

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

Williams Production RMT Company
Cedar Draw Unit 2 POD

ENVIRONMENTAL ASSESSMENT –WY-070-07-137

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Williams Production RMT Company’s Cedar Draw Unit 2 POD Coal Bed Natural Gas (CBNG) POD comprised of the following 74 Applications for Permit to Drill (APDs), as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	CEDAR DRAW UNIT 2 CDU	22-15SA	SENW	15	53N	75W	WYW143983
2	CEDAR DRAW UNIT 2 CDU	22-15WG	SENW	15	53N	75W	WYW143983
3	CEDAR DRAW UNIT 2 CDU	31-15SA	NWNE	15	53N	75W	WYW143983
4	CEDAR DRAW UNIT 2 CDU	31-15WG	NWNE	15	53N	75W	WYW143983
5	CEDAR DRAW UNIT 2 CDU	11-15SA*	NWNW	15	53N	75W	WYW143983
6	CEDAR DRAW UNIT 2 CDU	11-15WG	NWNW	15	53N	75W	WYW143983
7	CEDAR DRAW UNIT 2 CDU	13-15SA	NWSW	15	53N	75W	WYW143983
8	CEDAR DRAW UNIT 2 CDU	13-15WG	NWSW	15	53N	75W	WYW143983
9	CEDAR DRAW UNIT 2 CDU	24-15SA	SESW	15	53N	75W	WYW143983
10	CEDAR DRAW UNIT 2 CDU	24-15WG	SESW	15	53N	75W	WYW143983
11	CEDAR DRAW UNIT 2 CDU	33-15SA	NWSE	15	53N	75W	WYW143983
12	CEDAR DRAW UNIT 2 CDU	33-15WG	NWSE	15	53N	75W	WYW143983
13	CEDAR DRAW UNIT 2 CDU	42-15SA	SENE	15	53N	75W	WYW143983
14	CEDAR DRAW UNIT 2 CDU	42-15WG	SENE	15	53N	75W	WYW143983
15	CEDAR DRAW UNIT 2 CDU	44-15SA	SESE	15	53N	75W	WYW143983
16	CEDAR DRAW UNIT 2 CDU	44-15WG	SESE	15	53N	75W	WYW143983
17	CEDAR DRAW UNIT 2 CDU	33-19SA	NWSE	19	53N	75W	WYW146814
18	CEDAR DRAW UNIT 2 CDU	41-19SA	NENE	19	53N	75W	WYW135223
19	CEDAR DRAW UNIT 2 CDU	41-19WG	NENE	19	53N	75W	WYW135223
20	CEDAR DRAW UNIT 2 CDU	33-19WG	NWSE	19	53N	75W	WYW146814
21	CEDAR DRAW UNIT 2 CDU	13-20SA	NWSW	20	53N	75W	WYW143984
22	CEDAR DRAW UNIT 2 CDU	44-20SA	SESE	20	53N	75W	WYW143984
23	CEDAR DRAW UNIT 2 CDU	13-20WG	NWSW	20	53N	75W	WYW143984
24	CEDAR DRAW UNIT 2 CDU	44-20WG	SESE	20	53N	75W	WYW143984
25	CEDAR DRAW UNIT 2 CDU	33-20WG	NWSE	20	53N	75W	WYW143984
26	CEDAR DRAW UNIT 2 CDU	24-20SA	SESW	20	53N	75W	WYW143984
27	CEDAR DRAW UNIT 2 CDU	24-20WG	SESW	20	53N	75W	WYW143984
28	CEDAR DRAW UNIT 2 CDU	42-20SA	SENE	20	53N	75W	WYW143984
29	CEDAR DRAW UNIT 2 CDU	42-20WG	SENE	20	53N	75W	WYW143984
30	CEDAR DRAW UNIT 2 CDU	33-20SA	NWSE	20	53N	75W	WYW143984
31	CEDAR DRAW UNIT 2 CDU	13-21SA	NWSW	21	53N	75W	WYW143984
32	CEDAR DRAW UNIT 2 CDU	13-21WG	NWSW	21	53N	75W	WYW143984
33	CEDAR DRAW UNIT 2 CDU	11-21SA	NWNW	21	53N	75W	WYW143984
34	CEDAR DRAW UNIT 2 CDU	11-21WG	NWNW	21	53N	75W	WYW143984
35	CEDAR DRAW UNIT 2 CDU	22-21SA	SENW	21	53N	75W	WYW143984

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
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37	CEDAR DRAW UNIT 2 CDU	31-21WG	NWNE	21	53N	75W	WYW143984
38	CEDAR DRAW UNIT 2 CDU	33-21SA	NWSE	21	53N	75W	WYW143984
39	CEDAR DRAW UNIT 2 CDU	33-21WG	NWSE	21	53N	75W	WYW143984
40	CEDAR DRAW UNIT 2 CDU	44-21SA	SESE	21	53N	75W	WYW143984
41	CEDAR DRAW UNIT 2 CDU	44-21WG	SESE	21	53N	75W	WYW143984
42	CEDAR DRAW UNIT 2 CDU	22-21WG	SENE	21	53N	75W	WYW143984
43	CEDAR DRAW UNIT 2 CDU	24-21SA	SESW	21	53N	75W	WYW143984
44	CEDAR DRAW UNIT 2 CDU	24-21WG	SESW	21	53N	75W	WYW143984
45	CEDAR DRAW UNIT 2 CDU	42-21SA	SENE	21	53N	75W	WYW143984
46	CEDAR DRAW UNIT 2 CDU	42-21WG	SENE	21	53N	75W	WYW143984
47	CEDAR DRAW UNIT 2 CDU	41-22WG	NENE	22	53N	75W	WYW143984
48	CEDAR DRAW UNIT 2 CDU	12-22SA	SWNW	22	53N	75W	WYW130087
49	CEDAR DRAW UNIT 2 CDU	12-22WG	SWNW	22	53N	75W	WYW130087
50	CEDAR DRAW UNIT 2 CDU	21-22SA	NENW	22	53N	75W	WYW130087
51	CEDAR DRAW UNIT 2 CDU	21-22WG	NENW	22	53N	75W	WYW130087
52	CEDAR DRAW UNIT 2 CDU	32-22SA	SWNE	22	53N	75W	WYW143984
53	CEDAR DRAW UNIT 2 CDU	32-22WG	SWNE	22	53N	75W	WYW143984
54	CEDAR DRAW UNIT 2 CDU	41-22SA	NENE	22	53N	75W	WYW143984
55	CEDAR DRAW UNIT 2 CDU	11-28SA	NWNW	28	53N	75W	WYW143985
56	CEDAR DRAW UNIT 2 CDU	13-28SA	NWSW	28	53N	75W	WYW143985
57	CEDAR DRAW UNIT 2 CDU	11-28WG	NWNW	28	53N	75W	WYW143985
58	CEDAR DRAW UNIT 2 CDU	13-28WG	NWSW	28	53N	75W	WYW143985
59	CEDAR DRAW UNIT 2 CDU	22-28SA	SENE	28	53N	75W	WYW143985
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65	CEDAR DRAW UNIT 2 CDU	33-28SA	NWSE	28	53N	75W	WYW143985
66	CEDAR DRAW UNIT 2 CDU	33-28WG	NWSE	28	53N	75W	WYW143985
67	CEDAR DRAW UNIT 2 CDU	42-28SA	SENE	28	53N	75W	WYW143985
68	CEDAR DRAW UNIT 2 CDU	42-28WG	SENE	28	53N	75W	WYW143985
69	CEDAR DRAW UNIT 2 CDU	44-28SA	SESE	28	53N	75W	WYW143985
70	CEDAR DRAW UNIT 2 CDU	44-28WG	SESE	28	53N	75W	WYW143985
71	CEDAR DRAW UNIT 2 CDU	31-33SA	NWNE	33	53N	75W	WYW143986
72	CEDAR DRAW UNIT 2 CDU	31-33WG	NWNE	33	53N	75W	WYW143986
73	CEDAR DRAW UNIT 2 CDU	42-33SA	SENE	33	53N	75W	WYW143986
74	CEDAR DRAW UNIT 2 CDU	42-33WG	SENE	33	53N	75W	WYW143986

The following impoundment locations were inspected and approved for use in association with the water management strategy for the POD. Impoundments requiring bonds have been bonded through the WOGCC.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number
1	12-33-5375	SWNW	33	53	75	WYW143986

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number
2	21-33-5376	NENW	33	53	75	WYW143986
3	22-33-5375	SESW	33	53	75	WYW143986
4	14-20-5375	SWSW	20	53	75	WYW143984
5	43-19-5375	NESE	19	53	75	WYW146814
6	Backdoor	NENE	16	53	75	
7	Sweet	NESW	16	53	75	
8	Snake Charmer	SESW	16	53	75	
9	33-21-5375	NWSE	21	53	75	WYW143984
10	21-15-5375	NENW	15	53	75	WYW143983
11	23-15-5375	NESW	15	53	75	WYW143983
12	33-15-5375	NWSE	15	53	75	WYW143983
13	31-28-5375	NWNE	28	53	75	WYW143985
14	P13-20-5375	NWSW	20	53	75	WYW143984
15	P14-20-5375	SWSW	20	53	75	WYW143984
16	P23-20-5375	NWSE	20	53	75	WYW143984
17	P42-29-5375	SENE	28	53	75	WYW143985
18	34-20-5375	SWSE	20	53	75	WYW143984
19	Rock Hill	NWNW	28	53	75	WYW143985
20	George	SENE	19	53	75	WYW135223
21	Bellows	SESW	28	53	75	WYW143985
22	42-16-5375	SENE	16	53	75	
23	24-15-5375	SESW	15	53	75	WYW143985

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
 Williams Production RMT Company
 Cedar Draw Unit 2 POD
 PLAN OF DEVELOPMENT
 WY-070-07-137**

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 7 valid federal oil and gas mineral leases issued to the applicant by the BLM. Analysis has determined that federal CBNG is being drained from the federal leases by surrounding fee or state mineral well development. 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: Williams Production RMT Company’s Cedar Draw Unit 2 POD Plan of Development (POD) for 74 coal bed natural gas well APD’s and associated infrastructure.

