DECISION RECORD
For, Devon Energy Production Company, L.P.
Grayling Plan of Development
ENVIRONMENTAL ASSESSMENT –WY-070-10-332

BFO approves 80 applications to drill (APDs), a water management plan (WMP) for the use of federal water in 25 impoundments, 4 gypsum treatment plants, and most 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); to include On Shore Order No. 1.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001).
- National Historic Preservation Act of 1966 (NHPA) (16 USC 470).
- Endangered Species Act of 1973 (ESA) (16 USC 1531); Migratory Bird Treaty Act (16 USC 703).
- Powder River Basin Final Environmental Impact Statement (PRB FEIS), April 2003.
- Buffalo Resource Management Plan (RMP) 1985, Amendments 2001, 2003.
- Greater Sage-Grouse Habitat Management Policy on WY Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate, (WY-IM-2010-012), Jan 2010.
- DOI Order 3310.

The Selected Alternative.
Features. BFO approves Devon Energy Production Company, L.P. (Devon or operator) Grayling plan of development (POD) coalbed natural gas (CBNG) POD Alternative B from Environmental Assessment (EA) WY-070-10-332 as conditioned below. Alternative B is the modified proposed action, resultant of collaboration between the BLM and Devon and also includes mitigation requirements the operator must meet. Alternative B was analyzed in the EA and found to have no significant impacts on the human environment, beyond those described in the Powder River Basin Final Environmental Impact Statement (PRB FEIS) thus an EIS is not required. A summary of the details of the approval follow.

Well Sites:
BLM approves the following 80 APDs and their associated infrastructure:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
1	GRAYLING WPTU	1SS-1	NENE	1	41N	76W	WYW147310
2	GRAYLING WPTU	1SS-3	NENW	1	41N	76W	WYW147310
3	GRAYLING WPTU	1SS-5	SWNW	1	41N	76W	WYW147310
4	GRAYLING WPTU	1SS-7	SWNE	1	41N	76W	WYW147310
5	GRAYLING WPTU	1SS-9	NESE	1	41N	76W	WYW147310
6	GRAYLING WPTU	1SS-13	SWSW	1	41N	76W	WYW147310
7	GRAYLING WPTU	1SS-15	SWSE	1	41N	76W	WYW147310
8	GRAYLING WPTU	2SS-1	NENE	2	41N	76W	WYW147310
9	GRAYLING WPTU	2SS-5	SWNW	2	41N	76W	WYW147310
10	GRAYLING WPTU	2SS-7	SWNE	2	41N	76W	WYW147310
11	GRAYLING WPTU	2SS-9	NESE	2	41N	76W	WYW147310
12	GRAYLING WPTU	2SS-11	NESW	2	41N	76W	WYW147310

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
13	GRAYLING WPTU	2SS-13	SWSW	2	41N	76W	WYW147310
14	GRAYLING WPTU	2SS-15	SWSE	2	41N	76W	WYW147310
15	GRAYLING WPTU	3SS-1	NENE	3	41N	76W	WYW147310
16	GRAYLING WPTU	3SS-5	SWNW	3	41N	76W	WYW151707
17	GRAYLING WPTU	3SS-7	SWNE	3	41N	76W	WYW147310
18	GRAYLING WPTU	3SS-9	NESE	3	41N	76W	WYW147310
19	GRAYLING WPTU	3SS-13	SWSW	3	41N	76W	WYW151707
20	GRAYLING WPTU	4SS-1	NENE	4	41N	76W	WYW147310
21	GRAYLING WPTU	4SS-5	SWNW	4	41N	76W	WYW147310
22	GRAYLING WPTU	4SS-7	SWNE	4	41N	76W	WYW147310
23	GRAYLING WPTU	4SS-9	NESE	4	41N	76W	WYW147310
24	GRAYLING WPTU	4SS-11	NESW	4	41N	76W	WYW147310
25	GRAYLING WPTU	4SS-13	SWSW	4	41N	76W	WYW147310
26	GRAYLING WPTU	4SS-15	SWSE	4	41N	76W	WYW147310
27	GRAYLING WPTU	14S-5	SWNW	14	42N	76W	WYW147314
28	GRAYLING WPTU	14S-7	SWNE	14	42N	76W	WYW147314
29	GRAYLING WPTU	14S-8	SENE	14	42N	76W	WYW147314
30	GRAYLING WPTU	14S-9	NESE	14	42N	76W	WYW147314
31	GRAYLING WPTU	23S-5	SWNW	23	42N	76W	WYW147315
32	GRAYLING WPTU	23S-7	SWNE	23	42N	76W	WYW147315
33	GRAYLING WPTU	23S-11	NESW	23	42N	76W	WYW147315
34	GRAYLING WPTU	23S-13	SWSW	23	42N	76W	WYW147315
35	GRAYLING WPTU	23S-15	SWSE	23	42N	76W	WYW147315
36	GRAYLING WPTU	24S-13	SWSW	24	42N	76W	WYW147316
37	GRAYLING WPTU	24S-15	SWSE	24	42N	76W	WYW147316
38	GRAYLING WPTU	25S-1	NENE	25	42N	76W	WYW147316
39	GRAYLING WPTU	25S-2	NWNE	25	42N	76W	WYW147316
40	GRAYLING WPTU	25S-5	SWNW	25	42N	76W	WYW147316
41	GRAYLING WPTU	25S-7	SWNE	25	42N	76W	WYW147316
42	GRAYLING WPTU	25S-9	NESE	25	42N	76W	WYW147316
43	GRAYLING WPTU	25S-13	SWSW	25	42N	76W	WYW147316
44	GRAYLING WPTU	25S-15	SWSE	25	42N	76W	WYW147316
45	GRAYLING WPTU	26S-1	NENE	26	42N	76W	WYW147316
46	GRAYLING WPTU	26S-3	NENW	26	42N	76W	WYW147316
47	GRAYLING WPTU	26S-7	SWNE	26	42N	76W	WYW147316
48	GRAYLING WPTU	26S-9	NESE	26	42N	76W	WYW147316
49	GRAYLING WPTU	26S-15	SWSE	26	42N	76W	WYW147316
50	GRAYLING I RANCH FEDERAL	29S-1	NENE	29	42N	76W	WYW147317

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
51	GRAYLING I RANCH	29S-3	NENW	29	42N	76W	WYW147317
52	GRAYLING I RANCH	29S-5	SWNW	29	42N	76W	WYW147317
53	GRAYLING I RANCH	29S-7	SWNE	29	42N	76W	WYW147317
54	GRAYLING I RANCH	29S-9	NESE	29	42N	76W	WYW147317
55	GRAYLING I RANCH	29S-11	NESW	29	42N	76W	WYW147317
56	GRAYLING I RANCH	29S-15	SWSE	29	42N	76W	WYW147317
57	GRAYLING MOORE LAND	30S-1	NENE	30	42N	76W	WYW147317
58	GRAYLING MOORE LAND	30S-7	SWNE	30	42N	76W	WYW147317
59	GRAYLING MOORE LAND	30S-9	NESE	30	42N	76W	WYW147317
60	GRAYLING MOORE LAND	30S-11	NESW	30	42N	76W	WYW147317
61	GRAYLING MOORE LAND	31S-5	SWNW	31	42N	76W	WYW147317
62	GRAYLING MOORE LAND	31S-7	SWNE	31	42N	76W	WYW147317
63	GRAYLING MOORE LAND	31S-9	NESE	31	42N	76W	WYW147317
64	GRAYLING MOORE LAND	31S-11	NESW	31	42N	76W	WYW147317
65	GRAYLING MOORE LAND	31S-13	SWSW	31	42N	76W	WYW147317
66	GRAYLING I RANCH	31S-15	SWSE	31	42N	76W	WYW147317
67	GRAYLING I RANCH	32S-1	NENE	32	42N	76W	WYW147317
68	GRAYLING I RANCH	32S-5	SWNW	32	42N	76W	WYW147317
69	GRAYLING I RANCH	32S-13	SWSW	32	42N	76W	WYW147317
70	GRAYLING WPTU	33S-7	SWNE	33	42N	76W	WYW147318
71	GRAYLING WPTU	34S-1	NENE	34	42N	76W	WYW147318
72	GRAYLING WPTU	34S-3	NENW	34	42N	76W	WYW147318
73	GRAYLING WPTU	34S-5	SWNW	34	42N	76W	WYW147318
74	GRAYLING WPTU	34S-9	NESE	34	42N	76W	WYW147318
75	GRAYLING WPTU	34S-11	NESW	34	42N	76W	WYW147318
76	GRAYLING WPTU	35S-1	NENE	35	42N	76W	WYW147318
77	GRAYLING WPTU	35S-3	NENW	35	42N	76W	WYW147318
78	GRAYLING WPTU	35S-7	SWNE	35	42N	76W	WYW147318
79	GRAYLING WPTU	35S-9	NESE	35	42N	76W	WYW147318
80	GRAYLING WPTU	35S-11	NESW	35	42N	76W	WYW147318

Water Management:
BFO approves the POD's WMP, federal water use in the following impoundments, and 4 gypsum plants:

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	WINTERMUTE**	SWSW	24	42	76	3.0	0.6*	WYW147315
2	13-25-4276**	NWSW	25	42	76	11.0	1.2*	WYW147316
3	33-30-4275**	NWSE	30	42	75	14.2	3.1	WYW311966
4	11-31-4275**	NWNW	31	42	75	16.5	3.0	WYW311966
5	31-2-4176**	NWNE	2	41	76	6.2	1.2*	FEE
6	IBERLIN 23-9-4176**	NESW	9	41	76	14.8	3.0	WYW150758
7	IBERLIN 33-14-4176**	NWSE	14	41	76	8.6	2.2	FEE
8	11-22-4176**	NWNW	22	41	76	21.6	6.1	FEE
9	ARTESIAN UPPER RES**	SWNW	11	41	76	47.5	9.6	FEE
10	T42NR76W36SESW	SESW	36	42	76	1.4	0.6	STATE
11	44-31-4276**	SESE	31	42	76	48.7	24.6	WYW147317
12	T42NR76W19NWNE	NENE	19	42	76	8.7	2.9	WYW147315
13	T42NR76W27NESW	NESW	27	42	76	12.9	1.5	WYW147315
14	T42NR76W27SESE	SESE	27	42	76	6.8	0.8	WYW147315
15	T42NR76W34SENW	SENW	34	42	76	42.8	6.3*	WYW147315
16	T42NR76W34NESE	NESE	34	42	76	14.7	2.4*	WYW147315
17	T42NR76W35NWNW	NWNW	35	42	76	11.5	1.5*	WYW147315
18	NICHOLS STOCK RESERVOIR (T42NR76W28NESW)	NESW	28	42	76	10.7	1.5	WYW147315
19	T42NR76W21SESW	SESW	21	42	76	59.8	4.5	WYW147315
20	T42NR76W22NENW	NENW	22	42	76	14.5	2.3	WYW147315
21	T42NR76W10NENE	NENE	10	42	76	5.0	5.1	WYW147315
22	T42NR76W7SWSW	SWSW	7	42	76	14.9	2.1	WYW147315
23	IBERLIN 32-27-4176	SWNE	27	41	76	16.9	4.2	WYW314310
24	E31-28-4176	NWNE	28	41	76	16.0	4.0	WYW314304
25	E33-28-4176	NWSE	28	41	76	5.8	1.2	WYW160418

	GYPSUM WATER TREATMENT SYSTEMS	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	Aqua-Ject II	SENE	21	42	76	NA	0.25	WYW-147315
2	Aqua-Ject II	SWSE	3	42	76	NA	0.25	FEE
3	Crushed Gypsum Upset	NENW	22	42	76	NA	0.01	WYW-147315
4	Crushed Gypsum Upset	NWNE	10	42	76	NA	0.01	WYW-147315

*Within the Grayling POD Boundary
**Not constructed or improved from stock pond status

Limitations. Deferrals:
BFO defers 4 APDs and associated infrastructure pending resolution of the following issues, see below.

	Well Name or Location	Well #	Environmental Issue/Deficiency	Remedy
1	Moore Land Federal	30S-3	Class III cultural inventory was not completed for the NW of Section 30, T42N R76W.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.
2	Moore Land Federal	30S-5	Class III cultural inventory was not completed for the NW of Section 30, T42N R76W.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.
3	Partial Utility Corridor		Class III cultural inventory was not completed for approximately 750 feet of the proposed corridor, N/SW/SW/SW of Sec 20, T42N R76W, consisting of proposed unimproved road, proposed water, gas, electric located directly west of the 20S-13 existing fee CBNG well. NOTE: Deferral of this access/corridor will not affect any access for drilling of any well locations. Wells will be accessible for drilling from either end of this access/corridor.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.

	Well Name or Location	Well #	Environmental Issue/Deficiency	Remedy
4	Grayling WPTU	24S-7	BLM received an August 2010 wildlife report for an adjacent POD, indicating that sage-grouse males were observed strutting at 3 previously unknown locations in the west half of Section 19 T42N,R75W. One of these locations (SWNW of Section 19) is within 0.25 miles of the proposed road and utilities corridor servicing this well. WGFD requires 3 years of data to determine whether a location qualifies as a lek. Therefore, BLM defers approval of this well pending 2 more seasons (2011 and 2012) of survey information.	• Devon shall submit to BLM by 31 May, 2011 and 2012, a report of sage-grouse lek surveys performed in those years within 0.25 mile of proposed infrastructure, using the WGFD lek survey protocol. • Devon shall submit geospatial information to BLM by 31 May 2011 and 2012, showing the perimeter of any sage-grouse strutting grounds identified in 2011 and 2012 within 0.25 mile of proposed well infrastructure, using WGFD lek survey protocol. • BLM anticipates making final decision within 30 days of complete receipt of survey and geospatial information.
5	Graying WPTU	24S-9	This well is located approximately 0.3 miles, and the proposed access and utilities corridor are approximately 0.15 miles, from the new potential lek (SWNW of Section 19) discussed above. WGFD requires 3 years of data to determine whether a location qualifies as a lek. Therefore, BLM is deferring approval of this well pending 2 more seasons (2011 and 2012) of survey information.	• Same as the 24S-7 well.

THE FINDING OF NO SIGNIFICANT ACTION. The FONSI for EA WY-070-010-332 found no significant impact on the human environment aside from those revealed in the Powder River Basin FEIS and Supplement (1985 and 2003), thus an EIS was not required.

COMMENT OR NEW INFORMATION SUMMARY.
Scoping was discussed in the EA, Section 1.5, and is incorporated here by reference. Since early development of the Grayling proposal BLM received FWS consultation on golden eagles and Ute ladies'-tresses orchids and policies on sage-grouse and wilderness.

DECISION RATIONALE.
The decision to authorize the 80 APDs, WMP for handling federal waters in 25 impoundments, 4 gypsum treatment facilities, and associated infrastructure, as described in the EA, is based on the following:

1. The additional infrastructure will not result in any undue or unnecessary environmental degradation.

2. The selected alternative will help meet the nation's energy needs, and help stimulate local economies by maintaining workforce stability.

3. The Operator, in their POD, committed to:
   - Comply with all applicable federal, state, and local laws and regulations (MSUP p. 18).
   - Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits (MSUP p. 18).
   - 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 (MSUP Attachments, Tables, & Figures tab).
   - Provide water analysis from a designated reference well in each coal zone (WMP p. 5).

4. The Operator certified he has a Surface Use Agreement with the Landowners.

5. There was no practicable alternative to building about 450 feet of pipeline using an existing private right-of-way, due to adjacent very steep topography and impacts from this will be minor.

6. The selected alternative incorporates components of the Wyoming Governor's Sage Grouse Implementation Team's "core population area" strategy, the Governor's executive order, Wyoming BLM Instruction Memorandum 2010-012, Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate, and local research to provide mitigation for sage-grouse, while meeting the purpose and need for the Grayling Project.

7. The Grayling POD boundaries are clearly lacking in wilderness characteristics because of existing, extensive CBNG development, see Table 2.3 in the EA.

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

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

Field Manager: _____ Date: 3/1/11

Finding of No Significant Impact (FONSI)
For Devon Energy Production Company, L.P.
Grayling Plan of Development
ENVIRONMENTAL ASSESSMENT (EA) –WY-070-10-332

FINDING OF NO SIGNIFICANT IMPACT:
On the basis of the information contained in the EA (WY-070-10-332), and all other information available to me, it is my determination that:

1) The decision to approve, 80 Applications for Permit to Drill (APDs), the water management plan (WMP) allowing federal water in 25 impoundments, 4 gypsum treatment plants, and associated infrastructure previously onsited in the Devon Energy Production Company, L.P. (Devon or operator) Grayling coalbed natural gas (CBNG) plan of development (POD) will not have significant environmental impacts beyond those already addressed in Powder River Basin Environmental Inpact Statement (PRB EIS) to which the EA is tiered;

2) The decision to authorize 80 APDs, associated POD WMP, and infrastructure is in conformance with the Buffalo Field Office (BFO) Resource Management Plan (RMP) (1985, 2001, 2003); and

3) The decision to authorize 80 APDs, cumulative with the approvals for the other 3 Devon PODs in the Pine Tree Unit and their APDs does not constitute a major federal action having a significant effect on the human environment, beyond those analyzed and disclosed in the PRB FEIS. Therefore, an environmental impact statement is not necessary and will not be prepared.

This finding is based on my consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), with regard to the context, cumulative effects, and to the intensity of the impacts described in the EA, WY-070-10-332, which is incorporated here by reference.

CONTEXT:
Mineral development (coal, oil and gas, bentonite, and uranium) is a long-standing and common land use within the Powder River Basin. More than 40% of the nation's coal production comes from the Powder River Basin. The PRB FEIS reasonably foreseeable development predicted and analyzed the development of 51,000 CBNG wells and 3,200 oil wells (PRB FEIS ROD p. 2). The additional CBNG development described in Alternative B is insignificant within the national, regional, and local context.

INTENSITY:
The implementation of Alternative B will result in beneficial effects in the forms of energy and revenue production however; there will also be adverse effects to the environment. Design features and mitigation measures have been included within Alternative B to prevent significant adverse environmental effects.

The preferred alternative does not pose a significant risk to public health and safety. The geographic area of the PODs does not contain unique characteristics identified within the 1985 RMP, 2003 PRB FEIS, or other legislative or regulatory processes, aside from those recognized through interim project deferrals. There is no practicable alternative to constructing a utility corridor (pipeline) through an existing disturbance - an existing right-of-way 2-track on a private surface. The proposed action includes all measures, to include but not limited to design features, mitigation, etc., to minimize harm to a pothole.

Relevant scientific literature and professional expertise were used 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 (EA sec 4.2.7). No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected (EA sec 4). The Grayling POD boundaries are clearly lacking in wilderness characteristics due to extensive CBNG and mechanically maintained roads supporting the Pine Tree Unit CBNG development; see EA's Table 2.3.. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment.

Field Manager _____ Date 3/1/11

ENVIRONMENTAL ASSESSMENT (EA) WY-070-10-332
For Devon Energy Production Company, L.P.
Grayling Coalbed Natural Gas Plan of Development
Bureau of Land Management, Buffalo Field Office

1. INTRODUCTION

The Buffalo Field Office (BFO) analyzes a proposal by Devon Energy Production Company, L.P. (Devon or operator) for 84 applications to drill (APDs), use of federal water in 25 impoundments, 4 gypsum treatment facilities, and associated infrastructure collectively called the Grayling plan of development (POD). This site-specific analysis tiers into and incorporates by reference the information and analysis contained in the Powder River Basin Oil and Gas Project Final Environmental Impact Statement (PRB FEIS) (January 2003), and Resource Management Plan Amendment (RMP), #WY-070-02-065 (April 30, 2003), pursuant to 40 CFR 1508.28 and 1502.21. Persons may review these documents at the BLM Buffalo Field Office (BFO) and on our website. This environmental assessment (EA) addresses site-specific resources and impacts that eluded analysis in the PRB FEIS.

1.1. Background

Devon submitted the Grayling POD on December 30, 2008 with 89 federal APD's to develop and produce coalbed natural gas (CBNG) contained in coal formations in the Powder River Basin (PRB).

Onsite visits from June 21 to 25, 2010 evaluated the proposal and modified it as necessary to alleviate environmental impacts. BLM sent a post-onsite deficiency on July 7, 2010. Devon resubmitted the POD on August 24, 2010. A second deficiency letter was sent September 3, 2010. During NEPA analysis process and Endangered Species Act Section 7 consultation, issues regarding golden eagles and Ute ladies'-tresses orchid were identified that required additional field work (September 9, November 16) and analysis. Devon submitted an updated POD January 14, 2011 from which time the project proposal and the submittal of 84 APDs was complete. BFO shared proposed conditions of approval (COAs) with the operator on February 14, 2011.

The following resource conflicts require the wells' and associated infrastructure's, below, deferral for time to gather more information and analyze it in order to reduce environmental effects (see Section 4):

Cultural:
1. Moore Land Federal wells 30S-3, 30S-5—class III cultural resource inventory was not completed in the NW of Section 30, T42N R76W due to poor surface visibility caused by dense vegetation reported by SWCA Environmental Consultants (BFO report #70090015). Heavy vegetation in these areas constrained the discovery of cultural resources (see *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports V (3)*), therefore, the inventory does not meet the Wyoming SHPO or Secretary of the Interior's Standards and is unacceptable. The class III survey requirements can be met by employing systematic shovel testing across the areas of proposed infrastructure which require cultural inventory and/or waiting for surface visibility to improve to acceptable levels.

2. Class III cultural inventory was not completed for approximately 750 feet of the proposed corridor consisting of proposed unimproved road, proposed water, gas, electric located directly west of the 20S-13 existing fee CBNG well in the N/SW/SW/SW of Section 20, T42N R76W (see map D of the MSUP). Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the BFO.

Wildlife: wells 24S-7, 24S-9. BLM received a report submitted in August 2010 by another operator indicating that sage-grouse males were strutting at 3 locations within 0.25 miles of proposed infrastructure to service these wells. This is the first year that BLM was aware of the presence of these strutting grounds. WGFD requires 3 years of data to determine whether a location qualifies as a lek. BLM is deferring approval of these wells pending additional survey information. The sage-grouse survey requirements can be met by lek surveys performed in 2011 and 2012 within 0.25 mile of proposed infrastructure, according to WGFD lek survey protocol. Geospatial information indicating the perimeter of any sage-grouse strutting grounds, delineated according to WGFD protocol, is also needed for BLM to render a decision on these wells and to propose or adopt any mitigation, if necessary.

1.2. Purpose and Need for the Proposed Action

The purpose of the proposal is to explore, develop and produce oil and gas reserves conducted under the rights granted by a federal oil and gas lease in manners that protect the environment and natural resource conservation, as required in 43 CFR 3160, all Onshore Orders, and The Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et seq.), the Federal Land Policy Management Act, and other statutes and regulations.

The need for the proposal is obtaining approval for the environmental development of an oil and gas lease through APDs on federal lands and mineral resources managed by the BLM under the above authorities.

1.3. Decision to be Made

BLM will decide whether to approve, in whole or part, the proposed development of CBNG on the federal leasehold, and if so, under what terms and conditions that support the Bureau's multiple use edict.

