

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

Lance Oil & Gas Company Inc.
Quarter Circle 9 BETA POD

ENVIRONMENTAL ASSESSMENT –WY-070--08-055

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Lance Oil & Gas Company Inc.'s Quarter Circle 9 BETA POD Coal Bed Natural Gas (CBNG) POD comprised of the following 46 Applications for Permit to Drill (APDs):

	Well Name	Well #	QTR/QTR	Sec	TWP	RNG	Lease
1	Quarter Circle 9 Beta Fed	12-13	SWNW	13	51N	79W	WYW142091
2	Quarter Circle 9 Beta Fed	14-13	SWSW	13	51N	79W	WYW142091
3	Quarter Circle 9 Beta Fed	21-13	NENW	13	51N	79W	WYW142091
4	Quarter Circle 9 Beta Fed	23-13	NESW	13	51N	79W	WYW142091
5	Quarter Circle 9 Beta Fed	24-13	SESW	13	51N	79W	WYW142091
6	Quarter Circle 9 Beta Fed	31-13	NWNE	13	51N	79W	WYW142091
7	Quarter Circle 9 Beta Fed	32-13	SWNE	13	51N	79W	WYW142091
8	Quarter Circle 9 Beta Fed	33-13	NWSE	13	51N	79W	WYW142091
9	Quarter Circle 9 Beta Fed	12-14	SWNW	14	51N	79W	WYW142091
10	Quarter Circle 9 Beta Fed	13-14	NWSW	14	51N	79W	WYW142091
11	Quarter Circle 9 Beta Fed	22-14	SENW	14	51N	79W	WYW142091
12	Quarter Circle 9 Beta Fed	23-14	NESW	14	51N	79W	WYW142091
13	Quarter Circle 9 Beta Fed	31-14	NWNE	14	51N	79W	WYW142091
14	Quarter Circle 9 Beta Fed	32-14	SWNE	14	51N	79W	WYW142091
15	Quarter Circle 9 Beta Fed	34-14	SWSE	14	51N	79W	WYW142091
16	Quarter Circle 9 Beta Fed	42-14	SENE	14	51N	79W	WYW142091
17	Quarter Circle 9 Beta	12-15	SWNW	15	51N	79W	WYW142092
18	Quarter Circle 9 Beta	14-15	SWSW	15	51N	79W	WYW142092
19	Quarter Circle 9 Beta	21-15	NENW	15	51N	79W	WYW142092
20	Quarter Circle 9 Beta	23-15	NESW	15	51N	79W	WYW142092
21	Quarter Circle 9 Beta	32-15	SWNE	15	51N	79W	WYW142092
22	Quarter Circle 9 Beta	34-15	SWSE	15	51N	79W	WYW142092
23	Quarter Circle 9 Beta	41-15	NENE	15	51N	79W	WYW142092
24	Quarter Circle 9 Beta	43-15	NESE	15	51N	79W	WYW142092
25	Quarter Circle 9 Beta	11-22	NWNW	22	51N	79W	WYW142092
26	Quarter Circle 9 Beta	12-22	SWNW	22	51N	79W	WYW142092
27	Quarter Circle 9 Beta	31-22	NWNE	22	51N	79W	WYW142092
28	Quarter Circle 9 Beta	41-22	NENE	22	51N	79W	WYW142092
29	Quarter Circle 9 Beta	42-22	SENE	22	51N	79W	WYW142092
30	Quarter Circle 9 Beta Fed	11-23	NWNW	23	51N	79W	WYW142091
31	Quarter Circle 9 Beta Fed	14-23	SWSW	23	51N	79W	WYW142091
32	Quarter Circle 9 Beta Fed	21-23	NENW	23	51N	79W	WYW142091
33	Quarter Circle 9 Beta Fed	23-23	NESW	23	51N	79W	WYW142091

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35	Quarter Circle 9 Beta Fed	34-23	SWSE	23	51N	79W	WYW142091
36	Quarter Circle 9 Beta Fed	41-23	NENE	23	51N	79W	WYW142091
37	Quarter Circle 9 Beta Fed	44-23	SESE	23	51N	79W	WYW142091
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43	Quarter Circle 9 Beta Fed	32-24	SWNE	24	51N	79W	WYW142091
44	Quarter Circle 9 Beta Fed	34-24	SWNE	24	51N	79W	WYW142091
45	Quarter Circle 9 Beta Fed	43-24	NESE	24	51N	79W	WYW142091
46	Quarter Circle 9 Beta Fed	42-25	SENE	25	51N	79W	WYW142095

Disposal of federally produced water is by subsurface drip irrigation (SDI) system at 48 sites within Township 51 North, Range 79 West; Sections 1, 2, 3, 9, 10, 11, 16, 17 and 20.

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
Lance Oil & Gas Company Inc.
Quarter Circle 9 BETA POD
PLAN OF DEVELOPMENT
WY-070-08-055**

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on 8 federal oil and gas mineral leases (WYW142088, WYW142089, WYW142091, WYW142092, WYW142095, WYW160072, WYW153571 & WYW174600) issued to the applicant by the BLM. All 8 leases are committed to the Quarter Circle Nine Unit Agreement (WYW168658X)

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

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

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternative A - No Action

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

2.2. Alternative B Proposed Action

Proposed Action Title/Type: Lance Oil & Gas Company Inc.’s Quarter Circle 9 BETA POD Plan of Development (POD) for 47 coal bed natural gas well APD’s and associated infrastructure.

Proposed Well Information: There are 47 wells proposed within this POD, the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from the Wall coal seam. Proposed well house dimensions are 42 inch fiberglass cubical for the well head with the metering devise contained onsite inside a 3 foot by 3 foot by 8 foot tall metal skid structure. Well house color is Covert Green, selected to blend with the surrounding vegetation. Wells are located as follows:

	Well Name	Well #	QTR/QTR	Sec	TWP	RNG	Lease
1	Quarter Circle 9 Beta Fed.	12-13	SWNW	13	51N	79W	WYW142091
2	Quarter Circle 9 Beta Fed.	14-13	SWSW	13	51N	79W	WYW142091
3	Quarter Circle 9 Beta Fed.	21-13	NENW	13	51N	79W	WYW142091
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46	Quarter Circle 9 Beta	32-25	SWNE	25	51N	79W	WYW142095
47	Quarter Circle 9 Beta	42-25	SENE	25	51N	79W	WYW142095

Water Management Proposal:

Disposal of federally produced water is by subsurface drip irrigation (SDI) at 48 sites within Township 51 North Range 79 West; sections 1,2,3,9,10,11,16,17 and 20 developed by Beneterra, LLC.

The following CBNG water storage impoundments were proposed for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	44-14-5179	SESE	14	51	79	11.7	2.6	WYW142091
2	33-14-5179	NWSE	14	51	79	17.51	6.2	WYW142091
3	22-14-5179	SENE	14	51	79	14.65	3.4	WYW142091
4	21-14-5179	NENW	14	51	79	14.67	3.5	WYW142091
5	23-14-5179	NESW	14	51	79	13.88	4.9	WYW142091
6	34-14-5179	SWSE	14	51	79	56.21	13.14	WYW142091
7	21-15-5179	NENW	15	51	79	13.59	3	WYW142092
8	14-15-5179	SWSW	15	51	79	31.57	9.13	WYW142092
9	23-15-5179	NESW	15	51	79	29.19	9.7	WYW142092
10	13-15N-5179	NWSW	15	51	79	18.02	6.4	WYW142092
11	13-15S-5179	NWSW	15	51	79	14.85	3.3	WYW142092
12	14-16-5179	SWSW	16	51	79	31.36	8.11	NA
13	31-23-5179	NWNE	23	51	79	14.4	3.2	WYW142091
14	43-25-5179	NESE	25	51	79	6.4	2.3	WYW142095

County: Johnson

Applicant: Lance Oil & Gas Company Inc.

Surface Owners: BLM, State of Wyoming, Schuman, Lutterman

Project Description:

The proposed action involves the following:

- Drilling of 47 total federal CBM wells in the wall zone to depths ranging between 2,740 and 3,145 feet. Multiple seams will be produced by co-mingling production (a single well per location capable of producing from multiple coal seams) with the Big George coal zone if present but not prior to the BLM authorizing the change under sundry notice.
- Drilling and construction activities are anticipated to be completed within two years, the term of

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

- Well metering shall be accomplished by a combination of remote telemetry and well visitation. Metering would entail 2-3 visits per week to each well location during the frost free months and 4 visits per week during the winter months.
- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 14 proposed discharge points and 14 proposed stock water reservoirs within the Crazy Woman Creek watershed. Lance may discharge water from the Quarter Circle Beta POD to their Quarter Circle 9 POD outfalls, their Stewart Draw POD outfalls, the Bear Draw Beta RO Unit (WY0052639 outfall# 002) The operator may transport produced water via the Salt Creek Pipeline for reinjection near Midwest, Wyoming Lance has contracted Benneterra LLC to develop a subsurface drip irrigation to dispose of federally produced water at the confluence of Headgate Draw and Crazy Woman Creek at 48 irrigation sites.
- An unimproved and improved road network.
- A buried power line network to be constructed by the operator. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction has not been scheduled and will not be completed before the CBNG wells are producing. If the power line network is not completed before the wells are in production, then temporary diesel generators shall be placed at the 14 power drops.
- A storage tank of 500 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 24 months. Fuel deliveries are anticipated to be 3 times per week. Noise level is expected to be 100.5 decibels at 3 feet distance.
- A buried gas, water and power line network.

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

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

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

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

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

2.3. Alternative C – Environmentally Preferred

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of the project modifications identified by BLM and the operator following the initial project proposal (Alternative B). At the on-sites, all areas of proposed surface disturbance were inspected to insure that the project would meet BLM multiple use objectives to conserve natural resources while allowing for the extraction of Federal minerals. In some cases, access roads were re-routed, and well locations, pipelines, discharge points and other water management control structures were moved, modified, mitigated or dropped from further consideration to alleviate environmental impacts. Alternatives to the different aspects of the proposed action are always considered and applied as pre-approval changes, site specific mitigation and/or Conditions of Approval (COAs), if they will alleviate environmental effects of the operator’s proposal. The specific changes identified for the Quarter Circle 9 Beta POD are listed below under 2.3.1:

2.3.1.Changes as a result of the on-sites

Table 1.1 Changes to the POD agreed to by the operator.

Well #	Changes
12-13	Culvert added at the beginning of well access, St. 10+00. No mowing of sage brush will be needed at this location; utilize open grassy area surrounding well.
14-13	Reroute access to begin just NW of the 34-14 location and then skirt around above the 44-14 reservoir. Template # 6 will be realigned and engineered #5 withdrawn. Well access and impoundment will be coordinated.
21-13	Primitive roads leading west from this location will be signed closes to O & G traffic.
23-13	A liberal turning radius will be allowed at this location; it is the end of the road. Add typical B improvement to template road #24 at St 64+00 due to side slope. The proposed utility corridor to the west was withdrawn by the operator; this route is a narrow ridge leading to the drainage bottom; too steep and narrow to provide maintenance access for pumper without engineered access. The grazing lessee requested we add a stock tank at the well site and BLM agreed.
24-13	BLM recommended realignment of the access between St. 44+00 to the well location to avoid steep slopes. LOG agreed.
31-13	BLM recommended moving the well 75 feet north to avoid the bare soil slopes at the pad corners; pad will utilize the area between and upslope from the bare soil where slopes are less steep and reclamation potential is greater. This will be a drive through location to provide access to the 34-12 well in the Stewart Draw POD. The original access to the Stewart Draw 34-12 will be withdrawn to avoid slopes in excess of 25% along the existing primitive road. The well access template section will be engineered to ensure that proper drainage and soil stabilization is planned. LOG will incorporate expedient reclamation into the well pad and road designs. Revisit at preconstruction to inspect road & pad staking; any adjustments warranted will be made at that time.
32-13	The well pad design will be modified to provide a 20 foot vegetative buffer for the drainage located at the lower edge of the pad and extended on the east end along the access. Expedient reclamation will apply; LOG will incorporate expedient reclamation into the well pad design.
33-13	Template road #25 will be upgraded to a typical D due to side slope. Expedient reclamation will apply to pad and access & corridor; LOG will incorporate expedient reclamation into the well pad and road designs.