Proposed Well Information: There are 74 wells proposed within this POD, as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	CEDAR DRAW UNIT 2 CDU	22-15SA	SEnw	15	53N	75W	WYW143983

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
2	CEDAR DRAW UNIT 2 CDU	22-15WG	SENW	15	53N	75W	WYW143983
3	CEDAR DRAW UNIT 2 CDU	31-15SA	NWNE	15	53N	75W	WYW143983
4	CEDAR DRAW UNIT 2 CDU	31-15WG	NWNE	15	53N	75W	WYW143983
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10	CEDAR DRAW UNIT 2 CDU	24-15WG	SESW	15	53N	75W	WYW143983
11	CEDAR DRAW UNIT 2 CDU	33-15SA	NWSE	15	53N	75W	WYW143983
12	CEDAR DRAW UNIT 2 CDU	33-15WG	NWSE	15	53N	75W	WYW143983
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73	CEDAR DRAW UNIT 2 CDU	42-33SA	SENE	33	53N	75W	WYW143986
74	CEDAR DRAW UNIT 2 CDU	42-33WG	SENE	33	53N	75W	WYW143986

Water Management Proposal: The following impoundments were proposed for use in association with the water management strategy for the POD. Impoundments requiring WOGCC bonds have been bonded.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number
1	12-33-5375	SWNW	33	53	75	WYW143986
2	21-33-5376	NENW	33	53	75	WYW143986
3	12-15-5375	SESW	15	53	78	WYW143983
4	14-20-5375	SWSW	20	53	75	WYW143984
5	43-19-5375	NESE	19	53	75	WYW146814
6	Backdoor	NENE	16	53	75	
7	Sweet	NESW	16	53	75	
8	Snake Charmer	SESW	16	53	75	
9	33-21-5375	NWSE	21	53	75	WYW143984
10	21-15-5375	NENW	15	53	75	WYW143983
11	23-15-5375	NESW	15	53	75	WYW143983

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number
12	33-15-5375	NWSE	15	53	75	WYW143983
13	31-28-5375	NWNE	28	53	75	WYW143985
14	P13-20-5375	NWSW	20	53	75	WYW143984
15	P14-20-5375	SWSW	20	53	75	WYW143984
16	P23-20-5375	NWSE	20	53	75	WYW143984
17	P42-29-5375	SENE	28	53	75	WYW143985
18	34-20-5375	SWSE	20	53	75	WYW143984
19	Rock Hill	NWNW	28	53	75	WYW143985
20	George	SENE	19	53	75	WYW135223
21	Bellows	SESW	28	53	75	WYW143985
22	42-16-5375	SENE	16	53	75	
23	24-15-5375	SESW	15	53	75	WYW143985

County: Campbell

Applicant: Williams Production RMT Company

Surface Owners: John Kretschman; Dixie Reece; Floyd Land & Livestock; Deer Track Ranch, LLC; BLM; State of Wyoming

Project Description:

The proposed action involves the following:

- Drilling of 74 total federal CBM wells in the Anderson and Gates coal zones in the Fort Union Formation ranging from approximately 650 to 1800 feet deep. Multiple seams will be produced by co-locating wells (multiple wells at a single location each targeting a single formation).

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.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 23 discharge points and 23 stock water reservoirs (17 proposed and 6 existing) within the Upper Powder River watershed. CBNG discharge water will be partially stored in impoundments and partially allowed to overflow into downstream channels by the WYPDES permit.
- An unimproved and improved road network.
- An above ground power line network.
- A buried gas, water and power line network.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and Water Management Plan (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 MSRP, 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 (SUA) has been reached with all of the Landowners except Deer Track Ranch. Negotiations are in progress to reach a SUA.

2.3. Alternative C – Environmentally Preferred

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of the project modifications identified by BLM and the operator following the initial project proposal (Alternative B). At the on-sites, all areas of proposed surface disturbance were inspected to reduce potential impacts to natural resources. In some cases, access roads were re-routed, and well locations, pipelines, discharge points and other water management control structures were moved, modified, mitigated or dropped from further consideration to alleviate environmental impacts. Alternatives to the different aspects of the proposed action are always considered and applied as pre-approval changes, site specific mitigation and/or Conditions of Approval (COAs), if they will alleviate environmental effects of the operator’s proposal. The specific changes identified for the Cedar Draw Unit 2 POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Date of onsite	Well Number	Location	Sec	T/R	Onsite Notes
3/22/2007	11-15	NWNW	15	53/75	Moved access road to avoid going through the middle of a prairie dog town.
3/22/2007	22-15	SENW	15	53/75	Moved well 150 feet to the north due to unstable soils at original location. Moved access road to the south to avoid going through the middle of a large prairie dog town.
3/22/2007	31-15	NWNE	15	53/75	Moved wells 100 feet to the NW away from the edge of the ridge. Relocated road off ridge and away from unstable soils; this will also allow for a primitive road instead of engineered.
3/23/2007	41-19	NENE	19	53/75	New dirt work associated with road disturbance will be oriented toward the existing road disturbance where possible.
3/23/2007	24-20	SESW	20	53/75	Moved wells 50 feet north away from drainage and closer to the road resulting in less surface disturbance.

Date of onsite	Well Number	Location	Sec	T/R	Onsite Notes
3/23/2007	33-20	NWSE	20	53/75	Moved access road adjacent to reservoir reducing the disturbance to sagebrush habitat.
3/21/2007	42-20	SENE	20	53/75	Relocated both wells 50-100 feet to the southeast to reduce surface disturbance and located the pad further away from edge of ridge and drainage.
3/22/2007	11-21	NWNW	21	53/75	Moved wells 75 yards SE closer to the road reducing sagebrush disturbance.
3/22/2007	22-21	SENW	21	53/75	Moved SA well 50 feet to the south of WG well in order to move the well further away from the drainage. Engineered road will be designed as submitted except culvert will be larger, 24" or 36".
3/21/2007	24-21	SESW	21	53/75	Entire pad will not be built as designed. Only the NW and SW corners of the pad will be leveled off to reduce surface disturbance.
3/22/2007	31-21	NWNE	21	53/75	Moved wells 300 feet to the east to reduce disturbance to sagebrush. Pad dropped. Will use 120x12 feet slot. Small drainage around location will be mitigated.
3/22/2007	33-21	NWSE	21	53/75	Moved wells to north 300 feet just off access road to reduce disturbance to sagebrush.
3/21/2007	44-21	SESE	21	53/75	Moved wells 15 feet to the west to align wells more toward the center of the pad and away from drainage.
3/22/2007	12-22	SWNW	22	53/75	Moved wells to the south (20 to 40 feet) away from edge. Northern edges of pad will be rounded to reduce fill slopes.
3/22/2007	21-22	NENW	22	53/75	Moved wells approximately 50 feet to the south away from the pinnacle of the ridge to reduce disturbance by shortening the road and moving the location away from the edge of the ridge and drainage.
3/22/2007	41-22	NENE	22	53/75	Mowing will be kept to a minimum due to dense sagebrush habitat. No greater than 120x180 feet.
3/21/2007	13-28	NWSW	28	53/75	Moved SA well 50 feet to the east of the WG well so drill rig will have a more level spot. Landowner requested stock water tank at outfall.
3/21/2007	31-28	NWNE	28	53/75	Engineered road changes; road will be routed to the north of the knob out of shallow, unstable soil. New location will have more reclamation potential. Outfall moved toward the dam.
3/21/2007	42-28	SENE	28	53/75	Pad dropped. Will use 120x12 feet slot. Location will be brush-hogged no greater than 120x180 feet due to dense sagebrush habitat.
3/23/2007	44-28	SESE	28	53/75	Monitoring COAs will be applied for raptor nest.