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

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS & RMP Amendment. The proposed action is in compliance with all Federal laws, regulations, and policies. This includes, but is not limited to, the Federal Land Policy and Management Act (1976), the National Historic Preservation Act, the Endangered Species Act (1973), the Migratory Bird Treaty Act (1918), the Clean Water Act (1972), the Clean Air Act (1970), the National Environmental Policy Act (1969), and DOI Order 3310 with BLM Manuals 6300-1 and -2.

1.5. Scoping and Issues

External scoping was not conducted for this EA. Extensive external scoping was conducted for the PRB FEIS and is discussed beginning on p. 15 of the ROD and beginning on p. 2-1 of the FEIS. This action is similar in scope to the numerous other CBNG PODs that BFO has analyzed; external scoping would be unlikely to identify new issues as was verified by the few POD EAs that were externally scoped such as the Clabaugh POD (WY-070-EA08-134) and Hollcroft/Stotts Draw POD (WY-070-EA07-021).

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. Appendix A identifies those resources and land uses present and affected by the proposed action; those 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 significant issues for the affected resources to further focus the analysis. This EA addresses those site-specific impacts that eluded analysis in the PRB FEIS that would help in making a reasoned decision or may be related to a potentially significant effect. Issues for this project include:

- Soils and vegetation: site stability, reclamation potential, riparian and wetland communities, invasive species.

- Wildlife: Ute ladies'-tresses orchid, ferruginous hawk and golden eagle productivity, greater sage-grouse lek occupancy and persistence, bald eagle roosting, mountain plover nesting, migratory bird nesting, western burrowing owl nesting, swift fox dens.
- Cultural: The Bozeman Trail (listed on the National Register of Historic Places) and Ft. Fetterman to Ft. McKinney Telegraph Line (eligible for the National Register of Historic Places) are within the Area of Potential Effect (APE).
- Water: ground water depletion, quality and quantity of produced water.
- Social and Economic: revenue potential, local economics.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

BFO analyzed 2 alternatives, A and B. A brief description of each alternative is included in the following sections. Programmatic mitigation measures (PMM), as determined in PRB FEIS Record of Decision (ROD), apply to all alternatives, including the No Action Alternative (Alternative A). PMM are included in conditions of approval (COAs). Standard mitigation measures, operator-committed mitigation measures, and site-specific COAs would apply only to Alternative B and also in the COAs.

2.1. Alternative A - No Action

A No Action Alternative was considered in the PRB FEIS, Volume 1, pp 2-54 to 2-62. This alternative consists of no new federal wells. An oil and gas lease grants the lessee conditional rights to drill for, mine, extract, remove, and dispose gas deposits subject to the terms and conditions incorporated in the lease, laws, statutes, and regulations. The lease is subject to just compensation; see Robert L. Bayless, Producer, et. al., 177 IBLA 83 (2009). Accepting this alternative denies the operator's proposal.

2.2. Alternative B - Operator Proposed Action

Alternative B contains complete APDs and is based on the operator and BLM working to reduce environmental impacts. This alternative summarizes the POD as it was finally, after site visits, submitted to the BLM by Devon on August 24, 2010, identified as being complete January 14, 2011.

Proposed Action Title/Type: Proposed Action Title/Type: Devon Energy Production Company, L.P.'s Grayling CBNG POD.

Proposed Well Information: There are 84 wells proposed in this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from 1 coal seam. Proposed well house dimensions are 4 ft wide x 8 ft length x 4 ft height. Well house color is Covert Green (18-0617 TPX), selected to blend with the local vegetation. See Table 2.1, for a list of proposed wells.

Table 2.1 Proposed Wells – Alternative B

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
1	GRAYLING WPTU	1SS-1	NENE	1	41N	76W	WYW147310
2	GRAYLING WPTU	1SS-3	NENW	1	41N	76W	WYW147310
3	GRAYLING WPTU	1SS-5	SWNW	1	41N	76W	WYW147310
4	GRAYLING WPTU	1SS-7	SWNE	1	41N	76W	WYW147310
5	GRAYLING WPTU	1SS-9	NESE	1	41N	76W	WYW147310
6	GRAYLING WPTU	1SS-13	SWSW	1	41N	76W	WYW147310
7	GRAYLING WPTU	1SS-15	SWSE	1	41N	76W	WYW147310
8	GRAYLING WPTU	2SS-1	NENE	2	41N	76W	WYW147310
9	GRAYLING WPTU	2SS-5	SWNW	2	41N	76W	WYW147310

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
10	GRAYLING WPTU	2SS-7	SWNE	2	41N	76W	WYW147310
11	GRAYLING WPTU	2SS-9	NESE	2	41N	76W	WYW147310
12	GRAYLING WPTU	2SS-11	NESW	2	41N	76W	WYW147310
13	GRAYLING WPTU	2SS-13	SWSW	2	41N	76W	WYW147310
14	GRAYLING WPTU	2SS-15	SWSE	2	41N	76W	WYW147310
15	GRAYLING WPTU	3SS-1	NENE	3	41N	76W	WYW147310
16	GRAYLING WPTU	3SS-5	SWNW	3	41N	76W	WYW151707
17	GRAYLING WPTU	3SS-7	SWNE	3	41N	76W	WYW147310
18	GRAYLING WPTU	3SS-9	NESE	3	41N	76W	WYW147310
19	GRAYLING WPTU	3SS-13	SWSW	3	41N	76W	WYW151707
20	GRAYLING WPTU	4SS-1	NENE	4	41N	76W	WYW147310
21	GRAYLING WPTU	4SS-5	SWNW	4	41N	76W	WYW147310
22	GRAYLING WPTU	4SS-7	SWNE	4	41N	76W	WYW147310
23	GRAYLING WPTU	4SS-9	NESE	4	41N	76W	WYW147310
24	GRAYLING WPTU	4SS-11	NESW	4	41N	76W	WYW147310
25	GRAYLING WPTU	4SS-13	SWSW	4	41N	76W	WYW147310
26	GRAYLING WPTU	4SS-15	SWSE	4	41N	76W	WYW147310
27	GRAYLING WPTU	14S-5	SWNW	14	42N	76W	WYW147314
28	GRAYLING WPTU	14S-7	SWNE	14	42N	76W	WYW147314
29	GRAYLING WPTU	14S-8	SENE	14	42N	76W	WYW147314
30	GRAYLING WPTU	14S-9	NESE	14	42N	76W	WYW147314
31	GRAYLING WPTU	23S-5	SWNW	23	42N	76W	WYW147315
32	GRAYLING WPTU	23S-7	SWNE	23	42N	76W	WYW147315
33	GRAYLING WPTU	23S-11	NESW	23	42N	76W	WYW147315
34	GRAYLING WPTU	23S-13	SWSW	23	42N	76W	WYW147315
35	GRAYLING WPTU	23S-15	SWSE	23	42N	76W	WYW147315
36	GRAYLING WPTU	24S-13	SWSW	24	42N	76W	WYW147316
37	GRAYLING WPTU	24S-15	SWSE	24	42N	76W	WYW147316
38	GRAYLING WPTU	24S-7	SWNE	24	42N	76W	WYW147316
39	GRAYLING WPTU	24S-9	NESE	24	42N	76W	WYW147316
40	GRAYLING WPTU	25S-1	NENE	25	42N	76W	WYW147316
41	GRAYLING WPTU	25S-2	NWNE	25	42N	76W	WYW147316
42	GRAYLING WPTU	25S-5	SWNW	25	42N	76W	WYW147316
43	GRAYLING WPTU	25S-7	SWNE	25	42N	76W	WYW147316
44	GRAYLING WPTU	25S-9	NESE	25	42N	76W	WYW147316
45	GRAYLING WPTU	25S-13	SWSW	25	42N	76W	WYW147316
46	GRAYLING WPTU	25S-15	SWSE	25	42N	76W	WYW147316
47	GRAYLING WPTU	26S-1	NENE	26	42N	76W	WYW147316

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease
48	GRAYLING WPTU	26S-3	NENW	26	42N	76W	WYW147316
49	GRAYLING WPTU	26S-7	SWNE	26	42N	76W	WYW147316
50	GRAYLING WPTU	26S-9	NESE	26	42N	76W	WYW147316
51	GRAYLING WPTU	26S-15	SWSE	26	42N	76W	WYW147316
52	GRAYLING I RANCH FEDERAL	29S-1	NENE	29	42N	76W	WYW147317
53	GRAYLING I RANCH	29S-3	NENW	29	42N	76W	WYW147317
54	GRAYLING I RANCH	29S-5	SWNW	29	42N	76W	WYW147317
55	GRAYLING I RANCH	29S-7	SWNE	29	42N	76W	WYW147317
56	GRAYLING I RANCH	29S-9	NESE	29	42N	76W	WYW147317
57	GRAYLING I RANCH	29S-11	NESW	29	42N	76W	WYW147317
58	GRAYLING I RANCH	29S-15	SWSE	29	42N	76W	WYW147317
59	GRAYLING MOORE LAND	30S-1	NENE	30	42N	76W	WYW147317
60	GRAYLING MOORE LAND	30S-3	NENW	30	42N	76W	WYW147317
61	GRAYLING MOORE LAND	30S-5	SWNW	30	42N	76W	WYW147317
62	GRAYLING MOORE LAND	30S-7	SWNE	30	42N	76W	WYW147317
63	GRAYLING MOORE LAND	30S-9	NESE	30	42N	76W	WYW147317
64	GRAYLING MOORE LAND	30S-11	NESW	30	42N	76W	WYW147317
65	GRAYLING MOORE LAND	31S-5	SWNW	31	42N	76W	WYW147317
66	GRAYLING MOORE LAND	31S-7	SWNE	31	42N	76W	WYW147317
67	GRAYLING MOORE LAND	31S-9	NESE	31	42N	76W	WYW147317
68	GRAYLING MOORE LAND	31S-11	NESW	31	42N	76W	WYW147317
69	GRAYLING MOORE LAND	31S-13	SWSW	31	42N	76W	WYW147317
70	GRAYLING I RANCH	31S-15	SWSE	31	42N	76W	WYW147317
71	GRAYLING I RANCH	32S-1	NENE	32	42N	76W	WYW147317
72	GRAYLING I RANCH	32S-5	SWNW	32	42N	76W	WYW147317
73	GRAYLING I RANCH	32S-13	SWSW	32	42N	76W	WYW147317
74	GRAYLING WPTU	33S-7	SWNE	33	42N	76W	WYW147318
75	GRAYLING WPTU	34S-1	NENE	34	42N	76W	WYW147318
76	GRAYLING WPTU	34S-3	NENW	34	42N	76W	WYW147318
77	GRAYLING WPTU	34S-5	SWNW	34	42N	76W	WYW147318
78	GRAYLING WPTU	34S-9	NESE	34	42N	76W	WYW147318
79	GRAYLING WPTU	34S-11	NESW	34	42N	76W	WYW147318
80	GRAYLING WPTU	35S-1	NENE	35	42N	76W	WYW147318
81	GRAYLING WPTU	35S-3	NENW	35	42N	76W	WYW147318
82	GRAYLING WPTU	35S-7	SWNE	35	42N	76W	WYW147318
83	GRAYLING WPTU	35S-9	NESE	35	42N	76W	WYW147318
84	GRAYLING WPTU	35S-11	NESW	35	42N	76W	WYW147318

Water Management Proposal: Table 2.2 includes the water management impoundments and facilities proposed for use with this POD. All of the proposed impoundments and Aqua-Ject II treatment systems were previously analyzed and approved under the Kokanee and Brook Trout EA's. The impoundments with double asterisks have either not been improved or constructed at present time. Not all of these impoundments are located within the Grayling POD boundary. Those listed with a single asterisk in the Surface Disturbance column of Table 2.2 are located within the Grayling POD boundary. Existing pipeline infrastructure will be utilized to pump Grayling POD produced water to, at times, comingle with the Kokanee and Brook Trout well water to these facilities. No additional disturbance of surface land is needed to incorporate these facilities outside of what was already approved and analyzed except for the water utility tie in lines from the 84 new proposed Grayling wells. No additional volume of water beyond what the state has previously permitted as a maximum flow to be discharged to these reservoirs and associated outfalls is proposed (see Map C; Grayling Water Management Map of the MSUP.)

Table 2.2 Proposed Water Management:
The following water management infrastructure is analyzed for use in association with this POD:

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	WINTERMUTE**	SWSW	24	42	76	3.0	0.6*	WYW147315
2	13-25-4276**	NWSW	25	42	76	11.0	1.2*	WYW147316
3	33-30-4275**	NWSE	30	42	75	14.2	3.1	WYW311966
4	11-31-4275**	NWNW	31	42	75	16.5	3.0	WYW311966
5	31-2-4176**	NWNE	2	41	76	6.2	1.2*	FEE
6	IBERLIN 23-9-4176**	NESW	9	41	76	14.8	3.0	WYW150758
7	IBERLIN 33-14-4176**	NWSE	14	41	76	8.6	2.2	FEE
8	11-22-4176**	NWNW	22	41	76	21.6	6.1	FEE
9	ARTESIAN UPPER RES**	SWNW	11	41	76	47.5	9.6	FEE
10	T42NR76W36SESW	SESW	36	42	76	1.4	0.6	STATE
11	44-31-4276**	SESE	31	42	76	48.7	24.6	WYW147317
12	T42NR76W19NWNE	NENE	19	42	76	8.7	2.9	WYW147315
13	T42NR76W27NESW	NESW	27	42	76	12.9	1.5	WYW147315
14	T42NR76W27SESE	SESE	27	42	76	6.8	0.8	WYW147315
15	T42NR76W34SENW	SENW	34	42	76	42.8	6.3*	WYW147315
16	T42NR76W34NESE	NESE	34	42	76	14.7	2.4*	WYW147315
17	T42NR76W35NWNW	NWNW	35	42	76	11.5	1.5*	WYW147315
18	NICHOLS STOCK RESERVOIR (T42NR76W28NESW)	NESW	28	42	76	10.7	1.5	WYW147315
19	T42NR76W21SESW	SESW	21	42	76	59.8	4.5	WYW147315
20	T42NR76W22NENW	NENW	22	42	76	14.5	2.3	WYW147315
21	T42NR76W10NENE	NENE	10	42	76	5.0	5.1	WYW147315
22	T42NR76W7SWSW	SWSW	7	42	76	14.9	2.1	WYW147315
23	IBERLIN 32-27-4176	SWNE	27	41	76	16.9	4.2	WYW314310
24	E31-28-4176	NWNE	28	41	76	16.0	4.0	WYW314304
25	E33-28-4176	NWSE	28	41	76	5.8	1.2	WYW160418

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
	GYPSUM WATER TREATMENT SYSTEMS	**Qtr/Qtr**	**Sec**	**TWP**	**RNG**	**Capacity (Acre Feet)**	**Surface Disturbance (Acres)**	**Lease #**
1	Aqua-Ject II	SENE	21	42	76	NA	0.25	WYW-147315
2	Aqua-Ject II	SWSE	3	42	76	NA	0.25	FEE
3	Crushed Gypsum Upset	NENW	22	42	76	NA	0.01	WYW-147315
4	Crushed Gypsum Upset	NWNE	10	42	76	NA	0.01	WYW-147315

*Within the Grayling POD Boundary
**Not constructed or improved from stock pond status

County: Campbell and Johnson

Applicant: Devon Energy Production Company, L.P.

Surface Owners: Iberlin Ranch Limited Partnership, Moore Land Company, State of Wyoming, Bureau of Land Management

Drilling and Construction:

- Wells will be drilled to the Big George coal zone to depths of approximately 1400 feet.

- Drilling and construction activities are anticipated to be completed within 2 years, the term of an APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire POD.

- Well metering shall be accomplished by telemetry. Metering would entail 2 to 4 visits per month to each well.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy that was previously analyzed and approved under the Kokanee and Brook Trout EA's and permitted by the State: Use the 25 reservoirs that were previously analyzed, approved, and permitted -- not all of which are constructed (Table 2.2 above). Use 2 Aqua-Ject II water treatment systems and 2 passive flow, gypsum contact water treatment systems. Use 29 discharge points, not all of which are constructed. Devon converted 4 previous constructed outfalls into tire stock tanks.

- Devon is planning to contain the produced water in reservoirs with the exceptions of using their permitted pulse discharges to the Upper Powder River system and their permitted continuous discharge of produced water into the Antelope Creek watershed. Produced water discharged into the Antelope Creek watershed flows through 3 stock reservoirs prior to continuing to flow down drainage.

- A road network consisting of 14.0 miles of improved road and 10.3 miles of primitive road.

- An above ground power line network to be built by Powder River Energy Corporation. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed with separate NEPA process. Power line construction is unscheduled and may not be

complete before the CBNG wells are producing. If the power line network is not complete before the wells are producing, then temporary diesel generators shall be placed at the 24 power drops.

- A storage tank of 1000 gallon capacity shall be with each diesel generator. Generators are projected to be in operation for 6 to 12 months. Fuel deliveries are anticipated to be 2 times per week. Generator noise level is expected to be 86 decibels at 150 feet distance.

- A buried gas, water, and power line network, and 1 compression facility.

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

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

2.3. Alternatives Considered but Not Analyzed in Detail

The original POD for the Grayling was submitted by Devon on December 12, 2008 with 89 Federal APDs. A series of discussions and onsite visits occurred between BLM and Devon based on the initial project POD (see Sec 1.1). As a result of the onsites and discussions 5 wells (wildlife resource conflict) and their associated infrastructure were removed from the POD as submitted December 12, 2008 and required no further analysis.

The above changes documented in a revised project description were provided by Devon (January 14, 2011) in response to BLM's deficiency letters - resulted in a refined proposed project, which is discussed in this document as Alternative B. The POD, submitted January 14, 2011 was identified as being complete, the post-onsite deficiency letters, and the company's response to the deficiency letters are included in the Project Administrative Record, available for review at the BLM BFO.

2.4. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure proposed by the operator (Alternative B), are in Table 2.3The summary includes information for deferred wells and infrastructure. Deferrals are due to insufficient information that limits analysis and resultant decisions at this time. It is assumed that the mitigation requested will be met and further analysis will be completed. At that time a summary of infrastructure and associated disturbance will be amended.

Table 2.3 Summary of Alternatives

Acres or mileage within the Grayling POD Boundary of the action alternative, Alternative B, represent additional facilities and do not include the existing facilities (for specifics see MSUP, Surface Use Data Summary Form).

Facility	Alternative A (No Action) Proposed (includes existing conditions within the POD boundary) Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Total CBNG Wells	18	84
Wells recommended to be deferred	NA	4

Facility	Alternative A (No Action) Proposed (includes existing conditions within the POD boundary) Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Well Locations Nonconstructed Constructed Slotted NOTE: no constructed or slotted pads are required, ~1 ac. disturbance will consist of pit construction, mow and/or crushed vegetation and slight soil compaction	18	84/84 ac.
Gather/Metering Facilities Number of Facilities Acreage of Facilities	0	0
Compressors Number of Compressors Acreage of Facilities	1 .52 ac.	1 .52 ac.
Number of Ancillary Facilities Staging Areas Pump Stations	0 2/0.20 ac.	0 0
Acres (Miles) of Template/ Spot Upgrade Roads No Corridor With Corridor	4.0 7.3	.34 10.0
Acres (Miles) of Engineered Roads No Corridor With Corridor	0 0 0	0 .25
Acres (Miles) of Primitive Roads No Corridor With Corridor	1.6 .03	.24 19.7
Miles of Buried Power No Corridor With Corridor	0 0	.71 30.0
Miles of Pipeline No Corridor With Corridor	0 0	0 30.0
Existing Corridor not w/in access (water, gas, electric)	2.10	2.1
Miles of Overhead Powerlines	6.3	10.8
Number of Communication Sites	0	0
Number of Monitor Wells	0	0
Number of Treatment Facilities	0	0

Facility	Alternative A (No Action) Proposed (includes existing conditions within the POD boundary) Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Number of Impoundments On-channel Off-channel Lined Unlined	 3 0 3/10.2 ac.	
Water Discharge Points	5.2 ac.	
TOTAL ACRES DISTURBANCE	64.7 acres	**90.0 acres**

Note: for further detail concerning existing conditions see Surface Use Data Summary (SUDS) Form in the MSUP.

3. AFFECTED ENVIRONMENT

This section describes the environment affected by implementation of the alternatives described in Section 2. The affected environment aspects described here focus on the relevant major issues. A screening of all resources potentially affected is included in Appendix B. Resources that would be unaffected, or not affected beyond the level analyzed in the PRB FEIS, are not discussed in the EA.

3.1. Project Area Description

The Grayling POD is incorporated in the Devon Pine Tree Unit which is in southwestern Campbell and southeastern Johnson Counties. The 3 PODS' of the Pine Tree Unit encompass 23,268 acres within their boundaries. The Grayling POD area includes all or portions of sections 1-4 of T41NR76W and sections 14, 23-26, 29-35 of T42N, R76W approximately 7.5 miles east of Linch, Johnson County, Wyoming.

Elevations within the area range from 4,700 to 5,340 feet above sea level. Topography consists of fairly flat, broad highlands to deep, steep-sided, broad-bottomed gully systems, particularly along Von Burg Draw, Hay Draw and Davis Draw and their tributaries. Rocky outcrops occur on ridge tops in the north and far west, and eroded embankments with exposed sandstone and bare soil exist in drainages throughout the project area. The climate is semi-arid, averaging 13.1 inches of precipitation annually, about 68% of which occurs between April and September. The 57-year mean maximum and minimum temperatures for July and January were 90°F and 12°F, respectively. Land use in the area includes livestock grazing, oil production and, more recently, CBNG development. A network of existing roads within the project area will be used to access wells in the Grayling POD. These roads were constructed or improved to accommodate the existing fee and federal CBNG development and production. Land ownership in the project area consists of private, state, and federal surface. Existing land uses in the project area include livestock grazing, CBNG development and conventional oil production.

Fifteen reservoirs built in the Pine Tree Unit contain produced water from the Kokanee and Brook Trout POD's are proposed to contain the produced water from Grayling POD. Another 10 reservoirs in the Pine Tree Unit approved for construction in the Brook Trout POD Decision Record, are slated to contain the produced waters from all 3 POD developments, but they are neither improved from their existing stock pond reservoir status or have yet to be built (Table 2.2). Two Aqua-Ject II water treatment systems were built at 2 pump stations to reduce the Barium concentrations of the water prior to discharge to the outfalls.

In addition, 2 passive flow, gypsum water treatment systems were installed to treat the water for Barium concentrations prior to discharge to outfalls 001CD and 003CD for emergency upstart conditions of the Aqua-Ject II facilities (see Map D (MSUP) Grayling POD Project Map showing details of existing conditions within the Pine Tree Unit and proposed wells/infrastructure of the Grayling POD.

3.2. Soils & Vegetation

The general vegetation community within the project area consists of a mixed sagebrush/grassland mosaic. Various native bunch grasses dominate the vegetative composition of the project area intermixed with Wyoming big sagebrush. The greatest concentrations of sagebrush occurred among the gentler upland slopes and several minor tributaries of major drainages. Expansive grasslands occurred throughout the rolling hills and bottomlands. Elsewhere, grasslands occurred strictly along bottomlands, on ridge tops, and as infrequent upland meadows.