Well #	Changes
12-14	LOG requested to move this well approximately 1/4 mile north to provide better well spacing. New well location is next to the existing road to be improved by engineered section #8. Expedient reclamation applies; LOG will incorporate expedient reclamation into the engineered segment #8's design to address high erosion potential at St 1+00 to 3+00. LOG requested a 75 foot mowing radius at this well location adjacent to the existing access road; BLM agreed.
13-14	The well was moved 120 feet north to provide adequate work space avoiding a head cut and sage brush habitat. Revisit this location at the preconstruction inspection.
22-14	Revisit at preconstruction to inspect road & pad staking; any adjustments warranted will be made at that time. LOG requested a 75 foot mowing radius at this well location adjacent to the existing access road; BLM agreed.
23-14	LOG requested a 75 foot mowing radius at this well location adjacent to the existing access road; BLM agreed. The grazing lessee requested a stock tank be added at this location; BLM agreed.
31-14	LOG volunteered to minimize the template #10's well access & corridor to 35 feet clearing & 45 feet working width and 10 foot running surface. Ditch slopes of 1:1.5 to 1 will be allowed along the template access to facilitate minimizing width of disturbance. LOG will re-seed with forbs to minimize impacts to sage-grouse as sage-grouse sign was found within proximity of the well and access. Utilities will be placed in the road way to minimize width. There will be no parking or staging of materials beyond the disturbed areas of the access/corridor and well pad. During pipeline installation, fused pipe will be braced at least 6 inches no less than every 300 feet to allow sage-grouse brood to cross. LOG would like to revisit this location at the preconstruction to reinforce the need to their crew to minimize where possible to reduce the effects to sage-grouse.
32-14	Installation of a gate along engineered #7 at fence will be allowed prior to the preconstruction. LOG volunteered to minimize the template well access & corridor to 35 feet with 45 feet working width and reseed with forbs to minimize impacts to sage-grouse as sage-grouse sign was found within proximity of the well and access. Ditch slopes of 1:1.5 to 1 will be allowed along the engineered & template access to facilitate minimizing width of disturbance. LOG would like to revisit this location at the preconstruction to reinforce the need to their crew the need to minimize where possible to reduce the effects to sage-grouse.
34-14	BLM recommended that the well location be moved 300 feet east and to the existing access road to avoid sage brush habitat; LOG agreed. LOG volunteered to add forbs to the seed mix to promote sage-grouse forage.
42-14	BLM recommended shifting the NE edge of pad away from steep slopes and extending the pad north along the access road; LOG agreed. LOG volunteered to minimize the template well access & corridor to 35 feet clearing & 45 feet working width and reseed with forbs to minimize impacts to sage -rouse as sage-grouse sign was found within proximity of the well and access. Ditch slopes of 1:1.5 to 1 will be allowed along the template access to facilitate minimizing width of disturbance. Utilities will be placed in the road way to minimize width. There will be no parking or staging of materials beyond the disturbed areas of the access/corridor and well pad. During pipeline installation, fused pipe will be braced at least 6 inches no less than every 300 feet to allow sage-grouse brood to cross. LOG would like to revisit this location at the preconstruction to reinforce the need to their crew to minimize where possible to reduce the effects to sage-grouse and inspect pad staking and any adjustments will be made at that time.
12-15	Template #15 will be upgraded to typical B.
14-15	LOG request a larger 30 X 120 rig slot; BLM agreed.
21-15	Template #14 will be upgraded to typical B. Liberal turning radius will be allowed at this end of the road location. Expedient reclamation applies here; LOG will incorporate expedient reclamation into the rig slot diagram.
23-15	The location was moved 78 feet south to provide adequate the turning radius of the engineered access.
32-15	Engineered road #9 modified to include adequate stabilization measures. The pad design was modified to be show the topsoil pile on the east side of a drive through pad; resubmit design. Expedient reclamation applies; LOG incorporated expedient reclamation into the well pad design and engineered #9.
34-15	The access to the well location was upgraded to a typical B template road.

Well #	Changes
41-15	BLM recommended moving the well location to the opposite side of the reservoir to avoid using the dam as a crossing and compromising the structure with the installation of utilities. LOG looked at rerouting their utilities below the dam but multiple crossing of Black Diamonds infrastructure makes it prohibitive. LOG agreed to move the well as per BLM's recommendation. LOG requested that a pullout be added along engineered access #13 to support a small pad at the new location; BLM agreed. The landowner is in support of these changes. Template road #11 upgraded to a typical B. The landowner is in support of these changes. Revisit access route and well pad staking at preconstruction with any adjustments warranted to be made at that time.
43-15	LOG requested to enlarge the pad to 150 X 200 to provide adequate turning radius as this is the end of the road; BLM agreed. Staking to be inspected at the preconstruction with any adjustments warranted to be made at that time. Primitive road SW of pad to be signed closed to O & G traffic. Expedient reclamation applies; LOG incorporated expedient reclamation into the well pad design.
11-22	LOG request a larger 30 X 120 rig slot; BLM agreed.
12-22	Template road #15 will be upgraded to typical B starting at the 11-22 location due to headcuts and side slopes along this main access. Culverts were added at 2 small drainage crossings and a 20' vegetative buffer is required at headcut(s) along access near the well location. The landowner requested a stock tank to be added at this location.
31-22	Template road #19 will be upgraded to typical B but minimized to 20 foot clearing & 40 foot working width and utilities placed in the roadway. Revisit pad design & onsite staking during the preconstruction; any alterations to the design will be made at that time. Pad must avoid bare ground at the upper edge of the location.
41-22	At the start of Template road #20, the 18" culvert at drainage crossing was changed to a culvert/low water crossing combo. Resource road 34-15 will be added to the project as Template road #9. The existing parallel road to the NE (along the drainage bottom) within section 15 authorized under sundry will not be utilized for O & G traffic and will be signed "Closed to O & G traffic" at the state land boundaries.
42-22	The location was moved 120 feet north to avoid sage brush and allow more turning radius to the location. Template #20 was upgraded to typical B due to side slope; minimize the access road to 20 foot blading with 40 foot working width. Place utilities in the roadway. LOG requested a pad at this location. Revisit this location at the preconstruction with any adjustment needed to be address in the field at that time.
11-23	LOG requested a 75 foot mowing radius at this well location adjacent to the existing access road; BLM agreed.
14-23	LOG added a stabilization measures note to the well pad design and template # 28 road descriptions.
21-23	LOG has volunteered to minimize that portion of template segment #22 & corridor along an existing road and within the 1/4 mile of the Fleetwood sage-grouse lek (St 0+00 to St 20+00) to 35 foot blading and 45 foot working width. LOG also volunteered to reseed the disturbance within the 1/4 mile CSU with forbs that will provide sage-grouse forage.
32-23	No mowing of sage brush will be allowed here. LOG agreed to utilize the surrounding grassy area.
34-23	No mowing of sage brush will be allowed here. LOG agreed to utilize the surrounding grassy area.
41-23	Expedient reclamation applies Template road #2 from St 75+00 to St 105+00, utility corridor & well pad; LOG will incorporate expedient reclamation into the road descriptions and pad design. LOG has volunteered to minimize that portion of template segment #2 this (an existing primitive road) & corridor within the 1/4 mile of the Fleetwood sage-grouse lek (St 75+00 to St 100+00) to 45 foot clearing and 50 foot working width. During pipeline installation, fused pipe will be braced at least 6 inches no less than every 300 feet to allow sage-grouse brood to cross. LOG also volunteered to reseed the disturbance within the 1/4 mile CSU with forbs that will provide sage-grouse forage.
44-23	LOG requested a turnout off the access road at this location, BLM agreed. LOG requested a 75 foot mowing radius at this well location adjacent to the existing access road; BLM agreed.

Well #	Changes
12-24	This well location is 0.27 miles from the Fleetwood sage-grouse lek but is very visible from the lek. LOG volunteered to restrict well visitation hours before 9:00 am and after 3:00 pm during the sage-grouse breeding season for the life of the well. LOG has volunteered to minimize that portion of template segments #2 & #22 & corridor within the 1/4 mile of the Fleetwood sage-grouse lek to 45 feet clearing and 60 working width and template segment #5 & corridor within the 1/4 mile to 45 feet clearing and 75 working; this is existing primitive road. LOG also volunteered to reseed the disturbance within the 1/4 mile CSU with forbs that will provide sage-grouse forage. During pipeline installation, fused pipe will be braced at least 6 inches no less than every 300 feet to allow sage-grouse brood to cross. BLM requests that LOG modify the project MSUP to reflect this voluntary restriction for this well location as well as those template road segments #2, #5 & #22 that lie inside the 1/4 mile CSU of the Fleetwood sage-grouse lek. BLM commends LOG's voluntary mitigation measure but must stress that approval of the associated APD's hinges on LOG's commitment to reduce effects to sage-grouse within the Quarter Circle Nine Beta project area.
13-24	LOG volunteered to minimize the access road to primitive road with gravel surface. Mowing will avoid sage brush habitat west side of location with no more than a 50 foot working space utilized west of well stake. LOG would like to revisit this location at the preconstruction to reinforce the need to their crew the need to minimize where possible to reduce the effects to sage-grouse.
14-24	The well location was moved 250 feet south to avoid numerous erosion features at the pad location. Rerouted access utilizing existing primitive road SW of the location and crossing the draw above the 11-25-5179 impoundment approved with Quarter Circle 9 Alpha POD; engineered #6 is withdrawn and template #23 was realigned. Expedient reclamation will be applied LOG will incorporate expedient reclamation into the road template #23 road description and pad design. Revisit this location at preconstruction with any adjustments warranted to be may in the field at that time.
21-24	Expedient reclamation applies; LOG will incorporate expedient reclamation into the entire engineered segment #3 & pad design. BLM recommended moving the well 60 feet south to provide adequate work space; LOG agreed and requested a 70 X 200 pad incorporated into the road. Revisit pad staking during the preconstruction with any adjustments warranted to be made in the field at that time.
23-24	The ingress to the well pad was shifted east into the cut end of the well pad to provide a 20 foot vegetated buffer for the drainage located at the north edge of the design pad.
32-24	Expedient reclamation applies LOG will incorporate expedient reclamation into the entire engineered segment #3 & pad designs. BLM recommended realignment of engineered #3 beginning at St. 17+00 to the pad shifting the road uphill and avoiding sage brush habitat. LOG recommended realignment beginning at St 8+50 removing s-curve & 25% slope between St 11+00 to 15+00. A 20 foot vegetative buffer will be provided for the headcut below the proposed road.
43-24	A note will be added to the Engineered #2 and pad designs to include appropriate soil stabilization measures along the access route and pad.
32-25	LOG and BLM agreed that this location should be withdrawn from the project to avoid steep slopes and highly erosive soils as well as quality sage-grouse habitat demonstrating active sage-grouse use. BLM recommended that the 43-25 pit be a secondary impoundment at this time to avoid sage brush habitat; LOG agreed. LOG recognizes the reclamation challenges this location presents due to the erosion potential as well as the loss of sage grouse habitat. LOG does control the surrounding leases therefore drainage is not an issue.
42-25	Pad will be enlarged to facilitate truck turn around as this will be the end of the road. New pad design required. A note will be added to the pad designs to include appropriate soil stabilization measures. Revisit at the preconstruction to inspect pad staking; any adjustments warranted will be made at that time. This well lies beyond the road closer sign as per COA in the Coal Gulch Unit Beta POD; The sign will be moved to the west edge of this pad closing the road west of this location to O & G traffic.
General	All drilling and construction equipment and materials will be confined to a 150foot by 170foot work area for those well locations proposed without a constructed pad; agreed to by LOG.

Well #	Changes
WMP	Changes
SDI	LOG added subsurface drip irrigation (SDI) including 1 water pump station and 48 irrigation sites along Crazy Woman Creek capable of utilizing the majority of the CBNG produced water from the Quarter Circle 9 Beta POD to the as an alternative to water storage.
Impoundments	LOG withdrew all 14 proposed impoundments from POD in an effort to reduce effect to sage-grouse. Water will be managed by the approved impoundments within the Quarter Circle 9 Alpha and Stewart draw alpha PODs as well as the existing Bear Draw water treatment facility.
Stock Tanks	BLM proposed that all existing stock tanks within the project area be retrofitted with escape ramps. The landowner was comfortable with this and LOG agreed to install escape ramps on all proposed and existing stock tanks within the Quarter Circle 9 Beta POD.
Road	Changes
Template #27	The road description was modified to identify stations along this access for barrow areas to be used for road building materials as well as top soil storage areas.
General	Utility corridor disturbance will be contained within the width of disturbance described in the road design plans with the exception of drainage/culverts crossings where the utilize most avoid the drainage structure installed.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

1. Channel Crossings:
 - a) 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.
 - b) 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 UIC permit for the SDI system and

associated infrastructure to BLM as they are issued by WDEQ.

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.). This is applicable as a performance based measure for those areas identified with poor reclamation potential. See Table 4.1 for the specific map unit symbols identify poor reclamation potential.