- Proposed access road on BLM surface between the 12-22 and 32-22 wells was rerouted to an existing road on private surface to the south. Using existing road will eliminate building a new road and will reduce overall disturbance. Pipeline corridor will be moved to the south along existing fence on BLM surface to avoid highly erosive soils and steep slopes. SUA still needs to be reached with the landowner for road access.
- Reservoir 12-15-5378 was dropped to avoid grazing land the lessee wanted to preserve.
- Reservoir 23-15-5378 was enlarged to make up the lost capacity.
- Reservoir 21-33-5375 was moved approximately 500 feet downstream from private to BLM surface to avoid farmed ground.

- Reservoir 22-35-5375 was added on BLM surface to make up for lost storage volume lost when 21-33-5375 was moved.

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 a guidance document, “Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments” which was approved September, 2006. For WYPDES permits received by DEQ after the August 1st effective date, the BLM requires that operators comply with the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

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 in riparian areas, flood plains, or in natural drainage ways.
4. Soil or other material stockpiles will be placed outside floodplains.
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. The Companies will construct power lines to minimize the potential for raptor collisions with the lines. Potential modifications include burying the lines, avoiding areas of high avian use (for example, wetlands, prairie dog towns, and grouse leks), and increasing the visibility of the individual conductors.
4. The Companies will locate aboveground power lines, where practical, at least 0.5 mile from any sage grouse breeding or nesting grounds to prevent raptor predation and sage grouse collision with the conductors. Power poles within 0.5 mile of any sage grouse breeding ground will be raptor-proofed to prevent raptors from perching on the poles.
5. 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.
6. The Companies will limit the construction of aboveground power lines near streams, water bodies, and wetlands to minimize the potential for waterfowl colliding with power lines.
7. 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.

2.3.2.7.2. 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. If reclamation or weed treatment is proposed within suitable Ute ladies'-tresses habitat and during the orchid's growing season (July 1 – September 30) then a survey for the orchid, according to FWS protocol, shall be conducted prior to treatment. If any orchids are found, in order to minimize potential effects, the Service shall be consulted with prior to implementation.

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

General

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

Surface Use

1. Access and construction of the existing road located in the NWSE, Section 22, T53N, R75W on private surface will not be allowed until a Surface Use Agreement has been met with the landowner and a self-certification statement has been provided to the BLM.
2. The disturbance width of the pipeline in T53N, R75W, Section 22, NWSE running along the

fence-line between the 12-22 and 32-22 wells will be limited to 30 feet of total surface disturbance. The dirt work portion within this disturbance will be limited to 20 feet.

3. New dirt work associated with road disturbance for the access road going to the 41-19 location will be oriented toward the existing road disturbance where possible.
4. Due to close proximity to drainages, the Operator will line the pits at the following well locations: 42-15, 42-20, 13-21, 22-21, 24-21, 44-21, 41-22, 11-28, 13-28, 24-28, 31-28, and 33-28.
5. Engineered pads will be required at the following locations: 22-15, 31-15, 42-15, 42-20, 44-21, 12-22, 21-22, and 32-22.
6. For the 24-21 location, only the NW and SW corners of the engineered pad will be built as designed to level off these areas. The remaining area of the location is level and additional dirt work is not necessary.
7. Slots (120x12 feet) will be required at the following locations: 31-21 and 42-28.
8. Due to dense sagebrush habitat at the 41-22 and 42-28 locations, the working area around the well site will be mowed no greater than 120 x 180 feet.
9. For those proposed disturbance areas mentioned below, there are lands with limited reclamation capability that shall be stabilized in a manner which eliminates accelerated erosion until a self-perpetuating non-weed native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within 30 days of the completion of construction activities at the following locations:
 - All engineered roads and engineered pads
 - The entire section of road running along the narrow ridgeline in the NW ¼ of section T53N, R75W, Section 28.
10. The approval of this project does not grant authority to use off lease federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective on the date in which the right-of-way grant is signed by the authorized officer of the BLM.
11. 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 Cedar Draw Unit 2 POD is Covert Green, 18-0617 TPX.
12. Provide 4” of aggregate where grades exceed 8% for stability and erosion prevention.
13. 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 water bars shall be placed according to the following spacing:

<u>Grade</u>	<u>Drainage Spacing</u>
2-4%	310 ft
5-8%	260 ft
9-12%	200 ft
12-15%	150 ft

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

Reclamation Standards:

- C. 3. 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.
- C.4. 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.
- C.5. 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.
- C.6. 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.

15. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultivation 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. In lieu of a different specific mix desired by the surface owner, use the following:

Loamy/Shallow Loamy/Clayey Seed Mix

Species	% in Mix	Lbs PLS*
Western wheatgrass (<i>Pascopyrum smithii</i>)	30	3.6
Bluebunch wheatgrass (<i>Pseudoroegneria spicata ssp. Spicata</i>)	20	2.4
Green needlegrass (<i>Nassella viridula</i>)	20	2.4
Thickspike wheatgrass (<i>Elymus lanceolatus ssp. lanceolatus</i>)	15	1.8
Four-wing saltbush (<i>Atriplex canescens</i>)	5	0.6
White or purple prairie clover (<i>Dalea candidum, purpureum</i>)	5	0.6
Prairie coneflower (<i>Ratibida columnifera</i>)	5	0.6
Total	100%	12 lbs/acre

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- *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.

16. Please contact Theresa M. Gulbrandson Natural Resource Specialist, @ (307) 684-1166, Bureau of Land Management, Buffalo, if there are any questions concerning these surface use COAs.

Wildlife

1. The following conditions will reduce 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 timing limitation will affect the following:

<i>Township/ Range</i>	<i>Sec.</i>	<i>Affected Wells and Infrastructure</i>
53/75	17	The ENTIRE pipeline proposed to corridor the two-track in the southern portion of this section.
53/75	20	Wells: 13-20, 33-20, and 42-20 Impoundments: P13-20-5375 and P23-20-5375 ALL project related activities north of the access route to the 33-19 wells, north of the Plague impoundment and infrastructure associated with the 42-20 well including the compressor station.
53/75	21	Wells: 22-21, 24-21, 33-21, and 44-21 Impoundments: 33-21-5375 ALL project related activities within this ENTIRE section, <i>except</i> the 11-21, 13-21, 31-21, and 42-21 wells and their associated infrastructure.
53/75	28	Wells: 24-28, 31-28, 33-28 and 44-28 Impoundments: 31-28-5375 ALL project related activities within the SE ¼ of this section. ALL infrastructure associated with the 31-28 and 24-21 wells.
53/75	33	Wells: 31-33 and 42-33 Impoundments: 12-33-5375, 21-33-5375, and 22-33-5375 ALL project related activities within this ENTIRE 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 disturbing 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 disturbing 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. This applies to the following nest(s):

BLM ID#	SPECIES	UTM	LEGAL LOCATION	SUBSTRATE	CONDITION
3518	Unknown	428003E	NWNE Sec. 17	Juniper, live	Fair

BLM ID#	SPECIES	UTM	LEGAL LOCATION	SUBSTRATE	CONDITION
		4936490N	T53N, R75W		
None	Unknown	427855E 4934521N	SWNE Sec. 20 T53N, R75W	Juniper, dead	Good
None	Golden eagle	429502E 4933894N	NWSE Sec. 21 T53N, R75W	Cliff	Fair
2968	Red-tailed hawk	429944E 4931821N	NENE Sec. 33 T53N, R75W	Cottonwood, live	Good
3519	Unknown	428861E 4930928N	NWSW Sec. 33 T53N, R75W	Cottonwood, live	Poor
3795	Great-horned owl	429367E 4930964N	NESW Sec. 33 T53N, R75W	Juniper, live	Good

- d. Following nest productivity surveys (no earlier than June 1 or later than June 30), if nest 2968 (NENE Section 33, T53N, R73W) is active, Williams Production RMT Company will monitor the activity of the raptors at the nest for the remainder of the nesting period (until July 31 or the young have fledged) during operations and maintenance visits to the 44-28 well location for the first five years following project completion. Monitoring will occur as follows:

A biologist is required to monitor the nest during well metering, maintenance and other site visits (excluding emergencies) and document the birds' behavior in response to human activity, equipment activity and noise throughout the entire buffer. The biologist must be in position to monitor the nest at least ½ hour before the monitoring or maintenance crews arrive and begin work and ½ hour after the monitoring or maintenance crews leave for the day. The biologist will record all of the bird's activity and document weather conditions and submit a report of the activity to the BLM biologist.

- e. 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.
- f. Well metering, maintenance and other site visits within 0.5 miles of raptor nests shall be minimized as much as possible during the breeding season (February 1 – July 31), and restricted to between 0900 and 1500 hours.
2. The following conditions will reduce impacts to sage-grouse:
- a. No surface disturbing activities are permitted within 2 miles of a sage grouse lek 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:

<i>Township/ Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
53/75	15	Wells: 31-15, 33-15, 42-15, and 44-15 Impoundments: 21-15-5375, 23-15-5375, and 33-15-5375 ALL project related activities within the eastern ½ of this section.
53/75	21	Wells: 44-21 ALL project related activities southeast of and including the pipeline in the southeast ¼ of this section.
53/75	22	Wells: 12-22, 21-22, 32-22, and 41-22 ALL project related activities within this ENTIRE section.
53/75	27	ALL project related activities within this ENTIRE section.
53/75	28	Wells: 22-28, 24-28, 31-28, 33-28, 42-28, and 44-28

<i>Township/ Range</i>	<i>Section</i>	<i>Affected Wells and Infrastructure</i>
		Impoundments: 31-28-5375 ALL project related activities within the eastern ½ of this section.
53/75	33	Wells: 31-33 and 42-33 Impoundments: 21-33-5375 ALL project related activities within the eastern ½ of the section.