Perennial cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Common grasses noted during the onsite investigation include Indian ricegrass, needle and thread, western wheatgrass, cheatgrass, threadleaf sedge, little bluestem, and buffalo grass. Broom snakeweed, rubber rabbitbrush, and prickly pear are also found interspersed throughout the area. Trees within the project area were primarily limited to the major drainages and side tributaries.

The dominant soil orders in this major land resource area are Aridisols and Entisols. Soils have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams resulting in a wide variety of surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics such as topographic location, slope and elevation.

Soils within the project area were identified from the *South Campbell County Survey Area, Wyoming (WY605).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

The map unit symbols for the soils identified below and the associated ecological sites for the identified soil map unit symbols found within the POD boundary are listed in the table below. Ecological Site Descriptions are soil and vegetation community descriptions compiled by the Natural Resources Conservation Service (NRCS) for the purpose of resource identification, and providing management and reclamation recommendations.

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

Table 3.1 Ecological Sites and Map Units

Ecological Sites	Map Unit Name	Acres	%
Clayey (10-14 NP)	Renohill-Shingle-Worf Complex 3 to 15 % Slopes	335	4
Lowland (10-14 NP)	Clarkelen-Draknab Complex, 0 to 3 % Slopes	361	4.3
Loamy (10-14 NP)	Bidman Loam, 0 to 6 % Slopes	4957	58.7
Sandy (10-14 NP)	Bowbac-Worf Fine Sandy Loams, 3 to 15 % Slopes	1422	16.8
Shallow Loamy (10-14 NP)	Shingle-Worf Loams, 3 to 30 % Slopes	56	0.7
Shallow Sandy (10-14 NP)	Shingle-Taluce Complex, 3 to 30 % Slopes	1320	15.6

Dominant ecological sites and plant communities identified in this POD and its infrastructure are predominately loamy and sandy.

Loamy Sites: This site occurs on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10 to 14 inch precipitation zone. The soils of this site are moderately deep to 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.

Sandy Sites: occur on nearly level to steep slopes on landforms which include alluvial fans, hillsides, plateaus, ridges and stream terraces in the 10 to 14 inch precipitation zone. The soils of this site are moderately deep to very deep (greater than 20”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.

3.2.1. Reclamation Potential

Currently, soil conditions in the project area are being impacted by CBNG development as well as traditional activities, including livestock grazing and wildlife use. The majority of the area is categorized as having a: Fair reclamation potential this is consistent with field observations and analysis as ~ 60% of the project area consists of loamy soil types. Field observations of disturbed areas, show soil stabilization and revegetation are limiting factors affecting reclamation of disturbed areas. Impacts from grazing will also hinder vegetation establishment. Soil impacts (e.g., roads, linear pipeline scars, and artificial wet areas) can be readily observed in areas of Shallow Sandy and Sandy soil types.

Table 3.2 Reclamation Potential within the Grayling Project Area

Reclamation Potential	Acres
Fair	7760.8
Poor	657.3

3.2.1.1. Wetlands/Riparian

A considerable number of wetland and riparian areas were observed during the onsite visit. Many of the dams have been in existence for years, developing excellent wetlands around their shores and downstream of their dams. Table 3.3 shows the types and acreages of wetland/riparian area within the Grayling POD boundary. These wetlands developed plant communities dominated by cattails, rushes, sedges, willows and other wetland species. Artesian Draw has numerous wet and boggy areas within a mile of Artesian Upper Reservoir. Some of these are simply potholes which hold water from runoff events and snowmelt, then dry up in the late summer. There are 3 spreader dikes identified within the Pine Tree Unit and within potential influence of Grayling POD produced discharge water. The spreader dikes deflect the natural runoff water and help to irrigate nearby grass fields for agricultural benefit to the landowner.

The larger ephemeral and intermittent draws in the project area have well developed bottomlands. Some have incised channels through them, while others fan out into broad-bottomed swales.

Table 3.3 Wetland/Riparian Areas within the Grayling POD Boundary

Type of Wetland/Riparian Area	**Acres of Each Type**
Palustrine Emergent Temporarily Flooded	5.2
Palustrine Emergent Temporarily Flooded - Impounded	5.9
Palustrine Emergent Staturated	2.2
Palustrine Emergent Seasonally Flooded	47.2
Palustrine Emergent Seasonally Flooded - Impounded	16.0
Palustrine Forested Temporarily Flooded	1.1
TOTAL	**77.5**

The Antelope Creek watershed boundary is located approximately 2 miles to the south of the Grayling POD boundary. The Antelope Creek watershed receives produced water from the Pine Tree Unit via 3 permitted outfalls. The 2 draws within the Antelope Creek watershed that receive water from the Pine Tree Unit are the BT-3 and the Zephyr draws. These 2 draws drain into the Fink Prong drainage which is a tributary to Wind Creek. The Fink Prong drainage contains suitable habitat for Ute ladies'-tresses (UTL) orchids and the Wind Creek drainage is home to an identified population of Ute ladies'-tresses orchids.

This UTL orchid population is approximately 15 miles downstream of any proposed Grayling POD produced water discharge locations. The Ute ladies'-tresses orchid is listed as threatened under the Endangered Species Act (ESA). Further discussion of the ULT species is found in Section 3.3.2.1.3 and the affected environment for ULT is discussed in the PRB FEIS, p. 3-175.

The UTL population and identified habitat is within a broad open floodplain that contains cattails, rushes and sparse deciduous trees within the wetted perimeter of the non-defined channel. Harvested hay fields surround the well vegetated, wetted channel perimeter and the UTL population. Spreader dikes are built in the Wind Creek drainage. These spreader dikes retard the free flow of water down the drainage and create a wetted soil habitat by dispersing the water wider throughout the broad floodplain area.

3.2.1.2. Invasive Species

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

- Scotch thistle (*Onopordum acanthium L.*)

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Additionally, the operator inspected the Grayling POD for noxious weeds, and confirmed isolated patches within the project area. The following is a list of State and County Designated Noxious Weeds that were encountered within Grayling POD:

- Canada thistle (*Cirsium arvense L.*)
- Skeleton leaf bursage (*Franseria discolor Nutt.*)
- Spotted knapweed (*Centaurea maculosa Lam.*)
- Diffuse knapweed (*Centaurea diffusa Lam.*)

In addition, Campbell County Weed and Pest declared the following five species as weeds of concern within the Grayling POD Area.

- Black henbane (*Hyoscyarnus niger L.*)
- Buffalobur (*Solanum rostratum Dun.*)
- Common cocklebur (*Xanthium strumarium L.*)
- Salt cedar (*Tamarix ramosissima Ledeb.*)
- Leafy spurge (*Euphorbia esula L.*)

Cheatgrass is prevalent throughout the project area.
The state-listed noxious weeds are listed in PRB FEIS, Table 3-21, p. 3-104; and the Weed Species of Concern are listed in Table 3-22, p. 3-105.

3.3. Wildlife

A discussion of wildlife species that occur in the Powder River Basin is provided in the PRB FEIS, pp. 3-113 to 3-206. Information specific to the Grayling POD and/or information not discussed in the PRB FEIS is provided in this section.

A habitat assessment and wildlife inventory surveys of the Grayling POD area were performed over several years by ICF Jones & Stokes and ICF International (both referred to hereinafter as ICF) (ICF 2008, 2009, 2010a, 2010b). ICF performed surveys for bald eagle winter roosting, sage-grouse, sharp-

tailed grouse, raptor nesting activity, mountain plover, black-tailed prairie dogs, and habitat for Ute ladies'-tresses orchid. Big Horn Environmental Consultants (BHEC) conducted an additional survey for presence / absence of Ute ladies'-tresses on 18 and 19 August 2010. All surveys were conducted according to the Powder River Basin Interagency Working Group's protocols, available on the BFO website at the following URL: http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html.

A BLM biologist conducted field visits on June 21 to 25, September 9, and November 16, 2010. During those visits, the biologist verified the wildlife survey information, evaluated potential impacts to wildlife resources, and identified mitigation measures to reduce impacts to wildlife.

In addition to the surveys submitted by ICF and the onsite evaluation, the wildlife biologist also consulted databases compiled and managed by BLM BFO wildlife staff, the PRB FEIS, Wyoming Game and Fish Department (WGFD) datasets, and the Wyoming Natural Diversity Database (WYNDD) to evaluate the affected environment for wildlife species that may occur in the project area.

3.3.1. Habitat Types

Habitats present within the Grayling project area include mostly sagebrush shrubland and grassland. Limited woodlands and riparian habitats are also present.

Wyoming big sagebrush is the most abundant shrub in the area. It occurs in a patchy mosaic of sparse to moderately dense stands throughout the project area and averages 12 to 24 inches in height. The greatest concentrations occur among the gentler upland slopes that border Von Burg Draw and Collins Draw in the northern portion of the project area (Sections 14-15 and 22-24 T42N R76W). Sagebrush height often exceeds 36 inches in those areas. Silver sage is also present within Davis Draw and nearly all of the minor drainages throughout the project area.

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 considered one of the most imperiled ecosystems in North America (Samson and Knopf 1996, Knick et al. 2003, USFWS 2010). Sagebrush recovery after disturbance depends on the availability of an adjacent seed source and may take decades to occur (USFWS 2010).

Expansive grasslands occur throughout the rolling hills and bottomlands in the far western portion of the project area (Section 29-34 T42N R76W) and in the southern portion of the project area. Elsewhere, grasslands occur primarily along drainage bottoms and on ridge tops. Throughout the project area, grasses are generally tall (6 to 24 inches) and dense (usually less than 25% bare ground), particularly in bottomlands. The distributions of grassland-obligate species such as the black-footed ferret, burrowing owl, swift fox, black-tailed prairie dog, upland sandpiper, and mountain plover have diminished (Samson et al. 1998), therefore elevating the importance of maintaining healthy grasslands where they continue to occur.

Riparian habitats dominated by cottonwood trees occur along the major drainages (Dry Fork Powder River, Davis Draw, and Von Burg Draw) in the project area. Clustered stands and scattered individual trees compose relatively continuous bands of 25 to 100 mature (30 to 60 feet in height) cottonwoods along portions of the Davis Draw and Dry Fork Powder River from S33 T42N R76W to S24 T42N R77W, as well as Von Burg Draw throughout S15 and S22 T42N R76W. Several other small stands of cottonwoods occur within drainages throughout the project area, including SE S11, NENW S24, NWSW S25 T42N R76W, and SWNW S23 T41N R76W. Small stands of willows and box elders were also distributed along a few drainages in NW S23 and NE S11 T41N R76W and SW S13 T42N R76W,

respectively. Several shrub species are associated with some of the smaller drainages in the project area, including chokecherry, snowberry, currant, and serviceberry. Springs and/or seeps were noted in NE S31 and SW 34S-11.

Riparian ecosystems are typically the most structurally diverse and productive areas in a landscape. Functionally, they provide food, cover, and water for the largest diversity of species, and also provide migration routes and connectivity between other habitat types (Manci 1989).

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 within the PRB FEIS are described below.

3.3.2.1.1. Black-footed Ferret

The black-footed ferret is listed as endangered under the ESA. The affected environment for black-footed ferrets is discussed in the PRB FEIS, p. 3-175. Additional information regarding the affected environment for black-footed ferret is discussed here.

Active reintroduction efforts reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BFO administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004). The Grayling area is located within the Linch complex; however, USFWS determined that black-footed ferrets do not occur in Wyoming outside of the Shirley Basin, and the species has been block cleared for the rest of the state.

Current science indicates that a black-footed ferret population requires at least 1,000 acres of black-tailed prairie dog colonies for survival (USFWS 1989). The project area intersects several black-tailed prairie dog colonies, averaging 193 acres in size that, when grouped with other colonies within 1.5 km of each other, total approximately 2,300 acres. Black-footed ferret habitat is present within the project area.

3.3.2.1.2. Blowout Penstemon

Blowout penstemon is listed as endangered under the ESA. It is a regional endemic species with documented populations in the Sand Hills of west-central Nebraska and the northeastern Great Divide Basin of Carbon County, Wyoming. Suitable blowout penstemon habitat consists of sparsely vegetated, early succession, shifting sand dunes and blowout depressions created by wind. In Wyoming, the habitat is typically found on sandy aprons or the lower half of steep sandy slopes deposited at the base of granitic or sedimentary mountains or ridges. The project area does not contain habitats suitable for supporting blowout penstemon.

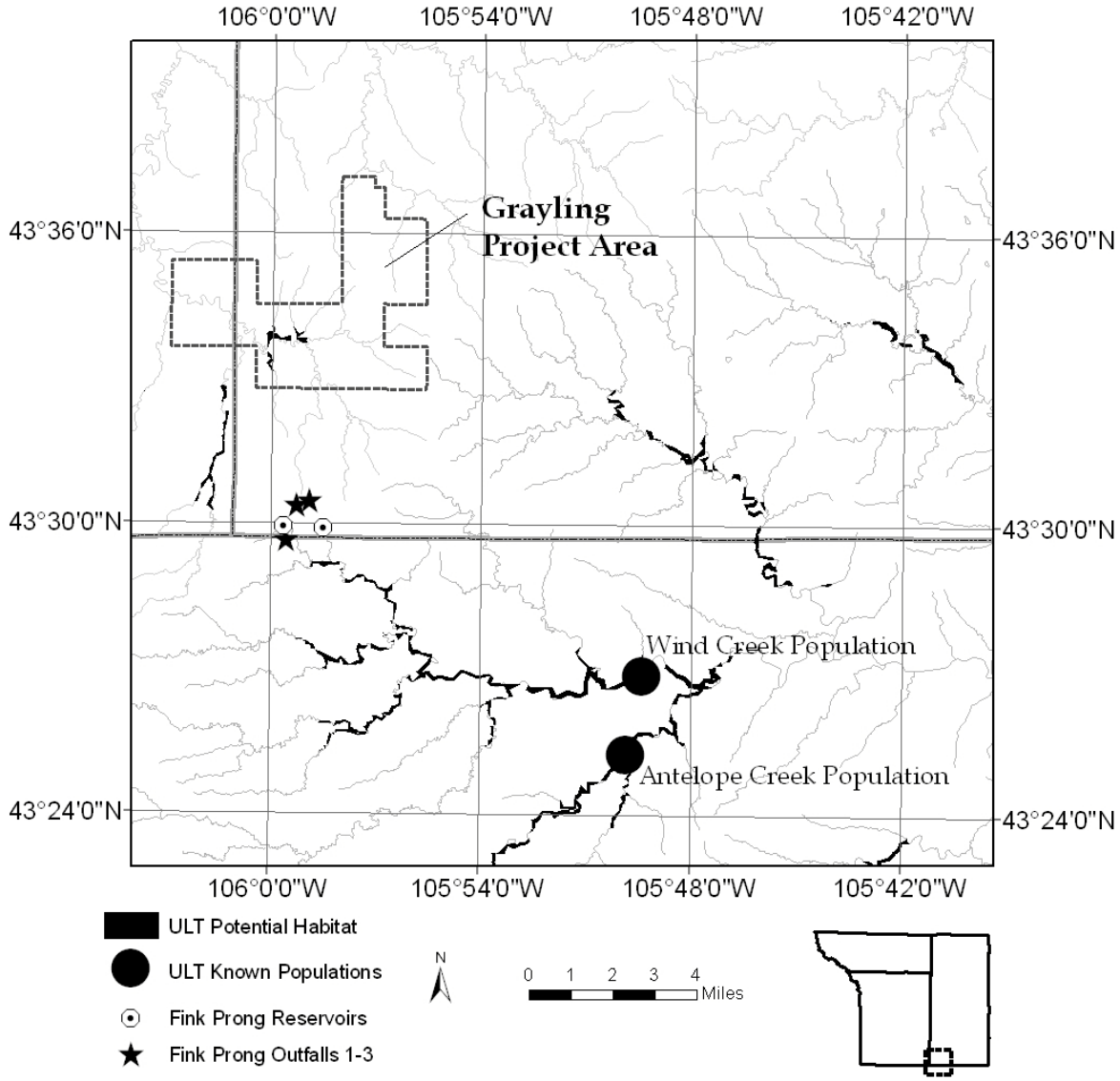
3.3.2.1.3. Ute ladies'-tresses orchid

The Ute ladies'-tresses orchid (ULT) is listed as threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS, p. 3-175. Suitable orchid habitat is present within the Grayling POD boundary. There are no known orchid populations in the Grayling POD boundary.

A Wyoming Natural Diversity Database model predicts undocumented populations may be present in the Buffalo Field Office administrative area, particularly within southern Campbell and northern Converse Counties – some of which are within the Grayling area. The model predicted that about 2.5 miles of Davis Draw (S33, 34 T42N R76W) and about 0.5 miles of Hay Draw (S4 T41N R76W) that occur within Grayling area are likely to support ULT. Approximately 0.8 miles to the west and southwest of the project area, a three mile stretch of the Dry Fork of the Powder River and one of its tributaries (S5, 8, 17, 19, &

20 T41N R76W) are also predicted by the model to support ULT. Figure W-1 shows the location of modeled habitat in proximity to the project area and the known populations of ULT.

Figure W-1. Known and Predicted Distribution of Ute ladies'-tresses orchid in relation to the Grayling Project Area*



* Note in the Figure that the Fink Prong Reservoirs and Outfalls are outside and to the south of the project area boundary, directly upstream of a known ULT population.

ICF surveyed the project area in 2007 and 2008. Suitable ULT habitat was reported along Davis Draw in section 29. At the onsite, the wildlife biologist noted that potential habitat may exist in Hay Draw in the SouthWest of section 4.

Big Horn Environmental Consultants (BHEC) surveyed the project area in 2008 and 2009, for Devon's Brook Trout POD (EA # WY-070-EA08-129), which geographically overlaps the Grayling POD.

According to their findings, (BHEC 2008a, BHEC 2008b, BHEC 2008c, BHEC 2009, BHEC 2010), potential habitat in the project area includes reaches of Artesian Draw and of the Fink Prong of Wind Creek, some of which are currently receiving discharge from current development associated with the Pine Tree Unit. The Fink Prong of Wind Creek is directly upstream of the Wind Creek ULT population, which are approximately 15 stream-miles downstream.

3.3.2.2. Proposed Species

3.3.2.2.1. Mountain Plover

The affected environment for mountain plover is discussed in the PRB FEIS, pp. 3-177 to 3-178. Additional information regarding the affected environment for mountain plover is discussed here.

At the time the PRB FEIS was written the mountain plover was proposed for listing as a threatened species under the ESA. USFWS withdrew the proposal in 2003 but reinstated it again in 2010. USFWS will submit a final listing determination in 2011. Mountain plover is a WGFD Species of Greatest Conservation Need (SGCN), because population status and trends are unknown but are suspected to be stable, habitat is vulnerable without ongoing significant loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a species with highest conservation priority, indicating they are clearly in need of conservation action. They are also listed by USFWS as a Bird of Conservation Concern (BCC) for Region 17, which includes the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions.

Several prairie dog colonies are located in the project area, and all have the potential to support mountain plover. While the grass cover in 2010 was too high for mountain plover, drought, wildfire, vegetative clearing, or intensive grazing would improve these areas for mountain plover habitat.

3.3.2.3. Candidate Species

3.3.2.3.1. Greater Sage-grouse

The affected environment for greater sage-grouse (sage-grouse) is discussed in the PRB FEIS, pp. 3-194 to 3-199. Additional information regarding the affected environment for sage-grouse is discussed here.

In 2010, USFWS determined that the sage-grouse was warranted for federal listing across its range, but the listing was precluded by other higher priority listing actions. Sage-grouse are listed as a WGFD SGCN because populations are declining, and they are experiencing ongoing significant loss of habitat. The Wyoming Bird Conservation Plan rates sage-grouse as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17. The sage-grouse population within northeast Wyoming exhibited a steady long term downward trend, as measured by lek attendance (WGFD 2008). Research suggests that these declines may be a result, in part, of CBNG development, as discussed in detail in USFWS (2010).

Sagebrush communities occur throughout and surrounding the Grayling POD area. An existing road was approved for oil and gas use within 0.25 mile of the Collins SW lek. The road travels in a north-south direction and was approved to access 3 federal wells and 4 fee wells. An overhead powerline also received approval along this route.

According to a statewide population density model that was developed based on lek attendance (Doherty 2008), the eastern portion of the project area (generally S14, 23, 24, 25, 26, 29, 30, 34 and 35 T42N R76W and S01, S02 T41N R76W) is partially contained in an area, that when combined with other similar areas, is predicted to contain 65% of the state's sage-grouse population, the highest density

category modeled. The western portion of the project area is contained in an area that is predicted to contain 75% of the state's sage-grouse population.

The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008) recommended that impacts be considered for leks within 4 miles of oil and gas developments. WGFD records indicate that 8 sage-grouse leks occur within 4 miles of the project area. These 8 lek sites are identified in Table 3.4.

Table 3.4 Sage-grouse leks within 4 miles of the Grayling POD

Lek Name	Distance from Project Area (mi)	Occupied?	WGFD Category of Impact
Brown Ranch	3.0	yes	Extreme
Cedar Canyon	1.0	yes	Extreme
Collins	0.3	no	High
Collins North	1.0	yes	Extreme
Collins SW	0.0	yes	Moderate
Cottonwood Creek 1	3.2	yes	Extreme
Cottonwood Creek 3	1.8	yes	Extreme

In addition to the above leks, an adjacent POD's 2010 a wildlife report indicated that sage-grouse males were strutting at 3 previously unknown locations in the west half of Section 19 T42N, R75W. One of these locations (SWNW of Section 19) is within 0.25 miles of the road and utility corridor to the 24-S9 and 24S-7. WGFD requires 3 years of data to determine if a strutting location qualifies as a lek.

There are currently 539 wells (Wyoming Oil and Gas Conservation Commission [WOGCC] 07/2010) within 4 miles of the 7 leks listed above, an area of 127 square miles. This amounts to a density of approximately 4.2 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.

WGFD developed impact thresholds to evaluate impacts to wildlife from oil and gas development, in its *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (WGFD 2009a). Moderate impacts occur when impairment of habitat function becomes discernable. High impacts occur when impairment of habitat function increases. Extreme impacts occur where habitat function is substantially impaired. Mitigation for each level of impact is discussed in the guidelines. Thresholds for impacts are generally determined by well densities. According to WGFD impact thresholds for oil and gas development, current impacts to 5 of the 7 leks are categorized as extreme. Collins lek is in the 'high' category and Collins SW is in the 'moderate' category.

3.3.3. BLM Sensitive Species

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

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

The project area contains habitats suitable for the following BLM Wyoming sensitive species: northern leopard frog, Baird's sparrow, bald eagle, Brewer's sparrow, ferruginous hawk, loggerhead shrike, long-

billed curlew, sage sparrow, sage thrasher, trumpeter swan, western burrowing owl, white-faced ibis, black-tailed prairie dog, and swift fox. The affected environments for these species are discussed in the PRB FEIS, pp. 3-113 to 3-206. During internal scoping, the impacts of the proposed project on bald eagles, ferruginous hawks, western burrowing owl, black-tailed prairie dogs, and swift fox were identified as potential issues, and those species are therefore discussed in more detail below.