2.3.2.5. Wetland/Riparian

1. No waste material will be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways.
2. The lower edge of soil or other material stockpiles will be located outside the active floodplain.
3. Disturbed channels will be re-shaped to their approximate original configuration or stable geomorphological configuration and properly stabilized.
4. 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 locate impoundments to avoid sagebrush shrublands, where practical.
4. 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.
5. 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. Black-footed Ferret

1. Prairie dog colonies will be avoided wherever possible.

2. If any black-footed ferrets are located, the USFWS will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.
3. Additional mitigation measure may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to black-footed ferrets or their habitat. In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2.3.2.7.2. Mountain Plover

1. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ¼ mile of occupied mountain plover nesting habitat.
2. Construction of ancillary facilities (for example, compressor stations, processing plants) will not be located within ½ mile of known nesting areas. The threats of vehicle collision to adult plovers and their broods will be minimized, especially within breeding aggregation areas.
3. Work schedules and shift changes will be set to avoid the periods from 30 minutes before to 30 minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.
4. Creation of hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas will be avoided by burying power lines, using the lowest possible structures for fences and other structures and by incorporating perch-inhibiting devices into their design.
5. When above ground markers are used on capped and abandoned wells they will be identified with markers no taller than four feet with perch inhibiting devices on the top to avoid creation of raptor hunting perches within 0.5 mile of nesting areas.
6. Reclamation of areas of previously suitable mountain plover habitat will include the seeding of vegetation to produce suitable habitat for mountain plover.

2.3.2.7.3. Ute Ladies'-tresses Orchid

1. Suitable habitat will be avoided wherever possible.
2. If suitable habitat for Ute ladies'-tresses cannot be avoided, surveys will be conducted in compliance with USFWS standards (USFWS 1995) by a BLM approved biologist or botanist. Surveys can only be conducted between July 20 and August 31.
3. Moist soils near wetlands, streams, lakes, or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.

2.3.2.8. 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

All changes made at the onsite will be followed. They have all been incorporated into the operator’s POD. See Table 1.1 for specific changes.

Surface Use

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

Reclamation Standards:

 1. The reclaimed area shall be stable and exhibit none of the following characteristics:
 - a. Large rills or gullies.
 - b. Perceptible soil movement or head cutting in drainages.
 - c. Slope instability on, or adjacent to, the reclaimed area in question.
 2. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.
 3. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
 - a. Successful onsite establishment of species included in the planting mixture or other desirable species.
 - b. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.
 4. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.
2. Provide 4” of aggregate where grades exceed 8%.
3. Surfacing material will be from a permitted pit. The parent material (rock) must be crushed and screened to meet road standards as set forth in Wyoming Supplement to BLM Road Manual 9113.
4. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12” or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

<u>Grade</u>	<u>Drainage Spacing</u>
2-4%	310 ft
5-8%	260 ft
9-12%	200 ft
12-16%	150 ft

5. If produced water is to be applied to road surfaces as dust abatement, the operator needs an approved Wyoming Oil & Gas Commission Facility Information for Road Application of Waste and Waste Water (Form 20) along with the proposed action describing locations, application rates, etc. Form 20 is available at <http://wogcc.state.wy.us>.
6. 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 Quarter Circle 9 Beta POD is Covert Green.
7. 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.
8. Adequate drainage control must be in place at all stages of construction and culverts installed as soon as feasible.
9. Final grading and surfacing shall occur immediately after utility installation is complete. All rills, gullies, and other surface defects shall be ripped to the full depth of erosion across the entire width of the roadway prior to final grading and surfacing.

10. **Horizontal curves with radius less than 220 feet require curve widening as follows:**

Turning Radius (ft)	Min. Curve Widening (ft)	Widened Lane Width (ft)
220 +	0	12
120 to 219	2	14
90 to 119	4	16
50 to 89	8	20

11. All roads, well pads, rig slot, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.
12. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction. Allowances will be granted for culverts, low water crossings, gas/electric metering points and valve sets.
13. Pipeline installation and/or corridors without road access will not exceed a disturbance width of 40 feet with clearing and blading not to exceed 30 feet.
14. Utility corridors will be expediently reclaimed following construction and maintained in a professional and workmanship manner avoiding tire rutting, settling and erosion.
15. A minimum 20 foot undisturbed vegetative buffer will be maintained for erosion features and drainages.
16. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a 35 foot radius of the well(s) stake unless otherwise stated in the “Changes agreed to during the onsite” Table 1.1 and Attachment 1.

17. The operator will maintain well drilling, completion and associated construction operations within a 150 foot by 170 foot work area for those locations where a constructed pad is not approved as designed.
18. Reserve pits containing frozen fluids will not be closed. See “Operations/Maintenance”, COA #11 of the Conditions of Approval document for further clarification.
19. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig slots, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. Segregation will not be required for trenches installed with wheel trenchers.
20. Segregated top soil at well sites will be redistributed once the instillation of gas, water and electrical utilities is complete at the well head.
21. Disturbance areas within the Quarter Circle 9 Beta POD have fragile soils and erosive conditions that shall be stabilized in a manner which eliminates erosion until a self-perpetuating non-weed native plant community has stabilized the site. These areas are identified in the road descriptions and engineered designs included in the MSUP, Access Roads Component to the Surface Use Plan, engineered road and well pad designs. Stabilization efforts shall be finished within 30 days of the completion of construction activities.
22. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. See page 18 of the MSUP for the appropriate seed mix as per soil type.

Wildlife

Bald Eagles

1. The following conditions will alleviate impacts to bald eagles:
No project related actions shall occur within one mile of bald eagle habitat identified along Crazy Woman Creek annually from November 1 through April 1 (CM9), prior to a winter roost survey or from February 1 through August 15 (CM8) prior to a nesting survey. This timing limitation will be in effect unless surveys determine the nest/roost to be inactive. This affects the following wells and infrastructure:

Township/Range	Section	Wells and Infrastructure
T51N/R79W	2	ALL proposed SDI, pipeline & utility corridor within this section.
T51N/R79W	3	ALL proposed SDI, pipeline & utility corridor within this section.
T51N/R79W	9	ALL proposed SDI, pipeline & utility corridor within this section.
T51N/R79W	10	ALL proposed SDI, pipeline & utility corridor within this section.
T51N/R79W	11	ALL proposed pump station, SDI, pipeline & utility corridor within this section.
T51N/R79W	14	ALL proposed road/corridor within N1/2 NWNW of this section.
T51N/R79W	15	Wells: 12-15-5179, 14-15-5179, 21-15-5179, 23-15-5179, 32-15-5179 & 41-15-5179 ALL proposed road/corridor within NW, SW, NENE & SWNE of this section.

Township/Range	Section	Wells and Infrastructure
T51N/R79W	16	ALL proposed SDI , pipeline & utility corridor within this section.
T51N/R79W	17	ALL proposed SDI and pipeline within this section.
T51N/R79W	20	ALL proposed SDI and pipeline within this section.
T51N/R79W	22	Wells: 11-22-5179 & 12-22-5179 ALL proposed road/corridor within NWNW and SWNW of this section.

- a. If a roost is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile will be established for all bald eagle winter roost sites (November 1 - April 1). Additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 AM and 3:00 PM may be necessary to prevent disturbance.
- b. If a nest is identified and construction has not been completed, a disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) would be established year round for all bald eagle nests. A seasonal minimum disturbance buffer zone of 1 mile will be established for all bald eagle nest sites (February 1 - August 15).
- c. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

Burrowing Owls

1. The following conditions will alleviate impacts to burrowing owls:
No surface disturbing activity shall occur within 0.25 miles of all identified prairie dog colonies from April 15 to August 31, annually, prior to a burrowing owl nest occupancy survey for the current breeding season. A 0.25 mile buffer will be applied if a burrowing owl nest is identified. This condition will be implemented on an annual basis for the duration of surface disturbing activities within the prairie dog town(s). This timing limitation will be in effect unless surveys determine the nest(s) to be inactive. This timing limitation will affect the following

Township/Range	Section	Wells and Infrastructure
T51N/R79W	20	ALL proposed SDI and pipeline within the NENE of this section.
T51N/R79W	16	ALL proposed SDI and pipeline within the SWSW & SESW of this section.
T51N/R79W	17	ALL proposed SDI and pipeline within the SESE of this section.
T51N/R79W	3	ALL proposed SDI and pipeline within the South Quarter of this section.

Mountain Plover

1. The following conditions will alleviate impacts to mountain plovers:
 - a. A mountain plover nesting survey is required in suitable habitat prior to commencement of surface disturbing activities in the following areas:

LEGAL LOCATION
SESW, NESW, SE, SWNE, SENE & NENE Sec. 2, T51N/R79W
NENW & NWNE Sec. 11, T51N/R79W
NESW, SWNW & SENW Sec. 15, T51N/R79W
NENW & SWNE Sec. 23, T51N/R79W

LEGAL LOCATION
SESE Sec. 9, T51N/R79W

- b. No surface disturbing activities are permitted in the suitable habitat area listed above, from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season. This timing limitation will be in effect unless surveys determine no plovers are present. This timing limitation will affect the following

Township/Range	Section	Wells and Infrastructure
T51N/R79W	2	ALL proposed SDI and pipeline within the SW, SE, & NE of this section.
T51N/R79W	9	ALL proposed SDI, pipeline & utility corridor within the SENE & NENE of this section.
T51N/R79W	11	ALL proposed SDI, pipeline & utility corridor within the North Half of this section.
T51N/R79W	14	Wells: 23-14-5179 & 32-14-5179 ALL proposed road/corridor within the NESW, NWSE & SWNE of this section.
T51N/R79W	15	Wells: 12-15-5179, 14-15-5179, 21-15-5179, 23-15-5179, 31-15-5179, 32-15-5179 & 34-15-5179 ALL proposed road/corridor within the SW, NW & E½ SE of this section.
T51N/R79W	16	ALL proposed SDI and pipeline within the NE, SE & S½ SW of this section.
T51N/R79W	23	Wells: 21-23-5179, 23-23-5179 & 32-23-5179 ALL proposed road/corridor within NENW, SWNW, NWSW, SESW, NESW & S½ NE of this section.

- 1) Mountain plover nesting surveys shall be conducted by a biologist following the most current USFWS Mountain Plover Survey Guidelines (the survey period is May 1-June 15). All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.
- a. If occupied mountain plover habitat is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between March 15 and July 31. If no mountain plover observations are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season (March 15).

Raptors

1. The following conditions will alleviate impacts to raptors:
- a. No surface disturbing activity shall occur within 0.5 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

Township/Range	Section	Wells and Infrastructure
T51N/R79W	1	ALL proposed SDI and pipeline within the West Quarter of section.
T51N/R79W	2	ALL proposed SDI, pipeline & utility corridor within this section.

Township/Range	Section	Wells and Infrastructure
T51N/R79W	3	ALL proposed SDI, pipeline & utility corridor within the SE & SESW of this section.
T51N/R79W	9	ALL proposed SDI and pipeline within this section.
T51N/R79W	10	ALL proposed SDI and pipeline within the North Half of this section.
T51N/R79W	11	ALL proposed SDI and pipeline within the NWNW & NENW this section.
T51N/R79W	12	ALL proposed road/corridor within NWSW, SWSW & SWSE of this section.
T51N/R79W	13	Wells: 12-13-5179 & 31-13-5179 ALL proposed road/corridor within the NENE, SENW & NENW of this section.
T51N/R79W	14	Wells: 12-14-5179, 13-14-5179, 22-14-5179, 23-15-5179, 31-14-5179, 32-14-5179 & 42-14-5179 ALL proposed road/corridor within the, NESW, NWSW, NWSW, W½NW & S½NW & NE of this section.
T51N/R79W	15	Wells: 31-15-5179, 34-15-5179 & 43-15-5179 ALL proposed road/corridor within the NWSW, W½NW, SESE, NESE,SENE & W½SWSE of this section.
T51N/R79W	16	ALL proposed SDI and pipeline within this section.
T51N/R79W	17	ALL proposed SDI and pipeline within the E½ SE of this section.
T51N/R79W	20	ALL proposed SDI and pipeline within the NENE of this section.
T51N/R79W	22	Wells: 31-22-5179 & 41-22-5179 ALL proposed road/corridor within the NENE &NWNE of this section.
T51N/R79W	23	Wells: 11-23-5179, 14-23-5179, 23-23-5179, 34-23-5179 & 44-23-5179 ALL proposed road/corridor within the SW, SE & NWNW of this section.
T51N/R79W	25	Wells: 42-25-5176 ALL proposed road/corridor within the SWSW of this section.
T51N/R79W	26	ALL proposed road/corridor within the NWNW & NE of this section.
T52N/R79W	35	ALL proposed SDI and pipeline within the East half of this section.

