section 4, Soils Direct and Indirect Effects, Alternative B) will be avoided with the denial of this APD. Thus impacts under Alternate C to miscellaneous areas have reasonable likelihood of minimizing adverse effects from surface disturbance and are likely to receive successful reclamation.

<u>Badlands and Rock outcrops</u>

Most landscapes can be reclaimed using established conventional reclamation methods. However, some areas have unique characteristics that make achieving all the reclamation requirements unrealistic. Areas posing the most extreme reclamation challenges will be identified as having LRP. Such is the case with

access road to and well location 21-22 5079; this location has highly sensitive and erosive soils, extremely sensitive vegetation types, soils with severe physical or chemical limitations (See WY Reclamation Policy, Appendix B of this EA). Alternatives considered throughout the process were avoidance or unconventional site specific reclamation. BLM did evaluate an unconventional site specific reclamation plan and found LRP areas could not be avoided but rather impacts were addressed by a combination erosion control blankets for environmentally sensitive erosion protection and the application of organic amendments to increase soil fertility. Soil testing is recommended to determine if lime and gypsum additions are required due to the potential for low pH and high salinity/sodicity. BLM will continue to strongly consider avoidance in order to retain the project within the parameters of the PRB ROD and the Wyoming Reclamation Policy. This is in line with BFOs current policy to avoid impacts to LRP areas.

4.3.2. Vegetation and Ecological Sites

Construction impacts discussed specific to proposed well 21-22 5079 (See Section 4, Vegetation and Ecological Sites Direct and Indirect Effects, Alternative B) will be avoided with the denial of this APD. Thus impacts under Alternate C to vegetation and ecological sites have reasonable likelihood of minimizing adverse effects from surface disturbance and are likely to receive successful reclamation.

Fragile Soils and Biological Crusts

Vegetation impacted by the proposed well 21-22 5079 Engineered Section 1 including the engineered pad is thin and susceptible to wind and water erosion. This susceptibility is primarily due to unstable soils and physical and chemical properties that limit plant growth. Biological crusts are indicative of locations with thin fragile soils with fragile root systems. These crusts and fine root systems are used to stabilize the surface and allow plant growth, in many cases biological, physical, and chemical soil crusts are the only stabilization mechanism. Such is the case with access road and well location 21-22 5079. Alternatives considered throughout the process were avoidance or unconventional site specific reclamation. BLM did evaluate an unconventional site specific reclamation plan and found fragile soils were not sufficiently addressed by the proposed remedy of a combination of erosion control blankets for environmentally sensitive erosion protection and the application of organic amendments to increase soil fertility. BLM will continue to strongly consider avoidance in order to retain the project within the parameters of the PRB ROD and the Wyoming Reclamation Policy. This is in line with BFOs current policy to avoid impacts to fragile soils.

4.3.3. Economics of CBNG Resource Extraction

4.3.3.1. Direct and Indirect Effects

Alternative C includes much of the proposed roads and pipeline networks needed to support the proposed wells but would result in the elimination of up to 1 well and its associated infrastructure. Under Alternative C, 73 APDs with timing limitations and / or COAs applied (largely analyzed under Alternative B) may eventually receive approval. The project would potentially produce 54,750,000 MCF of CBNG reserves and would generate about $212.4 million measured in the PV of the total revenue stream. The PV of the royalty stream would be nearly $25.8 million paid to the US Government general treasury. Of those federal royalties, the State of Wyoming would receive about $12.6 million.

Table 4.8. Comparison of Impacts of Fluid Minerals

Management Action	Total Gas (MCF)	Total Revenue @ $4.00/MCF	PV of Total Revenue Stream Discounted @ 3.00%	Federal Royalties @ 12.5 %	PV of Federal Royalties Discounted @ 3.00%	State of Wyoming - (49% of PV of Federal Royalty)
Alternative B	55,500,000	$222,000,000	$215,340,000	$26,917,500	$26,109,975	$12,793,887
Alternative C (Modified Action)	54,750,000	$219,000,000	$212,430,000	$26,553,750	$25,757,137	$12,620,997

Alternative C may yield approximately 1% less revenue measured in the PV of the revenue stream to the Operator and about 1% less discounted royalties to the federal government and the State of Wyoming.