- b. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
- c. 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.
- d. Well metering, maintenance and other site visits within 0.5 miles of documented sage grouse lek sites shall be minimized as much as possible during the breeding season (March 1– June 15), and restricted to between 0900 and 1500 hours.
3. The following conditions will reduce impacts to sharp-tail-grouse:
 - a. A survey is required for sharp-tailed grouse between April 1 and May 7, annually, within the project area for the life of the project and results shall be submitted to a BLM biologist.
 - b. If an active lek is identified during the survey, the 0.64 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
 - c. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.5 mile buffer until the following breeding season (April 1).
 - d. Creation of raptor hunting perches will be avoided within 0.64 miles of documented sharp-tailed grouse lek sites. Perch inhibitors will be installed to deter avian predators from preying on grouse.

Water Management Plan

1. Headcuts HC 28-1 and HC 28-2 located below Reservoir 31-28-5375 are large and are formed in erosive material. If erosion and slope failure develop on the face of these headcuts, then discharge of CBNG water over this headcut will be discontinued or the outlet pipe from the upstream reservoir will be extended so that it discharges downstream of the base of HC 28-2.

Cultural Resources

1. Road upgrade activities near sites 48CA4463 and 48CA5714 (NW ¼ of Section 28, T53N R75W) will have the following requirements:
 - The eastern edge of the existing two-track road will be the eastern boundary for road construction activities.
 - Temporary orange construction fencing will be placed along the eastern boundary of the two-

track road during construction activities and will be removed after completion.

2.4. Alternatives considered but not analyzed in detail

Direct Discharge

Direct discharge to tributaries of Wild Horse Creek is used as part of the water management strategy for the Cedar Draw Unit 2 POD, but sole use of this strategy is not feasible because the amount of water produced would overwhelm the infiltration and evapotranspiration capacity of the downstream tributaries and one downstream landowner has requested that ephemeral channels on his property remain dry. Limits imposed by the WDEQ discharge permit for this POD specify that CBNG water may not reach the Powder River.

Re-injection

Re-injection of produced water within the Cedar Draw Unit 2 POD was not a reasonable solution. A review of the well logs on file with the Wyoming Oil and Gas Conservation Commission and available geologic information suggests that there are no aquifers within the immediate area that have sufficient storage capacity to accept the volume of CBNG water that would be produced from the Cedar Draw Unit 2 POD. Re-injection into deep saltwater aquifers would also render the relatively high quality produced water unsuitable for future use.

Land Application

Land application of produced water within the Cedar Draw Unit 2 POD has also been considered. Land application would involve applying the water to cropland at agronomic rates through an irrigation system. Land application is at best a seasonal approach and would require the construction of several reservoirs to store produced water during the non-irrigation season. Due to the high construction and operating costs and lack of landowner interest, land application is not a primary strategy, but several sites are available and the landowner may consider using water from reservoirs for this purpose in the future.

Treatment of Produced Water

Treatment of produced water from the Cedar Draw Unit 2 POD with subsequent discharge into the Wild Horse Creek drainage has been extensively researched to examine the full range of possibilities. The following potential treatment technologies were considered: Sulfur burners, constructed wetlands, rapid spray distillation, electrodialysis reversal, electronic water purification, reverse osmosis, ion exchange with resins, ion exchange with zeolites and cation exchange and cation removal. Sulfur burner technologies were rejected since they will not address sodium concentrations in the produced water. Use of constructed wetlands was determined to not be a reasonable alternative since they have limited utility in removing total dissolved solids and salts. Given the short growing season in the Powder River, substantial reservoir storage would still be needed. Rapid spray distillation and electronic water purification are emerging technologies that are unproven and have not been demonstrated to effectively treat CBNG water. Electrodialysis reversal has not been cost effectively applied the treatment of CBNG water. Both electrodialysis reversal and reverse osmosis would generate a brine reject stream of up to 20 percent of the design flow of the treatment system. With ion exchange technologies, it is possible to substantially reduce the volume of brine reject water however the resulting reject stream would be more concentrated. The concentrated brine from these treatment systems would need to be appropriately managed to address potential environmental concerns. The brine waters could potentially be trucked off-site for disposal, which given the volumes associated with electrodialysis reversal and reverse osmosis, would render those options uneconomic. Other options for managing the brine reject streams include evaporation in a lined pit; or dilution to stock water standards and discharge to total containment reservoirs.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on July 11, 2006. Field inspections of the proposed Cedar Draw Unit 2 POD CBNG project were conducted on the following dates with listed attendees:

March 21, 2007 by: Kandy Laramore and Darrin Barton – Deer Track Ranch; Richard VanCampen, Peggy Carter, Duane Joslyn, Rex Lynde, Gabe Gill, and Ralph Demel – Williams Production RMT, Company; Brian Venn - WWC; Ben Shoup and Dave Huber – Arcadis; Chris Williams, Clint Crago, Kathy Brus, and Theresa Gulbrandson – BLM.

March 22, 2007 by: Kandy Laramore – Deer Track Ranch; Richard VanCampen, Peggy Carter, Duane Joslyn, Rex Lynde, Gabe Gill, and Ralph Demel – Williams Production RMT, Company; Brian Venn – WWC; Ben Shoup and Dave Huber – Arcadis; Chris Williams, Arnie Irwin, Jennifer Morton, and Theresa Gulbrandson – BLM

March 23, 2007 by: Rex Lynde, Gabe Gill, and Ralph Demel – Williams Production RMT, Company; Dave Huber – Arcadis; Jerry Means – private construction; Jennifer Morton, Randy Nordsvan, and Theresa Gulbrandson – BLM

March 27, 2007 by: Duane Joslyn and Ralph Demel – Williams Production RMT, Company; Greg Hicks – WWC; Ben Shoup – Arcadis; Jerry Means – private construction; Arnie Irwin, Lee Harrelson, and Theresa Gulbrandson – BLM.

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		Chris Williams
Wilderness Values			X	Theresa Gulbrandson
ACECs			X	Theresa Gulbrandson
Water Resources	X			Chris Williams
Air Quality		X		Theresa Gulbrandson
Cultural or Historical Values		X		Clint Crago
Prime or Unique Farmlands			X	Theresa Gulbrandson
Wild & Scenic Rivers			X	Theresa Gulbrandson
Wetland/Riparian	X			Chris Williams
Native American Religious Concerns			X	Clint Crago
Hazardous Wastes or Solids		X		Theresa Gulbrandson
Invasive, Nonnative Species	X			Theresa Gulbrandson
Environmental Justice		X		Theresa Gulbrandson

3.1. Topographic Characteristics of Project Area

The project area is located approximately 3 miles northeast of Croton, WY in northwestern Campbell

County, Township 53 North, Range 75 West, Sections 15, 16, 19-22, 28, and 33, Sixth Principal Meridian. The project area involves private and federal surface overlying federal minerals. The project area is bounded by Yates' Acacia POD to the south, Yates' Neo POD to the southeast and to the north, and Lance's NW Croton, Yates' Morphius and Williams' Cedar Draw Unit 1 PODs to the west. There is currently no CBNG development directly east of the project area.

Elevations within the project area range from 4000 to 4470 feet above sea level. The topography varies within the project area from narrow stream bottomlands to rolling hills, to steep ridges that rise into large flat mesas. Sandstone outcrops and buttes are scattered along ridgelines throughout the ridges and steep channel slopes. The majority of the project area is drained by ephemeral tributaries of the Middle Prong of Wild Horse Creek, an ephemeral tributary of the Powder River. The southern portion of the project area is drained by Cedar Draw, an ephemeral tributary to Wild Horse Creek. The climate is semi-arid, averaging 14 inches of precipitation annually, more than 60% of which occurs between May and September (Heath 2006).

3.2. Vegetation & Soils

3.2.1. Soils

Soils within the project area were identified from the *North Campbell County Survey Area, Wyoming (WY705)*. The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards and published in 2004. 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. Highly erosive soils and steep slopes are present throughout the project area and reclamation potential in these areas is low.

3.2.2. Vegetation

Vegetation throughout the project area varies depending on soils and topography. Steep ridges and draws in the area are dominated by juniper and big Wyoming sagebrush intermixed with native grasses. Cottonwood trees are sparsely scattered along ephemeral tributaries and around old ranch buildings. Large areas within the western half of the project area are covered by ponderosa pine, juniper, and cedar with an understory of sagebrush and native grasses. The major vegetation community in the lowland areas was historically sagebrush grassland. Big Wyoming sagebrush was most likely the predominant overstory species; however, much of the vegetation within the lowlands has been removed from the invasion of black-tailed prairie dog colonies and/or agricultural practices that cleared the area (Heath 2006). Grasses primarily dominate the vegetative community within the lowlands currently and common species include: western wheatgrass, needleandthread, and green needlegrass. Plains prickly pear cactus is found in areas heavily disturbed by prairie dogs or grazing.