- 1) 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 0.5 mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.
- 2) 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	UTMs (NAD83)	Legal Location
448	Golden Eagle	391733E 4918186N	Sec. 6, T51N/R79W
2652	Unknown Raptor	396383E 4912678N	Sec. 25, T51N/R79W
3445	Red-tail Hawk	394717E 4922100N	Sec. 35, T52W/R79W
3448	Red-tail Hawk	391042E 4917843N	Sec. 9, T51N/R79W
3449	Red-tail Hawk	395446E 4922653N	Sec. 25, T52N/T79W
3452	Unknown Raptor	394755E 491777N	Sec. 35, T52N/R79W
3453	Unknown Raptor	395220E 4921395N	Sec.36, T52N/R36W
3454	Unknown Raptor	395083E 4921421N	Sec.36, T52N/R79N
3792	Red-tail Hawk	393460E 4916095N	Sec. 14, T51N/R79W
3794	American Kestrel	394060E 4914114N	Sec. 23, T51N/T79W
4050	Golden Eagle	391739E 4918248N	Sec. 9, T51N/T79W
4051	Red-tail Hawk	393275E 4918336N	Sec. 10, T51N/T79W
4052	Red-tail Hawk	391956E 4918336N	Sec.10, T51N/R79W
4053	Great Horned Owl	394682E 4917164N	Sec. 14, T51N/R79W
4054	Great Horned Owl	390640E 4916186N	Sec. 16, T51N/R79W
4055	Golden Eagle	390070E 4916305N	Sec. 17, T51N/R79W
4116	Long Eared Owl	395650E 4920243N	Sec. 1, T51N/R79W
4117	Golden Eagle	394525E 4920039N	Sec. 2, T51N/R79W
4118	Red-tail Hawk	394424E 4920489N	Sec. 2, T51N/R79W
4119	Prairie Falcon	395776E 4918423N	Sec. 12, T51NR79W
4120	American Kestrel	395806E 4918345N	Sec. 12, T51N/R79W

BLM ID#	Species	UTMs (NAD83)	Legal Location
4471	American Kestrel	389697E 4917139N	Sec. 17, T51N/R79W
4472	Prairie Falcon	396276E 4917742N	Sec.12, T51N/R79W
4473	American Kestrel	391253E 4916493N	Sec. 16, T51N/R79W
4474	Red-tail Hawk	390634E 4916171	Sec. 16, T51N/R79W
4476	Red-tail Hawk	389693E 4915495N	Sec. 20, T51N/R79W
4477	Red-tail Hawk	389747E 4917344N	Sec. 8, T51N/R79W
4762	Unknown Raptor	391706E 4918162N	Sec. 9, T51N/R79W
5130	Great Horned Owl	390955E 4917679N	Sec. 9, T51N/R79W
5154	Unknown Raptor	394502E 4919985N	Sec. 2, T51N/R79W

- a) 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.
- b) Well metering, maintenance and other site visits within 0.5 miles of raptor nests should be minimized as much as possible during the breeding season (February 1 – July 31).

Sage Grouse

1. The following conditions will alleviate impacts to sage-grouse:
 - a. No surface disturbing activities are permitted within 2 miles of the Fleetwood Draw, Double Cross, Frank and Alvaro sage- grouse lek(s) 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:

Township/Range	Section	Wells and Infrastructure
T51N/R79W	1	ALL proposed SDI and pipeline within the NWNW of this section.
T51N/R79W	2	ALL proposed SDI and pipeline within the North ¼, SWNW & NWSW of this section.
T51N/R79W	3	ALL proposed SDI, pipeline and utility corridor within the NESE, SESE, SWSE, SESW & SWSW of this section.
T51N/R79W	9	ALL proposed SDI, pipeline and utility corridor within the SENE, NENE, NWSE, SWSE, NESE & N½SESE of this section.
T51N/R79W	10	ALL proposed SDI, pipeline and utility corridor within the North Half of this section.

Township/Range	Section	Wells and Infrastructure
T51N/R79W	11	ALL proposed utility corridor within the South Half of this section.
T51N/R79W	12	ALL proposed road/corridor within the W½ SW& SWSE of this section.
T51N/R79W	13	Wells: All 8 wells within this section. ALL proposed road/corridor within this section.
T51N/R79W	14	Wells: All 8 wells within this section. ALL proposed road/corridor within this section.
T51N/R79W	15	Wells: All wells except the 12-15-5179 (7 wells) ALL proposed road/corridor within this section Except the NWNW & N½SWNW.
T51N/R79W	22	Wells: All 5 wells within this section. ALL proposed road/corridor within this section
T51N/R79W	23	Wells: All 8 wells within this section. ALL proposed road/corridor within this section
T51N/R79W	24	Wells: All 8 wells within this section. ALL proposed road/corridor within this section
T51N/R79W	25	Wells: 42-25-5179 ALL proposed road/corridor within this section
T51N/R79W	26	ALL proposed road/corridor within this section
T52N/R79W	35	ALL proposed SDI and pipeline within the East Half of this section.

- 1) 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.
- b. Well metering, maintenance and other site visits within 2.0 miles of documented sage grouse lek sites should be minimized as much as possible during the breeding season (March 1– June 15).
- c. Maximum design speed on all operator-constructed and maintained roads will not exceed 25 miles per hour **except** travel along roads within 1/2 mile of the Fleetwood Draw sage-grouse lek located in. These roads will be posted at 10 mph. This will affect the following roads: Template Road Sections 2 (St 60+00 to 110+00), 5, 6 & 22 (St 0+00 to 35+00).

Ute ladies-tresses orchid

1. Lance Oil & Gas will complete the annual surveys for Ute ladies-tresses orchid along the banks of Crazy Woman Creek within the proposed SDI field at the following locations:

Township/Range	Section	SDI and Infrastructure
T51N/R79W	2	ALL proposed SDI and pipeline along stream bank at the SENW, NESW, NWSE, NWNE & NENE of this section.
T51N/R79W	9	ALL proposed SDI and pipeline along stream bank at the NWSE, NESE, SENE & NENE of this section.

Township/Range	Section	SDI and Infrastructure
T51N/R79W	10	ALL proposed SDI and pipeline along stream bank at the SWNW, SENW, NWNE & NENE of this section.
T51N/R79W	16	ALL proposed SDI and pipeline along stream bank at the NWSW, NESW & SWNE of this section.
T51N/R79W	17	ALL proposed SDI and pipeline along stream bank at the NESE of this section.
T52N/R79W	35	ALL proposed SDI and pipeline along stream bank at the SESE, SENE & NENE of this section.

Sharp-tailed Grouse

2. The following conditions will minimize 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 WGFDF 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.

Cultural

1. BLM cannot approve the disposal of federally produced water into the SDI system associated with the Quarter Circle Nine POD until BFO and the Wyoming SHPO decide upon an adequate inventory strategy.
 - a. The inventory strategy will likely involve subsurface testing to determine the possibility of impacts to buried cultural resources. It is assumed that BFO and SHPO will come to a consensus over this issue by mid-August. Please keep in mind that additional fieldwork may or may not be necessary before BFO can approve the disposal of federally produced water into the SDI system associated with this POD.
2. All earth moving activity in the following areas will be monitored by an archeologist who meets or exceeds the qualification standards recommended by the Secretary of the Interior. The Bureau has identified this area as containing the potential for buried cultural deposits (areas containing deep alluvial deposits).
 - a. All earth moving activities associated with construction of the buried utility corridor and SDI fields in T51N R79W Sections 20, 17, 16, 9, 10, 2, 3, 1 and T52N R79W section 35 that are in the alluvial deposits of the river floodplain.

2.4. Alternatives considered but not analyzed in detail

The first alternative evaluated for produced CBNG water within the Quarter Circle 9 BETA POD was discharge of raw production water directly into tributaries of Crazy Woman Creek and Coal Gulch. Due

to the dissected topography and WYDEQ permit limitations, continuous discharge of raw CBNG water into tributaries of Crazy Woman Creek and Coal Gulch is an undesirable water management alternative for the Quarter Circle 9 Beta POD.

Reinjection of produced water within the Quarter Circle Beta POD has also been considered. A review of well logs on file with the WOGCC and available geographic information suggests there are no aquifers within the immediate area that have sufficient storage capacity to accept the volume of CBNG water that would be produced within the Quarter Circle 9 Beta POD. Therefore, reinjection is not a reasonable solution for the disposal of produced water within the Quarter Circle 9 Beta POD. However, Lance may transport water via the Salt Creek Pipeline to an area near Midwest, Wyoming, where it will be re-injected into the Madison aquifer near Midwest.

Land application of raw production water within Quarter Circle 9 Beta POD has also been considered. Land application of raw production water would involve applying the water to cropland at agronomic rates through an irrigation system. Soil and water amendments such as gypsum and or sulfur would likely be required to counteract the absence of calcium in the CBNG water. Multiple landowners along Crazy Woman Creek have expressed an interest in utilizing CBNG produced water for irrigation. Based on discussion with these landowners, Lance has identified several sites near the confluence of Headgate Draw and Crazy Woman Creek that may be suitable for land application. Lance has determined that land application of CBNG produced water is a desirable water management for Quarter Circle 9 Beta POD.

The treatment of raw production water from Quarter Circle 9 Beta POD has been extensively researched to determine the feasibility of direct discharge into Flying E Creek. The following treatment technologies were considered: sulfur burners, constructed wetlands, rapid spray distillation, electro dialysis reversal, electronic water purification, osmosis, ion exchange using EMITS process and reversal osmosis (RO) technology.

Sulfur burner technologies were rejected since they will not address sodium concentrations in the produced water. Use of constructed wetlands was determined to be an unreasonable alternative since they have limited utility in removing total dissolved solids and salts and given the relatively short growing season in the Powder River Basin, other alternatives would still be required. Rapid spray distillation and electronic water purification are emerging technologies that are unproven and have not been demonstrated to effectively treat CBNG water. Electro dialysis reversal has not been cost effectively applied to treatment of CBNG water. Electro dialysis reversal would generate a brine reject stream of up to 20% of the designed treatment system flow. 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. RO treatment process uses a proven treatment technology and lance believes the use of RO treatment process is a valuable, efficient and economical water management alternative for the treatment and discharge of Quarter Circle 9 Beta POD produced water. By discharging treated water in Flying E Creek rather than discharging into less developed channels, potential damage to the surrounding area would be minimized. The containment and infiltration of CBNG produced water within the Quarter Circle 9 Beta POD has also been considered. However, due to landowner concerns, the additional disturbance, significant cost of construction and availability of desirable water management strategies, the containment of produced water within proposed on-channel and off-channel impoundments will be a secondary water management strategy.

2.5. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure originally proposed by the operator (Alternative B), and the infrastructure within the BLM/operator modified proposal (Alternative C) are presented in Table 2.5.