If Lance chose to pursue permits for APDs withdrawn on November 20, 2009, namely APDs 14-24 5079 and 23-24 5079 due to tribal consultation requirements, Lance likely could more than offset the revenue loss from implementation of Alternative C. If that were the case then there will be no loss in revenue stream to the operator, no reduction in royalties to the federal government, and the State of Wyoming.

4.3.3.2. Cumulative Effects

Cumulative effects for Alternative C are similar to those identified in Alternative B, but it is important to acknowledge there would be a reduction in revenue associated with not approving 1 well, which translates into about a 1% reduction ($2.9 million dollars) in the PV of the total revenue stream associated with these wells.

The impact from the reduction in wells would reduce the drilling activities in conjunction with lowering production and associated revenue to the operators. Moreover, there would be a loss of about $353 thousand dollars in the PV of federal and state royalties, which translates into a loss of about 1 percent. Property taxes and severance taxes would also go down as a result of not approving these wells. The reduction in drilling and subsequent production would also produce a minor impact on the local economy measured in terms of the loss in personal income and employment. But without running a regional economic model, those impacts cannot be quantified. However, the loss in economic activity would be, to some unknown extent, offset by the benefits to other resources and activities. For example, there are both market and non-market benefits associated with the preservation of wildlife habitat, maintenance of open space, maintaining buffer zones around nesting areas for raptors and creating and maintaining wildlife viewing areas for non-consumptive recreation use. But in the absence of quantifying these values, the benefits and costs associated with the reduction in oil wells compared to enhancing the area for wildlife and wildlife viewing cannot be made. Nonetheless, these tradeoffs need to be considered, at least qualitatively, when making these decisions. And while the Bear Draw Gamma POD project is primarily on private surface and/or landlocked federal surface, the benefit of a reduction in the number of wells approved is not just limited to private ranchers and those individuals that have access to the area, but there is also a non-use value component that would also add to the overall benefits of protecting this area.

4.3.3.3. Mitigation Measures

Mitigation measures for Alternative C are the same as those identified in Alternative B.

4.3.3.4. Residual Effects

Residual effects for Alternative C are the same as those identified in Alternative B.

5. CONSULTATION & COORDINATION

The BLM's BFO consulted with the agencies in Table 5.1 on the proposed project to confirm compliance with applicable laws and regulations.

Table 5.1. Consultations

Contact	Title	Organization	Onsite Presence
Allan Neilson	Lessee	Tear Drop Cattle Co., LLC	No
Brad Rogers	Biologist	USFWS	Yes
Bud Stewart	Energy Development Biologist	WGFD	Yes
Duane Stanahan	Landowner	Tear Drop Cattle Co., LLC	No
Mary Hopkins	State Historic Preservation Officer	SHPO	No
Nikki Lohse	Conservation District Coordinator	NRCS	No
Phil Gonzales	Conservation District Coordinator (retired)	NRCS	No
Robert Ruby	Landowner	Ruby Ranch	No
Tim Thomas	Wildlife Biologist	WGFD	Yes

6. REFERENCES AND AUTHORITIES

Agnew, W. D. 1983. Flora and Fauna Associated with Prairie Dog Ecosystems. Unpublished thesis. Colorado State University, Fort Collins. 47pp.

Agnew, W. D. 1988. Arthropod Consumption by Small Mammals on Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Eighth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM 154. pgs. 81-87.

Agnew, W., D. W. Uresk. and R. M. Mansen. 1986. Flora and Fauna Associated with Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Journal of Range Management 39, pgs 135-139

AHPIS, Animal and Plant Health Inspection Service. 2002. General information available online at http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html.

Aldridge, C. L., and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: a habitat-based approach for endangered greater sage-grouse. Ecological Applications 17:508-526.

Apa, A. D. 1985. Efficiency of Two Black-tailed Prairie Dog Rodenticides and Their Impacts on Non-target Bird Species. Unpublished thesis, South Dakota State University Brookings. 71pp.

Avian Power Line Interaction Committee (APLIC) 2006. R. Harness, contributing author to: Suggested Practices for Avian Protection on Power Lines: State of the Art in 2006. 207pp.

Bills, Thomas E. 2004. Powder River Basin Oil & Gas Project Semi-Annual Report: May 1, 2003 – October 31, 2003. BLM Buffalo Field Office. Buffalo, WY. 8pp.

Big Horn Environmental Consultants. 2008. Powder Valley Unit – Delta POD Wildlife Survey and Habitat Report. Sheridan, WY. 11pp.

