

**FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR**

**Nance Petroleum Corporation
East Badger POD**

ENVIRONMENTAL ASSESSMENT –WY-070-07-189

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize **Nance Petroleum Corporation's East Badger** Coal Bed Natural Gas (CBNG) POD comprised of the **68** Applications for Permit to Drill (APDs) with 13 additional APDs pending approval following the 30 day public posting period as indicated in the following table:

***NOTE: These APD's will be held pending the 30 day Public posting period ending October 6, 2007**

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	East Badger Federal	04-01CK	NENE	4	57N	80W	WYW146964
2	East Badger Federal	04-01KB	NENE	4	57N	80W	WYW146964
3	East Badger Federal	04-03CK	NENW	4	57N	80W	WYW146964
4	East Badger Federal	04-03KB	NENW	4	57N	80W	WYW146964
5	East Badger Federal	04-09CK	NESE	4	57N	80W	WYW146964
6	East Badger Federal	04-09KB	NESE	4	57N	80W	WYW146964
7	East Badger Federal	*04-09WIW	NESE	4	57N	80W	WYW146964
8	East Badger Federal	04-11CK	NESW	4	57N	80W	WYW146964
9	East Badger Federal	04-11KB	NESW	4	57N	80W	WYW146964
10	East Badger Federal	05-01CK	NENE	5	57N	80W	WYW146964
11	East Badger Federal	05-01KB	NENE	5	57N	80W	WYW146964
12	East Badger Federal	*05-02CK	NWNE	5	57N	80W	WYW146964
13	East Badger Federal	*05-02KB	NWNE	5	57N	80W	WYW146964
14	East Badger Federal	06-01CK	NENE	6	57N	80W	WYW146964
15	East Badger Federal	06-01KB	NENE	6	57N	80W	WYW146964
16	East Badger Federal	06-03KB	NENW	6	57N	80W	WYW146964
17	East Badger Federal	06-03CK	NENW	6	57N	80W	WYW146964
18	East Badger Federal	06-09CK	NESE	6	57N	80W	WYW146964
19	East Badger Federal	06-09KB	NESE	6	57N	80W	WYW146964
20	East Badger Federal	*06-09WIW	NESE	6	57N	80W	WYW146964
21	East Badger Federal	07-01CK	NENE	7	57N	80W	WYW146964
22	East Badger Federal	07-01KB	NENE	7	57N	80W	WYW146964
23	East Badger Federal	07-04CK	NWNW	7	57N	80W	WYW146964
24	East Badger Federal	07-04KB	NWNW	7	57N	80W	WYW146964
25	East Badger Federal	07-09CK	NESE	7	57N	80W	WYW146964
26	East Badger Federal	07-09KB	NESE	7	57N	80W	WYW146964
27	East Badger Federal	*07-09WIW	NESE	7	57N	80W	WYW146964
28	East Badger Federal	07-14CK	SESW	7	57N	80W	WYW146964

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
29	East Badger Federal	07-14KB	SESW	7	57N	80W	WYW146964
30	East Badger Federal	08-01CK	NENE	8	57N	80W	WYW146965
31	East Badger Federal	08-01KB	NENE	8	57N	80W	WYW146965
32	East Badger Federal	08-03CK	NENW	8	57N	80W	WYW146965
33	East Badger Federal	08-03KB	NENW	8	57N	80W	WYW146965
34	East Badger Federal	08-09CK	NESE	8	57N	80W	WYW146965
35	East Badger Federal	08-09KB	NESE	8	57N	80W	WYW146965
36	East Badger Federal	08-11CK	NESW	8	57N	80W	WYW146965
37	East Badger Federal	08-11KB	NESW	8	57N	80W	WYW146965
38	East Badger Federal	09-01CK	NENE	9	57N	80W	WYW146965
39	East Badger Federal	09-01KB	NENE	9	57N	80W	WYW146965
40	East Badger Federal	09-03KB	NENW	9	57N	80W	WYW146965
41	East Badger Federal	09-03CK	NENW	9	57N	80W	WYW146965
42	East Badger Federal	*09-03WIW	NENW	9	57N	80W	WYW146965
43	East Badger Federal	09-09CK	NESE	9	57N	80W	WYW146965
44	East Badger Federal	09-09KB	NESE	9	57N	80W	WYW146965
45	East Badger Federal	09-11CK	NESW	9	57N	80W	WYW146965
46	East Badger Federal	09-11KB	NESW	9	57N	80W	WYW146965
47	East Badger Federal	15-01CK	NENE	15	57N	80W	WYW146965
48	East Badger Federal	15-01KB	NENE	15	57N	80W	WYW146965
49	East Badger Federal	15-03CK	NENW	15	57N	80W	WYW160916
50	East Badger Federal	15-03KB	NENW	15	57N	80W	WYW160916
51	East Badger Federal	*15-03WIW	NENW	15	57N	80W	WYW160916
52	East Badger Federal	15-11CK	NESW	15	57N	80W	WYW160916
53	East Badger Federal	15-11KB	NESW	15	57N	80W	WYW160916
54	East Badger Federal	17-01CK	NENE	17	57N	80W	WYW146965
55	East Badger Federal	17-01KB	NENE	17	57N	80W	WYW146965
56	East Badger Federal	*17-01WIW	NENE	17	57N	80W	WYW146965
57	East Badger Federal	17-03CK	NENW	17	57N	80W	WYW146965
58	East Badger Federal	17-03KB	NENW	17	57N	80W	WYW146965
59	East Badger Federal	17-09CK	NESE	17	57N	80W	WYW146965
60	East Badger Federal	17-09KB	NESE	17	57N	80W	WYW146965
61	East Badger Federal	17-11CK	NESW	17	57N	80W	WYW146965
62	East Badger Federal	17-11KB	NESW	17	57N	80W	WYW146965
63	REMU East Badger Federal	30-19CK	NWSW	30	58N	80W	WYW146969
64	REMU East Badger Federal	30-19KB	NWSW	30	58N	80W	WYW146969
65	REMU East Badger Federal	33-01CK	NENE	33	58N	80W	WYW142849

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
66	REMU East Badger Federal	33-01KB	NENE	33	58N	80W	WYW142849
67	REMU East Badger Federal	33-11CK	NESW	33	58N	80W	WYW142849
68	REMU East Badger Federal	33-11KB	NESW	33	58N	80W	WYW142849
69	REMU East Badger Federal	*33-10CK	NWSE	33	58N	80W	WYW142849
70	REMU East Badger Federal	*33-10KB	NWSE	33	58N	80W	WYW142849
71	REMU East Badger Federal	34-01CK	NENE	34	58N	80W	WYW142849
72	REMU East Badger Federal	34-01KB	NENE	34	58N	80W	WYW142849
73	REMU East Badger Federal	35-01CK	NENE	35	58N	80W	WYW142849
74	REMU East Badger Federal	35-01KB	NENE	35	58N	80W	WYW142849
75	REMU East Badger Federal	*35-01WIW	NENE	35	58N	80W	WYW142849
76	REMU East Badger Federal	35-03CK	NENW	35	58N	80W	WYW142849
77	REMU East Badger Federal	35-03KB	NENW	35	58N	80W	WYW142849
78	REMU East Badger Federal	35-09CK	NESE	35	58N	80W	WYW142849
79	REMU East Badger Federal	35-09KB	NESE	35	58N	80W	WYW142849
80	REMU East Badger Federal	*35-12CK	NWSW	35	58N	80W	WYW142849
81	REMU East Badger Federal	*35-12KB	NWSW	35	58N	80W	WYW142849

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

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease Number
1	*Upper Antelope	NWNE	35	58	80	2.63	1	WYW142849
2	P57-80-04-04	NWNW	4	57	79	18.6	3	WYW146964
3	*P57-80-17-10	NWSE	17	57	80	14.1	2.4	WYW146965
4	P58-80-34-11	NESW	34	58	80	29.08	3.3	WYW144813
5	P57-80-10-11	NESW	10	57	80	12.86	2.1	WYW142848
6	57-80-03-03 Reservoir	NENW	3	57	80	44.94	6.5	NA
7	57-80-03-05 Reservoir	SWNW	3	57	80	25.43	4.6	NA
8	57-80-20-01 Reservoir	NENE	20	57	80	14.34	2.8	NA

***NOTE:** These are secondary impoundments and can not be constructed prior to submittal of the appropriate bond to BLM. See Conditions of Approval.

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

RATIONALE: The decision to authorize Alternative C, as described in the attached Environmental Assessment (EA), is based on the following:

1. The Operator, in their POD, has committed to:
 - Comply with all applicable Federal, State and Local laws and regulations.
 - Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
 - Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD.
 - Provide water analysis from a designated reference well in each coal zone.
2. The Operator has certified that a Surface Use Agreement has been reached with the Landowner(s).
3. Alternative C will not result in any undue or unnecessary environmental degradation.
4. It is in the public interest to approve these wells, as the leases are being drained of federal gas, resulting in a loss of revenue for the government.
5. Mitigation measures applied by the BLM will alleviate or minimize environmental impacts.
6. Alternative C is the environmentally-preferred Alternative.
7. The proposed action is in conformance with the PRB FEIS and the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001.

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

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

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

Field Manager: _____ Date: _____

**BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Nance Petroleum Corporation
East Badger POD
PLAN OF DEVELOPMENT
WY-070-07-189**

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to define and produce coal bed natural gas (CBNG) on 6 valid federal oil and gas mineral leases issued to the applicant by the BLM. The purpose for the proposal is to quantify reserves and produce coal bed natural gas (CBNG) on one or more valid federal oil and gas mineral leases issued to the applicant by the BLM. The need exists because without approval of the Applications for Permit to Drill (APDs), federal lease royalties will be lost and the lessee will be deprived of the federal gas they have the rights to develop.

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

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

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternative A - No Action

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

2.2. Alternative B Proposed Action

Proposed Action Title/Type: Nance Petroleum Corporation’s East Badger POD Plan of Development (POD) for coal bed natural gas well APD’s and associated infrastructure.

Proposed Well Information: There were 92 wells originally proposed within this POD. The wells are vertical bores proposed on 160 acre spacing pattern with 2 wells per location. Each well will produce from **multiple** coal seams. Proposed well house dimensions are 5 ft wide x 5 ft length x 5 ft height. Well house color is Covert Green, selected to blend with the surrounding vegetation.

The following were the proposed well locations submitted April 13, 2007 to BLM:

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	East Badger Federal	04-01CK	NENE	4	57N	80W	WYW146964
2	East Badger Federal	04-01KB	NENE	4	57N	80W	WYW146964
3	East Badger Federal	04-03CK	NENW	4	57N	80W	WYW146964
4	East Badger Federal	04-09CK	NESE	4	57N	80W	WYW146964
5	East Badger Federal	04-09KB	NESE	4	57N	80W	WYW146964
6	East Badger Federal	04-11CK	NESW	4	57N	80W	WYW146964
7	East Badger Federal	04-11KB	NESW	4	57N	80W	WYW146964
8	East Badger Federal	04-03KB	NENW	4	57N	80W	WYW146964
9	East Badger Federal	05-01CK	NENE	5	57N	80W	WYW146964
10	East Badger Federal	05-01KB	NENE	5	57N	80W	WYW146964
11	East Badger Federal	*05-03CK	NENW	5	57N	80W	WYW160916
12	East Badger Federal	*05-03KB	NENW	5	57N	80W	WYW160916
13	East Badger Federal	06-01CK	NENE	6	57N	80W	WYW146964
14	East Badger Federal	06-01KB	NENE	6	57N	80W	WYW146964
15	East Badger Federal	06-09CK	NESE	6	57N	80W	WYW146964
16	East Badger Federal	06-09KB	NESE	6	57N	80W	WYW146964
17	East Badger Federal	06-03CK	NENW	6	57N	80W	WYW146964
18	East Badger Federal	06-03KB	NENE	6	57N	80W	WYW146964
19	East Badger Federal	06-11CK	NESW	6	57N	80W	WYW146964
20	East Badger Federal	06-11KB	NESW	6	57N	80W	WYW146964
21	East Badger Federal	07-01CK	NENE	7	57N	80W	WYW146964
22	East Badger Federal	07-01KB	NENE	7	57N	80W	WYW146964
23	East Badger Federal	07-04CK	NWNW	7	57N	80W	WYW146964
24	East Badger Federal	07-04KB	NWNW	7	57N	80W	WYW146964
25	East Badger Federal	07-09KB	NESE	7	57N	80W	WYW146964
26	East Badger Federal	07-09CK	NESE	7	57N	80W	WYW146964
27	East Badger Federal	07-14CK	SESW	7	57N	80W	WYW146964
28	East Badger Federal	07-14KB	SESW	7	57N	80W	WYW146964
29	East Badger Federal	08-01CK	NENE	8	57N	80W	WYW146965
30	East Badger Federal	08-01KB	NENE	8	57N	80W	WYW146965
31	East Badger Federal	08-03CK	NENW	8	57N	80W	WYW146965
32	East Badger Federal	08-03KB	NENW	8	57N	80W	WYW146965
33	East Badger Federal	08-09CK	NESE	8	57N	80W	WYW146965
34	East Badger Federal	08-09KB	NESE	8	57N	80W	WYW146965
35	East Badger Federal	08-11CK	NESW	8	57N	80W	WYW146965
36	East Badger Federal	08-11KB	NESW	8	57N	80W	WYW146965
37	East Badger Federal	09-01CK	NENE	9	57N	80W	WYW146965
38	East Badger Federal	09-03CK	NENW	9	57N	80W	WYW146965