3.3.3.1. Bald Eagle

The affected environment for bald eagles throughout the entire Powder River Basin Oil and Gas Project Area is described in the PRB FEIS, p. 3-175. Additional information regarding bald eagles and site-specific information is provided here. At the time the PRB FEIS was written, the bald eagle was listed as a threatened species under the ESA. Due to successful recovery efforts, it was removed from the ESA on 8 August 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No bald eagle nests are documented within 1 mile of the Grayling POD. The nearest known nest is located 25 miles north along the Powder River.

Suitable bald eagle nesting and winter roosting habitat is present within 1 mile of the project area along the riparian corridors of the Dry Fork of the Powder River and Davis Draw (from S33 T42N R76W to S24 T42N R77W). The cottonwood trees in those areas were mature (30 to 60 feet in height) and existed in a relatively wide band (up to 300 feet across). Another significant stand of cottonwood trees existed within Von Burg Draw throughout S15 and S22 T42N R76W, but those trees were less suitable for bald eagles due to their isolation and location within a steep, narrow canyon. Several other small stands of cottonwoods were scattered throughout the project area, but in most cases, they were too small and isolated to attract bald eagles. An adequate prey base is also present in the area with extensive sheep ranching and over 2,000 acres of prairie dog colonies throughout the project area.

BLM's eagle survey data shows many observations of 1 to 4 bald eagles within 1 mile of the POD site along the riparian corridors of Dry Fork Powder River and Davis Draw. A total of 6 bald eagles were observed on 4 separate occasions during winter surveys in 2007/2008. On 13 December, 2007, 1 adult bald eagle was flying over sagebrush in NENE S26 T42N R76W and 2 adult bald eagles were perched in a cottonwood along Davis Draw in SENW S32 T42N R76W. On 14 February, 2008, 2 adult bald eagles were again perched in a cottonwood along Davis Draw in NENW Section 32, while 2 adult was perched in a lone cottonwood in Artesian Draw in SESE S03 T41N R76W. In addition, 2 adult bald eagles were observed perched on the ground in NWSE S13 T41N R76W during a spring ground survey on 26 June 2007. On 12 December, 2008, 1 adult bald eagle was seen perched in a cottonwood tree at Davis Draw, NWSW 35 T42N R76W. Also observed during 2008/2009 winter surveys, 1 adult bald eagle was seen perched in a cottonwood tree along Davis Draw in SENW 32 T42N R76W on 12 January, 2009. IFC also reported observations of a total of 19 adult and juvenile bald eagles during surveys in December of 2009 (IFC 2010b). One adult bald eagle was also observed near the Artesian Upper Reservoir on 22 June, 2010.

3.3.3.2. Ferruginous Hawk

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

Twenty-eight ground nests (meaning that their substrate is either a creek bank or ground/hillside) are located within 1 mile of Grayling POD. BLM assumes these nests were built and used by ferruginous hawks. The BLM nest IDs are listed here:

3507	3511	4492	4633	4637	4689	10426
3508	3512	4494	4634	4638	5336	10427
3509	3513	4495	4635	4646	10421	10428
3510	4491	4625	4636	4683	10425	10429

Surveys of the area began in 2004. Since that time, only 3 of the nests were reported as active: nests 4625, 4681, and 4683 were active in 2007. Nests 4683 and 4625 are only 360 feet apart, and it is likely that only 1 of these nests was active in that year. The duplicate reporting was probably a result of 2 different consultants surveying the area and using 2 different ID numbers for the same nest. Four of the nests were reported to be occupied since 2004: 4625 and 4626 in 2006, 4646 in 2007, and 4681 in 2008. All of these active and/or occupied nests are located to the east of the project boundary.

3.3.3.3. Western Burrowing Owl

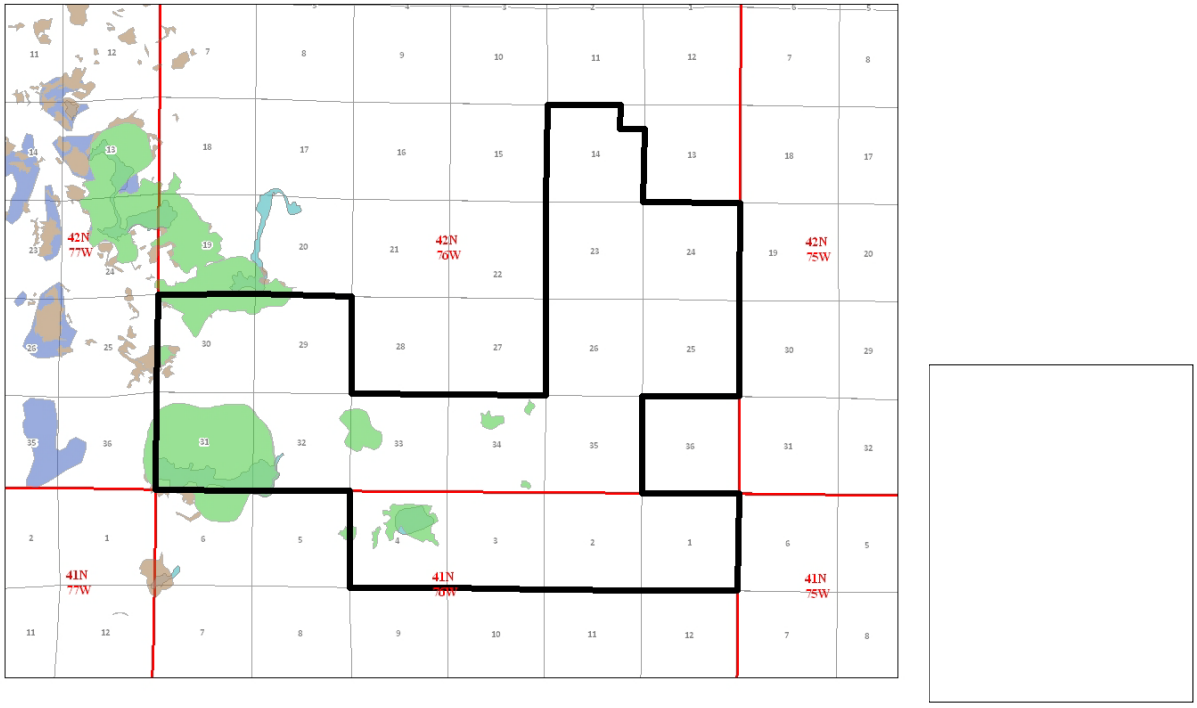
The affected environment for western burrowing owl (burrowing owl) is discussed in the PRB FEIS, p. 3-186. The Wyoming Bird Conservation Plan rates burrowing owls as a Level I species, indicating they are in need of conservation action. They are also a USFWS BCC in Region 17.

The BFO database indicates that no burrowing owl nests are reported within 0.5 mile of the Grayling POD; however, several prairie dog colonies are documented within the project boundary. Burrowing owl nesting is possible within the Grayling POD boundary.

3.3.3.4. Black-tailed prairie dogs

Eleven prairie dog colonies, totaling 2,158 acres, are documented within the project area in the spring of 2010 (ICF) (see Figure W-2 below). Prairie dogs were observed only in the town located in the northern portions of Sections 29 and 30, T42N, R76W.

Figure W-2. Black-tailed prairie dog colonies associated with the Grayling POD area.



3.3.3.5. Swift Fox

The affected environment for swift fox is discussed in the PRB FEIS, p. 3-189. Swift fox is listed as a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected to be stable, and habitat is vulnerable but is not undergoing substantial loss. Swift foxes prefer flat, shortgrass habitats and are often associated with black-tailed prairie dog colonies. In Wyoming, one of three swift fox strongholds has been documented in southern Campbell County (Dark-Smiley and Keinath 2003).

Suitable swift fox habitat exists throughout the project area and is associated with the prairie grasslands that occur mostly in the southwestern and southern portions of the POD and the active prairie dog colonies that occur across the POD (See Figure W-2). While swift fox may not prefer the taller grass currently present in the POD, varying climatic conditions, increased black-tailed prairie dog activity, or wildfire might favor shorter grass cover in some years. The closest known swift fox dens were reported in 2008 and are located approximately two miles to the west in S15 T42N R77W and six miles to the northwest in S19 T43N R77W. In 2007, active dens were reported six miles to the northwest in S19 and S30 T43N R77W and approximately 10 miles to the northeast in S8 T43N R74W. Swift fox surveys completed for Devon's Brooktrout POD in 2009 and 2010 did not find swift fox. The Brooktrout POD is adjacent, and to the north, of Grayling.

3.3.4. Big Game

Both pronghorn and mule deer were observed during field visits to the project area. WGFD data indicate that the project area contains yearlong and winter yearlong range for both species. The affected environment for pronghorn is discussed in the PRB FEIS, pp. 3-117 to 3-122, and for mule deer on pp. 3-127 to 3-132. The project area intersects two hunt areas for pronghorn and mule deer. Populations of pronghorn within the hunt areas are at or above the WGFD objectives. Mule deer are above the WGFD objective in the northern portion of the project and below the objective in the southern portion. The most current big game range maps are available from WGFD.

3.3.5. Aquatic Species

The project area is drained by the ephemeral and intermittent tributaries of Artesian Draw, Davis Draw, Von Burg Draw, and the Dry Fork of the Powder River. Several springs are documented within the project area. Fish are present in the large reservoir in S S03 T41N R76W. Herptile species likely use the springs, reservoirs, and wetland areas scattered throughout the project area. The Powder and Cheyenne River ecosystems and fisheries are discussed in further detail in the PRB FEIS, pp. 3-153 to 3-166.

A discussion of aquatic invertebrate communities is in the PRB FEIS, pp. 3-153 to 3-154. These can be indicators of the quality of aquatic environments (Peterson 1990), Perennial streams within northeastern Wyoming were sampled by USGS between 1980 and 1981, and generally supported invertebrate communities that included taxa adapted to flowing water. Ephemeral stream communities generally were composed of taxa adapted to standing water (Peterson 1990).

Table 3.5 lists the fish that occur in the Upper Powder River subbasin and their WGFD Native Species Status (NSS) designation, if applicable. WGFD has identified Species of Greatest Conservation Need (SGCN) within the state, all of which are given NSS designations. Seven of the species that may occur in the Upper Powder River subbasion are designated as either NSS 1, 2, or 3 species. Species in these designations are considered to be species of concern, in need of more immediate management attention, and more likely to be petitioned for listing under the Endangered Species Act (ESA). For these species, WGFD recommends that no loss of habitat function occur. WGFD allows for some modification of the habitat, provided that habitat function is maintained (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 are also stable. There is no special concern for these species.

Table 3.5 Fish that occur in the Upper Powder River Subbasin

Wyoming Native Species Status	Species	Wyoming BLM Sensitive
NSS1	Sturgeon chub	Yes
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
NSS7	Longnose dace	No
	Sand shiner	No
	White sucker	No
None	Common carp	No
	Rock bass	No
	Shovelnose sturgeon	No

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

WYNDD has completed the first year of a three-year herptile study in the Power River Basin in order to detect impacts from CBNG development (Griscom et al. 2009). Herptiles expected to occur in the Powder River Basin, according to these studies, are listed in Table 3.6 (Turner 2007, Griscom et al. 2009). Eight of the species listed are classified by WGFD as SGCNs, all with a rating of NSS4, indicating that they are widely distributed throughout their native ranges, and populations are stable. Of the species listed in Table 3.6, WYNDD reported that, for 2008 surveys, boreal chorus frogs were the most abundant amphibian in the PRB and were located 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.

Table 3.6 Herpetile species expected to occur in the Powder River Basin (Turner 2007,Griscom et al. 2009)

Species	Verified by Survey*	WGFD Status	Wyoming BLM Sensitive
Tiger salamander	Yes	NSS4	No
Northern leopard frog	Yes	NSS4	Yes
Milk Snake	No		No
Columbia spotted frog	Yes	NSS4	Yes
Bullfrog	Maybe	NSS4	No
Spiny softshell	Yes		No
Northern prairie lizard	No		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
Short-horned lizard	Yes		No
Sagebrush lizard	Yes		No
Eastern yellowbelly racer	Yes		No
Prairie rattlesnake	Yes		No
Western hog-nosed snake	Yes		No
Bullsnake	Yes		No
Terrestrial garter snake	Yes		No
Plains garter snake	Yes		No
Common garter snake	Yes		No
Snapping turtle	Yes		No
Painted turtle	Yes		No
Notes:* As reported in Turner (2007) and Griscom et al. (2009).			

3.3.6. Migratory Birds

The affected environment for migratory birds is discussed in the PRB FEIS, pp. 3-150 to 3-153.

3.3.7. Raptors

The affected environment for raptors is discussed in the PRB FEIS, pp. 3-141 to 3-148. Additional information not discussed in the PRB FEIS and site-specific information regarding raptor species is provided here. Three raptor species are known to use nests within 0.5 miles of the project area: golden

eagles, red-tailed hawks, and great-horned owls. Ferruginous hawks were documented to use nests within 1.0 miles of the project boundary. See section 3.3.3.2. for a discussion of the affected environment for ferruginous hawks.

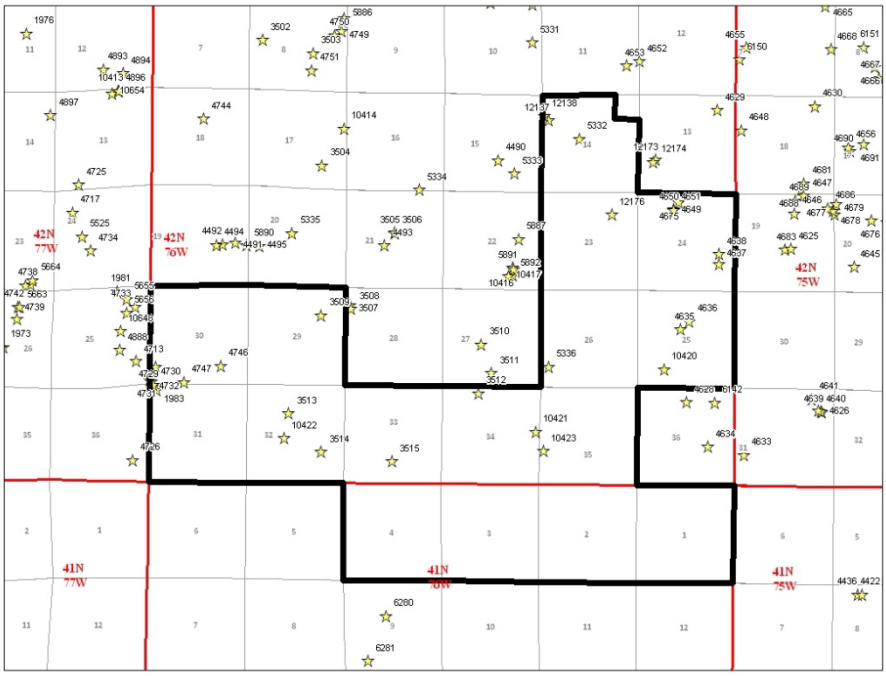
The following information regarding golden eagles is in addition to what was described in the affected environment section for raptors in the PRB FEIS. Golden eagles are listed as a Bird of Conservation Concern (BCC) by USFWS for Region 17, which encompasses the project area. Golden eagles are sensitive to extensive human activity around nest sites and are threatened by loss of nesting habitat to industrial development, powerline executions, and other factors (Nicholoff 2003). The WGFD Wyoming Bird Conservation Plan habitat objectives for golden eagles include maintaining open country to provide habitat for small mammals as a food source. Recommendations for management include restricting human activities near nests during peak breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories. Golden eagles have occupied 3 (and perhaps 4, but see discussion below) nests: 4650 (2006), 5332 (2007, 2008), 10420 (2009), and 10423 (2010).

Golden eagles often maintain several nests within 1 territory, and it is likely that it was the same pair that occupied all of these nests and simply moved to a different nest each year. A compressor station was built in 2009 within 0.5 miles of nest 10420. The station is in line-of-sight of the nest and was built prior to breeding season, indicating that the pair used the nest, despite the installation of the compressor station. The last report of nest 10420 in 2009 indicates that the 2 chicks were observed in the nest. In 2010, the pair occupied a small nest (10423) that appears to have been built by a red-tailed hawk, or similar-sized species. No observations were made of any young in the nest.

Nest 4650 is notable because it was occupied by golden eagles, red-tailed hawks, and great-horned owls since 2006. In 2007, the BLM database indicates that this nest was active with both golden eagles and red-tailed hawks. The database also indicates that nest 5332 was active with golden eagles in 2007. These nests are only 1 mile apart and it is unlikely that breeding golden eagle pairs would occupy nests in such close proximity. It is the biologist's opinion that nest 4650 was active with red-tailed hawks in that year, and that the golden eagles were actually in nest 5332, and that the report of nest 4650 being active with golden eagles was erroneous.

Sixty-three raptor nest sites occur within 0.5 mile of the project boundary (see Figure W-3 below).

Figure W-3. Raptor nests associated with the Grayling POD.



3.3.8. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection. Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals.

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

The human health issues related to WNv are well documented. Historic data collected by the CDC and published by the USGS at www.westnilemaps.usgs.gov are summarized in Table 3.7. Reported data from the Powder River Basin (PRB) includes Campbell, Sheridan and Johnson counties.

Table 3.7 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
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

Year	Total WY Human Cases	Human Cases PRB	Equine Cases PRB	Bird Cases PRB
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. During 2003, 36 raptor deaths were attributed to WNv in Wyoming, including golden eagle, red-tailed hawk, ferruginous hawk, American kestrel, Cooper's hawk, northern goshawk, great-horned owl, prairie falcon, and Swainson's hawk (Cornish et al. 2003). Actual mortality is likely to be greater.

Population impacts of WNv on raptors are unknown at present. The Wyoming State Vet Lab determined 22 sage-grouse in one study project (90% of the study birds), succumbed to WNv in the PRB in 2003. While birds infected with WNv have many of the same symptoms as infected humans, they appear to be more sensitive to the virus (Rinkes 2003).

Mosquitoes can potentially breed in any standing water that lasts more than 4 days. In the Powder River Basin, there is generally increased surface water availability associated with CBNG development. This increase in potential mosquito breeding habitat provides opportunities for mosquito populations to increase. Preliminary research conducted in the Powder River Basin indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than 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 treatment methods seem to be effective when focused on specific target areas, especially near communities, however they have not been applied over large areas nor have they been used to treat a wide range of potential mosquito breeding habitat such as that associated with CBNG development.

The WDEQ and the Wyoming Department of Health sent a letter to CBNG operators on June 30, 2004. The letter encouraged people employed in occupations that require extended periods of outdoor labor, be provided educational material by their employers about WNv to reduce the risk of WNv transmission.

The letter encouraged companies to contact either local Weed and Pest Districts or the Wyoming Department of Health for surface water treatment options.

3.4. Water Resources

In-channel downstream impacts are addressed in the WMP for the Grayling POD prepared by SWCA for Devon. Downstream concerns were previously addressed in the Kokanee and Brook Trout POD EA's. The quantity and quality of the produced water permitted by the WDEQ to be discharged from these 2 previously analyzed POD's is not being altered. Therefore there are not any additional adverse impacts anticipated beyond those already evaluated in the previous EA's.

The water resources affected with the Grayling POD project were previously analyzed under the Kokanee and Brook Trout EA's. All 3 POD's are within the Pine Tree Unit. Kokanee POD was approved on 6-15-07 EA #WY-070-06-114 and the West Pine Tree Brook Trout POD, aka Brook Trout, was approved on 9-17-08 EA #WY-070-08-129. Portions of existing water management infrastructure from these 2 previous POD's lie within the Grayling POD boundary and includes water pipelines, on-channel reservoirs, stock water tanks with outfalls to reservoirs, and pumping stations. The gypsum water treatment facilities and several of the reservoirs lie outside of the Grayling POD boundary, see Table 2.2 above.

The Pine Tree Unit project area is within the Upper Powder River drainage system, but also includes 3 outfalls and reservoirs that lie within the Antelope Creek drainage system. Antelope Creek drains into the Cheyenne River system. The Grayling POD boundary is comprised of ephemeral draws and intermittent creeks contained within a broad, rolling sage and grass covered landscape. Due to the development of CBNG and stock water impoundments, several of the draws now contain small ponds that capture the runoff. A few seeps that are located in the draws were developed for stock watering ponds. Some of the ephemeral channels are steeply incised with headcuts up to 10 feet high while others are well vegetated and show no major erosion degradation.

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

3.4.1. Groundwater

The groundwater in the Pine Tree Unit is historically used for stock water or domestic purposes. A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 25 registered stock and domestic water wells within 1 mile of a federal CBNG producing wells in the Grayling POD with depths ranging from 8 to 1200 feet. For additional information on water, refer to the PRB FEIS (January 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 FEIS. The MMRP called for the use of adaptive management where changes could be made based on monitoring data collected during implementation.

Specifically relative to groundwater, the plan identified the following PRB FEIS ROD, p. E-4:

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

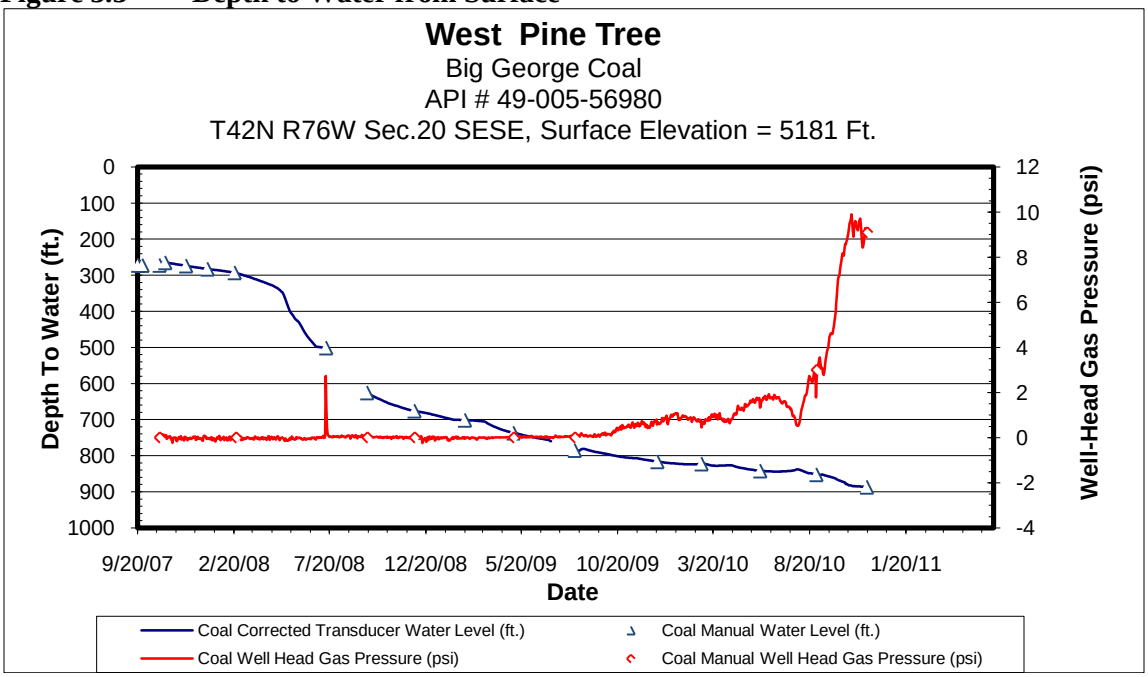
The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. The BFO periodically monitors PRB coal zone pressures as expressed in depth to water from surface since the early 1990s, Figure 3.3.