Braun C. E. 1998. Sage-grouse declines in western North America: what are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies. 67:134–144.

Braun C. E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin. 88:165–171.

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and Gas Development in Western north America: Effects on Sagebrush Steppe Avifauna with Particular Emphasis on Sage Grouse. In: Transactions of the 67th North American Wildlife and Natural Resources Conference. pp337-349.

Bureau of Land Management. 2004. Instruction Memorandum No. WY-2005-057: Statement of Policy Regarding Sage-Grouse Management Definitions, and Use of Protective Stipulations, and Conditions of Approval. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Bureau of Land Management. 2008. Fact Sheet Greater Sage-Grouse Buffalo Field Office RMP Amendment. May 28, 2008

Bureau of Land Management. 1990. Instruction Memorandum No. WY-90-564: Resource Management Plan Action and Wyoming BLM Standard Mitigation Guidelines for Surface Disturbing Activities. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Campbell, Thomas and Tim Clark. 1981. Colony Characteristics and Vertebrate Associates of White-tailed and Black-tailed Prairie Dogs. American Midland Naturalist, Vol. 105, No. 2 (April 1981). pgs 269-276.

Canfield, J. E., L. J. Lyon, J. M. Hillis, and M. J. Thompson. 1999. Ungulates. Chapter 6 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coordinated by G. Joslin and H. Youmans. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Clark, T. W., T. M. Campbell, D. G. Socha, and D. E. Casey. 1982. Prairie Dog Colony attributes and Associated Vertebrate Species. Great Basin Naturalist 42: 572-582.

Code of Federal Regulations (CFR)

1. 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of July 1, 2004.
2. 43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of October 1, 2006.

Confluence Consulting, Inc. 2004. Powder River Biological Survey and Implications for Coalbed Methane Development. Bozeman, MT. 179pp.

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines for management of sage grouse populations and habitats. Wildlife Society Bulletin 28:967-985.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.

Cornish, Todd; Terry Creekmore; Walter Cook; and Elizabeth Williams. 2003. "West Nile Virus - Wildlife Mortality in Wyoming 2002-2003". In: The Wildlife Society Wyoming Chapter Program and Abstracts for the Annual Meeting at the Inn in Lander, WY November 18-21, 2003. Wildlife Society Wyoming Chapter. 17pp.

Cornish, Todd. Personal Communication. Wyoming State Veterinary Laboratory, University of Wyoming. Laramie, WY. (307) 742-6638. tcornish@uwyo.edu.

Dantzker, M. S., Deane, G. B. & Bradbury, J. W. 1999. Directional acoustic radiation in the strut display of male sage grouse Centrocercus urophasianus. Journal of Experimental Biology, 202, 2893–2909.

Danvir, Rick E. 2002. Sage Grouse Ecology and Management in Northern Utah Sagebrush-Steppe: A Deseret Land and Livestock Wildlife Research Report. Deseret Land and Livestock Ranch and the Utah Foundation for Quality Resource Management. Woodruff, UT.

Debruin, R.H., R.M. Lyman, R.W. Jones, and L.W. Cook. 2001. Coal Bed Methane in Wyoming. Wyoming State Geologic Survey. Information Pamphlet 7.

Deisch, M. S., D. W. Uresk, and R. L. Lindor. 1989. Effects of Two Prairie Dog Rodenticides on Ground Dwelling Invertebrates in Western South Dakota. Ninth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM. Pgs 171-181.

Dobkin D. S. 1994. *Conservation and management of Neotropical migrant landbirds in the northern Rockies and Great Plains*. University of Idaho Press, Moscow, ID.

Doherty, K.E., D.E. Naugle, B.L. Walker, J.M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management. In press.

Ebert, Jamies I., and Timothy A. Kohler. 1988. The Theoretical Basis of Archaeological Predictive Modeling and a Consideration of Appropriate Data-Collection Methods, in *Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling* edited by W. James Judge and Lynne Sebastian, pp 97-171. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO.