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
39	East Badger Federal	09-03KB	NENW	9	57N	80W	WYW146965
40	East Badger Federal	09-09CK	NESE	9	57N	80W	WYW146965
41	East Badger Federal	09-09KB	NESE	9	57N	80W	WYW146965
42	East Badger Federal	09-11CK	NESW	9	57N	80W	WYW146965
43	East Badger Federal	09-11KB	NESW	9	57N	80W	WYW146965
44	East Badger Federal	09-01KB	NENE	9	57N	80W	WYW146965
45	East Badger Federal	15-01CK	NENE	15	57N	80W	WYW146965
46	East Badger Federal	15-01KB	NENE	15	57N	80W	WYW146965
47	East Badger Federal	15-03CK	NENW	15	57N	80W	WYW160916
48	East Badger Federal	15-03KB	NENW	15	57N	80W	WYW160916
49	East Badger Federal	15-09CK	NESE	15	57N	80W	WYW146965
50	East Badger Federal	15-09KB	NESE	15	57N	80W	WYW146965
51	East Badger Federal	15-11CK	NESW	15	57N	80W	WYW160916
52	East Badger Federal	15-11KB	NESW	15	57N	80W	WYW160916
53	East Badger Federal	17-01CK	NENE	17	57N	80W	WYW146965
54	East Badger Federal	17-01KB	NENE	17	57N	80W	WYW146965
55	East Badger Federal	17-03CK	NENW	17	57N	80W	WYW146965
56	East Badger Federal	17-03KB	NENW	17	57N	80W	WYW146965
57	East Badger Federal	17-09KB	NESE	17	57N	80W	WYW146965
58	East Badger Federal	17-11CK	NESW	17	57N	80W	WYW146965
59	East Badger Federal	17-11KB	NESW	17	57N	80W	WYW146965
60	East Badger Federal	17-09CK	NESE	17	57N	80W	WYW146965
61	East Badger Federal	33-01CK	NENE	33	58N	80W	WYW142849
62	East Badger Federal	33-01KB	NENE	33	58N	80W	WYW142849
63	East Badger Federal	*33-09CK	NESE	33	58N	80W	WYW142849
64	East Badger Federal	*33-09KB	NESE	33	58N	80W	WYW142849
65	East Badger Federal	33-11CK	NESW	33	58N	80W	WYW142849
66	East Badger Federal	33-11KB	NESW	33	58N	80W	WYW142849
67	East Badger Federal	34-01CK	NENE	34	58N	80W	WYW142849
68	East Badger Federal	34-01KB	NENE	34	58N	80W	WYW142849
69	East Badger Federal	34-09CK	NESE	34	58N	80W	WYW142849
70	East Badger Federal	34-09KB	NESE	34	58N	80W	WYW142849
71	East Badger Federal	35-01CK	NENE	35	58N	80W	WYW142849
72	East Badger Federal	35-01KB	NENE	35	58N	80W	WYW142849
73	East Badger Federal	35-03CK	NENW	35	58N	80W	WYW142849
74	East Badger Federal	35-03KB	NENW	35	58N	80W	WYW142849
75	East Badger Federal	35-09CK	NESE	35	58N	80W	WYW142849
76	East Badger Federal	35-09KB	NESE	35	58N	80W	WYW142849
77	East Badger Federal	*35-11CK	NESW	35	58N	80W	WYW142849
78	East Badger Federal	*35-11KB	NESW	35	58N	80W	WYW142849

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
79	REMU East Badger Federal	19-17CK	NWNW	19	58N	80W	WYW146966
80	REMU East Badger Federal	19-17KB	NWNW	19	58N	80W	WYW146966
81	REMU East Badger Federal	19-19CK	NWSW	19	58N	80W	WYW146966
82	REMU East Badger Federal	19-19KB	NWSW	19	58N	80W	WYW146966
83	REMU East Badger Federal	30-17CK	NWNW	30	58N	80W	WYW146969
84	REMU East Badger Federal	30-17KB	NWNW	30	58N	80W	WYW146969
85	REMU East Badger Federal	30-19CK	NWSW	30	58N	80W	WYW146969
86	REMU East Badger Federal	30-19KB	NWSW	30	58N	80W	WYW146969
87	Wyatt Unit East Badger Federal	08-11KB	NESW	8	57N	79W	WYW172897
88	Wyatt Unit East Badger Federal	09-09KB	NESE	9	57N	79W	WYW147426
89	Wyatt Unit East Badger Federal	17-01KB	NENE	17	57N	79W	WYW172897
90	Wyatt Unit East Badger Federal	17-03KB	NENW	17	57N	79W	WYW172897
91	Wyatt Unit East Badger Federal	17-09KB	NESE	17	57N	79W	WYW172897
92	Wyatt Unit East Badger Federal	17-11KB	NESW	17	57N	79W	WYW172897

***NOTE: These APD's for CK and KB wells replaced APD's originally submitted by the operator as these locations were moved outside the qtr/qtr staked prior to the onsite.**

Water Management Proposal:

The following impoundments are proposed for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease Number
1	Upper Antelope	NWNE	35	58	80	2.63	1	WYW142849
2	P57-80-04-04	NWNW	4	57	79	18.6	3	WYW146964
3	P57-80-17-10	NWSE	17	57	80	14.1	2.4	WYW146965
4	P58-80-34-11	NESW	34	58	80	29.08	3.3	WYW144813
5	P57-80-10-11	NESW	10	57	80	12.86	2.1	WYW142848
6	57-80-03-03 Reservoir	NENW	3	57	80	44.94	6.5	NA
7	57-80-03-05 Reservoir	SWNW	3	57	80	25.43	4.6	NA
8	57-80-20-01 Reservoir	NENE	20	57	80	14.34	2.8	NA

The APD's listed below were added to the East Badger POD after submittal to the BLM but prior to completion of the onsite inspections. Each location was inspected during the onsite as a water injection well (WIW) at a twin CBM well location. The APD's below for WIW wells were added to the POD as part of the operator's water management strategy.

	Water Injection Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	REMU East Badger Federal	35-01WIW	NENE	35	58N	80W	WYW142849
2	East Bader Federal	17-01WIW	NENE	17	57N	80W	WYW146965
3	East Bader Federal	15-03WIW	NENW	15	57N	80W	WYW160916

	Water Injection Well	Well #	QTR	Sec	TWP	RNG	Lease
	Name						
4	East Bader Federal	09-03WIW	NENW	9	57N	80W	WYW146965
5	East Bader Federal	07-09WIW	NESE	7	57N	80W	WYW146964
6	East Bader Federal	06-09WIW	NESE	6	57N	80W	WYW146964
7	East Bader Federal	04-09WIW	NESE	4	57N	80W	WYW146964

County: **Sheridan**

Applicant: **Nance Petroleum Corporation**

Surface Owners: **BLM, Padlock Ranch, Chase Farms, 7-Brothers Ranch,**

Project Description:

The proposed action involves the following:

- Drilling of 92 total federal CBM wells. The Cook (CK) wells will produce from the Anderson Dietz, Canyon and Cook coal seams. The Knobloch (KB) wells will produce from the Wall, Pawnee, Brewster/Arnold, King and Knobloch coal seams. These CBM wells will range in depth from 1,134 to 2,780 feet.

Drilling of 7 total Water Injection Wells (WIW) over federal minerals. These wells will be completed through zones that have the potential to produce federal minerals and therefore require an APD to be authorized by the BLM. These wells will range in depth from 400 to 1,000 feet.

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

- Well metering shall be accomplished by both **telemetry and well visitation**. Metering and maintenance varies greatly from individual well with daily to monthly well visits expected to each **well**.
- A Water Management Plan (WMP) that involves the following proposed infrastructure and strategy: **8** discharge points, **8** stock water reservoirs, and **10** water injection wells (**7** federal & **3** fee) within the **Upper Tongue River** primary watershed. Existing impoundments and injection wells approved in previous PODs, along with a center-pivot managed irrigation site in the Randall Prong POD, may be used to manage produced water from wells approved in this federal action.
- Development of deep groundwater monitoring wells.
- An unimproved and improved road network.
- An above ground power line network to be planned by KLJ Engineering and constructed by a **contractor**. The proposed route **has** been reviewed by KLJ Engineering. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction **has not** been scheduled and **will not** be completed before the CBNG

wells are producing. Temporary diesel generators shall be placed at the 20 proposed power drops. See Table 4.1 of the MSUP for locations.

A storage tank of 500 or 1,000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for up to 6 months. Fuel deliveries are anticipated to be 2 times per week. Noise level is expected to be 92 to 96 decibels at 1 meter distance.

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

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

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

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

The Operator has certified that a Surface Use Agreement has been reached with the Landowners.

2.3. Alternative C – Environmentally Preferred

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

Well locations are adjusted during the onsite to reduce effects on the landscape. When well locations are re-staked within an adjacent quarter/quarter, a new APD and plat were required. This occurred during the East Badger POD onsite and those APD's affected are noted in section 2.3.1 below. The specific changes identified for the **East Badger POD** POD are listed below under section 2.3.1.

2.3.1. Changes as a result of the on-sites

Well #'s	QTR	Sec	TWP	RNG	Comments
04-01CK/KB	NENE	4	57N	80W	This location is a hill top requiring a steep vertical pull to access. BLM recommended an alternate location approximately 200 feet SW to an area below the steepest slopes and authorize a designed pad if requested. This avoids both steep slopes and highly erosive soils. Operator agreed.
04-11CK/KB	NENW	4	57N	80W	There is a small drainage crossing to reach the proposed location; BLM recommended moving the location approximately 300' north to avoid the drainage; the operator agreed. MD7 will be moved to the VS16 location as the proposed access road to the north was withdrawn and the existing primitive will be utilized instead.
05-01CK/KB	NENE	5	57N	80W	The proposed location is on a hill top with a designed pad that was not staked. There are high erosion concerns for the pad and access due to slopes and soils. There is an existing primitive road to the east that would facilitate the access & corridor if improved. BLM recommended an alternate well location at the existing road approximately 500 feet NE. Operator agreed to the alternate location.
05-03CK/KB	NENW	5	57N	80W	BLM recommended an alternate location approximately 400 feet east that avoided a drainage crossing with steep ingress/egress; a constructed pad was added. The new location selected is in the 5-2 well spot. BLM recommended shifting the proposed primitive segment of the access down slope to the edge of and avoiding sage brush. The operator declined the recommendations.
06-01CK/KB	NENE	6	57N	80W	The proposed location and access is within an active drainage with a huge watershed above it. The Padlock Ranch is opposed to the access coming up from their surface. The operator staked an alternate location approximately 500' SW on the Chase Farm side of the fence with a constructed pad. The utility corridor will still follow the drainage to the NE but was realigned to cross the drainage avoiding steep cut banks and following a natural bench to the existing Oil & Gas road below. Expedient reclamation will be required for the corridor.
06-03CK/KB	NESE	6	57N	80W	Shallow sandy site warrants expedient reclamation. The access is an existing primitive road with slope >16% and shallow sandy soil; BLM recommends improvements as needed to meet BLM standards in accordance with a centerline profile for the entire road length.
06-09CK/KB & 06-09WIW	NENW	6	57N	80W	The location was moved approximately 300' east to the existing access road for an eyebrow location; 3-6% side slope at this location. Expedient reclamation is warranted due to the shallow sandy soils at this site.
06-11CK/KB	NESW	6	57N	80W	Access is designed on >25% slopes with very shallow sandy soil dropping around 280 vertical feet. The design shows the width of disturbance as up to 200'. The landowner representative stressed that it is the ranch's wish to minimize disturbance. There is no need for the road after abandonment and reclamation potential is poor.

Well #'s	QTR	Sec	TWP	RNG	Comments
					BLM recommended that the operator withdraw the proposed access and APD's from the POD. The operator agreed.
07-01CK/KB	NENE	7	57N	80W	BLM recommended shifting the start of the proposed start 200' down slope to facilitate a pullout area and avoid steeper side slopes. The road will be rerouted to avoid as much sagebrush as possible. Shallow sandy soil warrants expedient reclamation.
08-01CK/KB	NENE	8	57N	80W	The access to the north is existing to be improved with no issues. The road proposed to the SW is by design through Shallow sandy soils with side slopes and rock outcroppings; this is a loop road that is not necessary; BLM recommended that the SW road be withdrawn; the operator agreed.
08-09CK/KB	NESE	8	57N	80W	This is a tight location at the end of a ridge. BLM recommend that an alternate location be pursued as this is not a suitable location for a pad to be constructed as there is not sufficient building material available as well as highly erosive soils. The operator declined the recommendation on the grounds of spacing/drainage concerns. No pad will be granted here. This location will be inspected with the drilling supervisor during the preconstruction inspection. Expedient reclamation will apply.
09-03CK/KB & 09-03WIW	NENW	9	57N	80W	The designed segment of the access road is through highly erosive soils and sagebrush habitat. BLM recommended utilizing an existing road/fire break that follows the drainage and withdrawing the north half of the design segment. The operator agreed.
09-09CK/KB	NESE	9	57N	80W	BLM recommended shifting the road to follow the topography and the operator has agreed to minimize the access roads. The road to the south will be reduced to primitive with spot upgrades. The access to the north will be reduced to an improved road and the 90 degree corner in the design plans will be shifted east to avoid sagebrush and steep slopes. This location will be inspected with the drilling supervisor during the preconstruction inspection.
09-11CK/KB	NESW	9	57N	80W	There is a 10% vertical grade downhill to the location. BLM recommended pit liners be used due to sandy soil and rock outcrops at the edge of the slope below the location. The access will require design to negotiate a 16% slope with corner with rock outcroppings; Expedient reclamation will apply.
15-01CK/KB	NENW	15	57N	80W	Access realigned to provide a 20' vegetative buffer for erosion feature/outcrop along access road.
15-03CK/KB & 15-03WIW	NESE	15	57N	80W	BLM recommended shifting the access/corridor to follow the existing primitive road; operator agreed.
15-09CK/KB	NESW	15	57N	80W	The access road proposed through highly erosive, shallow sandy soil, rock out crops and >25% slopes with poor reclamation potential. The Team recommended that the operator withdraw the wells from the proposed action. The operator agreed.
17-01CK/KB	NENE	17	57N	80W	BLM recommended moving the location approximately

Well #'s	QTR	Sec	TWP	RNG	Comments
& 17-01WIW					220 feet south to avoid sage brush habitat; operator agreed. Access road goes through shallow sandy sites – Expedient reclamation applies.
17-09CK/KB	NESW	17	57N	80W	The utility corridor proposed to the south does not follow the access road. BLM recommended that it be rerouted to follow the proposed/existing access roads and the operator agreed.
17-11CK/KB	NESE	17	57N	80W	This is a tight location and BLM recommended either utilizing a constructed pad or an alternate location. The operator declined. This location will be inspected with the drilling supervisor during the preconstruction inspection.
19-17CK/KB	NWNW	19	58N	80W	APD's withdrawn by the operator prior to the onsite due to access issues.
19-19CK/KB	NWSW	19	58N	80W	This location is inside the Hanging Woman High Quality Sage Grouse Habitat polygon. The operator has agreed to withdraw these APD's from the proposed action at this time.
33-01CK/KB	NENE	33	58N	80W	There is a blowout area next to the location that will be avoided with a 20' vegetative buffer. Sage grouse brood sign found along the access route. BLM recommended that an alternate location that avoids the sagebrush be pursued; operator declined the recommendation. BLM recommended the access be realigned to follow the topography reducing cut & fill; landowner supported and operator agreed.
33-09CK/KB	NESE	33	58N	80W	BLM recommended an alternate location with larger work space area. The operator agreed to a new location approximately 850' NW. The access is proposed over rough ground including a segment with slopes >25%. The landowner recommended an alternate route along an existing primitive road that follows a fence, dropping down to the abandoned well pad and through a saddle with slopes <16%. The operator agreed to the landowner's recommendation. The new location is in the 33-10 well spot.
33-11CK/KB	NESW	33	58N	80W	The location is a shallow sandy site warranting expedient reclamation. The landowner recommended the proposed access to follow the existing primitive road and to cross the fence approximately 400' from the well location. The operator agreed.
34-01CK/KB	NENE	34	58N	80W	BLM recommended that the utility corridor from VS30 north be shifted to the west and follow the main access road; the landowner supported the recommendation. The access encroaches on headcuts and the drainage below; a 20 foot vegetative buffer for headcuts and drainage is required. The operator agreed.
34-09CK/KB	NESE	34	58N	80W	The proposed location is a hill top with a blowout area providing a tight work space. BLM recommended an alternate location to avoid erosive soils; the operator agreed to a location approximately 400' west.
35-01CK/KB & 35-01WIW	NENE	35	58N	80W	The operator recommended an alternate location next to the Upper Antelope reservoir and withdrawing the proposed access to avoid a raptor nest. BLM agreed and