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	45	47	46
Total Locations	45	47	46
Nonconstructed Pads	NA	13	14
Slotted Pads	NA	17	14
Constructed Pads	NA	17	18
Conventional Wells	5	0	0
Gather/Metering Facilities	0	0	0
Compressors	0	0	0
Monitor Wells	0	0	0
Impoundments	10	14	0
On-channel	4	10	0
Off-channel	6	4	0
Water Discharge Points (within impoundment disturbance)	5	14	0
Water Pump Station (supporting SDI system)	0	0	1
Improved Roads			
No Corridor	0	0	0
With Corridor	2.1	16.7	16.5
2-Track Roads			
No Corridor	0	0	2.5
With Corridor	18.9	0	1.9
Buried Utilities			
No Corridor	0.20	1.04	9.74
With Corridor	2.5	1.3	2.5
Overhead Powerlines	13.6	0	0
Communication Sites	0	0	0
Staging/Storage Areas	1	0	0
Other Disturbance – SDI sites	0	0	48 (612 acres)
Acres of Disturbance	160	235	827

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on June 11, 2007. The onsite field inspection for the Quarter Circle 9 Beta POD was conducted on January 8, 9, 10 & 11. The following individuals participated:

Representing BLM:

- Jim Verplancke, Natural Resource Specialist/Wildlife Biologist
- Melanie Hunter, Natural Resources Specialist
- Leigh Grench, Archeologist
- Mike Mckinley, Hydrologist
- Ted Hamersma, Civil Engineer Technician

Representing the operator:

- Tammi Hitt
- Joy Kennedy
- Ana Garan
- Colt Rodeman
- Shane Gasboda
- Liz Hunter, KLJ Engineering

Representing the Landowner(s):

Neal Schuman
Scott Lutterman

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			Jim Verplancke
Floodplains		X		Jim Verplancke, Mike McKinley
Wilderness Values			X	Jim Verplancke
ACECs			X	Jim Verplancke
Water Resources	X			Jim Verplancke, Mike McKinley
Air Quality		X		Jim Verplancke
Cultural or Historical Values	X			Leigh Grench
Prime or Unique Farmlands			X	Jim Verplancke

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Wild & Scenic Rivers			X	Jim Verplancke
Wetland/Riparian	X			Jim Verplancke, Mike McKinley
Native American Religious Concerns		X		Leigh Grench
Hazardous Wastes or Solids		X		Jim Verplancke
Invasive, Nonnative Species	X			Jim Verplancke
Environmental Justice		X		Jim Verplancke

3.1. Topographic Characteristics of Project Area

The Quarter Circle 9 Beta POD is located within the Stewart Draw, Fleetwood Draw, and Coal Gulch. The upper reaches and main portions of the POD tributary drainages consist of steep, dissected terrain with slopes at times exceeding 45%. The watersheds have slope gradients in the range 5 to 25% throughout most of the project area. Main portions of the drainage area consist of relatively undisturbed rangeland composed of a mixture of sagebrush and native grass. The main stems of the Quarter Circle 9 Beta POD tributary drainages possess slightly sinuous, well-vegetated channel bottoms with well-defined low flow channels. The upper reaches of the tributaries are characterized by narrow dendritic tributaries with steeply incised sides and narrow bottoms widths. The main stems of the lower portions of the drainages are characterized by moderately incised channels (5 to 10 feet deep on average) that are 10 to 40 feet wide on average within the lower reaches of the tributary channels. The incised channels are surrounded by well developed floodplains and have dendritic tributary systems. The minor tributaries exhibit little to no flood plain development within the upper reaches. The average annual precipitation for this area is approximately 13.29 inches, as derived from the Western Regional Center’s Wyoming Climate Summary at Buffalo, Wyoming, Station 481165 (WRCC 2005). More than half the annual precipitation normally occurs during the growing season, while April, May and June typically account for the majority of this moisture.

3.2. Vegetation & Soils

The Natural Resource Conservation Service, (NRCS, USDA), Technical Guides for the Major Land Resource Area 58B Northern Rolling High Plains indicates that the project area falls in the 10-14” Northern Plains precipitation zone. The dominant landforms and the soils of this area are hill sides, ridges, and escarpments with sandy to loamy soils and intermittent shale outcroppings. The predominant ecological site occurring within the proposed Quarter Circle 9 Beta POD is loamy and the dominant plant communities are Mixed Sagebrush /Grass Plant Community along the south facing hill sides and draw bottoms to north facing slopes and ridge tops.

Sites regularly observed throughout the uplands of project area, represent the sandy and shallow clayey ecological sites. These sites occur on nearly level to 50% slopes over landforms including hill sides, ridges and escarpments.

The loamy, sandy and shallow clayey soil sites are shallow (less than 20”to bedrock) well-drained soils formed in eolian deposits or alluvium over residuum. These soils have moderate to rapid permeability and may occur on all slopes. The bedrock may be of any kind except igneous or volcanic and is virtually impenetrable to plant roots. The surface soil will be one or more of the following textures: fine sandy loam, sandy loam, loamy fine sand, loamy sand, or sand. Thin ineffectual layers of other soil textures are disregarded. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick.

The main soil limitations include: depth to bedrock, low organic matter content, soil droughtiness, low water holding capacity, and high erosion potential especially in areas of steep slopes. Approximately 1,220 acres within the POD boundary has been identified by BLM as being susceptible to degradation due to steep slopes and/or highly erosive soil utilizing Soil Survey Geographical Data (SSURGO). The low annual precipitation should be considered when planning seeding.

Lowland ecological sites are found along the banks of the Crazy Woman Creek running north and south through the POD. These sites are also prevalent where the 2 main tributaries Stewart Draw and Fleetwood Draw draining north converge with the mainstem Crazy Woman Creek. A third tributary, Coal Gulch drains the southern end of the project area to the Powder River. These sites are located on nearly level land adjacent to streams that run water at least during the major part of the growing season with landforms consistent with alluvial fans, drainage ways & stream terraces. The soils of these sites are deep to very deep well-drained soils formed in mixed alluvium. These soils have moderate permeability. The surface soil will be highly variable and vary from 2 to 8 inches in thickness. Layers of the soil most influential to the plant community vary from 3 to 6 inches thick. The surface soil will be one or more of the following textures: very fine sandy loam, fine sandy loam, sandy loam, loam, silt loam, clay loam, clay, or silty clay. A fluctuating water table occurs in these areas and ranges from 1 to 5 feet, but is usually deeper than 3 feet. The main soil limitations include: depth to water table. The low annual precipitation should be considered when planning seeding.

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

Table 3.2 - Reclamation Potential

Reclamation Potential	Acres	% of Project Area
Poor	3179	39%
Moderate	5086	61%
Well	0	0%
Total acres	8265	

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

Table 3.3 – Soil Map Unit Types

Map Unit Symbol	Map Unit Name	Acres	%
607	Haverdad loam, 0 to 3 percent slopes	351	4%
613	Haverdad-Kishona loams, 0 to 3 percent slopes	209	3%
614	Forkwood loam, 0 to 6 percent slopes	177	2%
615	Cambria-Kishona-Zigweid loams, 6 to 15 percent slopes	825	10%
622	Cambria-Kishona-Zigweid loams, 0 to 6 percent slopes	286	3%
639	Forkwood-Cushman loams, 0 to 6 percent slopes	32	0%
640	Forkwood-Cushman loams, 6 to 15 percent slopes	225	3%

Map Unit Symbol	Map Unit Name	Acres	%
641	Forkwood-Ulm loams, 0 to 6 percent slopes	54	1%
649	Haverdad-Clarkelen complex, 0 to 3 percent slopes	385	5%
678	Cambria-Zigweid-Kishona loams, 0 to 3 percent slopes	53	1%
679	Cambria-Zigweid-Kishona loams, 3 to 6 percent slopes	101	1%
684	Samday-Shingle-Badland complex, 10 to 45 percent slopes	2442	30%
685	Kishona-Cambria-Zigweid loams, 6 to 15 percent slopes	56	1%
707	Theedle-Kishona loams, 6 to 20 percent slopes	252	3%
708	Theedle-Kishona-Shingle loams, 3 to 30 percent slopes	2566	31%
711	Turnercrest-Keeline-Taluce fine sandy loams, 6 to 30 percent slopes	154	2%
727	Haverdad-Kishona association, 0 to 6 percent slopes	89	1%
	Total	8265	100%

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

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information. The map unit symbols identified for the soils and the associated ecological sites found within the Quarter Circle 9 Beta POD boundary are listed in the table below.

Table 3.4 – Map Units and Ecological Sites

Ecological site description	Map Unit Symbol	Acres	%
LOWLAND (10-14NP)	607	351	4%
LOWLAND (10-14NP)	613	209	3%
LOAMY (10-14NP)	614	177	2%
LOAMY (10-14NP)	615	825	10%
LOAMY (10-14NP)	622	286	3%
LOAMY (10-14NP)	639	32	0%
LOAMY (10-14NP)	640	225	3%
LOAMY (10-14NP)	641	54	1%
LOWLAND (10-14NP)	649	385	5%
LOAMY (10-14NP)	678	53	1%
LOAMY (10-14NP)	679	101	1%
SHALLOW CLAYEY (10-14NP)	684	2,442	30%
LOAMY (10-14NP)	685	56	1%
LOAMY (10-14NP)	707	252	3%

Ecological site description	Map Unit Symbol	Acres	%
LOAMY (10-14NP)	708	2,566	31%
SANDY (10-14NP)	711	154	2%
LOWLAND (10-14NP)	727	89	1%
TOTAL		8,265	100%

3.2.1.1. Shallow Loamy Ecosite-Mixed Sagebrush/Grass Plant Community

Historically, this plant community evolved under grazing by bison and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush control. Wyoming big sagebrush is a significant component of this plant community. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

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

When compared to the Historical Climax Plant Community, big sagebrush and blue grama have increased. Bluebunch wheatgrass has decreased, often occurring only where protected from grazing by the sagebrush canopy. Production of cool-season grasses has also been reduced. Cheatgrass (downy brome) has invaded the state. The overstory of big sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope.

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

3.2.1.2. Lowland Ecosite-Mature cottonwoods/Cool-Season Grass Plant Community

This plant community evolved under moderate grazing by domestic livestock. Cool-season grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Mature cottonwoods make up the overstory.

Dominant grasses include rhizomatous wheatgrasses, Kentucky bluegrass, needleandthread, and green needlegrass. Grasses of secondary importance include prairie junegrass, Sandberg bluegrass, and slender wheatgrass. Forbs, commonly found in this plant community, include Louisiana sagewort (cudweed), plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Silver sagebrush and snowberry canopy cover may be 20-40%.

When compared to the Historical Climax Plant Community, western wheatgrass and green needlegrass have decreased. Needleandthread and Sandberg bluegrass have increased. Silver sagebrush has increased. Reproduction of cottonwoods is limited. The overstory of cottonwoods and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as birds, mule deer and antelope.

This site is stable and protected from excessive erosion. The biotic integrity of this plant community is intact. The cottonwood overstory along Crazy Woman Creek that enhances the wildlife habitat. The

watershed is functioning.

3.2.2. Wetlands/Riparian

Wetland/Riparian areas existing along Flying E Creek from the Bear Draw Beta RO may become further enhanced by additional water treated from the Quarter Circle 9 Beta POD.

3.2.3. Invasive Species

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

- Leafy spurge

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Additionally, the operator or BLM confirmed the following WERIC identified infestations and/or documented additional weed species during subsequent field investigations:

- Russian knapweed
- Saltcedar
- Spotted knapweed
- Scotch thistle
- Canada thistle
- Common Cocklrbur
- Buffalo bur

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

3.3. Wildlife

Land cover within the project area consists of sage brush step. Sage brush is the dominant shrub interspersed with short native grasses including blue grama. Large patches of cheat grass dominate some areas. Extensive areas of bare ground were not encountered during surveys with the exception of black-tailed prairie dog colonies. Timely spring precipitation in 2006, 2007 and 2008 has promoted growth of grassland areas. Current land uses within the project area include cattle grazing and CBNG development. Several resources were consulted to identify wildlife species that may occur in the proposed project area. Resources that were consulted include the wildlife database compiled and managed by the BLM Buffalo Field Office (BFO) wildlife biologists, the PRB FEIS, the Wyoming Game and Fish Department (WGFD) big game and sage-grouse maps, and the Wyoming Natural Diversity Database (WYNDD).

A habitat assessment and wildlife inventory surveys were performed by Big Horn Environmental Consultants (BHEC). BHEC performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol in 2006, 2007 and 2008. Surveys were not conducted for Ute ladies'-tresses orchid. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits on January 7, 8, 9, 10 and 11, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

Wildlife species common to the habitat types present are identified in the PRB FEIS (pg. 3-114). Species that have been identified in the project area or that have been noted as being of special importance are described below.

3.3.1. Big Game

Big game species expected to be within the Quarter Circle 9 Beta project area include pronghorn antelope and mule deer with rare observations of white-tailed deer and elk in the area. Mule deer and pronghorn antelope were observed routinely during the onsite field visits and sign of both species was found throughout the POD. The WGFD has determined that the entire project area provides yearlong range for pronghorn antelope and winter-yearlong range for mule deer. Within the project area along Crazy Woman Creek provides yearlong range for white-tailed deer. The Quarter Circle 9 Beta POD is outside the identified elk ranges for the Fortification Creek elk herd.

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.

Populations of pronghorn antelope, mule deer, and white-tailed deer within their respective hunt areas are above WGFD objectives. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by ephemeral tributaries of Crazy Woman Creek. No natural springs are documented within the project area. Fish that have been identified in the Crazy Woman Creek watershed are listed in the PRB FEIS (3-156-159).

The Powder River Basin is one of the last free-flowing prairie stream ecosystems left in the United States, with existing flows, turbidity, and water quality within historic ranges. The Powder River supports an intact native fish community including several rare or declining species. These species have evolved life history strategies that allow them to survive in extreme conditions (Hubert 1993). Native fish species include sauger, shovelnose sturgeon, goldeye, plains minnow, sand shiner, flathead chub, plains killifish, river carpsucker, sturgeon chub, western silvery minnow, channel catfish, fathead minnow, longnose dace, mountain sucker, shorthead redhorse, longnose sucker, stonecat, white sucker and others. Six of these are designated by the WGFD as either Native Species Status (NSS) 1, 2, or 3 species. Species in these designations are considered to be species of concern, in need of more immediate management attention, and more likely to be petitioned for listing under the Endangered Species Act.