Eckerle, William. 2005. Experimental: Archaeological Burial Model for Powder River and Tongue River Hydrological Basins, Wyoming. In *Adaptive Management and Planning Models for Cultural Resource in Oil and Gas Fields in New Mexico and Wyoming*, by Eric Ingbar, Lynne Sebastian, Jeffrey Altschul, Mary Hopkins, William Eckerle, Peggy Robinson, Judson Finley, Stephen A. Hall, William E. Hayden, Chris M. Rohe, Tim Seaman, Sasha Taddie, and Scott Thompson, pp. 39-102. Prepared for the Department of Energy, National Energy Technology Laboratory by Gnomon, Inc. Electronic Document, http://www.gnomon.com/DOEPumpIII/FinalCombinedReport.pdf, accessed August and September 2010.

Fahrig, L., and J. Paloheimo. 1988. Determinations of local population size in patchy habitats. Theorectical Population Biology 34:194-213.

Fertig, W. 2000. *Status Review of the Ute Ladies Tresses (Spiranthes diluvialis) in Wyoming*. Wyoming Natural Diversity Database, Laramie, Wyoming.

Geist, V. 1978. Behavior. Big Game of North America; ecology and management. Stackpole Books, Harrisburg, Pennsylvania.

Gelbard J. L., and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. Conservation Biology. 17:420–432.

Gibson, R. M. 1989. Field playback of male display attracts females in lek breeding Sage Grouse. Behavioral Ecology and Sociobiology 24: 439-443.

Gibson, R. M. and J. W. Bradbury. 1986. *Male and female mating strategies on sage grouse leks*. Pp. 379-398 in Ecological aspects of social evolution: birds and mammals (D. I. Rubenstein and R. W. Wrangham, eds.). Princeton Univ. Press, Princeton, New Jersey.

Grenier, M., B. Oakleaf, K. Taylor, and M. Hymas. 2004. *Inventory and Mapping of Black tailed Prairie Dogs in Wyoming – An Estimate of Acreage Completion Report*.

Grenier, M. 2003. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department. Lander, WY. 16pp

Haug, E. A. and L. W. Oliphant. 1985. Movements, Activity Patterns, and Habitat Use of Burrowing Owls in Saskatchewan. Journal of Wildlife Management. 54(1):27-35.

Hazlett, D.L. 1996. *The discovery of Spiranthes diluvialis along the Niobrara River in Wyoming and Nebraska*. Report prepared for the Bureau of Land Management Wyoming State Office.

Hazlett, D.L. 1997. *A 1997 search for Spiranthes diluvialis in southeastern Wyoming and western Nebraska*. Report prepared for the Bureau of Land Management Wyoming State Office.

Heidel, Bonnie. Botanist. Wyoming Natural Diversity Database. University of Wyoming. Laramie, WY.

Hiat, G.S. and D. Baker. 1981. Effects of oil/gas drilling on elk and mule deer winter distributions on Crooks Mountain, Wyoming. Wyoming Game and Fish Department.

Holloran, M. J, and S. H. Anderson. 2005. Spatial distribution of Greater Sage-Grouse nests in relatively contiguous sagebrush habitats. Condor 107:742-752.

Holloran, M J.; B. J. Heath; A. G. Lyon; S. J. Slater; J. L. Kuppiers; and S. H. Anderson. 2005. Greater sage-grouse nesting habitat selection and success in Wyoming. J. Wildl. Manage. 69(2):638-649.

Holloran, M. J., R. C. Kaiser, and W. A. Hubert. 2007. Population Response of yearling greater sage-grouse to the infrastructure of natural gas fields in southwestern Wyoming. Completion report. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY, USA. 34pp.

Hoogland, J. 1995. *The black-tailed prairie dog: Social life of a burrowing mammal*. Chicago: Chicago University Press.

Hubert, W. A. 1993. *The Powder River: a relatively pristine stream on the Great Plains*. Pages 387-395 in L. W. Hesse, C. B. Stalnaker, N. G. Benson, and J. R. Zuboy, editors. Restoration planning for the rivers of the Mississippi River ecosystem. Biological Report 19, National Biological Survey, Washington, D.C.

Ingelfinger, F., and S. Anderson. 2004. Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. Western North American Naturalist 64:385-395

Ingelfinger F. 2001. *The effects of natural gas development on sagebrush steppe passerines in Sublette County, Wyoming*. M.Sc. thesis, University of Wyoming, Laramie, WY.

Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Arc Wildlife Services Ltd., Calgary, Alberta, Canada.

Jellison, Bert. 2005. Sage-Grouse Restoration Project: Lake DeSmet Conservation District. Wyoming Game and Fish Department. Sheridan, WY.