Numerous CBNG and oil wells are drilled and are producing in this general area. A records search of the Wyoming State Oil and Gas Conservation Commission website shows that in 2010 there were 129 producing wells located in T42N, R76W, and 8 producing wells in T41N, R76W. These 2 townships encapsulate the Pine Tree Unit-which includes the proposed Grayling POD. As a result, the target coal zone pressure is likely reduced through off set water production.

The West Pine Tree groundwater monitoring well was installed by Devon as a part of the BLM deep groundwater monitoring program. It is at SESE Sec 20 T42N R76W. The monitoring well is approximately 0.25 mile away from 3 previous approved Brook Trout production wells and within the same distance to the north from the Grayling proposed well #Federal I Ranch 29-1. The initial water level of the Big George coal, which is indicative of the pressure in the coal zone, was recorded at 272 feet below ground level in the West Pine Tree monitoring well. The most recent measurement dated November 11, 2010, recorded the water level at 886.8 feet below ground level, for a decline of 614.8 feet since the well was completed.

This level of depressurization is within the potential predicted in the PRB FEIS which was forecast 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 on their website at http://www.wsgs.uwyo.edu.

Figure 3.3 Depth to Water from Surface



3.4.2. Surface Water

The project area lies in tributaries to the Upper Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt). Some of the drainages, Davis Draw and Artesian Draw in particular, could be characterized as 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 range from steep gullies to gentle, well vegetated grassy swales, without defined beds and banks.

The Brook Trout EA previously analyzed and approved the water management plan for the trans-basin pumping of CBNG produced water to the Cheyenne River drainage via tributaries to the Antelope Creek drainage. The Grayling POD WMP is utilizing the same WMP infrastructure and will discharge produced water to the BT-3 and Zephyr Draws. Devon is permitted under WYPDES Permit #WY0055581 to release 2.1 MGD (3.2 cubic feet per second) of produced water to these drainages. According to the water monitoring data submitted by Devon to the WDEQ the water discharged from the permitted outfalls is at or below the 2.1 MGD. The water released from these discharge points appears to infiltrate into the sandy soil prior to reaching 2.5 miles downgradient of the WY0055581-003 discharge point. The channel morphology immediately downgradient of the 2.5 mile location to approximately 4 miles downgradient, shows no indications of perennial surface flow and is more characteristic of ephemeral flow events. For site specifics regarding water discharged from the permitted outfalls see Fink Prong Soil Sampling 11-16 2010 Addendum to the WMP.

The BT-3 and Zephyr draws are headwater tributaries to Fink Prong and Wind Creek of Antelope Creek. These two drainages are ephemeral, without a strong gully component. They grade fairly quickly into gentle topography with broad-bottomed grassy swales without well defined beds and banks.

The PRB FEIS presents the historic mean electrical conductivity (EC, in µmhos/cm) and sodium adsorption ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS, p. 3-49). These water quality parameters ". . . illustrate the variability

in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS, p. 3-48). For the Upper Powder River, the EC ranges from 1197 µmhos/cm at maximum monthly flow to 3400 µmhos/cm at low monthly flow and the SAR ranges from 4.76 at maximum monthly flow to 7.83 at low monthly flow.

These values were determined at the USGS station located on the Powder River at Arvada (PRB FEIS, p. 3-49). The Antelope Creek gage near Teckla, Wyoming, shows an EC that ranges from 1800 µmhos/cm at maximum monthly flow to 2354 µmhos/cm at low monthly flow, and an SAR that ranges from 2.82 at maximum monthly flow to 2.6 at low monthly flow.

The operator identified 6 natural springs within 0.5 mile of this POD boundary. Spring 44-11-4176 was not considered further in the WMP analysis because even though it is within 0.5 mile of the Grayling POD boundary, a discharge was eliminated to the draw that may have had an effect on the spring recharge and water quality. Spring 31-14D-4176 is not within 0.5 mile of the Grayling POD boundary but is within a drainage that has an outfall upgradient of the spring location and could be influenced by produced water discharged down the drainage and was included in the 6 springs tally. Emigrant Spring is also not within 0.5 mile of the Grayling POD boundary but is adjacent to wells approved for the Brook Trout POD and was therefore included in this analysis due to the potential impacts from CBNG development in the Pine Tree Unit. The springs are listed in Attachment J and on page 19 of the water management plan. The operator committed to monitor the water quality and flow of these identified springs in the Brook Trout EA. Table 3.8 below shows the spring locations and some of the water quality data collected at the springs. Most if not all of these springs are highly impacted by livestock use, have no visible inflow, and are considered more of a ground seep than a spring.

Table 3.8 Seeps and Springs

Spring/Seep	Location	Date Sampled	EC, µmhos/cm	SAR	TDS, mg/L	Iron, µg/L
21-9-4176	NENW Sec 9 T41N R76W	6/22/2009	1603	5.4	1150	1020
Emigrant Spring	SWNW Sec 27 T42N R76W	7/8/2010	974	0.3	562	ND
11-22A-4176	NWNW Sec 22 T41N R76W	6/22/2009	1121	0.5	810	23,300
		7/27/2010	888	540	540	704
31-10-4176	NENW Sec 10 R41N R76W	6/22/2009	1821	1.4	1420	2110
		7/30/2010	1033	2.3	760	2200
44-11-4176*	SESE Sec 11 T41N R76W	6/22/2009	1973	0.9	1650	533
41-10A-4176	NENE Sec 10 T41N R76W	6/22/2009	1481	1.5	1160	132
		7/30/2010	1645	2.1	1330	1280
31-14D-4176	NWNE Sec 14 T41N R76W	6/22/2009	999	0.9	695	190
		7/30/2010	904	1.2	647	1160

*****Discharge removed from contributing drainage to the spring. Outfall converted to Stock Tank.

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

3.5. Cultural Resources

Class III cultural resource inventory was performed for the Grayling POD prior to on-the-ground project work (BFO project nos. 70090048, 70090015 Note: Class III cultural resource inventory was not submitted for NW of Section 30 and the SW/SW of Section 20, T42N R76W). ACR Consultants, Inc. and SWCA Environmental Consultants conducted combination block and linear, pedestrian and shovel test, 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*. Ardeth Hahn, BLM Archaeologist, reviewed the reports for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined both to be adequate. The following resources are located in or near the project area.

Site Number	Site Type	Eligibility*
48CA264	Bozeman Trail (West Pine Tree Segment 1)	E, noncontributing
48CA264	Bozeman Trail (West Pine Tree Segment 2)	E, contributing
48CA5494	Ft. Fetterman-Ft. McKinney Telegraph Line (West Pine Tree Segment 1)	E, noncontributing
48CA5494	Ft. Fetterman-Ft. McKinney Telegraph Line (West Pine Tree Segment 2)	E, contributing
48CA5847	Historic Site	NE
48CA6857	Historic & Prehistoric Site	NE
48CA6858	Historic Site	NE
48CA6859	Historic & Prehistoric Site	NE
48CA6860	Historic & Prehistoric Site	Unevaluated
48CA6861	Historic & Prehistoric Site	Unevaluated
48CA6862	Prehistoric Site	NE
48CA6863	Prehistoric Site	Unevaluated
48CA6864	Historic & Prehistoric Site	NE
48CA6865	Historic & Prehistoric Site	E
48CA6866	Historic Site	NE
48CA6867	Prehistoric Site	NE
48CA6868	Prehistoric Site	Unevaluated
48CA6869	Prehistoric Site	Unevaluated
48CA6870	Historic & Prehistoric Site	NE
48CA6871	Historic Site	NE

Site Number	Site Type	Eligibility*
48CA6872	Historic Site	NE
48CA6940	Historic Site	Unevaluated
48CA6941	Historic Site	Unevaluated
48CA6942	Prehistoric Site	NE
48CA7058	Historic Site	NE
48CA7059	Historic & Prehistoric Site	NE
48JO4101	Historic Site	NE
48JO4102	Historic & Prehistoric Site	NE
48JO4103	Historic & Prehistoric Site	NE
48JO4104	Historic & Prehistoric Site	NE
48JO4105	Historic Site	Unevaluated

*E=Eligible for the NRHP, NE=Not Eligible for the NRHP

Some of the project area analyzed in this EA occurs on deep alluvial and/or Aeolian deposits. Alluvial and Aeolian 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).

Portions of the project area were not able to be inventoried due to vegetation inhibiting ground visibility. Site 48CA264 (Bozeman Trail) is listed on the National Register of Historic Places, and site 48CA5494 (Ft. Fetterman to Ft. McKinney Telegraph Line) is eligible for the National Register of Historic Places. Contributing portions (typically expressed as wagon ruts) of each site are present in the project area. None of the contributing portions of the sites retain their integrity of setting due to modern additions to the landscape including CBNG wells, upgraded roads, pipelines, POD buildings, compressor stations, etc.

3.6. Visual Resources

The entire project area is classified as Visual Resource Management Class IV under the 2001 Update of the Resource Management Plan. The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention.

3.7. Wilderness

The Grayling POD area contains 18 operational CBNG wells, over 6.3 miles of overhead powerlines, about 11 miles of modern rural roads, and 1 compressor, see Table 2.3.

4. ENVIRONMENTAL EFFECTS

This section describes the environmental effects of the proposed action, alternative B. The effects analysis addresses the direct and indirect effects of implementing the proposed action, the cumulative effects of the proposed action combined with reasonably foreseeable Federal and non-federal actions, identifies and analyzes mitigation measures (COAs), and discloses any residual effects remaining following mitigation.

4.1. Alternative A

The No Action Alternative was analyzed as Alternative 3 in the PRB FEIS, and is incorporated by reference into this EA. Information specific to resources for this alternative is included within the PRB Final EIS on pages listed in Table 4.1.

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
Visual Resources		Direct and Indirect Effects	4-313
		Cumulative Effects	4-314

4.2. Alternative B

4.2.1. Soils & Vegetation

4.2.1.1. Soils Direct and Indirect Effects

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

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

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

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

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

Direct effects (removal and/or compaction) to vegetation would occur from ground disturbance caused by drilling rig equipment and construction of a compressor station, 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 may result in loss of vegetation and affect reclamation success for the life of the project.

4.2.1.1.1. Cumulative Effects

The designation of the duration of disturbance is defined in the PRB FEIS, p 4-1 and 4-151. Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization, as committed to by the operator in their POD Surface Use Plan and as required by the BLM in COAs.

Geomorphic effects of roads and other surface disturbance range from chronic and long-term contributions of sediment into waters of the state to catastrophic effects associated with mass failures of road fill material during large storms. Roads can affect geomorphic processes primarily by: accelerating erosion from the road surface and prism itself through mass failures and surface erosion processes; directly affecting stream channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and debris at road-stream crossings.

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

4.2.1.1.2. Mitigation Measures

The proponent planned their project to maximize the fluid mineral drainage while avoiding areas with soil limitation where possible. The proponent also designed the infrastructure such that no constructed well pads will be required and no engineered roads will be required. BLM made further recommendations during the onsite to avoid areas with low reclamation potential and poor site suitability. Disturbances

approved within these areas require complimenting the programmatic/standard COAs with site specific performance based reclamation related COAs. The following mitigation will be applied through a COA:

- Impacts to soils and vegetation from surface disturbance will be reduced by following the BLM applied mitigation. The planned wells are located in manners negating a need for constructed pads. Access roads are planned such that no engineered roads are required. The operator committed to minimizing disturbance widths for roads and pipeline corridors; and maintaining 20 foot vegetative buffers near drainages.
- The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). The Wyoming Reclamation Policy applies to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to an approved "Reference Site" or NRCS Ecological Site Transition State. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.
- Compaction would be remediated by plowing or ripping.

4.2.1.1.3. Residual Effects

Erosion will occur in the POD area due to the presence of highly erosive soils and the topography. Rilling and gullying of cut and fill slopes on, access/utility corridors, will take place. Impacts from livestock to stabilized cut and fill slopes will limit soils becoming stable and getting vegetation establish. 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.

4.2.1.1.4. Wetlands/Riparian

4.2.1.1.4.1. Direct and Indirect Effects

Most if not all of the drainages that are within influence of the produced water discharges from the Grayling POD, are receiving produced water discharges from the previously analyzed and permitted Kokanee and Brook Trout POD's. In drainages that are receiving produced water at or near the maximum permitted discharge volumes, little to no additional effect to the wetland/riparian environment should be detected (i.e. Fink Prong drainage). Those drainages that are not already receiving the permitted flow may incur the effects discussed in this section.

Re-surfacing water from the impoundments and through direct discharge into drainages will potentially allow for wetland-riparian species establishment. Pages 4-174 to 4-175 of the PRB FEIS address potential impacts to the wetland/ riparian environment including:

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

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

4.2.1.1.4.2. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Upper Powder River and Antelope Creek drainages and the total amounts that were predicted in the PRB FEIS (see Section 4.2.3.2.2).
- The commitment by the operator to monitor the volume of water flowing into the Fink Prong of Antelope Creek and into the Upper Powder River and to use their "Assimilative Capacity Credits" should discharge to the Powder River begin to occur.
- The WMP for the Grayling POD proposes that produced water will not contribute significantly to flows downstream beyond those already addressed in the Kokanee and Brook Trout EA's.

Additional mitigation measures may be required should discharges into the Powder River watershed from the downstream-most reservoirs become necessary.

4.2.1.1.4.3. Mitigation Measures

In addition to the mitigation measures listed above in the Cumulative Effects paragraph, the water management plan incorporates a gypsum water treatment system to minimize the potential environmental impacts of barium concentrations in the water discharged from the Grayling POD development. Devon has also removed four outfalls from the existing, permitted infrastructure and replaced them with float controlled stock tanks to minimize potential headcut migration and water discharge impacts to ephemeral draws (WMP pp. 5, 7, and 23)

4.2.1.1.4.4. 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.

4.2.1.1.5. Invasive Species

4.2.1.1.5.1. 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.

4.2.1.1.5.2. 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.

4.2.1.1.5.3. Mitigation Measures

The operator committed to the control of noxious weeds and species of concern using the following measures identified in their integrated pest management plan (IPMP):

1. Control Methods include physical, biological, and chemical methods:
   Physical methods include mowing during the first season of establishment, prior to seed formation, and hand pulling of weeds (for small or new infestations). Biological methods include the use of domestic animals, or approved biological agents. Chemical methods include the use of herbicides, done in accordance with the existing surface use agreement with the private surface owner.

2. Preventive practices:
   Certified weed-free seed mixtures will be used for re-seeding, and vehicles and equipment will be washed before leaving areas of known noxious weed infestations.

3. Education:
   The company will provide periodic weed education and awareness programs for its employees and contractors through the county weed districts and federal agencies. Field employees and contractors will be notified of known noxious weeds or weeds of concern in the project area.

4.2.1.1.5.4. Residual Effects

Control efforts by the operator are limited 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 within the project area.

4.2.2. Wildlife

As part of the POD proposal Devon included a December 18, 2008 report titled: Devon Energy Production Company – Grayling POD Infrastructure Planning and Biological Mitigation. This report identified 8 wells and 1 pump house targeted for further evaluation and/or relocation. The specific changes are listed below under the affected wildlife resource.

4.2.2.1. Habitat Types

4.2.2.1.1. Direct and Indirect Effects

The Grayling project, as proposed in Alternative B, 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 sagebrush habitats are lost or fragmented, sagebrush-obligate species decline through several mechanisms: areas of suitable habitat decrease (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 m 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. Due to this, sagebrush obligate species may not return for many years after reclamation activities are completed.

Impacts to sagebrush habitat was reduced by including several design features. Prior to the onsite:

- Well 23S-7 was relocated in order to corridor its location along an existing two-track road at the edge of a sagebrush stand.
- Well 25S-1 was relocated to reduce impacts on a sagebrush stand.
- Well 25S-3 was moved to the edge of a small patch of moderately dense sagebrush to reduce impacts to the stand, and the access road was moved to minimize impacts on sagebrush stands.
- Well 25S-7 was relocated to a grassy patch to reduce impacts to sagebrush stands and accommodate routing options that would allow minimization of disturbance to sagebrush stands along the access road.

Following the onsite:

- Removal of wells 24S-5, 23S-9, and 24S-11 from the project plan. These wells and associated infrastructure and access roads would have been constructed in sagebrush shrublands.
- Well 25S-3 was moved further to the SE in order to minimize disturbance to sagebrush shrublands.
- Wells 26S-1 and 26S-7 were moved to the main access road to corridor them with existing disturbance and eliminate the need for additional access roads through sagebrush shrublands.
- The road to 24S-13 was moved out of sagebrush shrublands.

Direct impacts will also occur to grasslands, but grasslands are generally easier to reclaim and re-establishment would occur more quickly.

Direct impact to wetland/riparian habitats will occur in NW S29 T42N R76W, where a pipeline is proposed across Davis Draw and in SW S04 T41N R76W, where a road improvement will be made across Hay Draw. Impacts to the portion of Davis Draw were minimized by Devon removing the access road and proposing a pipeline only. The pipeline disturbance will reclaim quickly, whereas road disturbance would have been much longer lasting and would have increased sedimentation and altered Davis Draw hydrology. The road improvement across Hay Draw will result in direct loss of wetland habitat and long-term habitat degradation from increased sedimentation and altered hydrology. A better alternative was not identified due to steep topography. A proposed access road was relocated to avoid riparian habitat in NE S31 T42N R76W and a pipeline was relocated to avoid riparian habitat in SW S34 T42N R76W.

4.2.2.1.2. Cumulative Effects

Cumulative effects would include impacts associated with additional mineral development and ongoing livestock grazing. Mineral development in the vicinity would further exacerbate loss of functional 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. Livestock grazing can imperil riparian habitats if not managed properly.

4.2.2.1.3. Mitigation Measures

No additional mitigation measures are proposed.

4.2.2.1.4. Residual Effects

Because no mitigation measures are proposed, there are no residual effects.

4.2.2.2. Threatened, Endangered, Proposed, and Candidate Species

Potential project effects on threatened and endangered species were analyzed and a summary is provided in 4.2.

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

Common Name (scientific name)	Habitat	Project Effects	Rationale
Endangered			
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NLAA	Potential habitat will be reduced due to construction in prairie dog colonies.
Blowout penstemon	Sparsely vegetated, shifting sand dunes	NE	No suitable habitat present.
Threatened			
Ute ladies'-tresses orchid	Riparian areas with permanent water	NLAA	Potential effects to downstream populations.
Proposed			
Mountain Plover	Short-grass prairie with slopes < 5%	NLJ	Project activities may favor or be detrimental.
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 Affect, not likely to adversely affect individuals or habitat.
NLJ – Not likely to jeopardize the continued existence of the species
MIIH – May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.

4.2.2.2.1. Threatened and Endangered Species

4.2.2.2.1.1. Black-Footed Ferret

4.2.2.2.1.1.1. Direct and Indirect Effects

Direct and indirect effects to black-footed ferret are discussed in the PRB FEIS. With approval of Alternative B, prairie dog colonies will be impacted by proposed activities in S29 through S34 T42N R76W and S04 T41N R76W. Suitable habitat is of sufficient size to support a black-footed ferret population and the project area is in the Linch prairie dog complex, identified by WGFD as a potential black-footed ferret reintroduction site. It is extremely unlikely that any black-footed ferret is present in the project area. However, if any become present, the proposed action will most likely make portions of the

project area unsuitable for ferrets. Implementation of the proposed development "may affect, but is not likely to adversely affect" the black-footed ferret.

4.2.2.2.1.1.2. Cumulative Effects

The cumulative effects to black-footed ferrets are discussed in the PRB FEIS, p. 4-251.

4.2.2.2.1.2. Blowout Penstemon

4.2.2.2.1.2.1. Direct and Indirect Effects

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

4.2.2.2.1.2.2. Cumulative Effects

The proposed project will have no effect on blowout penstemon.

4.2.2.2.1.3. Ute Ladies'-tresses Orchid

4.2.2.2.1.3.1. Direct and Indirect Effects

The Ute ladies'-tresses orchid is threatened by energy developments, noxious weeds, and water developments. Prolonged idle conditions in the absence of disturbance (flooding, grazing, mowing) may be a threat, just as repeated mowing and grazing during flowering may lead to declines (Hazlett 1996, 1997, Heidel 2007). Heavy equipment used for construction can dig up plants. Invasive weeds (transplanted by vehicle and foot traffic) in habitat could out-compete this fragile species. Avoiding surface disturbance in suitable habitat reduces the potential for these impacts. Further details regarding direct and indirect impacts can be found in the PRB FEIS, pp. 4-252 to 4-253.

With approval of Alternative B, portions of 4 drainages that contain suitable ULT habitat will be affected by the Grayling project. Davis Draw and Hay Draw will be directly disturbed to install a pipeline and improve a road, respectively. The areas that will be directly impacted along Davis Draw (NW S29 T42N R76W) and Hay Draw (SW S04 T41N R76W) were surveyed according to accepted protocol for the presence of ULT plants in 2010 by BHEC.

Artesian Draw and the Fink Prong of Wind Creek are currently being impacted by downstream flow from outfalls. These outfalls were approved for use under the Brook Trout POD, but they will also be used for discharge from wells approved with the Grayling project.

Big Horn Environmental Consultants identified suitable habitat that could receive produced water and surveyed those areas for the presence of ULT in 2008, 2009, and 2010. Three outfalls and 2 reservoirs in the Fink Prong of Wind Creek are directly upstream of the Wind Creek ULT population. In 2008, the BLM BFO consulted informally with USFWS about the potential impacts to ULT. With the addition of the Grayling proposal, the USFWS and BLM determined that the Brook Trout consultation would need to be re-initiated as a result of additional water from non-federal actions discharged after 2008. This EA acts as the BA for that consultation, in accordance with the 2007 PRB Oil and Gas Re-initiation of Formal Consultation.

The major tenet of the 2008 informal consultation for the Pine Tree Brook Trout CBNG PODs was a model prediction that the produced water from the Brook Trout wells would travel no more than 2.4 miles from these Artesian Draw and the Fink Prong of Wind Creek outfalls before infiltrating and will not reach the closest known population in Wind Creek, which is located approximately 15 miles downstream. To validate the model, the BLM collected soil samples from potentially affected reaches. Based on the data analysis, which is located in the water management section of the POD file, produced water is traveling past the 2.5 mile mark but is not reaching 4.2 miles, the next downstream sample location.

It is not known if CBNG discharge is harmful or beneficial to ULT. Discharges and reservoir seepage may create suitable habitat if the water chemistry is suitable to the plant. Due to the existence of suitable habitat, the potential for creation of additional habitat, the project's close proximity to known populations, the lack of direct impacts to any known plants, and the mitigation measures described below, implementation of the proposed coal bed natural gas project "***may affect, but is not likely to adversely affect***" ULT. The proposed action, with BLM applied mitigation, adheres to the Ute ladies'-tresses orchid informal consultation contained within the March 23, 2007 biological opinion (ES-6-WY-07-F012), as the WY BLM directed adoption of these measures, WY-IM-2007-20 (April 2007)..

4.2.2.2.1.3.2. Cumulative Effects

Cumulative effects are discussed in the PRB FEIS on pg. 4-253.