Well #'s	QTR	Sec	TWP	RNG	Comments
					the proposed designed access was withdrawn. The landowner recommended a new access that will come around the east side of the Upper Antelope reservoir and cross the dam. Temporary access will be allowed through the existing, dry reservoir where a crossing will be developed by laying the slopes back to meet BLM Guildlines this will also facilitate the utility corridor.
35-03CK/KB	NENW	35	58N	80W	The utility corridor between the 35-03 and the 35-11 locations were re-routed to follow the access road.
35-09CK/KB	NESE	35	58N	80W	The access was re-routed and the new access will be from the Upper Antelope reservoir. BLM agreed with the alternate access route and proposed utility corridor alignment to follow the topography and avoid excessive cut and fill. New access will be improved from the Upper Antelope reservoir following the contour.
35-11CK/KB	NESW	35	58N	80W	The proposed location is on 6% slopes over rough ground in good sagebrush. BLM recommended moving the location approximately 200 feet west to avoid sagebrush habitat; the operator agreed. New location is in the 35-12 well spot. The utilities between the 35-03 and the 35-11 will be kept tight with the access road.
30-17CK/KB	NWNW	30	58N	80W	This location is inside the Hanging Woman High Quality Sage Grouse Habitat polygon. The operator has agreed to withdraw these APD's from the proposed action at this time.
30-19CK/KB	NWSW	30	58N	80W	The proposed access is designed through blowouts; the landowner recommended an alternate route to avoid erosive soil and steep slopes as well as provide a minimum 20' vegetative buffer for the drainage below. The operator agreed.
08-11KB	NESW	8	57N	79W	This location is within the Otter Cr. High Quality Sage grouse Habitat polygon. The operator has agreed to withdraw this APD from the proposed action at this time.
09-09KB	NESE	9	57N	79W	This location is within the Otter Cr. High Quality Sage Grouse habitat polygon. The operator has agreed to withdraw this APD from the proposed action at this time.
17-01KB	NENE	17	57N	79W	This location is within the Otter Cr. High Quality Sage grouse Habitat polygon and a prairie dog town. The operator has agreed to withdraw this APD from the proposed action at this time.
17-03KB	NENW	17	57N	79W	This location is within the Otter Cr. High Quality Sage grouse Habitat polygon and a prairie dog town. The operator has agreed to withdraw this APD from the proposed action at this time.
17-09KB	NESE	17	57N	79W	This location is within the Otter Cr. High Quality Sage grouse Habitat polygon and a prairie dog town. The operator has agreed to withdraw this APD from the proposed action at this time.
17-11KB	NESW	17	57N	79W	This location is within the Otter Cr. High Quality Sage grouse Habitat polygon and a prairie dog town. The operator has agreed to withdraw this APD from the proposed action at this time.

Well #'s	QTR	Sec	TWP	RNG	Comments
WMP - Project Wide					Eight proposed CBNG-produced water storage impoundment locations were withdrawn by the operator as these impoundments were proposed within the Otter Cr. High Quality Sage grouse Habitat polygon and prairie dog towns.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

1. Channel Crossings:
 - a) Minimize channel disturbance as much as possible by limiting pipeline and road crossings.
 - b) Avoid running pipelines and access roads within floodplains or parallel to a stream channel.
 - c) 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.
 - d) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.
3. Concerns regarding the quality of the discharged CBNG water on downstream irrigation use may require operators to increase the amount of storage of CBNG water during the irrigation months and allow more surface discharge during the non-irrigation months.
4. The operator will supply a copy of the complete approved SW-4, SW-3, or SW-CBNG permits to BLM as they are issued by WSEO for impoundments.

2.3.2.3. Soils

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

2.3.2.4. Vegetation

1. Temporarily fence reseeded areas, if not already fenced, for at least two complete growing seasons to insure reclamation success on problematic sites (e.g. close to livestock watering source, erosive soils etc.).

2.3.2.5. Wetland/Riparian

1. Power line corridors will avoid wetlands, to the extent possible, in order to reduce the chance of waterfowl hitting the lines. Where avoidance can't occur, the minimum number of poles necessary to cross the area will be used.
2. Wetland areas will be disturbed only during dry conditions (that is, during late summer or fall), or when the ground is frozen during the winter.
3. No waste material will be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways.
4. The lower edge of soil or other material stockpiles will be located outside the active floodplain.
5. Disturbed channels will be re-shaped to their approximate original configuration or stable geomorphological configuration and properly stabilized.
6. Reclamation of disturbed wetland/riparian areas will begin immediately after project activities are complete.

2.3.2.6. Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.
2. The Companies will locate facilities so that noise from the facilities at any nearby sage grouse or sharp-tailed grouse display grounds does not exceed 49 decibels (10 dBA above background noise) at the display ground.
3. Containment impoundments will be fenced to exclude wildlife and livestock. If they are not fenced, they will be designed and constructed to prevent entrapment and drowning.
4. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

2.3.2.7. Threatened, Endangered, or Sensitive Species

2.3.2.7.1. Bald Eagle

1. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of Sundry Notices.
2. Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to bald eagles or their habitat.

2.3.2.7.2. Black-footed Ferret

1. Prairie dog colonies will be avoided wherever possible.

2.3.2.7.3. Ute Ladies'-tresses Orchid

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

2.3.2.8. Visual Resources

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

2.3.2.9. Noise

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

2.3.2.10. Air Quality

1. During construction, emissions of particulate matter from well pad and resource road construction will be minimized by application of water, or other dust suppressants, with at least 50 percent control efficiency. Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced or otherwise stabilized to reduce the amount of fugitive dust generated by traffic or other activities, and dust inhibitors (surfacing materials, non-saline dust suppressants, and water) could be used as necessary on unpaved collector, local and resource roads that present a fugitive dust problem. The use of chemical dust suppressants on BLM surface will require prior approval from the BLM authorized officer.

2.3.3. Site specific mitigation measures

1. All changes made at the onsite will be followed. They have all been incorporated into the operator's plan of development. Refer to section 2.3.1 "Changes as a result of the onsite" on pages 11-15.
2. All **Nance Petroleum Corporation** representatives and contractors will have a copy of the approved POD map and conditions of approval with them at all times while conducting activities within the **East Badger POD** project area.
3. The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231) specifically the following:
Reclamation Standards:
 1. The reclaimed area shall be stable and exhibit none of the following characteristics:
 - a. Large rills or gullies.
 - b. Perceptible soil movement or head cutting in drainages.
 - c. Slope instability on, or adjacent to, the reclaimed area in question.
 2. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.

3. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
 - a. Successful onsite establishment of species included in the planting mixture or other desirable species.
 - b. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.
4. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.
4. Provide 4" of aggregate where grades exceed 8%. Surfacing material must meet requirements set forth in Wyoming Supplement to BLM Road Manual 9113.
5. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

Grade	Drainage Spacing
2-4%	310 ft
5-8%	260 ft
9-12%	200 ft
12-16%	150 ft
6. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. This requirement will be waved for trenches installed with wheel trenchers.
7. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the East Badger POD is Covert Green.
8. If produced water is to be applied to road surfaces as dust abatement, the operator needs an approved Wyoming Oil & Gas Commission Facility Information for Road Application of Waste and Waste Water (Form 20) along with the proposed action describing locations, application rates, etc. Form 20 is available at <http://wogcc.state.wy.us>.
9. The following road description forms corresponding to the appropriate road design will be submitted to BLM prior to road construction: 09-01, 09-06, 26-11, 28-12, 30-06, 32-15 and 33-01.

10. "Roughed-in" or "Pioneer" roads shall be constructed according to the line and grade shown in the approved engineering design. Non-engineered roads shall be constructed to a line and grade established to meet the BLM Gold Book and 9113 guidelines as approved in the MSUP, and shaped according to an approved design template for that road.
 - a. Improved roads with utility corridor will not exceed a disturbance width of 45 feet defined as clearing and blading unless a specific design is included in the plan and profile section of the master surface use plan.
 - b. Primitive roads (2-tracks) with utility corridor will not exceed a disturbance width of 30 feet. Construction of primitive roads access/utility corridor within the POD will minimize impact to sagebrush by minimizing road width, mowing and wheel trenching
11. Adequate drainage control must be in place at all stages of construction and culverts installed as soon as feasible.
12. Final grading and surfacing shall occur immediately after utility installation is complete. All rills, gullies, and other surface defects shall be ripped to the full depth of erosion across the entire width of the roadway prior to final grading and surfacing.
13. Horizontal curves with radius less than 220 feet require curve widening as follows:

Turning Radius (ft)	Min. Curve Widening (ft)	Widened Lane Width (ft)
220 +	0	12
120 to 219	2	14
90 to 119	4	16
50 to 89	8	20
14. All roads, well pads, rig slot, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.
15. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction.
16. Pipeline installation and/or corridors without road access will not exceed a disturbance width of 30 feet with clearing and blading not to exceed 20 feet.
17. Utility corridors will be expediently reclaimed following construction and maintained in a professional and workmanship manner avoiding tire rutting, settling and erosion.
18. A minimum 20 foot undisturbed vegetative buffer will be maintained for erosion features and drainages along the access roads to the following well locations: 15-01CK/KB, 33-01CK/KB, 34-01CK/KB and 30-19CK/KB.
19. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a 75 foot radius of the well stake.
20. The operator will maintain well drilling, completion and associated construction operations within a 100 foot by 200 foot work area for those locations where a constructed pad is not approved as designed.
21. The following impoundments are considered secondary and may not be constructed prior to submittal of the appropriate bond to BLM under sundry notice Form 3160-5 for change of status: Upper Antelope reservoir and Pit 57-80-17-10.

22. This decision does not approve water disposal from federal wells in the East Badger POD to be discharged into any impoundments until the operator supplies a copy of the complete approved SW-4, SW-3, or SW-CBNG WSEO permits with a description of facilities as required in Onshore Oil and Gas Order No. 7 (59 FR 47365) to BLM authorized officer, and approval is obtained.
23. This decision does not approve water disposal from federal wells within the East Badger POD into impoundments. Prior to discharging water from the approved wells to impoundments the operator is required to submit a copy of the State of Wyoming approved WYPDES permit, including a current water quality analysis and description of facilities as required in Onshore Oil and Gas Order No. 7 (59 FR 47365).
24. An impoundment will be non-compliant if the proposed mitigation, or approved action, is not successful, i.e. leaking if permitted under full-containment. Disposal of federally produced water will cease into the non-compliant impoundment until successful mitigation is achieved. If produced water resurfaces below the mitigation site, or in adjacent drainages, the mitigation will be deemed unsuccessful and the impoundment will be lined or reclaimed.
25. Segregated top soil will be redistributed once the installation of gas, water and electrical utilities is complete at the well head.
26. Reserve pits containing frozen fluids will not be closed. See “Operations/Maintenance”, COA #10 of the Conditions of Approval document for further clarification.
27. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig slots, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. Segregation will not be required for trenches installed with wheel trenchers.
28. Reserve pit will be lined at the following locations: 09-11CK/KB
29. Disturbance areas mentioned below have fragile soils and erosive conditions that shall be stabilized in a manner which eliminates erosion until a self-perpetuating non-weed native plant community has stabilized the site. Stabilization efforts shall be finished within 30 days of the completion of construction activities.
 - Well site(s): 05-02, 06-01, 06-03, 06-09, 07-01, 07-04, 07-09, 07-14, 08-09, 09-01, 09-11, 15-11 and 33-10
 - Road / Pipeline segments associated with well(s): 06-01, 06-03, 06-09, 07-01, 07-04, 07-09, 07-14, 08-09, 09-11, 15-11, 17-01 and 17-03
 - Roads and Pipeline segment(s): 06-01 and 08-01 to LVS20
30. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

Seed Mix

Shallow Loamy Ecological Site Seed Mix, 15-19" Precipitation Zone		
Species	% in Mix	Lbs PLS*
Western Wheatgrass - <i>Rosana</i>	20	2.4
Idaho fescue – <i>Joseph</i>	30	3.6
Bluebunch wheatgrass – <i>Secar or P-7</i>	30	3.6
Rocky Mountain beeplant (Cleome serrulata)	10	1.2
Lewis - <i>Appar</i> , Blue, or Scarlet flax	5	0.6
White – <i>Antelope</i> or Purple Prairie Clover - <i>Bismarck</i>	5	0.6
Total	100%	12 lbs/acre

*PLS = pure live seed

*Northern Plains adapted species

*Double this rate if broadcast seeding

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

Wildlife

1. The following conditions will alleviate impacts to raptors:
 - a. No surface disturbing activity shall occur within ½ mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. **This condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following proposed wells and their associated infrastructure:

Township/Range	Section	Affected Wells and Infrastructure
58/80	33	Wells: 33-01CK & KB, 33-11CK & KB, and 33-10CK & KB ALL project related activities within this ENTIRE section.
58/80	34	Impoundment: Pit 34-11 ALL project related activities within this ENTIRE section, south of the VS 30.
57/80	3	Impoundment: Res. 03-03 ALL project related activities within the NENW ¼ ¼ of this section.
57/80	4	Wells: Fed 04-01CK & KB and Fed 04-03CK & KB Impoundment: Pit 04-04 ALL project related activities within the NE ¼ and NENW ¼ ¼ of this section.

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
57/80	6	ALL project related activities within the SESE ¼ ¼ of this section.
57/80	7	Wells: 07-01CK & KB ALL project related activities within the NENE and SENE ¼ ¼s of this section.
57/80	8	Wells: 08-03CK & KB ALL project related activities within the NW ¼ of this section.
57/80	15	Wells: 15-03CK & KB and 15-11CK & KB ALL project related activities within the west ½ and NWNE ¼ ¼ of this section.

- b. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbance activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a ½ mile timing buffer will be implemented. The timing buffer restricts surface disturbance activities within ½ mile of occupied raptor nests from February 1 to July 31.
 - c. Nest productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. Nests to be checked are within a ½ mile or less of the proposed development.
 - d. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
2. No surface disturbing activity shall occur within 0.25 miles of all identified burrowing owl nests from April 15 through August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. A 0.25 mile buffer will be applied if a burrowing owl nest is identified. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s). This timing limitation will affect the following proposed wells and their associated infrastructure:

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
57/80	3	Impoundments: Res. 03-03 and Res 03-05 ALL project related activities within the NW ¼ of this section.