Kelly Brian T. 2004. Letter to interested parties: Black-footed ferret clearance surveys. U.S. Fish and Wildlife Service (February 2, 2004). Cheyenne, WY. 4pp.

King, J. A. 1955. Social Behavior, Social Organization and Population Dynamics in a Black-tailed Prairie Dog Town in the Black Hills of South Dakota. Contr. Lab. Vert. Biol., University of Michigan. 67pp.

Klute, D. S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. U.S. Department of the Interior; Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C.

Knick, S. T., and J. T. Rotenberry. 1995. Landscape characteristics of fragmented shrubsteppe habitats and breeding passerine birds. Conservation Biology 9:1059-1071.

Knick S. T., D. S. Dobkin, J. T. Rotenberry, M. A. Schroeder, W. M. Vander Haegen, and C. van Riper III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor. 105:611–634.

Knight R. L., and J. Y. Kawashima. 1993. Responses of raven and Red-tailed Hawk populations to linear right-of-ways. Journal of Wildlife Management. 57:266–271.

Knopf F.L. and J.R Rupert. 1995. Habits and habitats of Mountain Plovers in California. Condor 97:743-751.

Lageson, D.R., and D.R. Spearing. 1991. Roadside Geology of Wyoming. Mountain Press Publishing Company.

Landry, R.E. 1979. *Growth and development of the Burrowing Owl*. M.S. thesis, California State University, Long Beach, CA.

Litzel, R. 2004. Personal communication [January 6 phone conversation with Jim Sparks]. Johnson County Weed and Pest District.

Lowham, H.W. Streamflows in Wyoming WRIR 88-4045 U.S. Geological Survey 1988

Lustig, Thomas D., March. 2003. Where Would You Like the Holes Drilled into Your Crucial Winter Range? Transactions of the 67th North American Wildlife and Natural Resources Conference.

Marra PP, Griffing SM, McLean RG. West Nile virus and wildlife health. Emerg Infect Dis [serial online] 2003 Jul. Available from: URL: http://www.cdc.gov/ncidod/vol9no7/03-0277.htm.

McCraken, J. G., D. W. Uresk and R. M. Mansen. 1985. Burrowing Owl Foods in Conata Basin, South Dakota. Great Basin Naturalist 45: 287-290.

McDonald, D., N.M. Korfanta, and S.J. Lantz. 2004. *The Burrowing Owl (Athene cunicularia): a technical conservation assessment*. USDA Forest Service, Rocky Mountain Region.

Meffe, G.K. and C.R. Carroll. 1994. *Principles of Conservation Biology*. Sinauer Associates, Inc. Sunderland, MA.

Miller, K.A Peak-Flow Characteristics of Wyoming Streams WRIR 03-4107 U.S. Geological Survey 2003

Mooney, A. 2004. Personal Communication [January 6 phone conversation with Jim Sparks]. Campbell County Weed and Pest District.

Moynahan, B. J. and M. S. Lindberg. 2004. *Nest Locations of Greater Sage-Grouse in Relation to Leks in North-Central Montana*. *Presented at* Montana Sage-Grouse Workshop, Montana Chapter of The Wildlife Society, Billings.

Moynahan, B. J.; M. S. Lindberg; J. J. Rotella; and J. W. Thomas. 2005. Factors Affecting Nest Survival of Greater Sage-Grouse in Northcentral Montana. J. Wildl. Manage.

Moynahan, B. J., M. S. Lindberg, J. J. Rotella, and J. W. Thomas. 2007. Factors affecting nest survival of greater sage-grouse in north-central Montana. Journal of Wildlife Management 71:1773-1783.

Naugle, D. E.; C. L. Aldridge; B. L. Walker; T. E. Cornish; B. J. Moynahan; M. J. Holloran; K. Brown; G. D. Johnson; E. T. Schmidtmann; R. T. Mayer; C. Y. Kato; M. R. Matchett; T. J. Christiansen; W. E. Cook; T. Creekmore; R. D. Falise; E. T. Rinkes; and M. S. Boyce. 2004. West Nile virus: Pending Crisis of Greater Sage-grouse. Ecology Letters. 7:704-713.

Naugle, David E.; Brett L. Walker; and Kevin E. Doherty. 2006. Sage Grouse Population Response to Coal-bed Natural Gas Development in the Powder River Basin: Interim Progress Report on Region-wide Lek Analyses. May 26, 2006. University of Montana. Missoula, MT. 10pp.