NSS1 species (sturgeon chub and western silvery minnow) are those that are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions are declining or vulnerable. NSS2 species (goldeye, shovelnose sturgeon, and sauger) are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions appear to be stable. NSS3 species (plains minnow) are widely distributed throughout their native range and appear stable; however, habitats are declining or vulnerable. For these species, the WGFD has been directed by the Wyoming Game and Fish Commission to recommend that no loss of habitat function occur. Some modification of the habitat may occur, provided that habitat function is maintained (i.e., the location, essential features, and species supported are unchanged).

The sturgeon chub was petitioned for listing under the Endangered Species Act in 2000. The sturgeon chub is a small minnow native to WY and is known to occur only in the Powder River and in one location on Crazy Woman Creek. The sturgeon chub requires large, free-flowing rivers characterized by swift flows, high variable flow regimes, braided channels, high turbidity, and sand/gravel substrates. On April 18, 2001, the U.S. Fish and Wildlife Service determined that the listing was not warranted, due to the

sturgeon chub population being more abundant and better distributed throughout their range than previously believed.

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them. Confluence Consulting, Inc. identified the following species present within the Clear Creek and Powder River watersheds: Woodhouse’s toad, Northern leopard frog, gopher snake, and garter snake (2004). Because sampling at the upper two sites on Clear Creek occurred late in the season, seasonality may have influenced the lack of reptiles and amphibians observed at these sites.

3.3.3.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. Many species that are of high management concern use shrub-steppe and shortgrass prairie areas for their primary breeding habitats (Saab and Rich 1997). Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151). Species observed by Big horn Environmental Consultants during 2007 surveys include bald eagle, golden eagle, red-tail hawk, prairie falcon, great-horned owl and burrowing owl. During the onsite field visits conducted in 2008, the BLM biologist observed golden eagle, red-tailed hawk and American kestrel within the project area.

3.3.4.Raptors

Raptor species expected to occur in suitable habitats within the Powder River Basin include northern harrier, golden eagle, red-tailed hawk, Swainson’s hawk, ferruginous hawk, American kestrel, prairie falcon, short-eared owl, great horned owl, bald eagle, rough-legged hawk, merlin, Cooper’s hawk, northern goshawk, long-eared owl, and burrowing owl. Raptor species nest in a variety of habitats including but not limited to; native and non-native grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities.

Thirty raptor nest sites were identified by Big Horn Environmental Consultants (BHEC 2007) and BLM within 0.5 mile of the project area, of these, 11 nests were active in 2007 and 11 were active in 2008.

Table 3.5. Documented raptor nests within the Quarter Circle 9 Beta project area in 2007.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	2007 STATUS	2008 STATUS
448	Golden Eagle	391733E 4918186N	Sec. 6, T51N/R79W	CTL	Good	Active	Inactive
2652	Unknown Raptor	396383E 4912678N	Sec. 25, T51N/R79W	JUL	Good	Inactive	Inactive
3445	Red-tail Hawk	394717E 4922100N	Sec. 35, T52W/R79W	CTL	Unknown	Unknown	Active
3448	Red-tail Hawk	391042E 4917843N	Sec. 9, T51N/R79W	CTL	Good	Active	Active
3449	Red-tail Hawk	395446E 4922653N	Sec. 25, T52N/T79W	CTL	Unknown	Unknown	Gone
3452	Unknown Raptor	394755E 491777N	Sec. 35, T52N/R79W	CTL	Unknown	Unknown	Inactive
3453	Unknown Raptor	395220E 4921395N	Sec.36, T52N/R36W	CTL	Unknown	Unknown	Inactive
3454	Unknown Raptor	395083E 4921421N	Sec.36, T52N/R79N	CTL	Unknown	Unknown	Active
3792	Red-tail Hawk	393460E 4916095N	Sec. 14, T51N/R79W	CTL	Fair	Inactive	Gone
3794	American	394060E	Sec. 23,	CLF	Unknown	Inactive	Inactive

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	2007 STATUS	2008 STATUS
	Kestrel	4914114N	T51N/T79W				
4050	Golden Eagle	391739E 4918248N	Sec. 9, T51N/T79W	CTL	Excellent	Active	Active
4051	Red-tail Hawk	393275E 4918336N	Sec. 10, T51N/T79W	CTL	Good	Active	Inactive
4052	Red-tail Hawk	391956E 4918336N	Sec.10, T51N/R79W	CTL	Excellent	Inactive	Gone
4053	Great Horned Owl	394682E 4917164N	Sec. 14, T51N/R79W	JUL	Poor	Occupied	Active (BBMA)
4054	Great Horned Owl	390640E 4916186N	Sec. 16, T51N/R79W	CTL	Fair	Inactive	Inactive
4055	Golden Eagle	390070E 4916305N	Sec. 17, T51N/R79W	CTL	Good	Active	Gone
4116	Long Eared Owl	395650E 4920243N	Sec. 1, T51N/R79W	JUN	Good	Inactive	Active (BBMA)
4117	Golden Eagle	394525E 4920039N	Sec. 2, T51N/R79W	CTL	Excellent	Active	Inactive
4118	Red-tail Hawk	394424E 4920489N	Sec. 2, T51N/R79W	CTL	Gone	Gone	Gone
4119	Prairie Falcon	395776E 4918423N	Sec. 12, T51NR79W	CLF	Unknown	Active	Active
4120	American Kestrel	395806E 4918345N	Sec. 12, T51N/R79W	CLF	Unknown	Active	Inactive
4471	American Kestrel	389697E 4917139N	Sec. 17, T51N/R79W	CTL	Unknown	Occupied	Inactive
4472	Prairie Falcon	396276E 4917742N	Sec.12, T51N/R79W	CLF	Unknown	Active	Active
4473	American Kestrel	391253E 4916493N	Sec. 16, T51N/R79W	CTL	Unknown	Inactive	Active
4474	Red-tail Hawk	390634E 4916171	Sec. 16, T51N/R79W	CTL	Good	Inactive	Active
4476	Red-tail Hawk	389693E 4915495N	Sec. 20, T51N/R79W	CTL	Fair	Active	Active
4477	Red-tail Hawk	389747E 4917344N	Sec. 8, T51N/R79W	CTL	Good	Active	Active
4762	Unknown Raptor	391706E 4918162N	Sec. 9, T51N/R79W	CTL	Good	Inactive	Inactive
5130	Great Horned Owl	390955E 4917679N	Sec. 9, T51N/R79W	CTL	Unknown	Inactive	Inactive
5154	Unknown Raptor	394502E 4919985N	Sec. 2, T51N/R79W	CTL	Fair	Inactive	Inactive

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 two 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 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale,

Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004).

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

Eighteen black-tailed prairie dog colonies were identified during site visits by Big Horn Environmental Consultants and Wyoming Game & Fish Dept. within the project area. The location and size of prairie dog colonies in project area are included below in Table 4.1. Fifteen of the prairie dog colonies interconnect and all of the colonies are within 1.5 km (0.9 mile) of other active colonies. The project area is located approximately five miles from the Arvada complex, the nearest potential reintroduction area. Black-footed ferret habitat is present within the Quarter Circle 9 Beta project area.

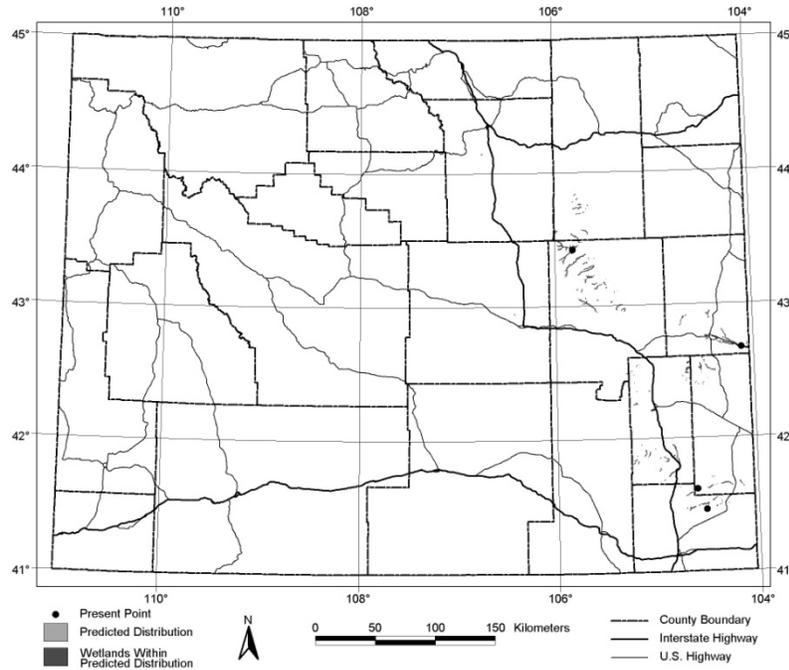
Table 3.6 Prairie Dog colonies within the project area.

UTM (NAD 83)	LEGAL LOCATION	ACRES
394162E/4919137N	Sec. 2, T51N/R79W	72.9
393823E/4918774N	Sec. 11, T51N/R79W	29.4
394032E/4918361N	Sec. 11, T51N/R79W	4.4
392253E/4916303N	Sec. 15, T51N/R79W	13.7
391475E/4916799N	Sec. 16, T51N/R79W	30.5
394306E/4916374N	Sec. 14, T51N/R79W	2.6
393846E/4918556N	Sec. 11, T51N/R79W	28.2
393799E/4914860N	Sec. 23, T51N/R79W	7.8
394353E/4915143N	Sec. 23, T51N/R79W	6.1
391487E/4916842N	Sec. 16, T51N/R79W	22.7
392147E/4916523N	Sec. 15, T51N/R79W	28.4
394766E/4919993N	Sec. 2, T51N/R79W	28.3
394058E/4919026N	Sec. 2, T51N/R79W	124.2
391227E/4918696N	Sec. 9, T51N/R79W	14.7
391428E/4916829N	Sec. 16, T51N/R79W	62.5
392194E/4916463N	Sec. 15, T51N/R79W	31.7
394259E/4915189N	Sec. 23, T51N/R79W	9.1
393751E/4914824N	Sec. 23, T51N/R79W	7.1

3.3.5.1.2. Ute 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. Wyoming Natural Diversity Database model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties.

Figure 3.1. Predicted Distribution of Ute ladies'-tresses in Wyoming



Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 and one in 2006 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. In Wyoming, *Spiranthes diluvialis* blooms from early August to early September, with fruits produced in mid August to September (Fertig 2000).

Crazy Woman Creek is a perennial stream with ephemeral tributaries. No natural springs were identified within the project area. Big Horn Environmental Consultants did not conduct a survey to identify Ute ladies'-tresses orchid within the project area. There are no known populations in the area. The majority of the project falls within areas drained by ephemeral drainages with heavy clay soils that immediately rise to upland vegetation. Crazy Woman Creek runs through the western-most portion of the POD and flows perennially. Big Horn Environmental Consultants will complete the annual surveys for Ute ladies'-tresses orchid on behalf of Lance Oil & Gas. Suitable orchid habitat is present within the Quarter Circle 9 Beta 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. Two habitat types, prairie dog colonies and sagebrush ecosystems, specifically, are the most common among habitat

types within the Powder River Basin and contain habitat components required in the life cycle of several sensitive species. These are described below in general terms. Those species within the Powder River Basin that were once listed or candidates for listing under the Endangered Species Act of 1973 and remain BLM Wyoming sensitive species are described in more detail. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

3.3.5.2.1. Prairie dog colony obligates

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

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, McCracken et al. 1985, Agnew 1986, Uresk and Sharps 1986, Deisch et al. 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list: swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), and long-billed curlew (*Numenius americanus*). Species observed by Big Horn Environmental Consultants include burrowing owl.

3.3.5.2.2. Sagebrush obligates

Sagebrush ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; in other words, species requiring sagebrush for some part of their life cycle. Sagebrush obligates within the Powder River Basin, listed as sensitive species by BLM Wyoming include greater sage-grouse, Brewer's sparrow, sage thrasher, and sage sparrow. Sage sparrows, Brewer's sparrows, and sage thrashers all require sagebrush for nesting, with nests typically located within or under the sagebrush canopy. Sage thrashers usually nest in tall dense clumps of sagebrush within areas having some bare ground for foraging. Sage sparrows prefer large continuous stands of sagebrush, and Brewer's sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Paige and Ritter 1999). Other sagebrush obligate species include sagebrush vole and pronghorn antelope. Species observed by Big Horn Environmental Consultants and the BLM wildlife biologist during field visits include greater sage-grouse.