3. The following conditions will alleviate impacts to sage grouse:
 - a. No surface disturbing activities are permitted within 2 miles of any greater sage-grouse leks between March 1 and June 15, prior to completion of a greater sage-grouse lek survey. **This condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following wells and infrastructure:

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
58/80	26	ALL proposed project related activities within this ENTIRE section.
58/80	27	ALL proposed project related activities within the east ½ of this section.

<i>Township/Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
58/80	34	Wells: Fed 34-01CK & KB ALL project related activities within the east ½ of this section.
58/80	35	Wells: 35-01 CK & KB, 35-03 CK & KB, 35-09 CK & KB, and 35-12 CK & KB Impoundment: Upper Antelope ALL proposed project related activities within this ENTIRE section.

- b. If an active sage grouse lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbance activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbance activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
 - c. Creation of raptor hunting perches will be avoided within 0.5 mile of documented sage grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sage grouse.
4. The following conditions will alleviate impacts to sharp-tailed grouse:
- a. Sharp-tailed grouse surveys are required throughout the project area for the current breeding season and results reviewed by a BLM biologist. If an active lek is identified during the survey, the 0.64 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.5 mile buffer until the following breeding season (April 1). The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist.
 - b. Creation of raptor hunting perches will be avoided within 0.64 miles of documented sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on sharp-tailed grouse.

Cultural

1. The cultural inventory was field checked on 6/19/07. Due to unusually heavy vegetation cover and later access concerns by a landowner (hunting season), the Bureau did not have the opportunity to perform compliance checks for the majority of the cultural inventory. The compliance checks will be performed during the pre-construction onsite. If any cultural resources are discovered during the compliance checks, they will be treated a discovery as outlined in Standard Condition of Approval #1 of the EA.
2. A site form update must be completed for site 48SH1389 before the construction of the utility corridor through the site boundaries. The Wyoming Cultural Properties Form site form update must include an updated cover page (Section 1-5), narrative description (section 7), and updated linear description pages (section 8G) including site condition photos.

Please contact Jim Verplancke, Natural Resource Specialist, @ (307) 684-1057, Bureau of Land Management, Buffalo, if there are any questions concerning these surface use COAs.

2.4. Alternatives considered but not analyzed in detail

Alternative	Analysis	Comments
Class V Shallow Injection Systems	Soils and Hydraulic analysis engineering and cost evaluation.	Uncertain regulatory compliance as determined by the engineering analysis of the geologic integrity. Not cost effective.
Treatment & Discharge	General engineering, cost feasibility estimates and regulatory review.	Lack of surface waters for mixing. Concern by Wyoming & Montana DEQ over change in hydraulic balance in Hanging Woman Creek Basin.
Direct Discharge to Channel	Regulatory review.	Same as treatment & discharge.
Misters	Conceptual analysis and evaluation of analogs.	Concern regarding elevating the soil salinity.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on **April 13, 2007**. Field inspections of the proposed **East Badger POD** CBNG project were conducted on June 19, 20, & 21 and July 16, 17, 18 & 19 of 2007. The following personnel attended.

Representing the BLM:

- Jim Verplancke, Natural Resource Specialist
- Jenny Morton, Wildlife Biologist
- Mike McKinley, Hydrologist
- Chris Perry, Civil Engineer

Representing the operator:

- Jesse Martin, Nance Petroleum Corp.
- Christi Haswell, Pearl Field Services
- Eric Rolli, Pearl Field Services
- Kimberlee L. Bonnet, Pearl Field Services
- Joey L. Sheeley, Pearl Field Services
- Bill Kovar, Pearl Field Services

Representing the Landowners:

- Scott Alexander, Chase Farms/NX Bar Ranch
- Don Luse, Padlock Ranch

This section describes the environment that would be affected by implementation of the Alternatives described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.1.

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

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species		X		Jennifer Morton
Floodplains		X		Jim Verplancke, Mike McKinley
Wilderness Values			X	Jim Verplancke
ACECs			X	Jim Verplancke
Water Resources	X			Jim Verplancke, Mike McKinley
Air Quality	X			Jim Verplancke
Cultural or Historical Values	X			G.L. "Buck" Damone III
Prime or Unique Farmlands			X	Jim Verplancke
Wild & Scenic Rivers			X	Jim Verplancke
Wetland/Riparian		X		Jim Verplancke, Mike McKinley
Native American Religious Concerns			X	G.L. "Buck" Damone III
Hazardous Wastes or Solids		X		Jim Verplancke
Invasive, Nonnative Species	X			Jim Verplancke
Environmental Justice		X		Jim Verplancke

3.1. Topographic Characteristics of Project Area

The East Badger POD is within the Powder River Basin (PRB) which lies within the Missouri Plateau of the northern Great Plains ecological region (Kuchler, 1964; Bailey, 1976). The dominant physiographic character of the uplands is one of a gently rolling prairie occasionally punctuated by prominent, non-eroded buttes and ridges. The project area is within the Waddle Creek, Middle Badger Creek, West Prong Hanging Woman and Upper Hanging Woman tributaries of the Upper Tongue River. The east portion of the project area is within the Upper Hanging Woman Creek tributary. The West Prong Hanging Woman Creek tributary drains the center of the project area. Waddle Creek and Middle Badger Creek drain the west portion of the East Badger POD boundary. Tributaries of the Upper Tongue River are immediately adjoined by steeply eroded "draws" and "breaks" (i.e., ridges and canyons) surrounding subordinate ephemeral or intermittent streams in the drainage bottoms for several miles distant from the main stem river. Typical of the Tongue River Breaks, many slopes are steep ranging from 15% to more than 25%. Hillsides appear terraced, and hilltops are generally at uniform elevations. Elevations within the project area range from 3,600 to 4,120 feet above sea level.

The regional climate is mid-latitude, interior continental, with relatively long, cold winters and relatively short, warm-hot summers and distinct spring and fall shoulder seasons. The summer growing season

(frost free) typically ranges from 95-130 days (ave. = 120 days) between late May and mid-September, with considerable daily variation and occasional cool periods. On the plains, average daily temperatures typically range from 5-10 (low) and 30-35 (high) degrees Fahrenheit in mid-winter, and between 55-60 (low) and 80-85 (high) degrees Fahrenheit in mid-summer. The regional climate is considered semi-arid, and typically, total annual precipitation ranges from 10-14 inches, with most of that coming as rain between May and September. Snowfall varies from year-to-year, but it is common to have continuous snow cover for a period of 30 days or more in a "normal" winter. Annual prevailing winds are from the southwest, but local conditions vary. Arctic air masses with strong winds commonly occur during the winter months, and air masses from the Gulf of Mexico sometimes influence summer weather conditions.

3.2. Vegetation & Soils

Soils within the project area were identified from the *Sheridan County Survey Area, Wyoming (WY633)*. 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.

Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges to 8+ inches in bottomland. Erosion potential varies from moderate to severe depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area.

Table 3.2 - Reclamation Potential

Reclamation Potential	Acres	%
Poor	12,383	48
Moderate	11,489	44
Fair	2,056	8

The map units identified for the soils within this project area are listed in the table below along with the individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.3 – Soil Map Unit Types

Map Unit	Map Unit Name	Acres	%
101	ABSTED-HAVERDAD ASSOCIATION, 0 TO 6 PERCENT SLOPES	74	<1
102	ABSTED-HAVERDAD ASSOCIATION, MOIST, 0 TO 6 PERCENT SLOPES	623	2
103	ABSTED-SLICKSPOTS COMPLEX, 0 TO 6 PERCENT SLOPES	203	<1
113	BIDMAN-ARVADA COMPLEX, MOIST, 0 TO 3 PERCENT SLOPES	306	1
114	BIDMAN-ULM, DRY, COMPLEX 0 TO 6 PERCENT SLOPES	370	1
115	BIDMAN, MOIST-ULM LOAMS, 0 TO 6 PERCENT SLOPES	1,006	4
117	CAMBRIA-FORKWOOD COMPLEX, 0 TO 15 PERCENT SLOPES	493	2
118	CAMBRIA-FORKWOOD COMPLEX, MOIST, 0 TO 9 PERCENT SLOPES	197	<1
120	CEDAK-RECLUSE ASSOCIATION, 6 TO 9 PERCENT SLOPES	21	<1
122	CEDAK-RECLUSE ASSOCIATION, DRY, 3 TO 15 PERCENT SLOPES	18	<1
128	CUSHMAN-FORKWOOD ASSOCIATION, MOIST, 0 TO 9 PERCENT SLOPES	256	<1
129	CUSHMAN-FORKWOOD ASSOCIATION, MOIST, 9 TO 15 PERCENT SLOPES	86	<1
131	CUSHMAN-WORF ASSOCIATION, MOIST, 3 TO 15 PERCENT SLOPES	198	65

Map Unit	Map Unit Name	Acres	%
146	GAYHART-BAHL ASSOCIATION, MOIST, 6 TO 15 PERCENT SLOPES	113	<1
148	HARGREAVE-MOSKEE ASSOCIATION, 3 TO 9 PERCENT SLOPES	35	<1
149	HARGREAVE-MOSKEE ASSOCIATION, 9 TO 15 PERCENT SLOPES	247	<1
150	HARGREAVE-MOSKEE ASSOCIATION, DRY, 3 TO 15 PERCENT SLOPES	425	2
155	HAVERDAD LOAM, MOIST, 0 TO 3 PERCENT SLOPES	354	1
157	HAVERDAD LOAM, MOIST, SALINE, 0 TO 3 PERCENT SLOPES	369	1
161	HAVERDAD, MOIST-WORTHENTON COMPLEX, 0 TO 3 PERCENT SLOPES	21	<1
164	HILAND-BOWBAC ASSOCIATION, 3 TO 15 PERCENT SLOPES	282	1
166	HILAND-DECOLNEY COMPLEX, 3 TO 15 PERCENT SLOPES	435	2
169	JONPOL-PLATMAK ASSOCIATION, 0 TO 9 PERCENT SLOPES	246	<1
173	LAMBMAN-HARGREAVE ASSOCIATION, 3 TO 15 PERCENT SLOPES	537	2
178	MOSKEE-NODEN COMPLEX, 0 TO 9 PERCENT SLOPES	16	<1
180	MOSKEE-NODEN FINE SANDY LOAMS, DRY, 0 TO 15 PERCENT SLOPES	65	<1
194	NUNCHO LOAM, 6 TO 9 PERCENT SLOPES	23	<1
196	NUNCHO CLAY LOAM, 3 TO 6 PERCENT SLOPES	25	<1
197	NUNCHO-EMIGRANT ASSOCIATION, 3 TO 9 PERCENT SLOPES	183	<1
198	NUNCHO-EMIGRANT ASSOCIATION, 9 TO 15 PERCENT SLOPES	49	<1
201	PARMLEED-BIDMAN ASSOCIATION, 3 TO 15 PERCENT SLOPES	30	<1
202	PARMLEED-BIDMAN ASSOCIATION, MOIST, 3 TO 9 PERCENT SLOPES	704	3
203	PARMLEED-BIDMAN ASSOCIATION, MOIST, 9 TO 25 PERCENT SLOPES	638	2
204	PARMLEED-RENOHILL COMPLEX, 3 TO 25 PERCENT SLOPES	63	<1
205	PARMLEED-RENOHILL COMPLEX, MOIST, 3 TO 9 PERCENT SLOPES	5	<1
208	PARMLEED-WORFKA ASSOCIATION, MOIST, 0 TO 9 PERCENT SLOPES	86	<1
209	PARMLEED-WORFKA ASSOCIATION, MOIST, 9 TO 25 PERCENT SLOPES	118	<1
223	RECLUSE LOAM, 0 TO 3 PERCENT SLOPES	244	1
234	RENOHILL-SAVAGETON COMPLEX, MOIST, 3 TO 10 PERCENT SLOPES	15	<1
236	RENOHILL-ULM, DRY, ASSOCIATION, 6 TO 15 PERCENT SLOPES	175	<1
237	RENOHILL, MOIST-ULM ASSOCIATION, 3 TO 10 PERCENT SLOPES	191	<1
240	RENOHILL, MOIST-WYARNO ASSOCIATION, 6 TO 9 PERCENT SLOPES	639	2
254	SHINGLE, MOIST-BAUX-ROCK OUTCROP COMPLEX, 30 TO 60 PERCENT SLOPES	257	<1
260	SHINGLE-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	992	4
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	3,491	13
262	SHINGLE-SAMDAY CLAY LOAMS, 6 TO 60 PERCENT SLOPES	60	<1
263	SHINGLE-SAMDAY CLAY LOAMS, MOIST, 3 TO 55 PERCENT SLOPES	656	2
264	SHINGLE-TALUCE COMPLEX, 9 TO 15 PERCENT SLOPES	24	<1
265	SHINGLE-TALUCE COMPLEX, MOIST, 9 TO 15 PERCENT SLOPES	679	3
267	SHINGLE-THEEDLE LOAMS, MOIST, 45 TO 75 PERCENT SLOPES	1,818	7
268	SHINGLE-THEEDLE-KISHONA ASSOCIATION, 6 TO 25 PERCENT SLOPES	1,691	6
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	3,402	13
274	SHINGLE-WORF COMPLEX, MOIST, 9 TO 15 PERCENT SLOPES	23	<1

Map Unit	Map Unit Name	Acres	%
278	TALUCE-TULLOCK-VONALEE ASSOCIATION, 6 TO 15 PERCENT SLOPES	17	<1
281	THEEDLE-KISHONA ASSOCIATION, 6 TO 15 PERCENT SLOPES	24	<1
282	THEEDLE-KISHONA ASSOCIATION, MOIST, 6 TO 9 PERCENT SLOPES	214	<1
304	WORFKA-SHINGLE-SAMDAY COMPLEX, 6 TO 30 PERCENT SLOPES	3	<1
305	WORFKA-SHINGLE-SAMDAY COMPLEX, MOIST, 6 TO 30 PERCENT SLOPES	366	1
309	WYARNO CLAY LOAM, 0 TO 3 PERCENT SLOPES	61	<1
310	WYARNO CLAY LOAM, 3 TO 6 PERCENT SLOPES	52	<1
311	WYARNO CLAY LOAM, 6 TO 9 PERCENT SLOPES	102	<1
317	ZIGWEID-KISHONA-CAMBRIA COMPLEX, 6 TO 15 PERCENT SLOPES	120	<1
318	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 0 TO 3 PERCENT SLOPES	513	2
319	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 3 TO 6 PERCENT SLOPES	691	3
320	ZIGWEID-KISHONA-CAMBRIA LOAMS, MOIST, 6 TO 9 PERCENT SLOPES	583	2
321	WATER	6	<1

Note: Additional site specific soil information is included in the Ecological Site interpretations which follow in Section 3.2.2.

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information. The map unit symbols identified for the soils and the associated ecological sites found within the East Badger POD boundary are listed in the table below.