Noss, R. F. and A. Cooperrider. 1994. *Saving Nature's Legacy: Protecting and Restoring Biodiversity*. Defenders of Wildlife and Island Press, Washington, D. C.

NRCS Web Soil Survey. n.d. Electronic document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Oakleaf, Bob. January 13, 1988. Letter to BFAT: Preliminary BFF Reintroduction Site Analysis, Meeteetse Management Plan Assignments. Wyoming Game and Fish Department. Lander, WY. 10pp.

Olenick, B. E. 1990. *Breeding biology of burrowing owls using artificial nest burrows in southeastern Idaho*. Thesis, Idaho State University, Pocatello, Idaho, USA.

Paige, C., and S. A. Ritter. 1999. *Birds in a sagebrush sea: managing sagebrush habitats for bird communities*. Partners in Western Flight working group, Boise, ID.

Patterson, C. T. and S. H. Anderson. 1985. Distributions of Eagles and a Survey for Habitat Characteristics of Communal Roosts of Bald Eagles (Haliaeetus leucocephalus) Wintering in Northeastern Wyoming. Wyoming Cooperative Fishery and Wildlife Research Unit. University of Wyoming. Laramie, WY.

Porneluzi, P, J. C. Bednarz, L. J. Goodrich, N. Zawada, and J. Hoover. 1993. Reproductive performance of territorial Ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. Conservation Biology 7:618-622.

Primack, R.B. 1993. Essentials of conservation biology. Sinauer Associates, Sunderland, Massachusetts, USA.

Reading, R. P., S. R. Beissinger, J. J. Grensten, and T. W. Clark. 1989. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. pgs 13-28.

Reading, R., and Randy Matchet. 1997. Attributes of Black-tailed Prairie Dog Colonies in Northcentral Montana. Journal of Wildlife Management 61(3): 664-673.

Rinkes, T. 2003. Personal communication [Draft notes from Annual Sage-Grouse and Sagebrush Species of Concern Meeting]. Bureau of land Management Wildlife Biologist/Sage Grouse Coordinator.

Robinson, S. K. 1992. *Population dynamics of breeding birds in a fragmented Illinois landscape*. Pages 408-418 in J. Hagan and D. W. Johnston, editors. Ecology and conservation of neotropical migrant land birds. Smithsonian Institution press, Washington, D. C.

Rogers, Brad. Personal Communication. Fish and Wildlife Biologist. U.S. Fish and Wildlife Service, Cheyenne Field Office. Cheyenne, WY.

Romin, Laura A., and Muck, James A. May 1999. Utah Field Office Guidelines For Raptor Protection From Human And Land Use Disturbances. U.S. Fish and Wildlife Service, Salt Lake City, Utah

Rotenberry J. T., and J. A. Wiens. 1980a. Habitat structure, patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. Ecology. 61:1228–1250.

Rowland, M. M., M. Leu, , S. P. Finn, S. Hanser, L. H. Suring, J. M. Boyd, C. W. Meinke, S. T. Knick, and M. J. Wisdom. 2005. Assessment of threats to sagebrush habitats and associated species of concern in the Wyoming Basins. Version 1.1, June 2005, unpublished report on file at USGS Biological Resources Discipline, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Rowland, M. M., M. Leu, , S. P. Finn, S. Hanser, L. H. Suring, J. M. Boyd, C. W. Meinke, S. T. Knick, and M. J. Wisdom. 2005. Assessment of threats to sagebrush habitats and associated species of concern in the Wyoming Basins. Version 1.1, June 2005, unpublished report on file at USGS Biological Resources Discipline, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebs, K.S. McKelvey, and J.R. Squires. 1999. The Scientific Basis for Lynx Conservation: Qualified Insights. Ch16. USDA Forest Service Technical Report RMRS-GTR-30.

Saab, V., and T. Rich. 1997. *Large-scale conservation assessment for neotropical migratory landbirds in the Interior Columbia River Basin*. USDA Forest Service General Technical Report PNW-GTR-399, Portland, Oregon, USA.

State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development. 2008. Using the best available science to coordinate conservation actions that benefit greater sage-grouse across states affected by oil and gas development in Management Zones I-II (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming). Unpublished report. Colorado Division of Wildlife, Denver; Montana Fish, Wildlife and Parks, Helena; North Dakota Game and Fish Department, Bismarck; Utah Division of Wildlife Resources, Salt Lake City; Wyoming Game and Fish Department, Cheyenne.