3.3.5.2.3. Bald eagle

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

Bald eagle nesting habitat is generally found in areas that support large mature trees. Eagles typically will build their nests in the crown of mature trees that are close to a reliable prey source. This species feeds primarily on fish, waterfowl, and carrion. In more arid environments, such as the Powder River Basin, prairie dogs, ground squirrels, and lagomorphs (hares and rabbits) can make up the primary prey base. The diets of wintering bald eagles are often more varied. In addition to prairie dogs, ground squirrels, and lagomorphs, carcasses of domestic sheep and big game may provide a significant food source in some

areas. Historically, sheep carcasses from large domestic sheep ranches provided a reliable winter food source within the Powder River Basin (Patterson and Anderson 1985). Today, few large sheep operations remain in the Powder River Basin. Wintering bald eagles may congregate in roosting areas generally made up of several large trees clumped together in stands of large ponderosa pine, along wooded riparian corridors, or in isolated groups. Bald eagles often share these roost sites with golden eagles as well.

Galleries of mature cottonwood trees along Crazy Woman Creek and the perennial stream flow provide for suitable bald eagle nesting as well as winter roosting habitat. Prey species for bald eagles within the Crazy Woman Creek watershed are numerous including yearling deer and pronghorn antelope, wild turkeys, cottontail rabbits and other small mammals found in the under story vegetation along Crazy Woman Creek, black-tailed prairie dogs in colonies lying above the floodplain as well as fish and waterfowl utilizing the perennial waters of Crazy Woman Creek. No bald eagle nests were observed within 0.5 miles of the project area during raptor surveys in 2006 and 2007 by BHEC. One bald eagle nest, active in 2007, exists in SWNW section 29 T.51N., R.79W, more than one mile from the Quarter Circle 9 Beta POD. In 2006-2007, BHEC made 16 observations of roosting bald eagles within 0.5 mile of the project area at ten locations during 4 separate survey dates. The results of bald eagle roost surveys conducted during the 2006-2007 season by BHEC are illustrated below in table 5. These winter roost survey results support “consistent winter use” extending one mile from proposed activities.

Table 3.7 2006-2007 Bald Eagle Winter Roost Survey Results

DATE	TIME AM	UTM (NAD 83)	LEGAL LOCATION	DESCRIPTION
12/6/2006	0715-0800	391245E 4917042N	section 16 T51N/R79W	1 adult BAEA perched in CTL
12/6/2006	0715-0800	391272E 4916381N	section 16 T51N/R79W	2 adult BAEA perched in CTL
12/6/2006	0715-0800	389708E 4915863N	section 17 T51N/R79W	1 adult BAEA perched in CTL
1/16/2007	1610	391078E 4916401N	section 16 T51N/R79W	1 immature BAEA in flight
1/16/2007	1611	391210E 4916977N	section 16 T51N/R79W	2 adult BAEA perched in CTL at confluence of Dry Creek and Crazy Woman Creek
1/16/2007	1612	390600E 4916833N	section 16 T51N/R79W	1 adult BAEA perched in CTL
1/16/2007	1613	391082E 4916967N	section 16 T51N/R79W	1 immature BAEA perched in CTL
1/18/2007	1613	391141E 4916180	section 16 T51N/R79W	2 immature BAEA perched in CTL
1/25/2007	0750	393833 4916562N	section 14 T51N/R79W	1 adult BAEA perched on fence post in the uplands
1/25/2007	0759	390869E 4916473N	section 16 T51N/R79W	2 adult BAEA perched in CTL
1/25/2007	0830	391104E 4916289N	section 16 T51N/R79W	2 adult BAEA perched in CTL

3.3.5.2.4. Black-tailed prairie dog

The black-tailed prairie dog was added to the list of Candidate species for federal listing on February 4, 2000 (USFWS 2000). On August 12, 2004, the U.S. Fish and Wildlife Service removed the black-tailed prairie dog’s Candidate status. BLM Wyoming considers prairie dogs as a sensitive species and

continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a diurnal rodent inhabiting prairie and desert grasslands of the Great Plains.

Due to human-caused factors, black-tailed prairie dog populations are now highly fragmented, and isolated (Miller 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems, such as landowner poisoning and disease, which affect long term population viability (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 Digital Ortho Quads indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001. However, aerial surveys conducted in 2003 to determine the status of known colonies indicated that a significant portion (approximately 47%) of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier 2004).

Eighteen black-tailed prairie dog colonies, totaling approximately 524.3 acres were identified within the project area during site visits by Big Horn Environmental Consultants or from Wyoming Game & Fish Dept. and BLM databases. Refer to Table 3.2 for locations and area of Prairie Dog Colonies within the project area.

3.3.5.2.5. Burrowing owl

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

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

Burrowing owl nesting habitat consists of open areas with mammal burrows. Individual burrowing owls have moderate to high site fidelity to breeding areas and even to particular nest burrows (Klute et al. 2003). Burrow and nest sites are reused at a higher rate if the bird has reproduced successfully during the previous year. Favored nest burrows are those in relatively sandy sites (possibly for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance, and slightly elevated locations. In Wyoming, egg laying begins in mid-April. Incubation is assumed to begin at the mid-point of the laying period and lasts for 26 days (Olenick 1990). Young permanently leave the primary nest burrow around 44 days from hatch (Landry 1979). Juveniles will continue to hunt with and associate with parents until migration (early September through early November) (Haug 1985).

The BLM BFO databases and the survey information provided by Big Horn Environmental Consultants indicate burrowing owl nests at the following locations within the project area or within 0.25 mile of the Quarter Circle 9 Beta project area in 2007 (see Table 3.4 below).

Table 3.8 Burrowing Owl nest locations.

BLM ID#	SPECIES	UTM (NAD 83)	LEGAL LOCATION	SUBSTRATE	CONDITION	STATUS IN 2006	STATUS IN 2007
58	Burrowing Owl	389984E 4915342N	NENE Sec. 20, T51N, R 79W	Active Burrow	Unknown	Unknown	Inactive
69	Burrowing Owl	389993E 4915341N	NENE Sec. 20 T51N, R79W	Active Burrow	Unknown	Unknown	Active

3.3.5.2.6. Grouse

3.3.5.2.6.1. Greater sage-grouse

The Greater sage-grouse is listed as a sensitive species by BLM (Wyoming). In recent years, several petitions have been submitted to the USFWS to list greater sage-grouse as Threatened or Endangered. On January 12th, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was “not warranted” following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse. In 2007, the U.S. District Court remanded that decision, stating that the USFWS’ decision-making process was flawed and ordered the USFWS to conduct a new Status Review as a result of a lawsuit and questions surrounding the 2005 review (Winmill Decision Case No. CV-06-277-E-BLW, December 2007).

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 throughout the project area. Moderately dense to dense sagebrush is the dominant vegetation type of the upland areas. Approximately 83% of the project area meets seasonal habitat requirements and are large enough to meet the landscape scale requirements for the bird (BLM 2008). Sage-grouse habitat models indicate that the majority of the project area contains high quality sage-grouse nesting habitat and high quality sage-grouse wintering habitat (Walker et al. 2007). BLM records identify 25 sage-grouse leks within 4 miles of the projects boundary. The 4-miles distance was recommended by the state wildlife agencies’ ad hoc committee for sage-grouse and oil and gas development for consideration of effects to nesting habitat (WGFD 2008). Sage-grouse sign (scat) was observed at 3 proposed well locations and along access routes proposed within the NENE and SWNE of section 14. Two sage-grouse were flushed at a proposed well location within NESE section 15 and one sage-grouse was observed along the existing primitive trail located SENE section 15. BLM records identified 25 sage grouse leks within 4 miles of the Quarter Circle 9 Beta POD. These 25 lek sites are identified below (Table 3.5).

Table 3.9. Sage-grouse leks surrounding the Quarter Circle 9 Beta project area.

LEK NAME	LEGAL LOCATION	OCCUPANCY AND ACTIVITY STATUS IN YEAR - PEAK MALES	DISTANCE FROM PROJECT AREA (MILES)
Fleetwood Draw	SENE Sec. 23, T51N/R79W	Occupied - 19	Within the project area
Double Cross Road	NWNW Sec. 5, T51N/R79W	Occupied 1997 to 2007 - 0	1.8
Clear Creek Cutoff	SW Sec. 11, T52N, R79W	Occupied 2000 – 19, 2001 – 3, 2002 – 0, 2003 – 0, 2004 – 7, 2005 – 0, 2006 – 7, 2007 - 0	3.0
Alvaro	SWNE Sec. 26,	Occupied	0.6

LEK NAME	LEGAL LOCATION	OCCUPANCY AND ACTIVITY STATUS IN YEAR - PEAK MALES	DISTANCE FROM PROJECT AREA (MILES)
	T52N/R80W	1999 – 17, 2000 to 2007 - 0	
Antelope Draw	SENE Sec. 1, T51N/R80W	Occupied 1999 – 12, 2000 – 0, 2001 – 26, 2002 – 2, 2003 to 2004 – 0, 2005 – 8, 2006 – 17, 2007 - 0	2.4
Antelope Draw - Stat	NWNW Sec. 36, T52N/R80W	Occupied 2005 – 0, 2006 – 33, 2007 - 1	3.8
Antelope Draw West	NESE Sec. 2, T51N/R80W	Occupied 2006 – 23, 2007 - 30	3.3
Antelope Reservoir NW	SWNW Sec. 1, T51N/R80W	Occupied 2005 – 18, 2006 – 46, 2007 - 34	2.9
Arpan Draw	SENE Sec. 12, T51N/R79W	Occupied 2007 - 16	
Christian II	NESE Sec. 26, T51N/R80W	Occupied 1999 – 75, 2000 – 99, 2001 - 40, 2002 - 14, 2003 - 9, 2004 – 10, 2005 – 15, 2006 – 11, 2007 - 10	3.4
Christian III	NENE Sec. 1, T50N/R80W	Occupied 2006 – 16, 2007 - 0	4.0
Coal Gulch	SENE Sec. 5, T50N/R78W	Occupied 2004 – 32, 2005 – 34, 2006 – 124, 2007 - 95	2.5
Cook Draw	NENE Sec. 14, T52N/R79W	Occupied 2001 – 31, 2002 to 2003 – 0, 2004 – 9, 2005 – 15, 2006, 26, 2007 - 30	2.3
Dry Creek I	SESE Sec. 11, T51N80W	Occupied 2000 – 28, 2001 – 16, 2002 to 2003 – 0, 2004 – 10, 2005 – 18, 2006 to 2007 - 0	2.3
Dry Creek II	SWSE Sec.12, T51N/R80W	Occupied 2003 – 2, 2004 to 2007 - 0	3.3
Dry Creek III	NW Sec. 14, T51N/R80W	Occupied 1997 to 2007 – 0	3.8
Frank	SWSW Sec. 33, T52N/R79W	Occupied 1999 – 3, 2000 to 2007 - 0	1.1
Grub Draw	SENE Sec. 16, T52N/79W	Occupied 2005 – 5, 2006 -1, 2007 -0	3.3
Kinney Draw I	SESE Sec. 4, T51N/78W	Occupied 2004 – 20, 2005 – 36, 2006 – 6, 2007 - 0	3.0
Kinney Draw II	SWNW Sec. 10, T51NR78W	Occupied 2004 – 7, 2005 – 35, 2006 – 55, 2007 - 68	3.1
McMillian Draw	SESE Sec. 2, T51N/R80W	Occupied 1999 – 6, 2000 to 2002 – 0, 2003 – 4, 2004 – 0, 2005 – 6, 2006 – 0, 2007 - 22	3.0

LEK NAME	LEGAL LOCATION	OCCUPANCY AND ACTIVITY STATUS IN YEAR - PEAK MALES	DISTANCE FROM PROJECT AREA (MILES)
Nurse Draw	NWSW Sec. 3, T51N/R78W	Occupied 2006 – 32, 2007 - 0	3.3
Sony Top	SWNE Sec. 19, T52N/R79W	Occupied 2006 – 5, 2007 - 0	3.9
Thompson Creek Rd I	SENE Sec. 13, T52N/R79W	Occupied 1999 – 22, 2000 – 20, 2001 – 6, 2002 - 10, 2003 – 13, 2004 – 9, 2005 to 2007 - 0	2.5
Thompson Creek Rd II	SESE Sec. 13, T52N/R79W	Occupied 1999 – 4, 2000 – 46, 2001 to 2007 - 0	2.1

3.3.5.2.6.2. Sharp-tailed grouse

Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is found where grasslands are intermixed with shrublands, especially wooded draws, shrubby riparian area, and wet meadows.

The Quarter Circle 9 Beta project area has the potential to support sharp-tailed grouse during most of the year. The mosaic of grasslands and sagebrush-grasslands could provide habitat from April through October. Cottonwoods and junipers could provide buds and berries, respectively, to sustain grouse through the winter. There are no sharp-tailed grouse leks documented in the project area.