Table 3.4 – Map Units and Ecological Sites

Map Unit	Ecological site
101	Loamy 10-14" Northern Plains
102	LOAMY (15-19 NP)
103	Loamy 10-14" Northern Plains
113	LOAMY (15-19 NP)
114	Loamy 10-14" Northern Plains
115	Loamy 10-14" Northern Plains
117	Loamy 10-14" Northern Plains
118	LOAMY (15-19 NP)
120	LOAMY (15-19 NP)
122	Loamy 10-14" Northern Plains
128	LOAMY (15-19 NP)
129	LOAMY (15-19 NP)
131	LOAMY (15-19 NP)
146	Clayey 10-14" Northern Plains
148	SANDY (15-19 NP)
149	SANDY (15-19 NP)
150	SANDY (10-14 NP)

Map Unit	Ecological site
155	LOWLAND (15-19 NP)
157	SALINE LOWLAND (10-14 NP)
161	LOWLAND (15-19 NP)
164	SANDY (10-14 NP)
166	SANDY (10-14 NP)
169	LOAMY (15-19 NP)
173	SHALLOW SANDY (15-19 NP)
178	SANDY (15-19 NP)
180	SANDY (10-14 NP)
194	LOAMY (15-19 NP)
196	CLAYEY (15-19 NP)
197	LOAMY (15-19 NP)
198	LOAMY (15-19 NP)
201	Loamy 10-14" Northern Plains
202	LOAMY (15-19 NP)
203	LOAMY (15-19 NP)
204	Loamy 10-14" Northern Plains
205	LOAMY (15-19 NP)
208	LOAMY (15-19 NP)
209	LOAMY (15-19 NP)
223	LOAMY (15-19 NP)
234	CLAYEY (15-19 NP)
236	Clayey 10-14" Northern Plains
237	CLAYEY (15-19 NP)
240	CLAYEY (15-19 NP)
254	VERY SHALLOW (15-19 NP)
260	SHALLOW LOAMY (10-14 NP)
261	SHALLOW LOAMY (15-19 NP)
262	SHALLOW LOAMY (10-14 NP)
263	SHALLOW LOAMY (15-19 NP)
264	SHALLOW LOAMY (10-14 NP)
265	SHALLOW LOAMY (15-19 NP)
267	SHALLOW LOAMY (15-19 NP)
268	Loamy 10-14" Northern Plains
269	LOAMY (15-19 NP)
274	SHALLOW LOAMY (15-19 NP)
278	SANDY (10-14 NP)
281	Loamy 10-14" Northern Plains
282	LOAMY (15-19 NP)
304	SHALLOW LOAMY (10-14 NP)

Map Unit	Ecological site
305	SHALLOW LOAMY (15-19 NP)
309	CLAYEY (15-19 NP)
310	CLAYEY (15-19 NP)
311	CLAYEY (15-19 NP)
317	Loamy 10-14" Northern Plains
318	LOAMY (15-19 NP)
319	LOAMY (15-19 NP)
320	LOAMY (15-19 NP)
321	Water

3.2.1. Dominant Ecological Sites and Plant Communities identified in this POD

Loamy:

This site occurs on gently undulating rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 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 unspecified sandstone and shale. These soils have moderate permeability and may occur on all slopes.

The Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Rhizomatous Wheatgrasses, Needleandthread, Blue Grama Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. The site is dominated by cool season midgrasses.

Shallow Loamy:

This site occurs on steep slopes and ridge tops, but may occur on all slopes on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 inch precipitation zone.

The soils of this site are shallow (less than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from shale and sandstone. These soils have moderate permeability and may occur on all slopes. The main soil limitations include depth to bedrock.

The HCPC for this site would be a Rhizomatous Wheatgrass, Bluebunch Wheatgrass, Idaho Fescue Plant Community. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. The state is dominated by cool season mid-grasses.

Mixed Sagebrush/Grass:

The plant community present on both the loamy and shallow loamy ecological sites is *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses and bluebunch wheatgrass have decreased. Cheatgrass has invaded the site.

Wyoming big sagebrush is a significant component of this Mixed Sagebrush/Grass plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

A summary of the ecological sites within the project area are listed in the table below along with the

individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.5 – Summary of Ecological Sites

Ecological Sites	Acres	Percent
LOAMY (15-19 NP)	9,312	36%
SHALLOW LOAMY (15-19 NP)	7,033	27%
LOAMY (10-14 NP)	4,092	16%
SANDY (10-14 NP)	1,223	5%
SHALLOW LOAMY (10-14 NP)	1,080	4%
CLAYEY (15-19 NP)	894	3%
SHALLOW SANDY (15-19 NP)	537	2%
LOWLAND (15-19 NP)	375	1%
SALINE LOWLAND (10-14 NP)	369	1%
SANDY (15-19 NP)	298	1%
CLAYEY (10-14 NP)	288	1%
VERY SHALLOW (15-19 NP)	257	1%
WATER	6	<1

3.2.2. Wetlands/Riparian

No wetland or riparian areas were noted during the onsite. Drainages are intermittent with no defined bed or bank. The reservoirs will be full-containment, however there is a potential for water to resurface downstream of the impoundment enhancing a wetland environment.

3.2.3. Invasive Species

The Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info) did not have data available for the East Badger POD area. However, the operator and BLM observed the following infestations of state-listed noxious weed species during the field investigations:

- Leafy spurge
- Russian knapweed
- Scotch thistle
- Canada thistle
- Houndstongue

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

3.3. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by ARCADIS (2006 and 2007). ARCADIS performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests and prairie dog colonies according to protocol in 2006 and 2007. Surveys were conducted for Ute ladies'-tresses orchid habitat.

A BLM biologist conducted field visits on June 19, 20, 21 and July 18, 2007. During this time, the

biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

Wildlife species common to the habitat types present are identified in the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (PRB FEIS 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.

3.3.1. Big Game

Big game species expected to be within the East Badger project area include pronghorn antelope, mule deer, and elk. The WGFD has determined that the project area contains Yearlong range for pronghorn antelope, and Winter-Yearlong range for mule deer. Elk within the project area are likely escapees from the herd managed by the Padlock Ranch. The WGFD is not managing for an elk population in this area.

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

Pronghorn antelope within the project area belong to the Clearmont herd unit. The 2004 estimated herd population was 4549 with a population objective of 3000. Mule deer within the project area belong to the Powder River herd unit. The 2004 estimated herd population was 55,561 with a population objective of 52,000. Populations of pronghorn antelope and mule deer within their respective hunt areas are above WGFD objectives.

Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by ephemeral tributaries of the Tongue River. There are no springs within the POD area currently on record with the WSEO or mapped on the USGS 1:24,000OTO Ranch, Wyoming-Montana or Roundup Draw, Wyoming Montana Quadrangles that cover the POD area (Nance 2007). Fish that have been identified in the Tongue River watershed are listed in the PRB FEIS (3-156-159).

3.3.3. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151).

3.3.3.1. Raptors

Ten raptor nest sites were identified by ARCADIS (2007) and BLM within 0.5 mile of the project area, of these four nests were active in 2007.

Table 4. Documented raptor nests within the East Badger project area in 2006 and 2007.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS IN 2006	STATUS IN 2007
3286	Great-horned owl	380743E 4978941N	NESW Sec. 33 T58N, R80W	Juniper, live	Good	Active	Inactive
350	Red-tailed hawk	380669E 4979312N	SESW Sec. 33 T58N, R80W	Ground, hillside	Poor	Gone	Gone
3280	Unknown	377370E 4984065N	NESW Sec. 2 T10N, R42W (Montana)	Cottonwood, live	Good	Inactive	Inactive
3281	Red-tailed hawk	376724E 4983649N	SESE Sec. 3 T10N, R42W (Montana)	Cottonwood, live	Excellent	Active	Inactive
364	Red-tailed hawk	381443E 4973123N	NENE Sec. 21 T57N, R80W	Box Elder, live	Excellent	Active	Inactive
4451	Unknown	387422E 4976228N	NWNE Sec. 7 T57N, R79W	Box elder, live	Fair	Inactive	Inactive
4452	Golden eagle	390202E 4975061N	NENW Sec. 16 T57N, R79W	Cottonwood, live	Excellent	Inactive	Active
4369	Red-tailed hawk	378637E 4976590N	NWNW Sec. 8 T57N, R80W	Juniper, dead	Excellent	Active	Inactive
4370	Red-tailed hawk	381934E 4974026N	NWSW Sec. 15 T57N, R80W	Juniper, live	Excellent	Active	Inactive
None	Red-tailed hawk	381443E 4973123N	NENE Sec. 21 T57N, R80W	Box elder, live	Excellent	New in 2007	Active
None	Red-tailed hawk	380998E 4978531N	SWSE Sec. 33 T58N, R80W	Juniper, live	Fair	New in 2007	Active
None	Red-tailed hawk	385041E 4979823N	NWNW Sec. 36 T58N, R80W	Cottonwood, live	Fair	New in 2007	Active

3.3.4. Threatened and Endangered and Sensitive Species

3.3.4.1. Threatened and Endangered Species

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

3.3.4.1.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 1988, the WGFD identified four prairie dog complexes (Arvada, Recluse, Thunder Basin National Grasslands, and Midwest) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Oakleaf 1988).

This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1000 acres of black-tailed prairie dog colonies for survival (USFWS 1989).

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

Two black-tailed prairie dog colonies were identified during site visits by ARCADIS within the project area. A 7.71 acre colony is located in NW Section 3, T57N, R80W and a 23.83 acre colony is located in SENE Section 25, T58N, R81W and NWNW Section 30, T58N, R80W. Nineteen other prairie dog colonies were documented within the surrounding area and, combined with these two colonies, total 492 acres. The project area is located approximately 15 miles from the Arvada complex, the nearest potential reintroduction area. Habitat of sufficient size to support a ferret population is not present within the East Badger project area.

3.3.4.1.2. Ute's Ladies Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 and one in 2006 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County.

Hanging Woman Creek, Spring Creek, and two forks of Waddle Creek (Randall Prong and Weltner Prong) and their tributaries are ephemeral. There are no springs within the POD area currently on record with the WSEO or mapped on the USGS 1:24,000OTO Ranch, Wyoming-Montana or Roundup Draw, Wyoming Montana Quadrangles that cover the POD area (Nance 2007). Suitable orchid habitat is not present within the East Badger project area.

3.3.4.2. Sensitive Species

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

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

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, Mac Cracken 1985, Agnew 1986, Uresk 1986, Deisch 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list. The species of concern are swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*).

3.3.4.2.1. Bald eagle

On February 14, 1978, the bald eagle was federally listed as Endangered. On August 8, 2007, the bald eagle was removed from the Endangered Species list. The bald eagle remains under protection by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, all conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (WY07F0075) shall continue to be complied with.

Bald eagle nesting habitat is generally found in areas that support large mature trees. Eagles typically will build their nests in the crown of mature trees that are close to a reliable prey source. This species feeds primarily on fish, waterfowl, and carrion. In more arid environments, such as the Powder River Basin, prairie dogs, ground squirrels, and lagomorphs (hares and rabbits) can make up the primary prey base. The diets of wintering bald eagles can be more varied. In addition to prairie dogs, ground squirrels, and lagomorphs, domestic sheep and big game carcasses may provide a significant food source in some areas. Historically, sheep carcasses from large domestic sheep ranches provided a reliable winter food source within the Powder River Basin (Patterson and Anderson 1985). Today, few large sheep operations remain in the Powder River Basin. Wintering bald eagles may congregate in roosting areas generally made up of several large trees clumped together in stands of large ponderosa pine, along wooded riparian corridors, or in isolated groups. Bald eagles often share these roost sites with golden eagles as well.

Potential habitat within the East Badger project area consists of scattered and isolated cottonwood and elm trees along the Main Prong Hanging Woman Creek, Middle Prong Hanging Woman Creek and the Weltner Prong and Randall Prongs of Waddle Creek. Multiple small prairie dog colonies in the area could provide a potential prey base, but no eagles have been recorded foraging in the colonies to date. The Tongue River is located Approximately 15 miles west of the project area. No bald eagle roost sites or nest were observed within or surrounding the project area. No observations of individuals have been recorded within or surrounding the project area.

3.3.4.2.2. Black-tailed prairie dog

On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog's Candidate status. The Buffalo Field Office however will consider prairie dogs as a sensitive species and continue to afford this species the protections described in the FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains. Their decline is related to multiple factors including, habitat destruction, poisoning, and Sylvatic plague.

Two black-tailed prairie dog colonies were identified during site visits by ARCADIS within the project area. A 7.71 acre colony is located in NW Section 3, T57N, R80W and a 23.83 acre colony is located in SENE Section 25, T58N, R81W and NWNW Section 30, T58N, R80W.

3.3.4.2.3. Burrowing owls

Burrowing owl nesting habitat consists of open areas with mammal burrows. Individual burrowing owls have moderate to high site fidelity to breeding areas and even to particular nest burrows (Klute et al. 2003). Burrow and nest sites are reused at a higher rate if the bird has reproduced successfully during the previous year. Favored nest burrows are those in relatively sandy sites (possibly for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance, and slightly elevated locations. The nesting season within the Powder River Basin typically runs from April 15 to August 31.

Burrowing owls use a wide variety of arid and semi-arid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground. Primary threats across the North American range of the burrowing owl are habitat loss and fragmentation primarily due to intensive agricultural and urban development, and habitat degradation due to declines in populations of colonial burrowing mammals (Klute 2003). Murphy et al. (2001) found that burrowing owls were greatly reduced or completely extirpated from northwest and central North Dakota.

Two burrowing owl nests were identified in a small 7.71 acre prairie dog colony within the project area in 2007.

3.3.4.2.4. Grouse

3.3.4.2.4.1. Greater Sage-grouse

Sage-grouse is listed as a sensitive species by BLM (Wyoming). In recent years, seven petitions have been submitted to the U.S. Fish and Wildlife Service (FWS) to list greater sage-grouse as Threatened or Endangered. On January 12th, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was "not warranted" following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse.

Greater sage-grouse are found in prairie, sagebrush shrublands, other shrublands, wet meadows, and agricultural areas; they depend upon substantial sagebrush stands for nesting and winter survival (BLM 2003). (Sage-grouse attend traditional courtship areas called leks which are in or adjacent to sagebrush dominated habitat. Several lek sites form clusters defined as a lek complex. Sage-grouse may be expected to interchange within a lek complex, visiting one lek site to another from one day to the next. Lek sites within a complex are usually < 3 km from one another. Lek complexes are clearly spatially separated from adjacent lek complexes by 6 km (Schroeder et al. 2000).

Suitable sage-grouse habitat is present throughout the project area. The East Badger project area is suited for sage-grouse breeding, nesting, and wintering grounds. Habitats within the project area, especially the moderately dense stands of sagebrush grasslands scattered throughout the project area have potential to support sage-grouse throughout the year. Moist draws and tributaries within the project area may provide

brood rearing and late summer habitat, while other areas of higher sagebrush densities provide potential for nesting sage-grouse. BLM and ARCADIS records identified five sage grouse leks within 3 miles of the East Badger POD. Hanging Woman Early Prong lek and four other leks (Early Prong, Hanging Woman Main Fork, Hanging Woman, and Hanging Woman Middle Fork) are located within 3.2 kilometers of each other. This placement of leks might indicate a lek complex. All nine lek sites are identified below (Table 6).