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.

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure, by dominant soil series are:

Loamy Sites:

This site occurs on land nearly level up to 50% slopes on landforms which include hill slopes and the associated alluvial fans and stream terraces, in the 15-17 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. 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/Big Bluestem Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. A mix of warm and cool season mid-grasses dominate the state.

There are primarily two plant communities found throughout the project area, the *Mixed Sagebrush/Grass* community and the *Heavy Sagebrush* community. Big sagebrush is a significant component of both communities, with sagebrush canopy cover ranging from 20% to 30% in the *Mixed Sagebrush/Grass* community, and often exceeding 60% in the *Heavy Sage* community. A mix of warm and cool-season grasses make up the majority of the understory of the *Mixed Sagebrush/Grass* community with the balance made up of annual cool-season grasses, and miscellaneous forbs. Compared to the HCPC, sagebrush and blue grama have increased and the production of cool season grasses has decreased. The dominant plants in the *Heavy Sagebrush* community tend to be somewhat similar to those found in the Historic Climax Plant Community. Weedy species, cool-season grasses, and sedges have increased and blue grama has decreased.

Dominant grasses identified throughout the project area include: Sandberg's blue grass, blue bunch wheatgrass, crested wheatgrass, little blue stem, blue grama, prairie junegrass, needleandthread, western wheatgrass, and cheat grass. Other vegetative species identified at onsite: juniper, ponderosa pine, cedar, Wyoming big sagebrush, yucca, yarrow, rabbitbrush, prickly pear cactus, fringed sagewort, ponderosa pine, and juniper.

Shallow Loamy Sites:

This site occurs on steep slopes and ridge tops, but may occur on all slopes on landforms which include hill sides, ridges and escarpments, in the 15-17 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 Historic Climax Plant Community for this site would be a Rhizomatous Wheatgrasses / Needleandthread / Big Bluestem Plant Community. A description of this plant community is described above.

The present plant communities are *Mixed Sagebrush/Grass* and *Heavy Sagebrush* communities as described above.

Clayey Sites:

This site occurs on nearly level to 30% slopes on landforms which include hill sides, alluvial fans & stream terraces in the 15-17 inch precipitation zone.

The soils of this site are moderately deep (greater than 20" to bedrock) to very deep, well-drained soils

that formed in alluvium or alluvium over residuum. These soils have slow permeability.

The HCPC for this site would be a Rhizomatous Wheatgrass/Green needlegrass community. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. A mix of warm and cool season mid-grasses dominate the state.

The present plant communities include a *Mixed Sagebrush/Grass* community and a *Heavy Sagebrush* community. Big sagebrush is a significant component of both plant communities and sagebrush canopy ranges from 20% to 30% in the *Mixed Sagebrush/Grass* community and can exceed 60% in the *Heavy Sagebrush* community. Cool-season grasses make up the majority of the understory of the *Mixed Sagebrush/Grass* community with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Compared to the HCPC, sagebrush and blue grama have increased, and green needlegrass and big bluestem have decreased, often occurring only where protected from grazing by the sagebrush canopy. The understory of the *Heavy Sagebrush* community includes rhizomatous wheatgrasses, green needlegrass, sideoats grama, Sandberg bluegrass, and prairie junegrass. This state differs from the Historic Climax Plant Community by an increase in big sagebrush and a decrease in grasses such as green needlegrass and big bluestem.

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 3.1 – Summary of Ecological Sites

Ecological Site	Acres	Percent
LOAMY (15-17NP)	1374	38%
CLAYEY (15-17NP)	927	25%
SHALLOW LOAMY (15-17NP)	895	25%
SHALLOW CLAYEY (10-14NP)	374	10%
SANDY (15-17NP)	78	2%
Total	3649	100%

3.2.3. Wetlands/Riparian

Wetlands in the POD area include five existing stock ponds and three short channel reaches where springs are present. Riparian strips are found along Windmill Draw and Lake Draw channels and their larger tributaries. Only a few smaller cottonwood trees were observed along the larger tributary channels.

3.2.4. Invasive Species

A search of the inventory maps and databases compiled by the University of Wyoming through cooperation between the BLM and Johnson County Weed and Pest revealed the possible presence of state-listed noxious weeds and invasive/exotic plant infestations. Populations of leafy spurge are found throughout the project area. Leafy spurge is a perennial weed that grows in nearly all soil types and habitats, spreads rapidly, and is difficult to control.

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 G&M, Inc (ARCADIS). ARCADIS performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests and prairie dog colonies according to protocol in 2005, 2006, and 2007. No

formal surveys were conducted for Ute ladies'-tresses orchid, though the project area was evaluated for potential habitat.

A BLM biologist conducted field visits on March 21-23, 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 Cedar Draw Unit 2 project area include pronghorn antelope, mule deer and elk. The project area is part of the Gillette pronghorn antelope herd unit. The 2004 estimated Gillette herd population was 13,985 with a population objective of 11,000 (WGFD 2004). Mule deer belong to the Powder River mule deer herd unit. The 2004 estimated Powder River herd population was 55,561 with a population objective of 52,000 (WGFD 2004).

The WGFD has designated the northern half of the project area as yearlong and small portions of the southern edge of the project area as winter range for pronghorn antelope. The western half of the project area is designated as winter-yearlong and the eastern half of the project area as yearlong range for mule deer. Populations of pronghorn antelope and mule deer within their respective hunt areas are above WGFD objectives.

Although the entire project area is outside of the Fortification Creek herd unit and therefore not managed for elk by the WGFD, thirteen elk data points were collected by the BLM from Fortification herd unit collared elk throughout the southern halves of Sections 19 and 20, T53N, R75W from April through July of 2005. These observations indicate that the elk are likely using this area as parturition grounds. Designated parturition range for the Fortification elk herd unit is located approximately 5.3 miles southwest of this location. Designated yearlong range is located approximately 2.0 miles southwest of this location and from activities associated with this project.

Winter use is when a population or portion of a population of animals uses the documented suitable habitat sites within this range annually, in substantial numbers only during the winter period. **Winter-Yearlong** use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions. 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 Middle Prong of Wild Horse Creek, an ephemeral tributary of the Powder River. During field investigations, a total of eight natural springs were found within a one-mile radius of the development area, four of which are located within the project area. The springs each produce a very small amount of water and have not been developed by the landowner (WWC Engineering 2006). Fish that have been identified in the Powder 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).

3.3.4. Raptors

Six raptor nest sites were identified by ARCADIS within 0.5 mile of the project area, two of which were active in 2006 and four of which were active in 2007 (Table 5.).

Table 5. Documented raptor nests within the Cedar Draw Unit 2 project area in 2006 and 2007.

BLM ID#	SPECIES	UTM	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS IN 2006/2007
3518	Unknown	428003E 4936490N	NWNE Sec. 17 T53N, R75W	Juniper, live	Fair	Inactive/Inactive
None	Unknown	427855E 4934521N	SWNE Sec. 20 T53N, R75W	Juniper, dead	Good	Inactive/Active
None	Golden eagle	429502E 4933894N	NWSE Sec. 21 T53N, R75W	Cliff	Fair	Active/Active
2968	Red-tailed hawk	429944E 4931821N	NENE Sec. 33 T53N, R75W	Cottonwood, live	Good	Active/Active
3519	Unknown	428861E 4930928N	NWSW Sec. 33 T53N, R75W	Cottonwood, live	Poor	Inactive/Inactive
3795	Great-horned owl	429367E 4930964N	NESW Sec. 33 T53N, R75W	Juniper, live	Good	Active/Active

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 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).

Five black-tailed prairie dog colonies were identified during site visits by ARCADIS partially or wholly within the project area. Five additional towns are located within 1.5km of those colonies. The project area is located within the Arvada potential reintroduction area.

Table 3. Black-tailed prairie dog colonies identified during site visits by ARCADIS and the BLM BFO database within the project area or within 1.5km. of those colonies, totaling 250 acres.

Location	Size in acres	Status
<i>Within the project area</i>		
NE Sec. 16, T53N, R75W	31	Active
NW Sec. 15, T53N, R75W	21	Active
NESE Sec. 16, T53N, R75W	7	Active
SE Sec. 15, T53N, R75W	17	Active
NWNE Sec. 33, T53N, R75W	2	Active
<i>Within 1.5 km of colonies (potential complex)</i>		
SESW Sec. 22, T53N, R75W	5	Active
NENE Sec. 3, T52N, R75W	29	Active
W Sec. 11, T52N, R75W	72	Active
SESW Sec. 10, T52N, R75W	33	Active
NWNW Sec. 13, T52N, R75W	33	Active

3.3.5.1.2. Bald eagle

On February 14, 1978, the bald eagle was federally listed as Endangered in all of the continental United States except for Minnesota, Wisconsin, Michigan, Oregon, and Washington. In these states the bald eagle was listed as Threatened. On July 12, 1995 the eagle's status was changed to Threatened throughout the United States. Species-wide populations are recovering from earlier declines, and the bald eagle was proposed for de-listing in 2000, but as yet no final decision has been made.