4.2.2.2.1.3.3. Mitigation Measures

No additional water will be discharged into Fink Prong or Artesian Draw in order to maintain the current contribution of produced water to the wetted reach between 2.5 and 4.2 miles below the existing discharges. In order to meet this standard, Devon will be required to monitor the wetted reach in Fink Prong to ensure produced water is not reaching known Ute Ladies'-tresses populations, conduct habitat suitability surveys each year in areas that receive Grayling project water, and in those areas receiving produced water that are identified as suitable habitat, conduct protocol surveys each year to determine if individual plants exist in those areas. Survey results will be submitted to the BLM each year.

4.2.2.2.1.3.4. Residual Effects

Ute Ladies'-tresses orchids are difficult to identify and do not bloom every year. Therefore; it is possible that undiscovered plants could be impacted if their supporting hydrology is sufficiently altered.

4.2.2.2.2. Proposed Species

4.2.2.2.2.1. Mountain Plover

4.2.2.2.2.1.1. Direct and Indirect Effects

Impacts to mountain plover are discussed in the PRB FEIS, pp. 4-254 to 4-255. Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may provide suitable nesting habitat for plovers. On the other hand, increased traffic, construction, and human activities within 0.25 mile may be disruptive to nesting behaviors. Direct and indirect impacts to mountain plover habitat for Alternative B are described below in the black-tailed prairie dog section.

4.2.2.2.2.1.2. Cumulative Effects

The cumulative impacts to mountain plovers are discussed in the PRB FEIS.

4.2.2.2.2.1.3. Mitigation Measures

To reduce impacts to nesting mountain plovers, BFO will require a 0.25 mile timing limitation on surface-disturbing activities for potential nesting habitat during the nesting season.

4.2.2.2.2.1.4. 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. Timing limitations do nothing to mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still 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.

4.2.2.2.3. Candidate Species

4.2.2.2.3.1. Greater Sage-grouse

4.2.2.2.3.1.1. 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 avoid nesting in developed areas.

Implementation of Alternative B of the Grayling project will adversely impact nesting and winter habitat through loss, fragmentation, and avoidance of habitats. Intact sagebrush stands that meet the habitat requirements of sage-grouse will be fragmented by project activities in Sections 14-15 and 22-24, T42N R76W. Traffic along the north-south road through Section 23 will travel within 0.25 miles of the Collins SW lek and may disturb nesting hens in the vicinity or breeding activities at the lek. Although the road is already approved for oil and gas use, additional federal wells to the north installed with the Grayling project will increase the need for maintenance and create a higher risk of the need for emergency repairs. These repairs may involve large equipment that may be visually disturbing to nesting hens or equipment that produces noise at such a level as to disturb breeding behavior. Both of these mechanisms may cause a decline in sage-grouse productivity. Recruitment at the lek may decline each year as young birds in search of breeding areas avoid the Collins SW lek because of activities associated with the project such as increased traffic and/or well maintenance.

The construction and operation of wells 24S-7 and 24S-9, as well as traffic on and maintenance of the access road, could disrupt breeding at the potential new sage-grouse lek(s) in section 19, T42N, R75W. These wells are located within 0.25 miles of potential new lek(s), and if authorized, the noise and human activity in the drilling and operation phases at these well locations could disturb breeding and nesting behaviors. Gathering 2 more years of lek survey data for this potential lek location(s) will provide the BLM sufficient information (verification of lek(s)) to either approve, deny, or mitigate these wells.

Table 4.3 Project Components Recommended for Deferral

Well # and/or Corridor	Environmental Issue/Deficiency	Remedy
24S-7	BLM received an August 2010 wildlife report for an adjacent POD, indicating that sage-grouse males were observed strutting at 2 previously unknown locations in the west half of Section 19 T42N,R75W. One of these locations (SWNW of Section 19) is within 0.25 miles of the proposed road and utilities corridor servicing this well. WGFD requires 3 years of data to determine whether a location qualifies as a lek. Therefore, BLM is deferring approval of this well pending 2 seasons (2011 and 2012) of survey information.	• Devon shall submit to the BLM by 31 May, 2011 and 2012, a report of sage-grouse lek surveys performed in those years within 0.25 mile of proposed infrastructure, according to WGFD lek survey protocol. • Devon shall submit geospatial information to BLM by 31 May 2011 and 2012, indicating the perimeter of any sage-grouse strutting grounds identified in 2011 and 2012 within 0.25 mile of all proposed infrastructure, delineated according to WGFD protocol.

Well # and/or Corridor	Environmental Issue/Deficiency	Remedy
24S-9	This well is located approximately 0.3 miles, and the proposed access and utilities corridor are approximately 0.15 miles, from the new potential lek (SWNW of Section 19) discussed above. WGFD requires 3 years of data to determine whether a location qualifies as a lek. Therefore, BLM is deferring approval of this well pending 2 more seasons (2011 and 2012) of survey information.	• Devon shall submit to the BLM by 31 May, 2011 and 2012, a report of sage-grouse lek surveys performed in those years within 0.25 mile of proposed infrastructure, according to WGFD lek survey protocol. • Devon shall submit geospatial information to BLM by 31 May 2011 and 2012, indicating the perimeter of any sage-grouse strutting grounds identified in 2011 and 2012 within 0.25 mile of all proposed infrastructure, delineated according to WGFD protocol.

4.2.2.2.3.1.2. 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 7 sage-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) and the Governor of Wyoming's Sage-Grouse Implementation Team (2010).

Excluding the Grayling project, there are approximately 210 proposed federal wells (Automated Fluid Minerals Support System [AFMSS] 08/2010) within the cumulative effects analysis area. With the addition of these wells, well density would increase to 5.9 wells per square mile. With approval of the Grayling project, an additional 84 wells would be drilled within 4 miles of theses leks well density would increases to 6.6 wells per square mile, well above the 1 well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development. With the approval of the Grayling project, all four leks would exceed the WGFD threshold category for extreme impacts.

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

The project area is not within identified Key (Core, Focus or Connectivity) habitats for Sage-grouse, and is, with applied mitigation, consistent with the WY BLM Sage-grouse Policy (IM-2010-012).

4.2.2.2.3.1.3. Mitigation Measures

In order to reduce the likelihood that activities associated with noise, construction, and human

disturbance, BLM will implement a timing limitation on all surface-disturbing activities within and adjacent to identified nesting habitat across the project area. Because nesting grouse have been shown to avoid infrastructure by up to 0.6 miles, the intent of this timing restriction is to decrease the likelihood that grouse will avoid these areas and increase habitat quality by reducing noise and human activities during the breeding season.

In addition to deferring the 24S-7 and 24S-9 wells, impacts to sage-grouse were reduced with the inclusion of several design features, some of which were already listed as mitigation to sagebrush shrublands:

Prior to the onsite, Devon worked with their contracted biologist to reduce impacts with the following project changes (for more details, see ICF 2008, Devon Energy Production Company – Graying POD Infrastructure Planning and Biological Mitigation).

- Well 23S-7 was relocated in order to corridor its location along an existing two-track road at the edge of a sagebrush stand. This well was also moved to increase its distance from the Collins SW sage-grouse lek.
- Well 23S-9. The well was moved 0.06 mile to the northeast in an attempt to minimize impacts to the Collins SW Lek. The well remained in view of the lek, approximately 0.25 miles away.
- Well 23S-11 was relocated to increase its distance from the Collins SW sage-grouse lek site. The new location is 0.23 miles from the lek, but moving it outside 0.25 miles would have increased road length and disturbance to sagebrush shrublands. The location was selected because it is corridored with the main access road and reduces disturbance to sage-grouse habitats. The move also resulted in rerouting of a pipeline that eliminated disturbance within 0.13 miles of the lek and moved it to between 0.23 and 0.25 miles from the lek.
- Well 25S-1 was relocated to reduce impacts on a sagebrush stand.
- Well 25S-3 was moved to the edge of a small patch of moderately dense sagebrush to reduce impacts to the stand, and the access road was moved to minimize impacts on sagebrush stands.
- Well 25S-7 was relocated to a grassy patch to reduce impacts to sagebrush stands and accommodate routing options that would allow minimization of disturbance to sagebrush stands along the access road.
- A pump house was originally proposed in S23, approximately 0.15 miles west of the Collins SW sage-grouse lek. The pump house was moved to increase its distance from the lek, corridor the disturbance along the main access road, and place it within a grass patch that reduced disturbance to sagebrush shrubland.

Following the onsite:

- Devon removed wells 24S-5, 23S-9, and 24S-11 from the project plan. These wells and associated infrastructure and access roads would have been constructed in sagebrush shrublands that provide nesting and wintering habitat for sage-grouse.
- Well 25S-3 was moved further to the SE in order to minimize disturbance to sagebrush shrublands that provide nesting and wintering habitat for sage-grouse.
- Wells 26S-1 and 26S-7 were moved to the main access road to corridor them with existing disturbance and eliminate the need for additional access roads through sagebrush shrublands that provide nesting and wintering habitat for sage-grouse.
- The road to 24S-13 was moved out of sagebrush shrublands to reduce disturbance to nesting and wintering habitat for sage-grouse.
- The compressor station was moved from its original proposed location which was approximately 0.25 miles to the north of the Collins SW lek to approximately 0.8 miles south of the lek. This location is

closer to existing disturbance, further from the lek, and eliminates the need for frequent traffic within a 0.25 mile buffer of the lek.

4.2.2.2.3.1.4. Residual Effects

A timing limitation does nothing to mitigate loss and fragmentation of habitat or changes in disease mechanisms. Suitability of the project area for sage-grouse will be negatively affected due to habitat loss and fragmentation and proximity of human activities associated with CBNG development.

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 the sensitive species (northern leopard frog, Baird's sparrow, bald eagle, Brewer's sparrow, ferruginous hawk, loggerhead shrike, long-billed curlew, sage sparrow, sage thrasher, trumpeter swan, western burrowing owl, white-faced ibis, black-tailed prairie dog, and swift fox) that may occur in the project area on pp. 4-257 to 4-273. During the issues identification process that occurred as a result of internal scoping, bald eagles, ferruginous hawks, western burrowing owls, black-tailed prairie dogs, and swift fox were determined to warrant further evaluation in this environmental assessment. Impacts to these species are discussed here.

4.2.2.3.1. Bald Eagle

4.2.2.3.1.1. Direct and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS, pp. 4-251 to 4-253. Additional site-specific information is provided here. Human activities, traffic, and construction may displace eagles from winter roosts, or nests within the suitable habitat along the riparian corridors of Dry Fork Powder River and Davis Draw.

4.2.2.3.1.2. Cumulative Effects

The cumulative effects for bald eagles are described in the PRB FEIS, pp. 4-251 to 4-253. In addition to the federal development, there will be fee development associated with the project that will have similar impacts on bald eagles. Livestock grazing also occurs in the area, which may provide some of the prey base for bald eagles that winter in the area. If bald eagles rely on the prairie dog colonies for prey, practices such as poisoning or shooting of prairie dogs or other intentional methods of extermination in order to increase forage for livestock can potentially harm bald eagles through a reduction in their prey base.

4.2.2.3.1.3. Mitigation Measures

To reduce the risk of disruption to the winter roosting activities of bald eagles, BFO will require a 1.0 mile radius timing limitation on all winter roost habitat between 1 Nov and 1 Apr, annually, until the habitat has been surveyed and no roosting documented for that season.

To reduce the risk of disruption to nesting bald eagles, BFO will implement a 0.5 mile disturbance-free buffer around all nests and a 1.0 mile radius timing limitation of all bald eagle nesting habitat between 1 Feb and 15 Aug, annually, until the habitat has been surveyed and no nesting documented for that season.

4.2.2.3.1.4. Residual Effects

Even with timing limitations, habitat may be degraded to a point that the area no longer provides habitat requirements for wintering bald eagles. A 0.5 mile buffer may not be sufficient to protect bald eagles from disturbance. A 1.0 mile timing restriction on construction activities does nothing to protect valuable habitats from disturbance and also does not mitigate impacts associated with fee development, and habitat may be degraded over time to such an extent that productivity of bald eagles may be reduced, resulting in possible violations of the Bald and Golden Eagle Protection Act.

4.2.2.3.2. Ferruginous Hawk

4.2.2.3.2.1. Direct and Indirect Effects

Impacts to ferruginous hawks are discussed in the PRB FEIS, p. 4-262. Additional information is provided here.

Research suggests that ferruginous hawks are sensitive to disturbance during the breeding season (Olendorff 1973, Gilmer and Stewart 1983, Schmutz 1984, White and Thurow 1985, Bechard et al. 1990). Ferruginous hawks have been shown to select nest sites that avoid human habitation or disturbance (Lokemoen and Duebbert 1976, Schmutz 1984). Once a nest site has been selected, ferruginous hawks were shown to abandon nest sites that are subject to disturbance (Snow 1974, White and Thurow 1985). When abandonment does occur, it tends to happen prior to hatching, so incubation represents a critically important time for reduced disturbance (Snow 1974, White and Thurow 1985). Sensitivity to disturbance may be inversely related to prey availability (White and Thurow 1985). Nests in proximity to disturbance have been shown to produce fewer young (Olendorff 1973, Blair 1978, White and Thurow 1985). Ferruginous hawks tend not to return to breed in territories where breeding attempts in previous year failed as a result of disturbance (White and Thurow 1985).

USFWS Wyoming Ecological Services Field Office recommends that a 1.0 mile seasonal buffer be implemented around ferruginous hawk nests, within which long-term land-use activities would be prohibited. They go on to state that these buffers can be modified based on local conditions, such as topography. Wells in Alternative B of the Grayling project were proposed within the USFWS recommended 1.0 mile buffer, but all wells were placed out of line-of-sight of known nests, reducing the visual impact of human activities at the wells on birds occupying any nests. The visual impact of a pump-jack was not considered when these wells were moved out of sight. Pump jacks are 10-14 feet high, as opposed to the 4-6 foot height of a traditional CBNG well house. Therefore, wells noted here as being out of sight may be in sight at nests if pump-jacks are installed. Use of pump-jacks will be addressed via sundry if they are proposed.

Table 4.4 Infrastructure proposed within 1.0 miles of Ferruginous Hawk Nests w/in the Grayling Project Area and design features incorporated by Devon to minimize impacts

BLM ID	Infrastructure w/in 1.0 miles	Design Features Incorporated by Devon to Minimize Impacts
3507	Wells 29S-1, 29S-3, 29S-5, 29S-7, 29S-9, 29S-11, 29S-15, access/utility corridors, powerline	Wells and access out of LOS. Utilities corridored with roads. Powerlines minimized as much as possible.
3508	Wells 29S-1, 29S-3, 29S-5, 29S-7, 29S-9, 29S-11, 29S-15, access/utility corridors, powerline	Wells and access out of LOS. Utilities corridored with roads. Powerlines minimized as much as possible.
3509	Well 29S-3, 29S-5, 29S-7, 29S-9, 29S-11, 29S-15, 32S-1, powerlines, access/utility corridors	Wells and access out of LOS. Utilities corridored with roads. Powerlines minimized as much as possible.

BLM ID	Infrastructure w/in 1.0 miles	Design Features Incorporated by Devon to Minimize Impacts
3510	Well 24S-3, 34S-5, 34S-1, access/utility corridors, powerlines	Nest location already surrounded by approved development and likely already compromised. Wells and access out of LOS. Utilities corridored with roads. Powerlines minimized as much as possible.
3511	Wells 34S-1, 34S-3, 34S-5, 34S-11, powerlines, utility corridors	Wells are out of LOS. Pipelines are corridored with access roads to minimize disturbance. Powerlines minimized as much as possible.
3512	Well 34S-1, 34S-3, 34S-5, 34S-7, 34S-9, 34S-11, access/utility corridors, powerlines	Wells are out of LOS of nest. Foraging opportunities to the south. Pipelines are corridored with access roads to minimize disturbance. Powerlines minimized as much as possible.
3513	Wells 29S-5, 29S-7, 29S-9, 29S11, 29S-15, 30S-9, 31S-7, 31S-9, 31S-15, 32S-1, 32S-5, 32S-13, access/utility corridors, powerlines	Wells are out of LOS of nest. Foraging opportunities to the northwest. Powerlines minimized as much as possible.
4491	Wells 29S-3, 29S-5, 30S-1, 30S-3, 30S-7, access utility corridors	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance.
4492	Wells 29S-3, 29S-5, 30S-1, 30S-3, 30S-7, access utility corridors	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance.
4494	Wells 29S-3, 29S-5, 30S-1, 30S-3, 30S-5, 30S-7, access utility corridors	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance.
4495	Wells 29S-1, 29S-3, 29S-5, 29S-7, 30S-1, 30S-3, 30S-7, access/utility corridors, powerline	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance. Powerlines minimized as much as possible.
4625	Wells 24S-7, 24S-9, 25S-1, access/utility corridors	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance.
4633	Wells 1SS-1, 1SS-3, 1SS-7, 1SS-9, access/utility corridors, powerline	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance. Powerlines minimized as much as possible.
4634	Well 35S-9, 1SS-1, 1SS-3, 1SS-5, 1SS-7, 1SS-9, access/utility corridors, powerline	Wells are out of LOS of nest. Access and pipelines corridored to minimize disturbance. Powerlines minimized as much as possible.
4635	Well 23S-15, 24S-9, 24S-11, 24S-13, 24S-15, 25S-1, 25S-3, 25S-7, 25S-5, 25S-11, 25S-9, 25S-13, 25S-15, 26S-1, 26S-7, 26S-9, 26S-15, 35S-1, access/utility corridors, overhead powerline, pump station, staging area	Well 25S-3 was moved closer to main access road to reduce fragmentation and preserve foraging habitat to the north. Well 25S-7 and pump station corridored with main access road to consolidate disturbance. Powerline and main access road corridored. Pump station consolidated with well location. All wells out of LOS, because nest is situation low in a drainage.

BLM ID	Infrastructure w/in 1.0 miles	Design Features Incorporated by Devon to Minimize Impacts
4636	Well 24S-7, 24S-9, 24S-11, 24S-13, 24S-15, 25S-1, 25S-3, 25S-7, 25S-5, 25S-11, 25S-9, 25S-13, 25S-15, 26S-1, 26S-7, 26S-9, access/utility corridors, overhead powerline, pump station	Well 25S-3 was moved closer to the main access road to reduce fragmentation and preserve foraging habitat to the north. Well 25S-7 and pump station corridored with main access road to consolidate disturbance. Powerlines corridored with access roads. All wells out of LOS, because nest is situation low in a drainage.
4637	Well 23S-9, 24S-7, 24S-9, 24S-11, 24S-13, 24S-15, 25S-1, 25S-3, 25S-7, 25S-9, access roads, powerlines, pump station	Well 25S-3 was moved closer to main access road to reduce fragmentation and preserve foraging habitat to the north. Well 25S-7 and pump station corridored with main access road to consolidate disturbance. Powerlines corridored with access roads.
4638	Well 24S-7, 24S-9, 24S-11, 24S-13, 24S-15, 23S-9, 25S-1, 25S-3, 25S-8, pump station, powerlines	Well 25S-3 was moved closer to main access road to reduce fragmentation and preserve foraging habitat to the north. Well 25S-7 and pump station corridored with main access road to consolidate disturbance. Powerlines corridored with access roads.
4646	Well 24S-9, access/utility corridor, powerline	Wells out of LOS. Infrastructure corridored.
4683	Wells 24S-7, 24S-9, 24S-15, powerlines, access/utility corridors	Wells out of LOS. Infrastructure corridored.
4689	Well 24S-9, powerlines, access/utility corridors	Wells out of LOS. Infrastructure corridored.
5336	Wells 23S-13, 26S-3, 26S-7, 26S-9, 26S-15, staging area, 35S-1, 35S-3, 35S-7, 35S-11, 34S-9, 34S-1, powerlines, access/utility corridors, staging area	Pipeline corridored with access road to minimize disturbance. Wells are out of LOS.
10421	Wells 26S-15, 35S-1, 35S-3, 35S-8, 35S-9, 35S-11, 2SS-5, 3SS-1, 3SS-7, 34S-11, 34S-3, 34S-5, 34S-9, powerlines, access/utility corridors	Well 34S-9 was moved back to the access road as far as possible, based on boundary constraints. Powerline is corridored with access road to minimize disturbance. Nest is out of LOS of proposed infrastructure because it is located low in a drainage.

4.2.2.3.2.2. Cumulative Effects

In addition to the federal development, there will be fee development associated with the project that will have similar impacts on ferruginous hawks as those discussed in the PRB FEIS. Even without federal development, the extent of fee development alone may surpass a threshold that makes the area unsuitable for ferruginous hawks through avoidance and degradation of habitat quality.

Activities associated with livestock grazing may disturb ferruginous hawks, but these activities are often transient in nature and occur at low enough frequencies that disturbance to breeding ferruginous hawk pairs is likely minimal. If ferruginous hawks rely on the abundant prairie dog colonies for prey, practices such as poisoning or shooting of prairie dogs or other intentional methods of extermination in order to increase forage for livestock can affect ferruginous hawk productivity through a reduction in prey availability.

Because no breeding activity is recorded within 0.5 miles of the project area, it is not possible to determine the relative value of certain nests or areas to ferruginous hawks, and it must be assumed that all areas around nests are equally important to the species. It is possible that ferruginous hawks already abandoned the area because of current land use activities and that additional disturbance would not have any impact on the species, because the habitat has lost its value for breeding pairs.

4.2.2.3.2.3. Mitigation Measures

See Table above for design features. To reduce the risk of decreased productivity or nest failure, BFO will implement a 0.5 mile radius timing limitation on surface disturbance during the breeding season around active ferruginous hawk nests. This radius is not consistent with USFWS Ecological Services Field Office recommendations (1.0 mile for ferruginous hawks).

4.2.2.3.2.4. Residual Effects

Even with a timing limitation, ferruginous hawks may abandon nests due to alterations in foraging habitats associated with development or because of sensitivity to well or infrastructure placement. Even with timing limitations on surface-disturbing activities, ferruginous hawks may be displaced by other development activities. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some ferruginous hawks. Timing limitations do nothing to mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still 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. Collisions with or electrocutions from powerlines will still occur. Harassment or displacement of nesting individuals will still occur during the production and abandonment phases of the project.

4.2.2.3.3. Western Burrowing Owl

4.2.2.3.3.1. Direct and Indirect Effects

Impacts to burrowing owls are discussed in the PRB FEIS, p. 4-263. Because Alternative B of the Grayling project will directly disturb prairie dog colonies, suitable nesting habitats for burrowing owls will be disturbed or destroyed. Direct and indirect impacts to burrowing owl habitat are described below in the black-tailed prairie dog section.

4.2.2.3.3.2. 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. Activities associated with livestock grazing may harass or disturb burrowing owls, 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 burrowing owl productivity through a reduction in nest site availability.

4.2.2.3.3.3. Mitigation Measures

The Thunder Basin National Grasslands 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 (February 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 4 1/2 months (See Chapter 3 for breeding, nesting, and migration chronology) from 6 1/2 months and from 0.5 mile to 0.25 mile.

4.2.2.3.3.4. Residual Effects

The timing limitation will do nothing to 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.