Steenhof K., M. N. Kochert, and J. A. Roppe. 1993. Nesting by raptors and Common Ravens on electrical transmission line towers. Journal of Wildlife Management. 57:272–281.

Stinson, D. W., D. W. Hays, and M. A. Schroeder. 2004. Washington State Recovery Plan for the Sage-grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 109 pages.

Temple S. A. 1986. Predicting impacts of habitat fragmentation on forest birds: A comparison of two models. Pages 301-304 in Wildlife 2000 (J. Verner, C. J. Ralph, and M. L. Morrison, Eds.). Univ. Wisconsin Press, Madison.

Temple S.A., and J. R. Cary. 1988. Modeling dynamics of habitat-interior bird populations in fragmented landscapes Conserv. Biol.2 :340-347.

Temple, S.A., and B.A. Wilcox. 1986. Introduction: Predicting effects of habitat patchiness and fragmentation. In *Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates*, ed. J. Verner, M.L. Morrison, and C.J. Ralph, 261-62. Madison: University of Wisconsin Press.

The National Environmental Policy Act of 1969 (NEPA), as amended (Pub. L. 91-90, 42 U.S.C. 4321 et seq.).

Urban, D. L., and H. H. Shugart, Jr. 1984. Avian demography in mosaic landscapes: modeling paradigm and preliminary results. Pages 273-280 in J. Verner, M. L. Morrison, and C. J. Ralph editors. Wildlife 2000: Modeling habitat relationships of terrestrial vertebrates. University of Wisconsin Press, Madison.

U.S. Department of the Interior, Bureau of Land Management and Office of the Solicitor (editors). 2001. The Federal Land Policy and Management Act, as amended. Public Law 94-579.

U.S. Department of the Interior 2001, Bureau of Land Management, Buffalo Field Office. Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office April 2001.

U.S. Department of the Interior 2003, Bureau of Land Management. Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment. April 30, 2003.

U.S. Department of the Interior 2007, US Fish and Wildlife Service. Reinitiation of Formal Consultation for Powder River Oil and Gas Project. March 23, 2007

U.S. Department of the Interior, Fish and Wildlife Service. 2002. Final Biological and Conference Opinion for the Powder River Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties (WY6633). U.S. Fish and Wildlife Service. December 17, 2002. Cheyenne, WY. 58pp.

U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 1989. Black-footed ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, CO and Albuquerque, NM.

Vander Haegen, W. M., F. C. Dobler, and D. J. Pierce. 2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, USA. Conservation Biology 14:1145-1160.

Walker B, Naugle D, Rinkes T. 2003. The Response of Sage Grouse to Coal-bed Methane Development and West Nile virus in the Powder River Basin: Is There a Link ? Page 6 in: Program and Abstracts for the Annual Wildlife Society Meeting, Wyoming Chapter.

Walker, B.L., D. E. Naugle, and K.E. Doherty. 2007. Greater sage-grouse population response to energy development and habitat loss. Journal of Wildlife Management 71:2644-2654.

WDEQ, June 14, 2004. Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments

Windingstad, R. M., F. X. Kartch, R. K. Stroud, and M. R. Smith. 1987. Salt toxicosis in waterfowl in North Dakota. Jour. Wildlife Diseases 23(3):443-446.

Wyoming Game and Fish Department (WGFD). 2004. Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands. WGFD. Cheyenne, WY

WGFD. 2003. Wyoming Greater Sage-Grouse Conservation Plan. WGFD. Cheyenne, WY

WGFD. 2004. Sheridan Region Wyoming Game and Fish Department: Annual Sage-Grouse Completion Report for 2004. Wyoming Game and Fish Department. Gillette, WY.

WGFD. 2005. Northeast Wyoming Local Working Group Area: Annual Sage-Grouse Completion Report for 2005. Wyoming Game and Fish Department. Buffalo, WY. 42pp.

WGFD. 2008. Hunting and Sage-Grouse: A Technical Review of Harvest Management On a Species of Concern in Wyoming. Wyoming Game and Fish Department. Green River, WY. 21pp.

WGFD. 2009. Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats. Version 2.0, revised: May 2009 Wyoming Game and Fish Department. Cheyenne, WY.

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