Table 6. Sage-grouse leks surrounding the East Badger project area.

Lek Name	Legal Location	WGFD Classification (2006)	Status In 2006 (Peak Males)	Status In 2007 (Peak Males)	Distance From Project Area (miles)
Hanging Woman West Fork	SESW Sec. 25 T58N, R80W	Occupied	17	0	0.48
NX Bar	SWSE Sec. 4 T10N, R42W (Montana)	Occupied	18	14	2.3
Hanging Woman	NENE Sec. 8 T57N, R79W	Occupied	0	0	3.2
Hanging Woman Middle Fork	SWSE Sec. 8 T57N, R79W	Occupied	12	0	3.1
Hanging Woman Early Prong	SWSE Sec. 18 T57N, R79W	Occupied	26	0	2.6
Hanging Woman Main Fork	SENE Sec. 15 T57N, R79W	Occupied	0	0	5.8
Early Prong	NENW Sec. 21 T57N, R79W	Occupied	6	6	4.4
BI-18B	SWNW Sec. 33 T9N, R43W (Montana)	Occupied (see Miles City FO for more information)	Unknown	0	~2.5
BI-23	SESE Sec. 28 T9N, R42W (Montana)	Occupied (see Miles City FO for more information)	Unknown	0	~2.8

3.3.4.2.4.2. Sharp-tailed grouse

Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is common where grasslands are intermixed with other shrublands, especially wooded draws, shrubby riparian areas, and wet meadows (PRB FEIS 3-148). Typical breeding habitat for sharp-tailed grouse consists of mixed prairie grasslands, mountain foothills, shrublands, willows, and irrigated native meadows (Cerovski et al. 2004). Height and density of vegetation and shrubs are important factors determining nesting and early brood rearing habitat.

Pastures which surround the sharp-tailed grouse leks in the northwest portion of the project area appeared to have received light to moderate grazing, which provides favorable residual cover for nesting grouse during years of adequate precipitation (Huber 2007). Four sharp-tailed grouse leks are located within 3 miles of the project area. These four lek sites are identified below (Table 7) with peak male counts as recorded by ARCADIS.

Table 7. Sharp-tailed grouse leks surrounding the East Badger project area.

Lek Name	Legal Location	Status In 2006 (Peak Males)	Status In 2007 (Peak Males)	Distance From Project Area (miles)
NX Bar I	SWNE Sec. 24 T58N, R81W	4	4	1.3
NX Bar II	NWNW Sec. 4 T10N, R42W (Montana)	Not surveyed	Not surveyed	2.7
NX Bar III	SESE Sec. 23 T58N, R81W	16 of unknown sex	9 of unknown sex	1.4
West Prong Hanging Woman	NWNE Sec. 31 T58N, R79W	Not surveyed	0	1.7

3.3.4.2.5. Mountain plover

Mountain plovers, which are a Buffalo Field Office sensitive species, are typically associated with high, dry, short grass prairies containing vegetation typically shorter than four inches tall, and slopes less than 5 degrees (BLM 2003). Mountain plovers are closely associated with heavily grazed areas such as prairie dog colonies and livestock pastures.

Suitable mountain plover habitat is present within the project area. Positive plover nesting habitat features were found within the project area mainly in the form of the active prairie dog colony in Section 30, T58N, R80W, which contained short vegetative height and >30% bare ground in 2006. This colony was surveyed for plover during optimum observation hours on May 11, May 31, and June 14, 2006. High prairie dog densities allowed for short vegetative height throughout the growing season. Breeding or nesting plovers were not observed in 2006 (Huber 2006). Plover surveys were conducted in all colonies during optimum light conditions of May 8, May 26, and June 9, 2007. Above average seasonal moisture resulted in increased vegetative height somewhat in those colonies with high densities by June; however, no plover were observed again in 2007 (Huber 2007).

3.4. West Nile Virus

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

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

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

Table 3.4 Historical West Nile Virus Information

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

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

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

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

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

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

3.5. Water Resources

The project area is within the **Upper Tongue River** drainage system. The East Badger POD is within portions of 4 watersheds with respective drainage areas; Waddle Creek (50.5 sq. miles), Upper Hanging Woman Creek (37.5 sq. miles), West Prong of Hanging Woman Creek (52.9 sq. miles), and Middle Badger Creek (26.8 sq. miles).

3.5.1. Groundwater

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

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

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

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

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

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

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area

showed 10 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 59 to 1,356 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

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

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters “illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area” (PRB FEIS page 3-48). For the Upper Tongue river Watershed, the EC ranges from 318 at Maximum monthly flow to 731 at Low monthly flow and the SAR ranges from 0.36 at Maximum monthly flow to 0.86 at Low monthly flow. These values were determined at the USGS station located near Decker, MT (PRB FEIS page 3-49).

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the East Badger POD project prior to on-the-ground project work (BFO project no. 070070039). Foothills Archaeological Services conducted a Class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) for the project. G.L. “Buck” Damone III, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The following cultural resource is located in the area of potential effect.

Table 3.5 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48SH1389	Historic Road	Not Eligible

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action POD, which resulted in development of Alternative C as the preferred alternative, have reduced the potential impact to the environment which will result from this action. The environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

The majority of the proposed disturbance was planned within uplands areas containing loamy and shallow loamy ecological sites. Efforts have been made to avoid soil conditions with limited reclamation potential. However, in those areas where erosion concerns associated with proposed disturbance could not be avoided, mitigation and/or site specific COA's to address soil stabilization in a timely fashion have been applied. Portions of the project are planned within lowland ecological sites and measures have been taken to provide adequate buffers for riparian areas.

The predominance of shallow soils, steep slopes and climatic limitations throughout the POD as identified by the NRCS Soil Survey for Northern Sheridan County and the BLM onsite investigations warrant the need for additional reclamation related conditions of approval (COA's) and the use of best management practices (BMP's) to help assure that the reclamation requirements of the Wyoming Reclamation Policy will be met.

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 limit re-vegetation. 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 dependant on soil, climate, topography and cover.
- Soil compaction is the collapse of soil pores resulting in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and soil type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Modification of hill slope hydrology.

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

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the proposed well locations, 71 can be drilled without a well pad being constructed and 10 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 71 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 12 x 30 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 71 wells at 32 multi-well locations would involve approximately 0.46 acre/location for 14.7 total acres. The other 10 wells at 5 multi-well locations requiring cut & fill pad construction would disturb approximately 1.8 acres. The total estimated disturbance for all 81 wells would be 16.5 acres.

Approximately 15.2 miles of improved roads would be constructed to provide access to various well locations. Approximately 5.0 miles of new two-track trails and 9.4 mile of existing resource roads would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface

disturbance and overall environmental impacts. Approximately 0.7 miles of pipeline would be constructed outside of corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad Locations	32	0.46/acre or Site Specific	14.7	Long Term
Constructed Pad Locations	5		1.8	
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Impoundments	8	Site Specific Site Specific Site Specific or 0.01 ac/WDP	25.7	Long Term
On-channel	4		14.9	
Off-channel	4		10.8	
Water Discharge Points	8		0.08	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads				Long Term
No Corridor	1.8	40' Width	8.9	
With Corridor	13.4	45' Width	73.1	
2-Track Roads				Long Term
No Corridor	0.5	14' Width	0.9	
With Corridor	4.5	30' Width	16.2	
Pipelines				Short Term
No Corridor	0.7	15' Width	1.3	
With Corridor	8.3	30' Width	30.0	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Buried Power Cable No Corridor	0	12' Width or Site Specific	0	Short Term
Overhead Powerlines	14.9	15' Width	54.3	Long Term

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

4.1.1. Wetland/Riparian

No wetland or riparian areas were noted during the onsite. Drainages are intermittent with no defined bed or bank. The reservoirs will be full-containment.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment.

4.1.2. Invasive Species

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

1. Weed Spraying – Spot Spraying – Spring & Fall
 - a. Identify all noxious weeds within disturbed areas
 - b. Application rates as per Sheridan County Weed & Pest recommendation:
 - i.Spring applications: 1 quart Tordon 22k, 1 quart 2-4D and 1 quart wetting agent per acre
 - ii.Fall applications: 10 ounces Plateau per acre
 - iii.Residual effects of the chemical combination(s) will control weeds annually
2. Preventive practices such as washing the undercarriage of vehicles may also be implemented to minimize seed transport and dispersal.
3. Education of personnel utilizing the “Weed Handbook” issued by the Wyoming Weed & Pest Council.

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

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

4.1.3. Cumulative Effects

The PRB FEIS stated that cumulative impacts to soils could occur due to sedimentation from water erosion that could change water quality and fluvial characteristics of streams and rivers in the sub-

watersheds of the Project Area. SAR in water in the sub-watersheds could be altered by saline soils because disturbed soils with a conductivity of 16 mmhos/cm could release as much as 0.8 tons/acre/year of sodium (BLM 1999c). Soils in floodplains and streambeds may also be affected by produced water high in SAR and TDS. (PRB FEIS page 4-151).

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

- They are proportional to the actual amount of cumulatively produced water in the **Upper Tongue River** drainage, which is approximately 49.0% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into Waddle Creek, Upper Hanging Woman Creek, West Prong of Hanging Woman, and Middle Badger Creek drainages and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water from flowing into the Upper Tongue River Watershed.
- The WMP for the East Badger POD proposes that produced water will not contribute significantly to flows downstream due to the use of full-containment impoundments.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

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

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

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

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. In order to survive 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.

4.2.1.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-211.

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be discharged into 22 existing and 8 proposed impoundments. If a reservoir were to discharge, it is unlikely produced water will reach a fish-bearing stream. It is unlikely downstream species would be affected.

4.2.2.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-247. No additional mitigation measures are required.

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area will impact migratory birds. Native habitats are being lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Human activities displace migratory birds farther than simply the physical habitat disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Density of breeding Brewer's sparrows declined by 36% within 100 m of dirt roads within a natural gas field, effects occurred along roads with light traffic volume (<12 vehicles per day). Findings suggest that indirect habitat losses from energy development may be substantially larger than direct habitat losses (Ingelfinger 2004).

Density of breeding sage sparrows was reduced by 57% within a 100-m buffer of dirt roads regardless of traffic volume. The density of roads constructed in natural gas fields exacerbated the problem and the area of impact was substantial (Ingelfinger 2004).

Overhead power lines may affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235.

4.2.4. Raptors Direct and Indirect Effects

Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to

remain away from the nest and their chicks for the duration of the activities. This absence can lead to over heating or chilling of eggs or chicks. The prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

Table 5. Infrastructure within close proximity to documented raptor nests within the East Badger project area (Timing limitations will apply to this infrastructure).

BLM ID#	UTM (NAD 83)	SPECIES	2007 STATUS	WELL / PIT NUMBER	DISTANCE (MILES)
None	385041E 4979823N	Red-tailed hawk	Active	Well 35-01	0.21
				Upper antelope impoundment	0.38
None	380998E 4978531N	Red-tailed hawk	Active	Pit 04-04	0.41
				Well 33-10	0.21
				Well 33-11	0.40
				Well 04-03	0.43
				Well 04-01	0.42
3286	380743E 4978941N	Great-horned owl	Inactive	Pit 04-04	0.45
				Well 33-10	0.27
				Well 33-11	0.19
4369	378637E 4976590N	Red-tailed hawk	Inactive	Well 07-01	0.30
				Well 08-03	0.25
4370	381934E 4974026N	Red-tailed hawk	Inactive	Well 15-11	0.24

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a one-half mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation to be located greater than one-quarter mile from occupied raptor nests.

The 35-01 wells were proposed in direct line of sight and within close proximity to an active red-tailed hawk nest. The wells were relocated to the west and around a knob to remove them from line of sight of this nest.

4.2.4.1. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-221. No additional mitigation measures are required.

4.2.5. Threatened and Endangered and Sensitive Species

Within the BLM Buffalo Field Office there are two species that are Threatened or Endangered under the Endangered Species Act. Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.2.5.1. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered and Sensitive Species

Table 4.3 Summary of Threatened and Endangered Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (<i>Mustela nigripes</i>)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	NE	Suitable habitat is of insufficient size.
Threatened				
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Riparian areas with permanent water	NP	NE	No suitable habitat present.

Presence

K Known, documented observation within project area.

S Habitat suitable and species suspected, to occur within the project area.

NS Habitat suitable but species is not suspected to occur within the project area.

NP Habitat not present and species unlikely to occur within the project area.

Effect Determinations

Effect Determination

LAA Likely to adversely affect

NE No Effect.

NLAA May Affect, not likely to adversely effect individuals or habitat.

4.2.5.1.1. Black-footed ferret

Because the black-tailed prairie dog colonies within and adjacent to the East Badger project area are of insufficient size for supporting ferrets and are isolated from any prairie dog complexes, implementation of the proposed development should have “no effect” on the black-footed ferret.

4.2.5.1.2. Ute’s Ladies Tresses Orchid

Many of the reservoirs are located within ephemeral drainages of Hanging Woman Creek, Spring Creek, and two forks of Waddle Creek (Randall Prong and Weltner Prong) and their tributaries. Remaining proposed reservoirs are located in upland habitats. There are no springs within the POD area. Suitable habitat is not present within the East Badger project area.

Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial, however no historic seed source is present within or upstream of the project area. Implementation of the proposed coal bed natural gas project should have “no effect” on the Ute ladies’- tresses orchid as suitable habitat is not present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

Table 4.4 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (<i>Rana pipiens</i>)	Beaver ponds, permanent water in plains and foothills	S	MIIH	Additional water will affect existing waterways. Prairie not mountain habitat.
Spotted frog (<i>Ranus pretiosa</i>)	Ponds, sloughs, small streams	NP	NI	
Birds				
Baird's sparrow (<i>Ammodramus bairdii</i>)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Mature forest cover often within one mile of large water body.	S	MIIH	Project includes overhead power.
Brewer's sparrow (<i>Spizella breweri</i>)	Basin-prairie shrub	S	MIIH	Sagebrush cover will be affected.
Burrowing owl (<i>Athene cunicularia</i>)	Grasslands, basin-prairie shrub	K	MIIH	Prairie dog colony may be indirectly disturbed.
Ferruginous hawk (<i>Buteo regalis</i>)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Sagebrush grasslands will be affected.
Greater sage-grouse (<i>Centrocercus urophasianus</i>)	Basin-prairie shrub, mountain-foothill shrub	K	WIPV	Sagebrush cover will be affected.
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Long-billed curlew (<i>Numenius americanus</i>)	Grasslands, plains, foothills, wet meadows	NP	NI	Habitat not present.
Mountain plover (<i>Charadrius montanus</i>)	Short-grass prairie with slopes < 5%	NP	NI	Habitat not present.
Northern goshawk (<i>Accipiter gentilis</i>)	Conifer and deciduous forests	NP	NI	No forest habitat present.
Peregrine falcon (<i>Falco peregrinus</i>)	cliffs	NP	NI	No nesting habitat present.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage sparrow (<i>Amphispiza billineata</i>)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Sage thrasher (<i>Oreoscoptes montanus</i>)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Trumpeter swan (<i>Cygnus buccinator</i>)	Lakes, ponds, rivers	S	MIIH	Reservoirs may provide migratory habitat.
White-faced ibis (<i>Plegadis chihi</i>)	Marshes, wet meadows	NP	NI	Permanently wet meadows not present.
Yellow-billed cuckoo (<i>Coccyzus americanus</i>)	Open woodlands, streamside willow and alder groves	NP	NI	Streamside habitats not present
Fish				
Yellowstone cutthroat trout (<i>Oncorhynchus clarki bouvieri</i>)	Mountain streams and rivers in Tongue River drainage	NP	NI	Outside species range.
Mammals				
Black-tailed prairie dog (<i>Cynomys ludovicianus</i>)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Prairie dog towns will be affected.
Fringed myotis (<i>Myotis thysanodes</i>)	Conifer forests, woodland chaparral, caves and mines	NP	NI	Habitat not present.
Long-eared myotis (<i>Myotis evotis</i>)	Conifer and deciduous forest, caves and mines	NP	NI	Habitat not present.
Spotted bat (<i>Euderma maculatum</i>)	Cliffs over perennial water.	NP	NI	Cliffs & perennial water not present.
Swift fox (<i>Vulpes velox</i>)	Grasslands	NP	NI	Habitat not present.
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	Caves and mines.	NP	NI	Habitat not present.

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

Presence

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

Project Effects

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

4.2.5.2.1. Bald eagle

Based on the raptor nesting and bald eagle winter roost surveys and lack of suitable habitat, it is unlikely bald eagles nest or roost within the East Badger project area. The proposed project should not affect bald eagle nesting or winter roosting.

There are no existing overhead three-phase distribution lines within the project area. Nance is proposing 14.9 miles of overhead three-phase distribution lines. There are currently no improved roads within the project area, with 15.2 miles proposed.

The presence of overhead power lines may adversely affect foraging bald eagles. Bald eagles forage opportunistically throughout the Powder River Basin particularly during the winter when migrant eagles join the small number of resident eagles. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through August 14, 2007, Service Law Enforcement salvage records for northeast Wyoming identified that 180 raptors, including 1 bald eagle, 106 golden eagles, 1 unidentified eagle, 28 hawks, 44 owls and 8 unidentified raptors and 1 great-blue heron were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2007). Of the 180 raptors electrocuted 58 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper's hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

Roads present a collision hazard, primarily from bald eagles scavenging on carcasses resulting from other road related wildlife mortalities. Collision risk increases with automobile travel speed. Typically two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses the BLM Buffalo Field Office reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; eagles (bald and golden) were observed feeding on 16 of the reported road-side carcasses (<4%).

Produced water will be stored in 30 reservoirs which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the reservoirs on eagles is unknown. The reservoirs could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of reservoirs should be reported to determine the need for any future management.

4.2.5.2.2. Black-tailed prairie dog

A main access route is existing along the prairie dog colony in Section 3, T57N, R80W. This access route will be used by project traffic on a regular basis. A pipeline corridor and overhead power lines are proposed along this route. Two reservoirs are proposed next to this colony, one directly to the northeast and one directly to the southwest.

The presence of reservoirs may limit colony expansion. Power poles may provide habitat for avian predators, increasing prairie dog predation. Mineral related traffic on the adjacent roads may result in prairie dog road mortalities.

4.2.5.2.3. Burrowing owl

Primary threats across the North American range of the burrowing owl are habitat loss and fragmentation primarily due to intensive agricultural and urban development, and habitat degradation due to declines in populations of colonial burrowing mammals. The dramatic reduction of prairie habitat in the United States has been linked to reduction of burrowing owl populations, (Klute, 2003). A main access route exists along the prairie dog colony in Section 3, T57N, R80W, containing the burrowing owl nest. This access route will be used by project traffic on a regular basis. A pipeline corridor and overhead power lines are proposed along this route. Two reservoirs are proposed next to this colony, one directly to the northeast and one directly to the southwest. Use of roads and pipeline corridors may increase their vulnerability to vehicle collision. Overhead power lines provide perch sites for raptors that could potentially result in increased burrowing owl predation. CBNG infrastructure such as well houses may provide shelter and den sites for ground predators such as skunks and foxes.

A .25 mile seasonal disturbance-free buffer zone is recommended for burrowing nest locations within the East Badger POD.

4.2.5.2.4. Grouse

4.2.5.2.4.1. Greater sage-grouse

Five leks are present within 3 miles of the East Badger project area. Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, power lines, reservoirs and other infrastructure (Theiele 2005, Oedekoven 2004). Sage grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. The Wyoming Game and Fish Department (WGFD) feels a well density of eight wells per section creates a high level of impact for sage grouse and that sage-grouse avoidance zones around mineral facilities overlap creating contiguous avoidance areas (WGFD 2004).

The presence of overhead power lines and roads within the project area may adversely affect sage grouse. Overhead power lines create hunting perches for raptors, thus increasing the potential for predation on sage grouse. Increased predation from overhead power near leks may cause a decrease in lek attendance and possibly lek abandonment. Overhead power lines are also a collision hazard for sage grouse flying through the area. Increased roads and mineral related traffic can affect grouse activity and reduce survival (Braun et al. 2002). Activity along roads may cause nearby leks to become inactive over time (WGFD 2003).

Noise can affect sage grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). Sage grouse attendance on leks within one mile of compressors is lower than for sites farther from compressors locations (Braun et al. 2002).

Another concern with CBNG is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (Oedekoven 2004). West Nile virus represents a significant new stressor which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). Powder River Basin grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. Comm.).

The Buffalo Field Office (BFO) Resources Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA), which includes the WGFD, 1977 sage-grouse guidelines (Bennett 2004). Under pressure for standardization BLM Wyoming adopted the two-mile recommendation in 1990, and instructed the field offices to incorporate the measure into their land use plans (Bennett 2004, Murkin 1990).

The two-mile recommendation was based on research which indicated between 59 and 87 percent of sage-grouse nests were located within two-miles of a lek (Bennett 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho's Snake River plain.

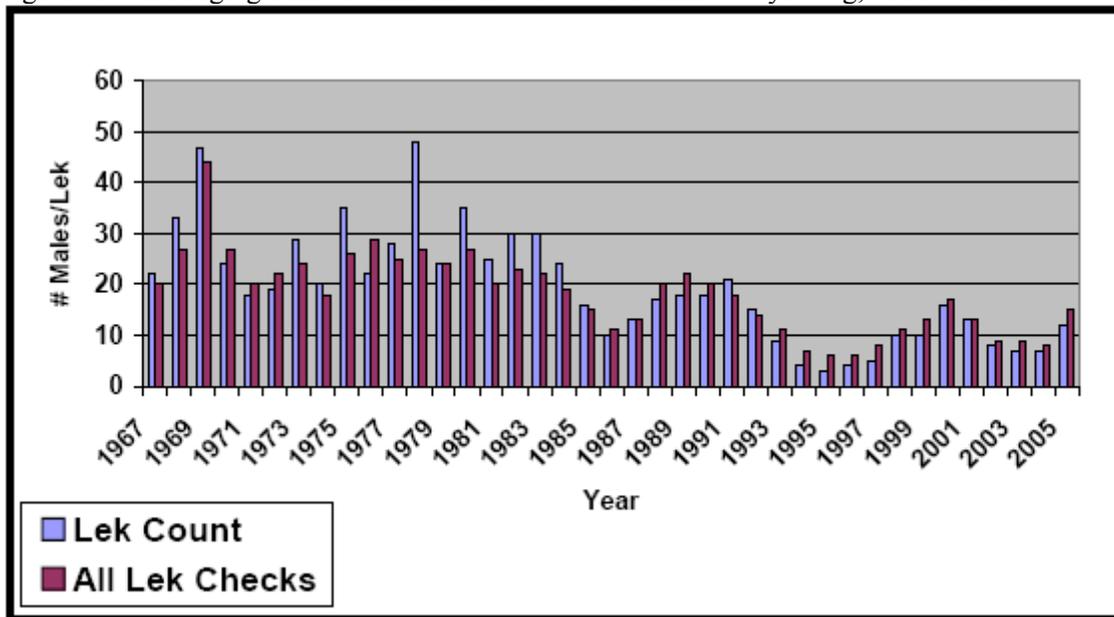
Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the lek of breeding (Bennett 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage grouse hens nested within 3 km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

Percentage of sage-grouse nesting within a certain distance from their breeding lek is unavailable for the Powder River Basin. The Buffalo and Miles City field offices through the University of Montana with assistance from other partners including the U.S. Department of Energy and industry are currently researching nest location and other sage-grouse questions and relationships between grouse and coalbed natural gas development. Habitat conditions and sage grouse biology within the Buffalo Field Office is probably most similar to Moynahan's north-central Montana study area.

Vegetation communities within the Powder River Basin are naturally fragmented as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. Without contiguous habitat available to nesting grouse it is likely a smaller percentage of grouse nest within two-miles of a lek within the PRB than grouse within those areas studied in the development of the 1977 WAFWA recommendations and even the Holloran and Moynahan study areas. Holloran and Moynahan both studied grouse in areas of contiguous sagebrush habitats without large scale fragmentation and habitat conversion (Moynahan et al In press, Holloran and Anderson 2005). A recent sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within Holloran and Anderson's Upper Green River Basin study area to be 58% with an average patch size greater than 1200 acres; meanwhile Powder River Basin sagebrush coverage was estimated to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size decreased by more than 63% in forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005). Recognizing that many populations live within fragmented habitats and nest much farther than two miles from the lek of breeding WAFWA revised their sage grouse management guidelines (Connelly et. al. 2000) and now recommends the protection of suitable habitats within 5 km (3.1 mi) of leks where habitats are not distributed uniformly such as the Powder River Basin.

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

Figure 1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2005.



Sage-grouse populations within the PRB are declining independent of coalbed natural gas development. CBNG is a recent development, with the first well drilled in 1987 (Braun et al. 2002). In February 1998 there were 420 producing wells primarily restricted to eastern Campbell County (BFO 1999). By May 2003 there were 26,718 CBNG wells permitted within the BFO area (Oedekoven 2004). The Powder River Basin Oil and Gas Project Final Environmental Impact Statement estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003). Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (Oedekoven 2004). In other terms, CBNG development is expected to accelerate the downward sage-grouse population trend.

A two-mile timing limitation given the long-term population decline and that less than 50% of grouse are expected to nest within the limitation area is likely insufficient to reverse the population decline. Moynahan and Lindberg (2004) like WAFWA (Connelly et al. 2000) recommend increasing the protective distance around sage grouse leks. Even with a timing limitation on construction activities, sage-grouse may avoid nesting within CBNG fields because of the activities associated with operation and production. As stated earlier, a well density of eight wells per section creates sage-grouse avoidance zones which overlap creating contiguous avoidance areas (WGFD 2004).

An integrated approach including habitat restoration, grazing management, temporal and spatial mineral limitations etc. is necessary to reverse the population decline. The Wyoming Game and Fish Department (WGFD) has initiated such a program within the Buffalo Field Office area (Jellison 2005). The WGFD program is modeled after a successful program on the Deseret Ranch in southwestern Wyoming and northeastern Utah. The Deseret Ranch has demonstrated a six-fold increase in their sage-grouse population while surrounding areas exhibited decreasing populations (Danvir 2002).

4.2.5.2.4.2. Sharp-tailed grouse

Four sharp-tailed grouse leks are located within 3 miles of the project area. Effects to sharp-tailed grouse are likely to be similar to those to greater sage-grouse.

4.2.5.2.5. Mountain plover

Mineral development may have mixed effects on mountain plovers. Disturbed ground such as buried pipe line corridors and roads may be attractive to plovers while human activities within one-quarter mile may be disruptive. Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. The existing overhead power lines adjacent to the project area provide perch sites for raptors potentially resulting in increased mountain plover predation. CBNG infrastructure such as the well houses may provide shelter and den sites for ground predators such as skunks and foxes. An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

Suitable mountain plover habitat is present within the project area; however, the project should not affect mountain plovers as disturbance is not proposed within the suitable habitat.

4.2.5.3. Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-271.

4.3. West Nile Virus Direct and Indirect Effects

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

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

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

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

4.4. Water Resources

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

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

The maximum water production is predicted to be 25.0 gpm per twin well location (74 CBM wells at 37 well pad locations) or 925 gpm (2.06 cfs or 1,491.8 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 Tongue River drainage, the projected volume produced within the watershed area was 22,351 acre-feet in 2006 which is the maximum production. As such, the volume of water resulting from the production of these wells is 6.7% of the total volume projected for 2006. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 39 % to groundwater aquifers and coal zones in the Upper Tongue River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 361 gpm will infiltrate at or near the discharge points and impoundments (582 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, “the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater.” (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. “The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers.” (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 59 to 1,356 feet compared to 1,134-1,450 feet to the Cook and 1,800-2,780 to the Knobloch. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

Adherence to the drilling plan, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and utilizing proper cementing procedures will protect any potential fresh water aquifers above the target coal zone. This will ensure that ground water will not be adversely impacted by well drilling and completion operations.

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

Shallow ground water monitoring is ongoing at impoundment sites across the basin. Due to the limited data available from these sites, the still uncertain overall fate or extent of change that is occurring due to infiltration at those sites, and the extensive variable site characteristics both surface and subsurface, it is

not reliable at this time to infer that findings from these monitoring wells should be directly applied to other impoundment locations across the basin.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, “Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004, and is currently being revised as the “Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments” which should be approved by June, 2006. Approximately 800 new impoundments have been investigated to date with 102 impoundments in 52 permits that have gone into compliance monitoring. The Wyoming DEQ has established an Impoundment Task Force which is in the process of drafting an “Impoundment Monitoring Plan” to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments should begin in the spring of 2006. For WYPDES permits received by DEQ after the August 1st effective date, the BLM will require that operators comply with the requirements outlined in the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

4.4.1.1. Groundwater Cumulative Effects:

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

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

4.4.2. Surface Water

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

Table 4.5 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	TDS, mg/l	SAR	EC, μmhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	2,500
Primary Watershed at Decker, MT Gauging station		0.36	318
Historic Data Average at Maximum Flow		0.86	731
Historic Data Average at Minimum Flow			
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I)	500		

Predicted Values	TDS, mg/l	SAR	EC, µmhos/cm
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # WYW0052407 At discharge point	5,000		7,500
Predicted Produced Water Quality C0-mingled Coal Zones	1,330	49.9	1,950

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is **1330.0** mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the co-mingled water produced from the Anderson, Dietz, Canyon, **Cook, Wall, Pawnee, Brewster/Arnold, King and Knobloch** target coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of **25.0** gallons per minute (gpm) is projected is to be produced from these **37** well twin well locations, for a total of 925 gpm for the POD. See Table 4.5.