4.2.2.3.4. Black-tailed Prairie Dogs Direct and Indirect Effects

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS, p. 3-179. At the time the PRB FEIS was written, the black-tailed prairie dog was added to the list of candidate species for federal listing in 2000 (USFWS 2000). It was removed from the list in 2004. 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.

In Alternative B, 7 wells and their associated infrastructure are proposed within the prairie dog colony in Sections 31 and 32 and 2 wells and their associated infrastructure in the colony in Section 30, T42N, R76W. These wells and infrastructure were not moved due to lack of activity observed within this prairie dog colony and will directly impact approximately 17.5 acres.

4.2.2.3.4.2. Cumulative Effects

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 aerial imagery indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001, but aerial surveys conducted in 2003 indicated that approximately 47% of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier et al. 2004). Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented and isolated (Miller 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems that affect long term population viability, such as landowner poisoning and disease (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

4.2.2.3.4.3. Mitigation Measures

None proposed.

4.2.2.3.4.4. Residual Effects

None identified.

4.2.2.3.5. Swift Fox

4.2.2.3.5.1. Direct and Indirect Effects

Impacts to swift fox are discussed in the PRB FEIS, p. 4-265. In addition to those impacts, site-specifically, the project will impact swift foxes or their habitat. The construction of well pads, roads, and pipelines in prairie dog colonies and suitable grasslands will cause direct habitat loss and may disrupt foxes ability to forage, breed, raise young, or find adequate shelter. During construction of these facilities, there is the possibility that swift foxes may be killed by earth moving equipment. Constant noise, movement of equipment, and habitat alterations puts considerable stress on the animals and is likely to cause a decrease in fox reproductive success. Construction can remove protective cover and expose individuals to predators. Project related traffic may result in swift fox road mortalities.

4.2.2.3.5.2. Cumulative Effects

In addition to the federal development, fee development associated with the project 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 negatively affect swift fox through a reduction in prey availability.

4.2.2.3.5.3. Mitigation Measures

The PRB FEIS produced a sensitive species mitigation measure requiring clearance surveys for sensitive species at appropriate times (see FEIS ROD A.5.11 #1. page A-34). The Thunder Basin National Grasslands (TBNG) in Campbell County, WY, cooperated with the BLM in the creation of the 2003 PRB EIS and applied a standard condition to oil and gas activities in association with swift fox dens. Therefore, in order to protect the species, the BLM BFO incorporated the following condition from the TBNG Land Resource Management Plan in order to implement the FEIS ROD A.5.11 #1 programmatic mitigation. "To reduce disturbances to swift fox during the breeding and whelping seasons, prohibit the following activities within 0.25 miles of their dens from March 1 to August 31: Construction (e.g. roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling." This timing restriction, based on the best available science and coordination with the Operator, will reduce direct impacts to swift foxes within the project area during the pupping season. Additional site-specific methods and procedures were analyzed, such as habitat protection without surveys for the animal and track-plate survey methodology (Dark-Smiley and Keinath 2003). However, after coordination with the operator, the above condition of approval was agreed upon to provide for protection of swift fox during their most vulnerable time (pupping), while providing the least restrictive conditions possible to meet the conservation objectives.

4.2.2.3.5.4. Residual Effects

A timing limitation will not mitigate habitat loss, but will reduce direct mortality. Swift fox dens and prey availability will still be impacted through loss of prairie dog colonies, despite the restriction on the timing of construction.

4.2.2.4. Big Game

4.2.2.4.1. Direct and Indirect Effects

Under the environmentally preferred alternative, winter-yearlong and yearlong range for pronghorn and mule deer would be directly disturbed with the construction of wells, reservoirs, pipelines and roads. Table 4.1 summarizes 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 2004a). A multi-year study on the Pinedale Anticline suggests that, not only do mule deer avoid mineral activities, but, after 3 years of drilling activity, they had not become accustomed to the disturbance (Madson 2005).

Big game animals are expected to return to the project area following construction; however, populations will likely be 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 7 years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer are 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, pp. 4-181 to 4-215.

4.2.2.4.3. Mitigation Measures

No further mitigation measure applied.

4.2.2.4.4. Residual Impacts

While big game animals are expected to return to the project area following construction, continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to the new disturbances (Lustig 2003). Habitat effectiveness for big game is anticipated to be reduced in the project area.

4.2.2.5. Aquatic Species

4.2.2.5.1. Direct and Indirect Effects

Devon is permitted to discharge into the Upper Powder River drainage by the WDEQ utilizing assimilative capacity credits. If reservoir discharged water reaches a fish-bearing stream species would be affected.

Road construction will take place in proximity of the large reservoir in S S03, but that activity is not likely to alter the habitat provided by the reservoir for resident fish. Direct impacts to herptile habitat will occur in the portions of Davis Draw (S29 T42N R76W) that will be disturbed to construct a pipeline and Hay Draw (S04 T41N R76W) to improve a road. Discharged water may create herptile habitat.

The Grayling POD does not include any changes to existing or approved water management. Impacts from this action that are in addition to those described in the PRB FEIS on pp. 4-235 to 4-247 and the Brook Trout and Kokanee PODs (WY-070-06-114 and WY-070-08-129) include recent research conducted by Peterson et. al. (2010).

Peterson et. al. (2010) produced a Scientific Investigations Report – Ecological Assessment of Streams in the Powder River Basin Structural Basin, Wyoming and Montana, 2005-2008. The authors' findings, and those from Davis et. al. (2009) demonstrate that fish species sampled in the Powder, Cheyenne, Belle Fourche, and Tongue River drainages are not acutely affected by CBNG discharged water. Chronic adverse effects could be occurring at currently undetected rates. The Peterson et. al. (2010) work does indicate that changes to the macroinvertebrate and periphyton communities could be due in part to CBNG discharge. Further monitoring is warranted, and the Aquatic Task Group is revising their monitoring plan to asses CBNG discharge impacts to these lower trophic levels. Other Aquatic Task Group research has demonstrated that current levels of sodium bicarbonate in some discharged water are toxic to young fathead minnows (Farag in press 2010). Skaar (2001) described sodium bicarbonate toxicity concerns to

aquatic life in the Powder and Tongue rivers. Farafg (2010 in press) found that untreated produced water caused toxicity of 2-day-old fathead minnows, white sucker, and palid sturgeon. In-situ experiments placing 2-day-old fish in the Powder River, Tongue River, SA Creek, Beaver Creek, and Burger Draw showed significantly higher mortality in the tributaries than in the mainstems. Treating water before discharge mitigates this impact. Other studies have not shown changes to the fish communities in tributaries that receive produced water discharge (Davis 2008) or in other tributary and mainstem streams (Petterson et. al. 2010).

4.2.2.5.2. 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. Migratory Birds

4.2.2.6.1. Direct and Indirect Effects

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

Disturbance of habitat within the project area is likely to impact migratory birds. 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 (<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 within the Powder River Basin nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are 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. For the Grayling POD, timing limitations for raptors and grouse will be sufficient to protect migratory bird populations in the area.

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, p.4-235. No additional mitigation measures are required.

4.2.2.6.3. Mitigation Measures

In compliance with Section IV F of the Memorandum of Understanding between the US Department of Interior BLM and the USFWS to identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations and to implement approaches lessening such take: A survey will be required within 0.5 mile of any construction activities that may occur between February 1 and August 31 for the presence of nesting migratory birds. If any nests are found, a 0.1 mile avoidance buffer will be applied to the nest and construction activities will not occur within 0.1 mile of the nest until after August 31.

As required in BLM Manual Handbook H-1741-2 Water Developments, a Condition of Approval requiring all stock tanks to be equipped and maintained with effective wildlife escape devices will reduce potential bird mortality from drowning.

4.2.2.7. Raptors

4.2.2.7.1. Direct and Indirect Effects

Direct and indirect effects to raptors are described in the PRB FEIS, pp. 4-216 to 4-220. Alternative B of the Grayling project will result in disturbance in proximity of nesting raptors, including direct loss of foraging habitats and indirect losses associated with declines in habitat effectiveness. All raptors using nests in the vicinity of the Grayling project will likely be impacted to some extent by the human disturbance associated with operation and maintenance. Additional information and site-specific impacts are discussed here.

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.

In addition, the construction of overhead power will pose an electrocution and collision risk to raptors. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a).

The distance from wells, topography providing cover, and timing restrictions will reduce the impact project activities will have on nesting raptors on some nests. Several nests are in close proximity to wells and infrastructure but are out of line of sight of those activities, thereby affording a visual buffer for incubating adults and growing chicks. Table 4.5 lists raptor nests (other than ferruginous hawk nests) that are located within 0.5 miles of the Grayling project, the infrastructure 0.5 miles of the nest and any design features incorporated by Devon to mitigate impacts.

Table 4.5 Proposed infrastructure within 0.5 mile of documented raptor nests (in addition to the Ferruginous hawks previously discussed) within the Grayling Project area

BLM ID	Infrastructure w/in 0.5 miles	Mitigation (in addition to TLS)
1983	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
3515	Well 33S-7, utility	Operator moved powerline away from nest. Access roads are corridored with existing disturbance.
4495	Access/utility corridor, powerline	Access and pipelines corridored to minimize disturbance.
4628	Well 25S-13, 25S-15 & access road, utility	Nest is adjacent to main access road and within 0.4 miles of a compressor station. The nest is already impacted by development closer than where the new wells are proposed, and the impacts of existing development probably already surpass impacts of the additional wells.
4635	Well 25S-3 & access road, well 25S-7, well 25S-9 & access road, well 25S-11 and access road, overhead powerline	Wells out of LOS. Powerline and main access road corridored. Pump station consolidated with well location.
4649	Well 24S-7	Well is out of LOS. Nest is located in a drainage and connected to undisturbed habitat to the north that provides foraging potential.
4650	Well 24S-7	Well is out of LOS. Nest is located in a drainage and connected to undisturbed habitat to the north that provides foraging potential.
4651	Well 24S-7	Well is out of LOS. Nest is located in a drainage and connected to undisturbed habitat to the north that provides foraging potential.
4675	Well 24S-7	Well is out of LOS. Nest is located in a drainage and connected to undisturbed habitat to the north that provides foraging potential.
4713	Utility corridor, well 30S-5	Undeveloped areas to the west provide foraging opportunities
4726	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
4729	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
4730	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
4731	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
4732	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
4733	Well 30S-3, 30S-5	Undeveloped areas to the west provide foraging opportunities
4746	Well 30S-9, well 30S-11, powerlines, utility corridor	Well located along existing two-track to minimize disturbance.
4746	Utility corridor	Undeveloped areas to the west provide foraging opportunities
4747	Wells 30S-11, 31S-7, 31S-5, utility corridor, access roads, powerlines	Utilities/roads corridored. Nest is visually obstructed by cottonwood galleries along Davis Draw.
4747	Well 31S-5, utility corridor	Undeveloped areas to the west provide foraging opportunities
5332	Wells 14S-3, 14S-5 14S-7, 14S-11, access roads, overhead powerline	Devon removed the 14S-3 from the project plan. The 14S-7 was relocated approximately ¼ mile east and the access route was changed to use the access to the 14S-9 well and continue north. The access route to the 14S-5 was rerouted to remove it from the ridge-top that was in direct line of sight and within approximately 0.20 mile of the nest. The 14S-11 well was relocated approximately ¼ mile to the south. The proposed power drop was relocated to the 14S-9 well location.
5335	Access utility corridors	Access and pipelines corridored to minimize disturbance.
5655	Well 30S-5	Undeveloped areas to the west provide foraging opportunities
5656	Well 30S-5	Undeveloped areas to the west provide foraging opportunities
5887	Well 23S-5	Well 23S-5 approximately 0.5 mile from nest and out of LOS.

BLM ID	Infrastructure w/in 0.5 miles	Mitigation (in addition to TLS)
5890	Access/utility corridor, powerline	Access and pipelines corridored to minimize disturbance.
6144	Well 24S-7	Well is out of LOS. Nest is located in a drainage and connected to undisturbed habitat to the north that provides foraging potential.
10415	Well 23S-7 and access road, access road	Well 23S-7 out of LOS
10419	Utility corridor	Undeveloped areas to the west provide foraging opportunities
10419	Well 30S-5	Undeveloped areas to the west provide foraging opportunities
10420	Well 25S-5, 26S-9, 25S-13, 25S-15	Well 25S-11 was dropped from the project plan. Well 25S-13 was moved across road and out of LOS. Well 25S-5 is 0.5 miles downstream and below nest. Well 26S-9 is corridored with main access road. Well 25S-15 is adjacent and visually below the compressor station to consolidate disturbance. Golden eagles have used this nest, despite presence of compressor station, main access road, powerlines, discharge point, and pump station within 0.5 miles.
10422	Wells 32S-13, 32S-5, access/utility corridors, powerline	Foraging opportunities to the east. Roads/pipelines/powerline corridored.
10423	Well 34S-9 and access road, 35S-11 and access road, segment of powerline	Well 34S-9 was moved back to the access road as far as possible, based on boundary constraints. Powerline is corridored with access road to minimize disturbance. Nest is out of LOS of both wells.
10648	Well 30S-5	Undeveloped areas to the west provide foraging opportunities
12137	Well 14S-5	Nest is adjacent to undisturbed areas to the north that provide foraging opportunities. The access road that continued to the north was removed from the project plan to minimize disturbance.
12138	Well 14S-5	Connected to undisturbed areas to the north for foraging. The access road that continued to the north was removed from the project plan to minimize disturbance.

Nest 4638 was reported by the consultant but was not located at the onsite by the wildlife biologist and therefore was not included in the above table.

Impacts to raptors are difficult to predict, because different species and even different individual birds show varying levels of tolerance to disturbance. It is likely that the project will exceed a tolerance threshold for some raptor pairs, particularly for more sensitive species such as ferruginous hawks and golden eagles. Red-tailed hawks and great-horned owls are often more tolerant of disturbance and may continue to use nests, or their populations may increase within the project area at the expense of other species that may have used the area in the past.

A golden eagle pair appears to have maintained a breeding territory, consisting of at least 3 nests for at least the last several years (since 2007). As exhibited by their use of a nest directly within line of sight of and less than 0.5 miles away from a compressor station in 2009 and that is directly adjacent to a main oil and gas road that receives relatively heavy traffic, this pair has demonstrated high fidelity to the territory within the project area. The pair used a nest further to the south and away from the compressor station in 2010, but the nest is also within 0.5 miles of a well-traveled highway. It is not possible to predict the threshold of development above which the pair will no longer tolerate, but it is likely that increasing traffic volume, well density, habitat fragmentation, and loss of prairie dog habitat, will eventually exceed a threshold that may cause abandonment use of the territory. With implementation of the Grayling project, that threshold is likely being approached, and mitigation was therefore critical. In order to

minimize impacts to the 3 golden eagle nests within 0.5 miles of the Grayling POD, the following design features were incorporated by Devon:

To minimize impacts to golden eagle nest 5332:

- Devon removed the 14S-3 well and its associated access route from the project plan. Well 14S3 was originally proposed approximately 0.27 mile from this nest and had an access route that was visible from the nest.
- The 14S-7 was relocated approximately 0.25 mile east and the access route was changed to use the access to the 14S-9 well and continue north. The 14S-7 well was originally proposed 0.25 mile from nest 5332 and had an access route that was visible from this nest. Both the well and access route are now located approximately 0.5 mile from this nest.
- The access route to the 14S-5 well was originally proposed along a ridge-top approximately 0.20 mile from this nest. The access route to the 14S-5 was rerouted to remove it from the ridge-top.
- The 14S-11 well was originally proposed in direct line of sight of nest 5332. The 14S-11 well was relocated approximately 0.25 mile to the south. This well is now a fee location located approximately 0.5 mile from this nest.
- A power drop was originally proposed approximately 0.25 mile east of nest 5332. The proposed power drop was relocated to the 14S-9 well location.
- A road was originally proposed to loop to the north of nest 5332, effectively cutting the nest off from foraging areas downstream of and directly to the north of the nest. The road was dropped from the plan to maintain a direct connection to undisturbed foraging habitats to the north.

To minimize impacts to nest 10420:

- Devon removed well 25S-11from the project in order to maintain connectivity with undisturbed foraging habitats to the north. Well 25S-11 was originally proposed within 0.25 miles of, and in line-of-sight of, golden eagle nest 10420.
- The 25S-13 well was moved across the main access road, away from and out of line-of-sight of the nest and corridored with a pump station and main access road to minimize disturbance. Well 25S-13 was originally proposed within 0.25 miles of, and in line-of-sight of, golden eagle nest 10420.

To minimize impacts to nest 10423:

- Well 34S-9 was originally proposed within 0.25 miles of, and in line-of-sight of, nest 10423. The well was moved towards the main access road to minimize fragmentation of foraging habitats. The new location is further away from, and out of line-of-sight of, the nest.

4.2.2.7.2. Cumulative Effects

The cumulative effects on raptors are described in the PRB FEIS, p. 4-221.

4.2.2.7.3. Mitigation Measures

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.

4.2.2.7.4. Residual Impacts

Even with a timing limitation, raptors may abandon nests due to alteration in foraging habitats associated with development or because of sensitivity to well or infrastructure placement. Declines in breeding populations of some species that are more sensitive to human activities may occur.

4.2.2.8. West Nile Virus

4.2.2.8.1. 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 page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNv species and its effects in Wyoming.

4.2.2.8.2. 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.

4.2.2.8.3. Mitigation Measures

There is no evidence that treatment, either through the use of larvicides or malathion, 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.

4.2.3. Water Resources

Water resource concerns were previously addressed in the Kokanee and Brook Trout POD EA's. The quantity and quality of the produced water permitted by the WDEQ discharged from these 2 previously analyzed POD's is unaltered. Therefore there are not any additional potential impacts anticipated beyond those already evaluated in the previous analyses.

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 the Antelope Creek 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 WMP. 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 WMP involves the following infrastructure and strategy: 29 discharge points and 25 stock water reservoirs. Devon removed 4 outfalls to reservoirs previously approved under the Brook Trout POD to eliminate potential increased erosion in the ephemeral drainages above downstream reservoirs. The 4 removed outfalls were converted to stock water tanks with float control valves to provide containment of discharge water from this POD. Devon altered their WYPDES permit to change these discharges to stock watering tanks (WYPDES Permit #WY0055905 -001, 004, 005, 006). The majority of the water management infrastructure is within the Upper Powder River watershed. However, 3 of the 29 discharge points are permitted to continuously drain into the Antelope Creek watershed, which is a tributary system to the Cheyenne River. Permitted pulse discharges to the Upper Powder River system from the reservoirs are included in the WMP. Two Aqua-Ject II solution grade gypsum treatment systems installed at 2 existing pumping stations and 2 new, upset condition, stand-alone emergency crushed gypsum treatment tank facilities will treat the produced water to reduce Barium concentrations prior to discharge.

The maximum water production for the 84 wells is predicted to be 10.0 gpm per well or 840.0 gpm (1.9

cubic feet per second (cfs) or 1,355 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 60,319 acre-feet in 2010 (maximum production is estimated in 2006 at 171,423 acre-feet). As such, the volume of water resulting from the production of these wells is 2.2% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

The water management strategy proposes to pump a portion of the produced water from the project across the divide for discharge into the Cheyenne River Watershed. Under WYPDES Permit #WY0055581, Devon is permitted to discharge up to 2.1 million gallons per day (2,352 acre-feet per year) into the Cheyenne River Watershed (Antelope Creek) through 3 discharges located in BT-3 and Zephyr Draws. For the Antelope Creek drainage, the projected volume produced within the watershed area was 3,574 acre-feet in 2010 (maximum production is estimated in 2004 at 17,685 acre-feet). As such, the volume of water resulting from the permitted discharge of 2.1 MGD into Antelope Creek from the 3 outfalls is 66% of the total volume projected for 2010. This volume of produced water was previously analyzed under the Brook Trout EA and was determined to be 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 and 28% in the Antelope Creek drainage, PRB FEIS, p. 4-5. For this proposal it may be assumed that of the proposed 840 gpm (1355 acre feet per year), a maximum of 336 gpm will infiltrate at or near the discharge points and impoundments (542 acre feet per year) in the Powder River Watershed. In the Antelope Creek drainage, the Grayling POD contribution of 840 gpm, 235 gpm would infiltrate at or near the discharge points and impoundments (379 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 coal bed natural gas production is possible impacts to the groundwater. “The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers.” (PRB FEIS, 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 water wells originally produced from depths which range from 8 to 1200 feet compared to 1,200-1,600 feet to the Big George coal seams. 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.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to “…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater 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, 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 utilizing 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.

In order to address the potential impacts from infiltration on shallow ground water, the WDEQ developed a guidance document, "Compliance Monitoring and Siting Requirements for Unlined Impoundments Receiving Coalbed Methane Produced Water" (November, 2008) which is accessible on their web site. For all new WYPDES permits, the WDEQ requires that the proponent investigate the shallow groundwater at the proposed impoundment locations based on information received from the WDEQ, as of July, 2010, over 2013 impoundment sites were investigated with more than 2297 borings. Of these impoundments, 264 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 135 impoundments requiring monitoring are presently being used. As of the second quarter of 2010, only 20 of those monitored impoundments (14.6%) 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 removed some of the water saturation in the coal zones for the production of gas. As seen in the West Pine Tree groundwater monitoring well administered by the BLM, the groundwater levels may drop due to the CBNG dewatering action. Groundwater recharge post-CBNG development was analyzed within the PRB FEIS. An estimated 28 to 43 percent of the groundwater removed would infiltrate the surface and recharge the shallow aquifers above the coal, PRB FEIS ROD pg. 4-68.

4.2.3.2. Surface Water

4.2.3.2.1. Direct and Indirect Effects

Produced Water Quality

Table 4.6 shows the 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). 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 4.6 Comparison of Water Quality

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Upper Powder River Watershed at Arvada, WY Gauging station Historic Data Average at Maximum Flow		4.76	1,797

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
WDEQ Water Quality Requirement for WYPDES Permit # WY0040649 to Upper Powder River Watershed At discharge point At Irrigation Compliance point	 AC* NA**	 AC* <6.67x EC-3.33	 7,500 <2,800
WDEQ Water Quality Requirement for WYPDES Permit # WY0053911 to Upper Powder River Watershed At discharge point At Irrigation Compliance point	 NA** NA**	 NA** <7.10x EC-2.48	 3,570 <4,580
WDEQ Water Quality Requirement for WYPDES Permit # WY0055581 to Antelope Creek Watershed At discharge point	 NA**	 10	 2,000
Predicted Produced Water Quality Big George Coal	 795	 6.8	 1291
Emigrant Spring SWNW Sec 27, T42N R76W (Powder River Drng)	562	0.3	974
Spring 21-9-4176 NENW Sec 9, T41N R76W (Powder River Drng)	1150	5.4	1603

AC* = Assimilative Capacity values vary per month
NA** = Not Applied or listed in the permit

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops, PRB FEIS, p. 4-69. The water quality projected for this POD is 795.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If in the future the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the Big George target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 10.0 gallons per minute (gpm) is projected is to be produced from each of these 84 wells, for a total of 840 gpm for the POD.

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 improves water quality at downstream locations.