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.

The Cedar Draw Unit 2 project has mature trees associated with it. Adult bald eagles were observed during January and February 2006 along Middle Prong Wild Horse Creek. The eagles were perched in cottonwood trees along the Middle Prong Wild Horse Creek drainage. The most suitable winter roost habitat is located within Sections 2 and 3, T53N, R75W along Middle Prong Wild Horse Creek, approximately 2 miles from the project area. Potential roost habitat also occurs along Wild Horse Creek within Section 6, T52N, R76W and Section 36, T53N, R76W. These large cottonwood trees, which are approximately 2 miles south of the project area, could potentially be used by wintering bald eagles for roost sites. However, no eagles were observed within these stands during winter surveys (Heath 2006). During 2007 winter roost surveys, ARCADIS G&M observed single adults within this cottonwood stand on January 24, and February 23 (Huber 2007).

3.3.5.1.3. 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 (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.

No perennial streams were located within the project area; however a few scattered stock ponds and four springs were observed within the Cedar Draw Unit 2 project area. All of the stream channels within the area are ephemeral with moderate to steep sloping banks and predominantly vegetated by grasses and forbs. Stream channels were stable and were not re-shaping or moving from spring runoff or significant precipitation events. Several small stock ponds occur within the area. The springs only flowed a short distance before surface flow ceased. The primary vegetation observed around the springs was sedges and rushes and channels were fairly steep without a broad open floodplain. Soils were also high in clay content which reduces the suitability of the drainages for propagation of the orchid. Based on inappropriate hydrology of the streams proposed for crossing or construction activities and disqualifying habitat features within the project area, suitable orchid habitat is not present within the Cedar Draw Unit 2 project area.

3.3.5.2. 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*).

3.3.5.2.1. 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.

Five black-tailed prairie dog colonies were identified during site visits by ARCADIS partially or wholly

within the project area.

Table 4. Black-tailed prairie dog colonies identified during site visits by ARCADIS and the BLM BFO database within the project area, totaling 78 acres.

Location	Size in acres	Status
NE Sec. 16, T53N, R75W	31	Active
NW Sec. 15, T53N, R75W	21	Active
NESE Sec. 16, T53N, R75W	7	Active
SE Sec. 15, T53N, R75W	17	Active
NWNE Sec. 33, T53N, R75W	2	Active

3.3.5.2.2. 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).

Suitable sharp-tailed grouse habitat exists throughout the project area. One sharp-tailed grouse lek was documented within 2 miles of the project area. The Windmill Draw sharp-tailed grouse lek was discovered during the 2007 breeding seasons. This lek was documented as active during field visits on April 18 and 25, 2007.

Greater sage-grouse are found in prairie, sagebrush shrublands, other shrublands, wet meadows, and agricultural areas; they depend upon substantial sagebrush stands for nesting and winter survival (BLM 2003).

Suitable sage-grouse habitat is present within the project area. Two documented sage-grouse leks are present within two miles of the project area (Table 6). Sage-grouse were observed by ARCADIS on both of these leks in 2006 and 2007.

Table 6. Documented sage-grouse and sharp-tailed grouse leks within two miles of the Cedar Draw Unit 2 project in 2006 and 2007.

Lek ID	UTM NAD83	Legal Location	Status (Peak Males) in 2006/2007	Distance From Project Area (Miles)
Laramore	432237E 4931855N	SWSW Sec. 26 T53N, R75W	10/14	1.6
Playa	433858E 4937162N	SWSW Sec. 12 T53N, R75W	21/11	1.0
Windmill Draw (new in 07)	432049E 4932764N	SWNW Sec. 26 T53N, R75W	0/10	1.0

3.3.5.2.3. 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.

Mountain plover breeding and nesting habitat exists throughout the project area, mainly in the prairie dog colonies listed in Table 6. Surveys for mountain plover occupancy according to Service protocol were conducted during 2005 and 2006 (ARCADIS) nesting seasons. No mountain plovers were observed.

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

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 Powder River drainage system. South Windmill Draw, a tributary to Middle Fork Wild Horse Creek, drains most of the POD area. Lake Draw, a larger named tributary to South Windmill Draw courses through the center of the POD area. Cedar Draw, Deadman Draw and Spring Draw are small tributaries to Wild Horse Creek that drain the west side of the POD area.

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 8 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 140 to 1012 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 Wild Horse Creek drainage which is a tributary to the Upper Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) 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 range from well vegetated grassy swales without well-defined bed and banks to incised channels with steep and erosive banks.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in $\mu\text{mhos/cm}$) 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 CBNG produced water of varying chemical composition to surface drainages within the Project Area” (PRB FEIS page 3-48). For the Upper Powder River watershed, the EC ranges from 1,797 at Maximum monthly flow to 3,400 at Low monthly flow and the SAR ranges from 4.76 at Maximum monthly flow to 7.83 at Low monthly flow. These values were determined at the USGS station located at Arvada, WY, Station ID 06317000 (PRB FEIS page 3-49).

The operator has identified eight natural springs within one-mile of the POD boundary (see Table 11, page 25 of the WMP). The estimated flow rate of the springs was equal to or less than 10 gallons per day. Water quality analyses for all springs are found in Attachment G of the WMP. Spring 24-21c is typical of the springs with a water quality of 5620 $\mu\text{mhos/cm}$ conductivity and 5470 mg/l TDS.

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

3.6. Cultural Resources

A Class III inventory was conducted for the Cedar Draw 2 project prior to on-the-ground project work (BFO project #'s 70060263). Greer Services, conducted the Class III inventories following the

Archeology and Historic Preservation: Secretary of the Interior’s Standards and Guidelines (48FR190) for the proposed project. Clint Crago, BFO archaeologist, reviewed the reports for technical adequacy and for compliance with BLM and Wyoming State Historic Preservation Office standards, and determined them to be adequate. The following resources are located within the Area of Potential Effect (APE).

Table 3.6 Cultural Resource Sites Identified within the Cedar Draw II Project Area

Site Number	Site Type	Eligibility
48CA2528	Historic Dump	Not Eligible
48CA2529	Historic Homestead	Not Eligible
48CA4452	Historic Homestead	Not Eligible
48CA4453	Historic Herder Camp and Prehistoric Lithic Scatter	Not Eligible
48CA4454	Historic Dump	Not Eligible
48CA4455	Historic Artifact Scatter and Prehistoric Lithic Scatter	Not Eligible
48CA4456	Historic Herder Camp	Not Eligible
48CA4457	Historic Homestead Historic and Prehistoric Lithic Scatter	Not Eligible
48CA4458	Historic Homestead	Not Eligible
48CA4463	Historic Artifact Scatter and Prehistoric Stone Circle Site, Lithic Scatter	Eligible
48CA5247	Historic Artifact Scatter	Not Eligible
48CA5248	Historic Homestead	Not Eligible
48CA5382	Prehistoric Lithic Scatter	Not Eligible
48CA5708	Historic Dump	Not Eligible
48CA5713	Historic Foundations and Artifact Scatter	Not Eligible
48CA5714	Prehistoric Stone Circle Site	Eligible

3.7. Foot Rot

Foot rot, also called infectious pododermatitis, foul claw, or hoof rot, is an acute or chronic infection of cattle characterized by lameness, swelling, and inflammation of the skin of the coronary band and the skin between the claws. The disease is seen most commonly in feedlot cattle or in the winter and spring months when mud, urine, and manure are the greatest problem. There is no indication that incidence of foot rot has occurred or increased anywhere in the Powder River Basin in association with coal bed methane development. It is extremely unlikely foot rot problems will occur or increase as a result of this project, therefore it will not be discussed further in this analysis.

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

Impacts to vegetation and soils from surface disturbance will be reduced by following the operator's plans and BLM applied mitigation. The operator has proposed to drill 74 wells on 37 locations. Of the 37 proposed twin well locations, 26 can be drilled without a well pad being constructed, 2 will require slots, and 9 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the (56) 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 25 x 45 x 8 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 56 wells would involve approximately 0.5 acre/well for 14 total acres. The other 18 wells requiring cut & fill pad construction would disturb approximately 0.6 acres/well pad for a total of 5.4 acres. The total estimated disturbance for all 74 wells would be 19.4 acres.

Approximately 14.1 miles of improved roads would be constructed to provide access to various well locations. Approximately 8.5 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Approximately 2.3 miles of pipeline would be constructed outside of corridors. In addition, 8 staging areas (200 x 200 feet/staging area) throughout the POD would disturb approximately 7.4 acres. A transformer station requiring cut & fill pad construction approximately 120 x 180 in size would disturb approximately 0.6 acres.

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

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Soil Compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Loss of soil vegetation cover, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.
- Soil productivity would be eliminated along improved roads and severely restricted along two track trails until successful final reclamation is achieved.
- Modification of hill slope hydrology.

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. Seed mixes for the Cedar Draw Unit 2 POD were determined based on soil map unit types, the dominant ecological sites found within the project area, and the mixing of soil horizons in disturbed areas. A loamy/shallow loamy/clayey seed mix was created for the entire POD (see site specific COAs).