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

There are discharge points proposed for this project. They have been appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, **8** impoundments (161.98 acre-ft.) would potentially be constructed within the project area. These impoundments will disturb approximately 25.7 acres including the dam structures. Of these water impoundments, **4** would be on-channel reservoirs disturbing **14.9 acres**, and **4** would be off-channel ponds disturbing **10.8 acres**. The off-channel impoundments would result in evaporation and infiltration of CBNG water. Criteria identified in “Off-Channel, Unlined CBNG Produced Water Pit Siting Guidelines for the Powder River Basin, Wyoming” (WDEQ, 2002) was used to locate these impoundments. Monitoring may be required based upon WYDEQ findings relative to “Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” (June 14, 2004). Existing impoundments will be upgraded and proposed impoundments will be constructed to meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of **0.31**cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a

concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 74 CBM wells (37 locations) is anticipated to be a total of 925 gpm or 2.06 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in Waddle Creek, Upper Hanging Woman Creek, West Prong of Hanging Woman, and Middle Badger Creek from this action (0.31 cfs) may add a maximum 0.25 cfs to the Upper Tongue River flows, or 4.95% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow of the Upper Tongue River Watershed (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

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

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

Permit effluent limits were set at (WYPDES permit No. WYW0052407):

Total Petroleum Hydrocarbons	10 mg/l max
pH	6.5 to 8.5
TDS	5000 mg/l max
Specific Conductance	7500 mg/l max
Sulfates	3000 mg/l max
Radium 226	60 pCi/l max
Total Selenium	50 µg/l max
Total Arsenic	200 µg/l max

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit.

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

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

In-channel downstream impacts are addressed in the WMP for the East Badger POD prepared by Pearl Field Services for Nance Petroleum Corporation.

4.4.2.1. Surface Water Cumulative Effects

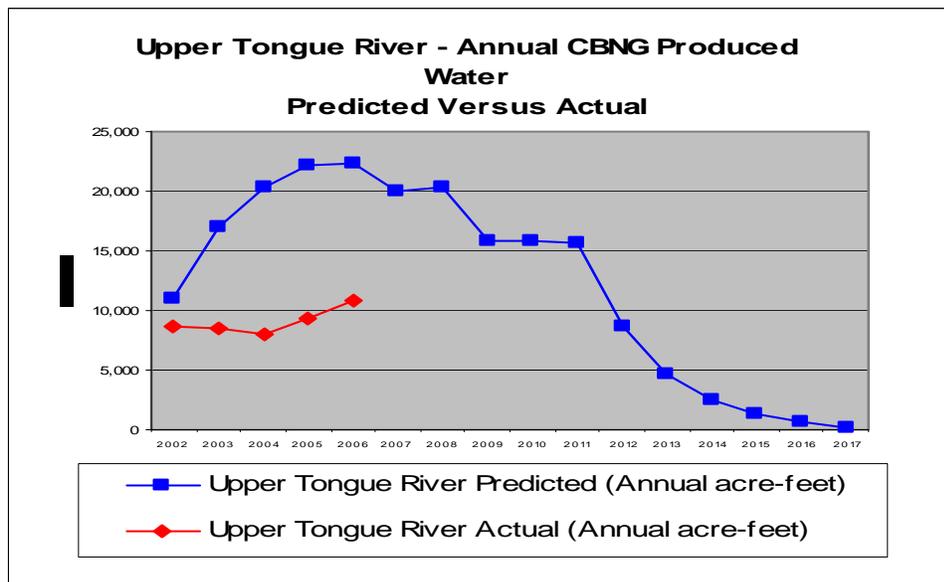
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the **Upper Tongue River** watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of March 2007 all producing CBNG wells in the **Upper Tongue River** watershed have discharged a cumulative volume of 45,412 acre-ft of water compared to the predicted 92,725 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is **49.0%** of the total predicted produced water analyzed in the PRB FEIS for the **Upper Tongue River** watershed.

Table 4.6 Actual vs predicted water production in the Upper Tongue River watershed 2006 Data Update 3-16-07

Year	Upper Tongue River Predicted (Annual acre-feet)	Upper Tongue River Predicted (Cum acre-feet from 2002)	Upper Tongue River Actual (Annual acre-feet)		Upper Tongue River Actual (Cumulative acre-feet beginning 2002)	
			Ac-ft	% of Predicted	Ac-ft	% of Predicted
2002	11,019	11,019	8,675	78.7	8,675	78.7
2003	16,950	27,969	8,574	50.6	17,248	61.7
2004	20,272	48,241	7,971	39.3	25,220	52.3
2005	22,133	70,374	9,397	42.5	34,617	49.2
2006	22,351	92,725	10,795	48.3	45,412	49.0
2007	19,945	112,670				
2008	20,282	132,952				
2009	15,782	148,734				
2010	15,782	164,516				
2011	15,654	180,170				
2012	8,646	188,816				
2013	4,721	193,537				
2014	2,522	196,059				
2015	1,290	197,349				
2016	601	197,950				
2017	214	198,164				
Total	198,164		45,412			

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



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

The PRB FEIS states, “Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ’s (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the two states develop a better understanding of the effects of CBM discharges through the enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met.” (PRB FEIS page 4-117)

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

1. They are proportional to the actual amount of cumulatively produced water in the **Upper Tongue River** drainage, which is approximately **49.0%** of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

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

4.5. Cultural Resources

The inventory was field checked on 6/19/07. Due to unusually heavy vegetation cover and later access concerns by a landowner (hunting season), the Bureau did not have the opportunity to perform compliance checks for the majority of cultural inventory. The compliance checks will be performed during the pre-construction onsite. If any cultural resources are discovered during the compliance checks, they will be treated a discovery as outlined in Standard Condition of Approval #1 of the EA.

Non eligible site 48SH1389 will be impacted by the project. There are no eligible sites within the APE of the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 9/24/07 that no historic properties exist within the APE.

If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the *Standard COA* (General)(A)(1).

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Don Luse	Natural Resource Specialist	Padlock Ranch	Yes
Rachel Ridenour		Padlock Ranch	No
Scott Alexander	Ranch Manager	Chase Farms/NX Bar Ranch	Yes
Jock Hutton		OTO Ranch	No
Lori Badgett		7 Brothers Ranch, Fidelity E & P Co.	No
Wayne Ransbottom		7 Brothers Ranch, Fidelity E & P Co.	No
Mary Hopkins	Interim SHPO	Wyoming SHPO	No

6. OTHER PERMITS REQUIRED

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

7. REFERENCES AND AUTHORITIES

- Agnew, W. D. 1983. Flora and Fauna Associated with Prairie Dog Ecosystems. Unpublished thesis. Colorado State University, Fort Collins. 47pp.
- Agnew, W. D. 1988. Arthropod Consumption by Small Mammals on Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Eighth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM 154. pgs. 81-87.
- Agnew, W., D. W. Uresk. and R. M. Mansen. 1986. Flora and Fauna Associated with Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Journal of Range Management 39, pgs 135-139.
- AHPIS, Animal and Plant Health Inspection Service. 2002. General information available online at <http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html>.

- Apa, A. D. 1985. Efficiency of Two Black-tailed Prairie Dog Rodenticides and Their Impacts on Non-target Bird Species. Unpublished thesis, South Dakota State University Brookings. 71pp.
- Avian Power Line Interaction Committee. 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute. Washington, D.C. 125pp.
- Bills, Thomas E. 2004. Powder River Basin Oil & Gas Project Semi-Annual Report: May 1, 2003 – October 31, 2003. BLM Buffalo Field Office. Buffalo, WY. 8pp.
- Campbell, Thomas and Tim Clark. 1981. Colony Characteristics and Vertebrate Associates of White-tailed and Black-tailed Prairie Dogs. American Midland Naturalist, Vol. 105, No. 2 (April 1981). pgs 269-276.
- Canfield, J. E., L. J. Lyon, J. M. Hillis, and M. J. Thompson. 1999. Ungulates. Chapter 6 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coordinated by G. Joslin and H. Youmans. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.
- Clark, T. W., T. M. Campbell, D. G. Socha, and D. E. Casey. 1982. Prairie Dog Colony attributes and Associated Vertebrate Species. Great Basin Naturalist 42: 572-582.
- Code of Federal Regulations (CFR)
1. 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of July 1, 2004.
 2. 43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of October 1, 2006.
- Cornish, Todd; Terry Creekmore; Walter Cook; and Elizabeth Williams. 2003. "West Nile Virus - Wildlife Mortality in Wyoming 2002-2003". In: The Wildlife Society Wyoming Chapter Program and Abstracts for the Annual Meeting at the Inn in Lander, WY November 18-21, 2003. Wildlife Society Wyoming Chapter. 17pp.
- Deisch, M. S., D. W. Uresk, and R. L. Lindor. 1989. Effects of Two Prairie Dog Rodenticides on Ground Dwelling Invertebrates in Western South Dakota. Ninth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM. Pgs 171-181.
- Geist, V. 1978. Behavior. Big Game of North America; ecology and management. Stackpole Books, Harrisburg, Pennsylvania.
- Grenier, Martin. 2003. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department. Lander, WY. 16pp
- Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Arc Wildlife Services Ltd., Calgary, Alberta, Canada.
- Kelly Brian T. 2004. Letter to interested parties: Black-footed ferret clearance surveys. U.S. Fish and Wildlife Service (February 2, 2004). Cheyenne, WY. 4pp.
- King, J. A. 1955. Social Behavior, Social Organization and Population Dynamics in a Black-tailed Prairie Dog Town in the Black Hills of South Dakota. Contr. Lab. Vert. Biol., University of Michigan. 67pp.

- Litzel, R. 2004. Personal communication [January 6 phone conversation with Jim Sparks]. Johnson County Weed and Pest District.
- Lowham, H.W. Streamflows in Wyoming WRIR 88-4045 U.S. Geological Survey 1988
- Lustig, Thomas D., March. 2003. Where Would You Like the Holes Drilled into Your Crucial Winter Range? Transactions of the 67th North American Wildlife and Natural Resources Conference.
- Marra PP, Griffing SM, McLean RG. West Nile virus and wildlife health. Emerg Infect Dis [serial online] 2003 Jul. Available from: URL: <http://www.cdc.gov/ncidod/vol9no7/03-0277.htm>.
- McCracken, J. G., D. W. Uresk and R. M. Mansen. 1985. Burrowing Owl Foods in Conata Basin, South Dakota. Great Basin Naturalist 45: 287-290.
- Miller, K.A Peak-Flow Characteristics of Wyoming Streams WRIR 03-4107 U.S. Geological Survey 2003
- Mooney, A. 2004. Personal Communication [January 6 phone conversation with Jim Sparks]. Campbell County Weed and Pest District.
- Oakleaf, Bob. January 13, 1988. Letter to BFAT: Preliminary BFF Reintroduction Site Analysis, Meeteetse Management Plan Assignments. Wyoming Game and Fish Department. Lander, WY. 10pp.
- Patterson, Craig T. and Stanley H. Anderson. 1985. Distributions of Eagles and a Survey for Habitat Characteristics of Communal Roosts of Bald Eagles (*Haliaeetus leucocephalus*) Wintering in Northeastern Wyoming. Wyoming Cooperative Fishery and Wildlife Research Unit. University of Wyoming. Laramie, WY.
- Reading, R. P., S. R. Beissinger, J. J. Grensten, and T. W. Clark. 1989. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. Montana BLM Wildlife Technical Bulletin No. 2. pgs 13-28.
- Reading, R., and Randy Matchet. 1997. Attributes of Black-tailed Prairie Dog Colonies in Northcentral Montana. Journal of Wildlife Management 61(3): 664-673.
- Rinkes, T. 2003. Personal communication [Draft notes from Annual Sage-Grouse and Sagebrush Species of Concern Meeting]. Bureau of land Management Wildlife Biologist/Sage Grouse Coordinator.
- Rogers, Brad. Personal Communication. Fish and Wildlife Biologist. U.S. Fish and Wildlife Service, Cheyenne Field Office. Cheyenne, WY.
- Romin, Laura A., and Muck, James A. May 1999. Utah Field Office Guidelines For Raptor Protection From Human And Land Use Disturbances. U.S. Fish and Wildlife Service, Salt Lake City, Utah
- Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebs, K.S. McKelvey, and J.R. Squires. 1999. The Scientific Basis for Lynx Conservation: Qualified Insights. Ch16. USDA Forest Service Technical Report RMRS-GTR-30.
- The National Environmental Policy Act of 1969 (NEPA), as amended (Pub. L. 91-90, 42 U.S.C. 4321 et

seq.).

- Uresk, D. W. and J. C. Sharps. 1986. Denning Habitat and Diet of the Swift Fox in Western South Dakota. Great Basin Naturalist 46: 249-253.
- U.S. Department of the Interior, Bureau of Land Management and Office of the Solicitor (editors). 2001. The Federal Land Policy and Management Act, as amended. Public Law 94-579.
- U.S. Department of the Interior, Bureau of Land Management, Buffalo Field Office, Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office April 2001.
- U.S. Department of the Interior, Bureau of Land Management, Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment. April 30, 2003.
- U.S. Fish and Wildlife Service (USFWS). 1989. Black-footed ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, CO and Albuquerque, NM.
- U.S. Fish and Wildlife Service. 2002. Final Biological and Conference Opinion for the Powder River Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties (WY6633). U.S. Fish and Wildlife Service. December 17, 2002. Cheyenne, WY. 58pp.
- Walker B, Naugle D, Rinkes T. 2003. The Response of Sage Grouse to Coal-bed Methane Development and West Nile virus in the Powder River Basin: Is There a Link ? Page 6 in: Program and Abstracts for the Annual Wildlife Society Meeting, Wyoming Chapter.
- WDEQ, June 14, 2004. Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments

8. LIST OF INTERDISCIPLINARY TEAM PREPARERS AND REVIEWERS

Jim Verplancke, Natural Resource Specialist
Arnie Irwin, Soil Specialist
Dan Sellers, Acting Supervisory Natural Resource Specialist
Mike McKinley, Hydrologist
Mike Worden, Petroleum Engineer
Norma Cope, Legal Instruments Examiner
Sharon Soule, Legal Assistant
G.L. "Buck" Damone III, Archaeologist
Jennifer Morton, Wildlife Biologist
Gerald Queen, Geologist
Thomas Bills, Environmental Coordinator
Buddy Green, Assistant Field Manager, Resources
Paul Beels, Associate Field Manager, Minerals & Lands
Chris E. Hanson, Field Manager

Interdisciplinary Team Lead: **Jim Verplancke**