In addition to dissolved iron mitigation, the operator is and will use a gypsum treatment to mitigate barium concentrations anticipated present in the produced water. Devon installed 2 Aqua-Ject II gypsum injection systems at 2 central water gathering facilities in the West Pine Tree Field (WMP pg. 4 and Att. H). As a backup barium treatment in case of an upset condition, Devon is permitted by WDEQ to install two stand-alone crushed gypsum treatment systems at outfalls 001CD and 003CD (WMP pg. 4 and Att I).

The operator obtained a Wyoming Pollutant Discharge Elimination System (WYPDES) permit for the discharge of water produced from this project from the WDEQ.

Permit effluent limits were set at (WYPDES Permit WY0040649):

Chlorides	150 mg/l
pH	6.5 to 9.0
TDS	5000 mg/l
Specific Conductance	7500 mg/l
Total Barium	1800 µg/l
Total Arsenic	8.4 µg/l
Dissolved Iron	1000 µg/l
TDS	Assimilative Capacity (varies monthly)
SAR	Assimilative Capacity (varies monthly)

The WYPDES permit WY0040649, also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is IMP1 and IMP2 located at NESE Sec 36 and SWSW Sec 35 T42N R76W respectively.

Permit effluent limits were set at (WYPDES Permit WY0053911):

Chlorides	150 mg/l
pH	6.5 to 9.0
Specific Conductance	3570 mg/l
Total Barium	1800 µg/l
Total Arsenic	8.4 µg/l
Dissolved Iron	1000 µg/l

The WYPDES Permit WY0053911, also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is IMP1 - IMP located in Sections 7, 19, 21, 28, 33, and 34, T42N R76W respectively (WMP Att. D, WYPDES WY0053911 pg 13).

Permit effluent limits were set at (WYPDES Permit WY0055581):

Chlorides	46 mg/l
pH	6.5 to 9.0
Specific Conductance	2,000 mg/l
Total Barium	1800 µg/l
Total Arsenic	2.4 µg/l
Dissolved Iron	1000 µg/l
SAR	10

The WYPDES Permit WY0055581, also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for this permit is at the three discharge point outfalls located in Sections 28 and 22, T41N R76W respectively (WMP Att. D, WYPDES WY0055581 pg 8).

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. The reference well will be sampled at the wellhead for analysis within 60 days of initial production. The water analysis will be submitted to the BFO.

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

Produced Water Control
There are 29 discharge points proposed for this project. Seven of the 29 discharge points that were approved in the 2 previous EA's are not built. They are appropriately sited and use appropriate water energy dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, Devon proposes to use 25 on-channel impoundments with a total holding capacity of 434.5 acre-feet with a surface disturbance of 99.4 acres. Ten of the 25 reservoirs are either not upgraded or built though previously approved under the Brook Trout EA. Originally 26 reservoirs were proposed but after the on-site field meetings, Devon withdrew the E21-1-4176 reservoir from the Grayling WMP. Four outfall locations that were initially proposed were also withdrawn as outfalls and instead were converted to float controlled, tire stock tank discharge points utilized for the disposal of the produced water via livestock consumption. Float controls on the 4 stock tanks will eliminate surface water flow to ephemeral drainages down gradient of these 4 locations. Eleven of the on-channel reservoirs were previously approved for use under the Kokanee POD and the remaining 14 on-channel reservoirs were approved for use under the Brook Trout POD. Included in the 14 Brook Trout reservoirs previously approved are 3 reservoirs and discharges within the Antelope Creek Watershed (WY0055581-001,002, 003). The produced water discharged to the Antelope Creek drainage is permitted for continuous discharge. The Antelope Creek reservoirs allow for flow through of the produced water. Additionally, the operator intends to periodically discharge some produced water to creek channels in the Upper Powder River watershed as provided under WDEQ's Assimilative Capacity Credit program.

These impoundments were previously analyzed and approved under the Brook Trout and Kokanee EA's. Based upon the previous analysis of the soils and infiltration rates at these impoundments, WDEQ waived the need for installation of shallow groundwater monitoring wells at the impoundments (WMP pg. 24 and Att. B). Existing impoundments will be upgraded and proposed impoundments will be built to meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

Produced Water Quantity
Devon is permitted to discharge to the Upper Powder River using their assimilative capacity credits and for continuous discharge to Antelope Creek (Cheyenne River). The WMP incorporates discharges to impoundments and to ephemeral drainages that drain to the impoundments. The WMP also incorporates pulse discharges out of the impoundments into tributary drainages to the Upper Powder River and the continuous discharge to Antelope Creek. 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. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Devon is permitted to release 2.1 MGD (3.2 cfs, 2,352 ac-ft/yr) to the Antelope Creek drainage via the Fink Prong channel. The produced water of the Grayling POD's 84 wells will be comingled into the 2.1 MGD volume and therefore will not add additional volume to the permitted and previously analyzed flows into the Fink Prong drainage. All 3 of the discharges flow into reservoirs but the reservoirs are not full containment.

In the WMP the operator provided an analysis of the potential development in the watershed above the project area and downstream to the confluence with the next higher order watershed (WMP pgs. 12-18). Based on the 80 acre per well spacing criteria, and discounting topographic considerations and other

factors listed below, the operator calculated 644 wells could be developed within the acreage described. The BLM agrees with the operator that the maximum flow rate of 840 gpm is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream and downstream to the confluence with the next higher order watershed of the project area, 25.3 cfs, is much less than the volume of runoff estimated at 285 cfs from the 2-year storm event for the drainage, WMP pgs. 12-18.

Springs

The development of coal bed natural gas and the production and discharge of water in the area surrounding the existing natural spring may affect the flow rate or water quality of the spring. The operator identified 6 springs or seeps within the area of influence of development of the Grayling POD.

No measurable flow was observed at any of the springs, therefore no flow data was available. Most of the potholes experience regular impacts from livestock as they appear to have been developed for stock watering. The water is stagnant, muddy, and filled with algae. Emigrant Spring, although not directly affected by the water management facilities, was included in this analysis as it is adjacent to wells of the Brook Trout POD and could have shown influence of produced water on the water quality and quantity. A metal stock tank was observed to be entrenched near the headwater of this spring. The operator collected water samples in 2009 and 2010 and provided the analysis data results in Attachment J of the WMP.

In-channel downstream impacts are addressed in the WMP for the Grayling POD prepared by SWCA for Devon Energy Production. Downstream concerns were previously addressed in the Kokanee and Brook Trout POD EA's. The quantity and quality of the produced water permitted by the WDEQ to be discharged from these 2 previously analyzed POD's is not being altered. Therefore there are not any additional adverse impacts anticipated beyond those already evaluated in the previous EA's.

4.2.3.2.2. Cumulative Effects

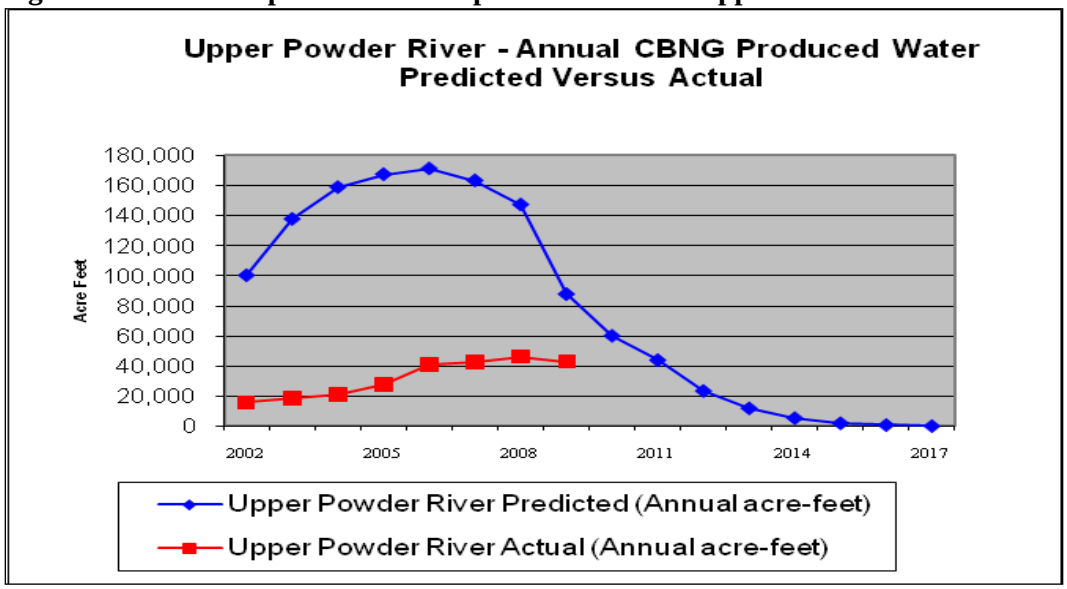
The analysis in this section includes cumulative data from fee, state and federal CBNG development in the Upper Powder River and Antelope Creek watersheds. BFO obtained this data from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2009, all producing CBNG wells in the Upper Powder River watershed discharged a cumulative volume of 255,531 acre-ft of water compared to the predicted 1,135,567acre-ft disclosed in the PRB FEIS, Table 2-8, p. 2-26. These figures are presented graphically in Figure 4.1 and Table 4.7. This cumulative volume is 22.5 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.7 Actual vs predicted water production in the Upper Powder River watershed *2009 Data Update 04-06-10*

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	43,009	48.8	255,531	22.5
2010	60,319	1,195,886				
2011	44,169	1,240,055				
2012	23,697	1,263,752				
2013	12,169	1,275,921				
2014	5,672	1,281,593				
2015	2,242	1,283,835				
2016	1,032	1,284,867				
2017	366	1,285,233				
Total	**1,285,233**		**255,531**			

Figure 4.1 Actual vs predicted water production in the Upper Powder River watershed



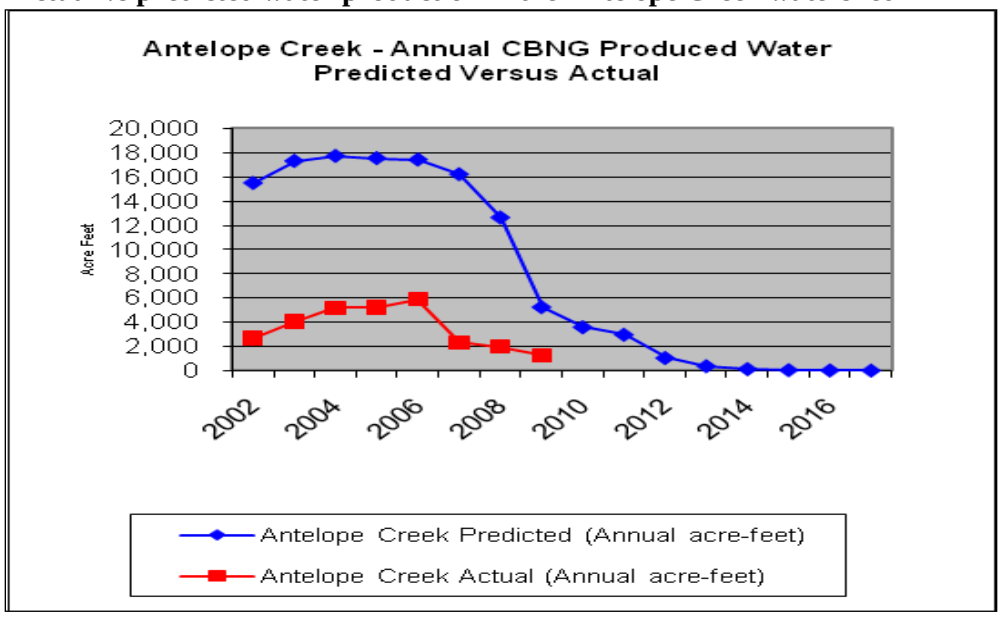
As of December 2009, all producing CBNG wells in the Antelope Creek watershed discharged a cumulative volume of 28,599 acre-ft of water compared to the predicted 119,323 acre-ft disclosed in the

PRB FEIS, Table 2-8, p. 2-26. These figures are presented graphically in Figure 4.2 and Table 4.8. This cumulative volume is 24 % of the total predicted produced water analyzed in the PRB FEIS for the Antelope Creek watershed.

Table 4.8 Actual vs predicted water production in the Antelope Creek watershed
2009 Data Update 04-06-10

Year	Antelope Creek Predicted (Annual acre-feet)	Antelope Creek Predicted (Cumulative acre-feet from 2002)	Antelope Creek Actual (Annual acre-feet)		Antelope Creek Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	15,460	15,460	2,668	17.3	2,668	17.3
2003	17,271	32,731	4,042	23.4	6,710	20.5
2004	17,685	50,416	5,181	29.3	11,891	23.6
2005	17,503	67,919	5,234	29.9	17,125	25.2
2006	17,385	85,304	5,869	33.8	22,994	27.0
2007	16,180	101,484	2,327	14.4	25,321	25.0
2008	12,613	114,097	1,983	15.7	27,304	23.9
2009	5,226	119,323	1,295	24.8	28,599	24.0
2010	3,574	122,897				
2011	2,956	125,853				
2012	1,041	126,894				
2013	363	127,257				
2014	124	127,381				
2015	40	127,421				
2016	13	127,434				
2017	3	127,437				
Total	**127,437**		**28,599**			

Figure 4.2 Actual vs predicted water production in the Antelope Creek watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. Electrical conductivity (EC) and SAR are the parameters of concern for suitability of irrigation water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from-existing wells within each of the 10 primary watersheds in the Powder River Basin. 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 22.5% of the total predicted in the PRB FEIS.
2. They are proportional to the actual amount of cumulatively produced water in the Antelope Creek drainage, which is approximately 24% of the total predicted in the PRB FEIS.

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

4.2.3.2.3. Mitigation Measures

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 four feet below the channel bottom.

The operator committed to monitor and mitigate the discharge points and erosion stabilization measures, and schedule any necessary remedial work to protect the hydrologic features within the POD boundary.

Devon will complete the groundwater monitoring and mitigation per the water well agreement with each landowner, and as included in the surface use agreement with the individual landowners.

4.2.3.2.4. Residual Effects

"Streams enhanced by large volumes of CBM 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. Downcutting (stream erosion) and sediment deposition (aggradation) are natural processes that occur as stream drainages age through time. Downcutting 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 CBM discharge and outfall locations are carefully controlled. Increased flows could cause downcutting 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. Cultural Resources

4.2.4.1. Direct and Indirect Effects

Lack of class III cultural inventory in the NW of Section 30 and the SW/SW of Section 20, T42N R76W, precludes analysis of direct and indirect effects, and unidentified historic properties could be impacted by

the Moore Land Federal 30S-3 and 30S-5 wells and associated infrastructure, and the utility corridor located directly west of the 20S-13 existing fee CBNG well.

Non eligible sites 48CA6857, 48CA6859, 48CA6864, 48CA6867, 48CA6870, 48CA7058, and 48JO4102 will be impacted by the proposed project.

No contributing portions of NRHP listed site 48CA264 (Bozeman Trail) and NRHP eligible site 48CA5494 (Ft. Fetterman to Ft. McKinney Telegraph Line) will be physically impacted. None of the historic properties within the project area retain their integrity of setting. The proposed project will not diminish any other aspects of integrity of the historic properties. Following the Wyoming State Protocol Section VI(B)(1) the Bureau of Land Management determined that the project will result in "No Adverse Effect". The Wyoming State Historic Preservation Officer (SHPO) concurred with the Bureau's determination on 9/24/2010 (SHPO# 0910LKN001).

Table 4.9 Project Components Recommended for Deferral

Well # and/or Corridor	Environmental Issue/Deficiency	Remedy
30S-3	Class III cultural inventory was not completed for the NW of Section 30, T42N R76W.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.
30S-5	Class III cultural inventory was not completed for the NW of Section 30, T42N R76W.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.
Utility Corridor	Class III cultural inventory was not completed for approximately 750 feet of the proposed corridor consisting of proposed unimproved road, proposed water, gas, electric located directly west of the 20S-13 existing fee CBNG well in the N/SW/SW/SW of Section 20, T42N R76W.	Class III cultural inventory that meets the Secretary of the Interior's Standards must be completed, and a report 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* must be received and accepted by the Buffalo Field Office, by July 31, 2011.

4.2.4.2. 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. However, lack of cultural inventory in the NW of Section 30 and the SW/SW of Section 20, T42N R76W, means that even this partial mitigation would not occur for the Moore Land Federal 30S-3 and 30S-5 wells and associated infrastructure, and the utility corridor located directly west of the 20S-13 existing fee CBNG well.

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 - that information can potentially get into the wrong hands. BLM authorizations resulting in new access can inadvertently lead to impacts to sites from increased visitation by the public.

4.2.4.3. Mitigation Measures

Without adequate class III cultural inventory, mitigation measures cannot be formulated and undocumented historic resources can be adversely affected for the Moore Land Federal 30S-3 and 30S-5 wells and associated infrastructure, and the utility corridor located directly west of the 20S-13 existing fee CBNG well.

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).

Fencing: A temporary fence will be installed by a qualified archaeologist who meets or exceeds the qualification standards recommended by the Secretary of the Interior during road and utility corridor construction (T42N R76W Sections 24, 25, and 36) along the Bozeman Trail/Ft. Fetterman to Ft. McKinney Telegraph Line, West Pine Tree Segment 2, as described in the site specific COA's.

Archaeological Monitoring: When a project is constructed in an area with a high potential for buried cultural material, archaeological monitoring is often included as a condition of approval. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance. Due to the presence of alluvial and/or Aeolian deposits identified by the NRCS soil survey (NRCS n.d.), and areas of Moderate to High Sensitivity Zones per the PUMP III Model (Eckerle 2005), the operator will be required to have an

archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COA's.

4.2.4.4. 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.

4.2.5. Visual Resources

4.2.5.1. Direct and Indirect Effects

Three well locations were proposed on ridgelines and were highly visible from the HWY 387. Disturbance associated with the construction of the well locations and associated infrastructure would result in the wells and associated infrastructure becoming key visual observation points.

4.2.5.2. Mitigation Measures

The BLM in concurrence with operator moved the 3 wells such that the wells and associated infrastructure are no longer key visual observation points.

4.2.6. 4.2.6 Wilderness

The Grayling POD area is clearly lacking in wilderness characteristics because it hosts 18 operational CBNG wells, over 6.3 miles of overhead powerlines, about 11 miles of modern rural roads, and 1 compressor, see Table 2.3.

5. CONSULTATION & COORDINATION

Agencies summarized in Table 5.1 were consulted on the proposed project to confirm compliance with applicable laws and regulations.

Table 5.1 Consultations

Contact	Title	Organization	Present at Onsite
Brad Rogers	Wildlife Biologist	US Fish & Wildlife Service	Yes
Pauline Schuette	Wildlife Biologist	US Fish & Wildlife Service	No
Eric Holborn	Natural Resource Specialist (NRS	BLM	Yes
Courtney Frost	Wildlife Biologist	BLM	Yes
Jennifer Morton	Wildlife Biologist	BLM	Yes
Bill Ostheimer	Wildlife Biologist	BLM	No
Keith Anderson	Hydrologist	BLM	Yes
Kathy Brus	Supervisory NRS	BLM	Yes
Rick Taylor	Production Supervisor	Devon Energy Company	Yes
Becky Byrum	Regulatory Agent	Devon Energy Company	Yes
Pat Kirkendol	Production Supervisor	Devon Energy Company	Yes
Peter Angelos	Surveyor	LSI	Yes
Mary Hopkins	State Historic Preservation Officer	State Historic Preservation Office	No

Contact	Title	Organization	Present at Onsite
Richard Currit	Senior Archaeologist Review & Federal Consultation, NEPA Coordinator	State Historic Preservation Office	No
Laura Nowlin	Historic Preservation Specialist	State Historic Preservation Office	No
Ardeth Hahn	Archeologist	BLM	Yes

6. OTHER PERMITS REQUIRED

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

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Appendix A: Resource and Species Worksheets

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality	Yes	Yes	Yes	PRB FEIS: 3-291-298, 4-404-406, 4-377-386
Noise	Yes	Yes		
Cultural	Yes	Yes	No	
Native American religious concerns	No	No	No	
Traditional Cultural Properties	No	No	No	
Mineral Potential				PRB FEIS: 3-66-70, 3-230, 4-127-129
Coal	Yes	Yes	Yes	PRB FEIS: 3-66
Fluid Minerals	Yes	Yes	Yes	PRB FEIS: 3-68-69
Locatable Minerals	No	No		
Other leasables	No	No		
Salable minerals	No	No		
Paleontology				PRB FEIS: 3-65-66, 4-125-127
PFYC 3				PRB FEIS: 3-65-66, 4-125-127
PFYC 5				PRB FEIS: 3-65-66, 4-125-127
Rangeland management				Not in PRB FEIS
Existing range improvements	No			Proposed action is 99% on Fee surface, where proposed access/utilities (A/U) crosses Federal surface no range improvements will be required, reclamation of disturbed lands will be covered under the APD requirements
Proposed range improvements	No			
Recreation				PRB FEIS: 3-263-273, 4-319-328
Developed site	No			PRB FEIS: 3-266, 4-326
Walk-in-Area	No			
Social & Economic	Yes	Yes	Yes	PRB FEIS: 3-275-289, 4-336-370
Environmental Justice	N/A			
Transportation	Yes	Yes		Covered in EA
Soils & Vegetation				PRB FEIS: 3-78-107, 4-134-152, 4-153-164, 4-393-394, 4-406
Erosion Hazard	Yes	Yes	Yes	PRB FEIS: 3-82, 4-135
Poor Reclamation Potential	Yes	Yes	Yes	PRB FEIS: 3-86, 4-149-152
Slope hazard	No			PRB FEIS: 3-81, 4-135
Forest products	No			
Prime and Unique Farmland	No			
Invasive Species	Yes	Yes	No	PRB FEIS: 3-103-108, 4-153-172
Wetlands/Riparian	Yes	No	Yes	PRB FEIS: 4-117-124, 3-108-113, 4-172-178, 4-406

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Special Designations				
Proposed ACEC	No			
Wild & Scenic River	No			PRB FEIS: 3-273
Wilderness Characteristics/Citizen Proposed	No	No	No	DOI Order 3310, see sections 3.7 and 4.2.6 this EA
WSA	No			
Visual Resources				PRB FEIS: 3-252-263, 4-302-314, 4-403
Class II	no			
Class III	Yes	Yes		Addressed at onsites, operator voluntarily moved 3 wells in direct line of site of HWY 387
Water				PRB FEIS: 3-1-56, 4-1-122, 4-135, 4-33, 4-405
Floodplains	Yes	NO	Yes	PRB FEIS: 3-36-56, 4-85 to 86, 4-117 to 124 ,4-69-122, 4-393, 4-405
Ground water	Yes	Yes	Yes	PRB FEIS: 3-1-30, 4-1-69, 4-392, 4-405
Surface water	Yes	Yes	Yes	PRB FEIS: 4-85-86, 4-117-124, 3-36-56. 4-69-122, 4-393, 4-405
Drinking water	Yes	Yes	Yes	PRB FEIS: 3-52, 4-50-52
Wildland Urban Interface	N/A			
Waste Management	No			
Wildlife				PRB FEIS: 3-113-153, 4-179, 4-247, 4-397
ESA listed, proposed, or candidate species	Yes	Yes	Yes	
BLM sensitive species	Yes	Yes	No	
General wildlife	Yes	Yes	Yes	
West Nile virus potential	Yes	Yes	No	