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	28	0.5/acre	14	Long Term
Constructed Pad	9	or Site Specific	5.4	
Gather/Metering Facilities	0	Site Specific	0.0	Long Term
Screw Compressors	0	Site Specific	0.0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments	23		72.3	Long Term
On-channel	19	Site Specific	43.1	
Off-channel	4	Site Specific	28.7	
Water Discharge Points	23	Site Specific or 0.02 ac/WDP	0.46	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	1	Site Specific	13.4	
Improved Roads	14.1	60' Width or Site Specific	97.1	Long Term
No Corridor	5.5		38.5	
With Corridor	8.6		58.6	
2-Track Roads	8.5	12' Width or Site Specific	30.9	Long Term
No Corridor	3.2		5	
With Corridor	5.3	40' Width or Site Specific	25.9	
Pipelines	3.6	25' Width or Site Specific	13.2	Short Term
No Corridor	2.3		6.9	
With Corridor	1.3		6.3	
Buried Power Cable	0	12' Width or Site Specific	0	Short Term
No Corridor				
Overhead Powerlines	0.0	15' Width	0	Long Term
Additional Disturbance	8 Staging Areas	200 x 200	7.4	Short Term

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
	Transformer Station	120 x 180	0.6	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

Channels in and potentially downstream of the POD area will be perennialized in some reaches by sustained CBNG discharge that is not contained by reservoirs. As the hydrologic regime of these channels change from ephemeral (in most stream reaches) to perennial, riparian species composition may change to those that are more adept to inundated root zones. Existing riparian vegetation may be impacted by the influx of these more water resistant species, such as salt grass, foxtail barley and salt cedar (tamarisk). Less desirable species may out-compete more desirable grazing species such as western wheatgrass. Also, soil chemistry may change due to exposure to CBNG discharge which can influence species success. Specifically, salts can become elevated in the riparian soils, thus favoring salt tolerant plant species for growth.

4.1.2. Invasive Species

The Operator has a comprehensive weed management program that will focus on preventing the introduction of noxious weeds and other identified weedy species, and controlling previously established leafy spurge infestations during the construction, operation, and reclamation of the Cedar Draw Unit 2 POD. This plan includes education of employees and contractors, prevention through inspections and monitoring, and control using chemical and mechanical methods. For more information see Cedar Draw Unit 2 POD, Integrated Weed Management Plan.

Cheatgrass or downy brome (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) are known to exist in the affected environment. These two species are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time. Pricklypear cactus (*Opuntia polyacantha*), is a native species and found throughout native rangelands. A control program for this species is not recommended.

Utilization of existing facilities and 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.

4.1.3. Cumulative Effects

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

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur to soils and vegetation as a result of discharged produced CBNG water. The cumulative effects on vegetation and

soils are within the analysis parameters and impacts described in the PRB FEIS for the following reasons:

- They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 16.8% 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 Wild Horse Creek drainage.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, yearlong and winter range for pronghorn antelope and winter-yearlong and 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. Given these impacts, it is likely elk may no longer use the remaining habitat within the project area.

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 will be discharged into 6 existing and 13 proposed on-channel impoundments and 4 proposed off-channel impoundments. If an impoundment 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

WDEQ is aware of the concerns about the effects of water quality and flows relative to discharge of treated water directly into the Powder River. They are taking a conservative approach to permitting until more information can be obtained and their watershed based permitting approach is implemented. Long term water quality and flow monitoring, that would be required in the NPDES permit, would ensure that effluent limitations are met. Under permitted conditions, it is not anticipated that existing downstream water uses would be affected. The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-247. No additional mitigation measures are required.

4.2.3. Migratory Birds Direct and Indirect Effects

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

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 Cedar Draw Unit 2 project area (Timing limitations will apply to this infrastructure).

BLM ID#	UTM (NAD 83)	SPECIES	WELL / PIT NUMBER	DISTANCE
None	427855E 4934521N	Unknown	Wells: 13-20 SA, WG 33-20 SA, WG 42-20 SA, WG	0.43 0.27 0.42
None	429502E 4933894N	Golden eagle	Wells: 22-21 SA, WG 24-21 SA, WG 33-21 SA, WG 44-21 SA, WG 31-28 SA, WG Impoundments: 33-21-5375 31-28-5375	0.40 0.25 0.21 (out of line-of-sight) 0.37 0.44 0.15 0.41
2767	429944E 4931821N	Red-tailed hawk	Wells: 24-28 SA, WG 33-28 SA, WG 44-28 SA, WG 31-33 SA, WG 42-33 SA, WG Impoundments: 21-33-5375 22-33-5375	0.44 0.47 0.18 0.23 0.30 0.42 0.46
3519	428861E 4930928N	Unknown	Impoundments: 12-33-5375 21-33-5375 22-33-5375	0.25 0.45 0.37
3795	429367E 4930964N	Great-horned owl	Wells: 31-33 SA, WG 42-33 SA, WG Impoundments: 12-33-5375 21-33-5375 22-33-5375	0.47 0.44 0.33 0.36 0.27

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 44-28 SA, WG wells remain within 950' and line-of-sight of the red-tailed hawk nest in NENE Section 33, T53N, R75W and may still disturb nesting activities, thereby reducing productivity and possibly result in nest abandonment. In order to evaluate this well's effect on nesting activity, Williams' Production RMT Company will be required to monitor the activity of nesting raptors in association with well maintenance and operation visits.

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 three species that are Threatened or Endangered under the Endangered Species Act. Potential project effects on Threatened and Endangered Species were analyzed in a Biological Assessment and a summary is provided in Table 4.3. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered 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 of insufficient size.
Threatened				
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Mature forest cover often within one mile of large water body.	S	LAA	Project includes overhead power.
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.

Listed Species

- 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 the Cedar Draw Unit 2 project area are of insufficient size for supporting ferrets, implementation of the proposed development should have “no effect” on the black-footed ferret.

4.2.5.1.2. 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 Cedar Draw Unit 2 project area. The proposed project should not affect bald eagle nesting or winter roosting, though given the high volume of prairie dog colonies within the project area, is “likely to adversely affect” foraging bald eagles.

There are 3.2 miles of existing overhead three-phase distribution and single-phase lines within the project area. The wire spacing is likely in compliance with the Avian Power Line Interaction Committee’s (1996) suggested practices and with the Service’s standards (USFWS 2002); however other features may not be in compliance. Williams previously proposed an additional 1.9 miles of overhead three-phase distribution lines within the project area and 6.3 miles outside the project area as part of the Cedar Draw Unit 1 project. This previously proposed and approved line has not yet been constructed and will be used to also service the Cedar Draw Unit 2 project.

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

Produced water will be stored in 17 proposed and 6 existing impoundments which may attract eagles if reliable prey is present, most likely in the form of waterfowl. The effect of the impoundments on eagles is unknown. The impoundments could prove to be a benefit (e.g. increased food supply) or an adverse effect (e.g. contaminants, proximity of power lines and/or roads to water). Eagle use of impoundments should be reported to determine the need for any future management.

4.2.5.1.3. Ute’s Ladies Tresses Orchid

Many of the impoundments are located within ephemeral drainages of the Powder River. The remaining proposed impoundments are located in upland habitats. Eight springs were identified within one-mile of the project area. Only Spring 16-2 may be affected by channel discharge (WWC Engineering 2006).

Impoundment seepage may create suitable habitat if historically ephemeral drainages become perennial, however no historic seed source is present within the project area. Implementation of the proposed coal bed natural gas project should not affect 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.
Spotted frog (<i>Rana pretiosa</i>)	Ponds, sloughs, small streams	NP	NI	Prairie not mountain habitat.
Birds				
Baird's sparrow (<i>Ammodramus bairdii</i>)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
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	S	MIIH	Prairie dog colony present.
Ferruginous hawk (<i>Buteo regalis</i>)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Sagebrush cover 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%	S	MIIH	Habitat may be affected by roads and pipelines
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. Black-tailed prairie dog

To prevent direct habitat loss, the access / pipeline corridors to the 11-15 and 22-15 wells shall be relocated to avoid the prairie dog colony. The two access / pipeline corridors associated with the 33-15, 42-15, and 44-15 wells were unable to be relocated due to topography. The well houses and nearby power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent road may result in prairie dog road mortalities.

4.2.5.2.2. Grouse

Direct grouse habitat loss from wells and their associated corridors will total 23.1 acres. From the construction of impoundments, 22.2 acres of sagebrush habitat will be directly lost.

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

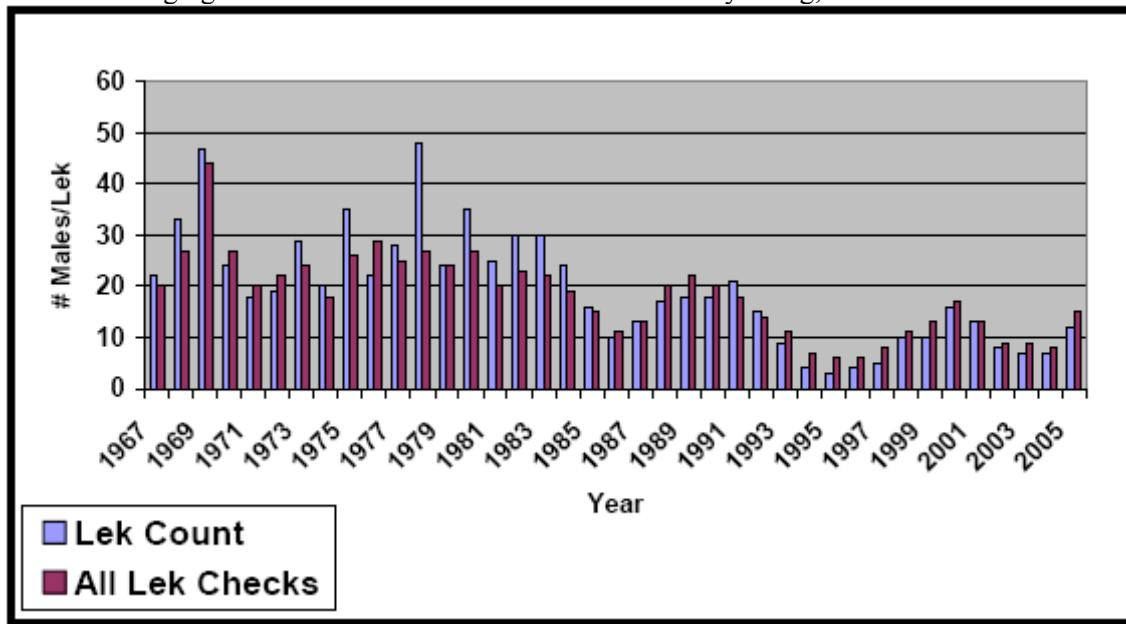
Upper Green River Basin study area, reported only 45% of their sage grouse hens nested within 3 km (1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found 36% of their grouse nesting within 3 km of the capture leks. Moynahan's study area was north-central Montana in an area of mixed-grass prairie 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).

Impacts to sharp-tailed grouse will be similar to greater sage-grouse.

4.2.5.2.3. Mountain plover

Suitable mountain plover habitat is present within the project area, but limited to within the prairie dog colonies in the eastern portions of the project area. Surveys for mountain plover were conducted in 2005 and 2006. No plovers were observed.

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, roads, pipe line corridors, and nearby metering facilities 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).

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 Powder River watershed and a commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), should minimize project area and downstream potential 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 30 gpm per well or 1110 gpm (2.5 cfs or 1,791 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 22,351 acre-feet in 2006 (estimated maximum year). As such, the volume of water resulting from the production of these wells is 8% 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 40% to groundwater aquifers and coal zones in the Upper Powder River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 444 gpm will infiltrate at or near the discharge points and impoundments (716 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 140 to 1012 feet compared to 650 to 1800 feet spanning the Anderson and Gates coal production zones. 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 gaging 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

Predicted Values	TDS, mg/l	SAR	EC, µmhos/cm
Most Restrictive Proposed Limit –		2.0	1,000
Least Restrictive Proposed Limit		10.0	3,200
Upper Powder River Watershed at Arvada, WY USGS #06317000 Gauging Station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			

Predicted Values	TDS, mg/l	SAR	EC, µmhos/cm
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirements for WYPDES Willow Creek General Watershed Permit			
At discharge point	5,000	na	7,500
At Irrigation Compliance point	na	na	na
Predicted Produced Water Quality			
Anderson Coal Zone	1,840	27.3	2,780
Gates Coal Zone	1,430	20.8	2,200

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 1840.0 mg/l TDS which is/is not within the WDEQ criteria for agricultural use (2000 mg/l TDS).

The quality for the water produced from the Anderson and Gates target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 30.0 gallons per minute (gpm) is projected is to be produced from these 37 wells, for a total of 1110.0 gpm for the POD. See Table 4.5 .

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

There are 23 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, 17 new impoundments (324.3 acre-feet) would potentially be constructed within the project area, along with 6 existing impoundments that will be upgraded. These impoundments will disturb approximately 71.8 acres including the dam structures. Of these water impoundments, 13 will be on-channel reservoirs that will disturb 43.1 acres and 4 will be off-channel ponds disturbing 28.7 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 at least 0.4 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). Some CBNG water will be discharged to channels downstream of reservoirs, therefore this flow rate could be substantially higher. 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 Powder River of 68 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 37 well locations is anticipated to be a total of 1110.0 gpm or 2.5 cfs to impoundments. Since the WYPDES permit allows for direct discharge this POD could contribute the full 2.5 cfs to downstream flow, or 2.0 cfs using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) to the Upper Powder River flows, or 3% of the predicted total CBNG produced water contribution.

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP page 3). Based on the area of the South Windmill Draw watershed above the POD (14.9 sq mi) and an assumed density of one wells per location every 80 acres, the potential exists for the development of 123 wells which could produce a maximum flow rate of 3,690 gpm (8.2 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 8.2 cfs, is much less than the volume of runoff estimated from the 2-year storm event for the South Windmill Draw of the drainage which equals 134 cfs.

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

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

Permit effluent limits were set at (WYPDES permit number WY0050865 page 2):

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	1 pCi/l max
Dissolved iron	1000 µg/l max
Dissolved manganese	630 µg/l max
Total Barium	1800 µg/l max
Total Arsenic	7 µg/l max
Chlorides	46 mg/l

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

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.

The development of coal bed natural gas and the production and discharge of water in the area surrounding the existing natural spring may affect the flow rate or water quality of the spring.

In-channel downstream impacts are addressed in the WMP for the Cedar Draw Unit 2 POD prepared by Western Water Consultants for Williams Production RMT Company.

4.4.2.1. Surface Water Cumulative Effects

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

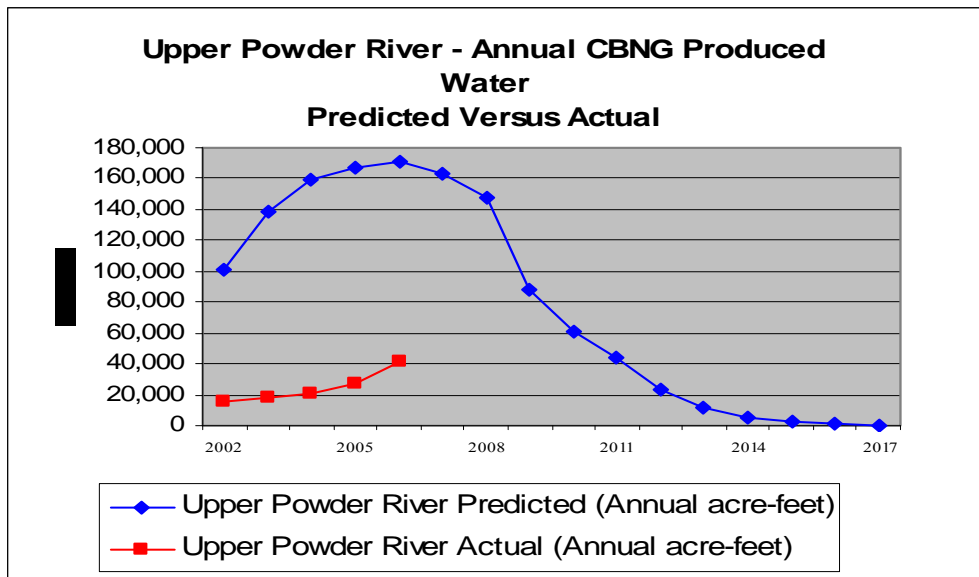
As of December 2006, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 123,984 acre-ft of water compared to the predicted 736,519 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Table 4.6 and Figure 4.1 following. This volume is 16.8 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

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

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

2017	366	1,285,233			
Total	1,285,233		123,984		

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



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

The PRB FEIS states, “Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ’s (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. 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 Powder River drainage, which is approximately 16.8% 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 Powder River watershed and page 117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

Sites 48CA2528, 48CA4452, 48CA4453, 48CA4454, 48CA4455, 48CA5247, 48CA5248 and 48CA5708 will be impacted by the project; however all are considered not eligible to the NRHP. Sites 48CA4463 and 48CA5714 have been recommended as eligible to the NRHP and require avoidance measures including temporary fencing to mitigate potential impacts (refer to site specific mitigation measures - Section 2.3.3) On 6/14/07, the Bureau electronically notified the Wyoming State Historic Preservation Office (SHPO), following section V(A)(2) of the Wyoming State Protocol, that no historic properties were identified in the area of potential effect.

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
Penny Bellah	POD Specialist	Williams Production RMT, Co.	No
Duane Joslyn	Operations Superintendent	Williams Production RMT, Co.	Yes
John Kretschman	Landowner		Yes
Kandy Laramore	Permittee	Deer Track Ranch	Yes
Darrin Barton	Permittee	Deer Track Ranch	Yes
Ben Shoup	Project Manager	Arcadis	Yes
Mary Hopkins	Interim Wyoming 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.

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