3.3.5.2.7. Mountain plover

The mountain plover was proposed for listing in 1999 (USFWS). In 2003, the USFWS withdrew a proposal to list the Mountain Plover as a Threatened species, stating that the population was larger than had been thought and was no longer declining. Mountain plovers, which are a BLM sensitive species, are typically associated with high, dry, short grass prairies (BLM 2003). Mountain plover nesting habitat is often associated with heavily grazed areas such as prairie dog colonies and livestock pastures.

Suitable mountain plover habitat is present within the project area within 18 black-tailed prairie dog colonies ranging in size from 4.4 to 124.2 acres. Big Horn Environmental Consultants did not document mountain plovers within the Quarter Circle 9 Beta POD.

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 3.10 Historical West Nile Virus Information

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

*Wyoming Department of Health Records September 12, 2007.

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

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

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

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

associated with CBNG development.

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

3.5. Water Resources

The project area is within Stewart Draw, Fleetwood Draw, and Coal Gulch which are tributaries to the Crazy Woman Creek drainage system. The headwaters of Stewart Draw and Fleetwood Draw are typified by steep-gradient gully systems intersected by randomly degraded claystone exposures with sparse vegetation. The headwaters of Coal Gulch are typified by moderate gradient gully systems intersected by randomly degraded scoria and claystone exposures that are moderately to sparsely vegetated.

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, domestic or miscellaneous water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 72 to 770 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 Stewart Draw, Fleetwood Draw, and Coal Gulch drainages, which are tributaries to the Crazy Woman Creek watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined bed and bank.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters “illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area” (PRB FEIS page 3-48). For the Crazy Woman Creek watershed, the EC ranges from 1,066 at Maximum monthly flow to 1,937 at Low monthly flow and the SAR ranges from 1.29 at Maximum monthly flow to 2.26 at Low monthly flow. These values were determined at the USGS station located at Crazy Woman Creek at Upper Station near Arvada, WY (PRB FEIS page 3-49).

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the Quarter Circle Nine Beta project prior to on-the-ground project work (BFO Inventory No. 70070147). SWCA Environmental Consultants conducted a block and linear Class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior’s Standards and Guidelines (48CFR190) for the project. Leigh Grench and G.L. “Buck” Damone III, BLM Archaeologists, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The following resources are located within the project area.

Table 3.5 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48JO3080	Prehistoric	Not Eligible
48JO3086	Historic	Not Eligible
48JO3212	Historic	Not Eligible

Site Number	Site Type	National Register Eligibility
48JO3374	Historic	Not Eligible
48JO3677	Historic	Not Eligible
48JO3743	Prehistoric	Eligible
48JO3744	Prehistoric	Not Eligible
48JO3959	Prehistoric	Not Eligible
48JO3960	Historic	Not Eligible
48JO4052	Prehistoric	Not Eligible
48JO4053	Historic	Not Eligible

4. ENVIRONMENTAL CONSEQUENCES

The changes to the proposed action (Alternative B) resulted in development of Alternative C as the preferred alternative. The changes have reduced impacts to the environment which will result from this action. The environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

The majority of the proposed disturbance was planned within uplands areas containing loamy and shallow loamy ecological sites. Efforts have been made to avoid soil conditions with limited reclamation potential. However, in those areas where erosion concerns associated with proposed disturbance could not be avoided, mitigation and/or site specific COA's to address soil stabilization in a timely fashion have been applied (See site specific COA # 23). Portions of the project are planned within lowland ecological sites and measures have been taken to provide a minimum 20 foot undisturbed vegetative buffers for riparian areas.

The predominance of shallow soils, steep slopes and climatic limitations throughout the Quarter Circle 9 Beta POD as identified by the NRCS Soil Survey for Northern Johnson County and the BLM onsite investigations warrant the need for additional reclamation related conditions of approval (COA's) and the use of best management practices (BMP's) to help assure that the reclamation requirements of the Wyoming Reclamation Policy will be met. Table 4.1 identifies those Map Unit Symbols within the Quarter Circle 9 Beta POD with a poor reclamation rating. Surface disturbance within these areas may warrant expedient reclamation and/or performance based mitigation measures to ensure adequate stabilization and timely re-vegetation. During the onsite inspection, those areas that demonstrated highly erosive feature were recommended by BLM to be avoided. Where avoidance was not possible and/or feasible to the operator, site specific COA#23 has been applied to ensure expedient reclamation and stabilization measures is implemented. Programmatic mitigation measure 2.3.2.3 Vegetation may also be applied as a performance based measure.

Table 4.1 – Soil Map Units with Poor reclamation potential

MUSYM	Reclamation Rating	Acres	%
708	Fair	2566	31%
684	Poor	2442	30%

MUSYM	Reclamation Rating	Acres	%
615	Fair	825	10%
649	Poor	385	5%
607	Poor	352	4%
622	Fair	286	3%
707	Fair	252	3%
640	Fair	225	3%
613	Fair	209	3%
614	Fair	177	2%
711	Fair	154	2%
679	Fair	101	1%
727	Fair	89	1%
685	Fair	56	1%
641	Fair	54	1%
678	Fair	53	1%
639	Fair	32	0%

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

- Mixing of horizons occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and limit re-vegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Loss of soil vegetation cover, biologic crusts, organic matter, and productivity.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil compaction is the collapse of soil pores resulting in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and soil type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Modification of hill slope hydrology.

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

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 46 proposed well locations, one is on existing or reclaimed conventional well pads, 14 can be drilled without a well pad being constructed 14 will utilize a 30'x120' rig slot and 18 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 14 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (2 pits with estimated approximate size of 32 x 20 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 14 wells would involve approximately 0.5 acre/well for 7 total acres. Likewise the rig slot locations would have an estimated disturbance of 0.5 acre/well for 7 total acres. The other 18

wells requiring cut & fill pad construction would disturb approximately 0.82 acres/well pad for a total of 14.7 acres. The total estimated disturbance for all 46 wells would be 18.7 acres.

Approximately 16.5 miles of improved roads would be constructed to provide access to various well locations. Approximately 1.9 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 9.74 miles of pipeline would be constructed outside of corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

Proposed stream crossings, including culverts and 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 4.2 summarizes the proposed surface disturbance.

Table 4.2 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	28	0.5/acre	25.7	Long Term
Constructed Pad	18	Site Specific	14.7	
Gather/Metering Facilities	0	Site Specific	0.0	Long Term
Screw Compressors	0	Site Specific	0.0	Long Term
Monitor Wells	0.0	0.1/acre	0.0	Long Term
Impoundments				Long Term
On-channel	0	Site Specific	0.0	
Off-channel	0	Site Specific	0.0	
Water Discharge Points	0	Site Specific or 0.01 ac/WDP	0.0	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads		50' Width or Site Specific		Long Term
No Corridor	0.0		0.0	
With Corridor	16.5		99.8	

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
2-Track Roads No Corridor	0.0	12' Width or Site Specific		Long Term
With Corridor	1.9	35' Width or Site Specific	8.1	
Pipelines No Corridor	9.74	35' Width or Site Specific	41.3	Short Term
With Corridor	3.2		13.6	
Buried Power Cable No Corridor	Miles Buried Power Not within Corridor	12' Width or Site Specific	0.0	Short Term
Overhead Powerlines	0.0	15' Width	0.0	Long Term
SDI Water Pump Station	1	Site Specific	12	Long Term
SDI Sites	48	Site Specific	612	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

Wetland/Riparian areas existing along Flying E Creek from the Bear Draw Beta RO may become further enhanced by additional water treated from the Quarter Circle 9 Beta POD.

4.1.2. Invasive Species

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

1. Weed Spraying – Spot Spraying – Spring & Fall
 - a. Identify all noxious weeds within disturbed areas
 - b. Application rates as per Johnson County Weed & Pest recommendation:
 - i. Chemicals/application rates applied species specific; See Quarter Circle 9 Beta Weed and Pest Plan for specifics.
 - ii. Spring applications – May 15-July 30
 - iii. Fall applications – Sept. 1-Sept. 30
 - iv. Residual effects of the chemical combination(s) will control weeds annually.
 - v. Domestic animals or approved biological agents may be used in areas most suited for the type of control.
2. Preventive practices
 - a. Washing the undercarriage of vehicles may be implemented to minimize seed transport and dispersal.
 - b. Disturbance areas will be promptly re-seeded with certified weed free seed mix.
 - c. Certified weed free mulch will be used in necessary locations.
 - d. Surface disturbance will be minimized to the extent consistent with the MSUP.
3. Education of personnel:

- a. LOG will provide periodic weed education and awareness programs for its employees and contractors.
- b. Employees and contractors will be encouraged to report any new noxious weed infestations.
- c. Field employees and contractors will be notified of known noxious weed infestations of concern in the project area.

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

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

4.1.3. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Crazy Woman Creek drainage, which is approximately 0.9% of the total predicted in the PRB FEIS in 2007.
- 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 Stewart Draw, Fleetwood Draw, and Coal Gulch and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water from flowing into the Crazy Woman Creek Watershed.
- The WMP for the Quarter Circle 9 BETA POD proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

Under the environmentally preferred alternative, yearlong range for pronghorn antelope and white-tailed deer as well as winter-yearlong range for mule deer would be directly disturbed with the construction of wells, reservoirs, pipelines and roads. Table 4.1 summarized the proposed activities; items identified as

long term disturbance would be direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they should provide some habitat value as these areas are reclaimed and native vegetation becomes established.

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

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

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

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

4.2.1.1. Big Game Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be managed utilizing various strategies. Water may be discharged to impoundments included in LOG’s Stewart Draw POD, the Bear Draw Beta water treatment facility (WY0052639 outfall# 002), transport produced water via the Salt Creek Pipeline for reinjection near Midwest, Wyoming, and/or utilized for subsurface drip irrigation along Headgate Draw and Crazy Woman Creek. If a reservoir were to discharge, it is unlikely that the produced water will reach a fish-bearing stream, and that downstream species would be affected.

The Wyoming Department of Environmental Quality (DEQ) regulates effluent discharge through the National Pollution Discharge Elimination System in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The Wyoming DEQ has established effluent limits for the protection of game and non-game, aquatic life other than fish, wildlife, and other water uses.

Altering water temperatures, flow timing and magnitude, turbidity and chemical composition of the

Powder River could harm native fish species that inhabit the Powder River. Alterations could also allow for non native species to become established. Any water development that alters discharge patterns, reduces turbidity, changes water quality, modifies sediment transport, or blocks migratory routes for fish is likely to result in changes in the fish community. Additionally, altering of tributaries may have adverse effects to aquatic species. Tributaries provide spawning and nursery habitat for riverine fishes and support unique fish assemblages. Seasonal movements of riverine fishes into tributaries may be essential to the continued maintenance of several species found in the Powder River (Hubert 1993).

4.2.2.1. Change in Water Quality

Fish and amphibian species have evolved and adapted to existing conditions. Changes in water quality may have detrimental impacts on the native aquatic fauna. Major information gaps for these species include feeding habits, reproduction, specific habitat preference (pools, riffles, runs, backwaters, side channels, or a combination), and seasonal habitat use, therefore, it is difficult to fully understand how changes in water quality may affect native aquatic fauna.

The WGFD initiated a detailed fish and amphibian survey of the main-stem Powder River in 2004 to determine baseline species composition and distribution in the Basin. In accordance with the PRB FEIS, a monitoring plan was established by the PRB Interagency Working Group. The plan calls for baseline data collection over a three year period which is intended to provide information relative to the effects upon the aquatic biota of CBNG water.

Changes in the conductivity and sodium absorption ratio may occur as increased flows move sediment from channel bottoms and potentially increase erosion of floodplains. Confluence Consulting, Inc. reported high salinities and electrical conductivities, possibly due to CBNG water, for the Spotted Horse drainage in their report on the Powder River (2004). This report indicated that CBNG discharges could affect native species in the drainage. See Section 3.5.2 of this EA for water quality information associated with this project.

4.2.2.2. Change in Water Quantity

Native fauna in the Powder River drainage have evolved and adapted to a dynamic hydrography with high sediment loads. Changes in this flow regime (i.e., perennial flows) may seriously impact native fauna by altering their use of historical habitats for spawning, rearing, and reproduction. Alterations that impact channel morphology is an issue, and may have impacts to the aquatic biota due to changes in sediment loads, loss of habitat, and possible disruption of migration movements due to barriers created by culverts and/or head cuts.

It is difficult to assess, due to limited information, what effects this discharge may have upon the aquatic biota in the Powder River system. The increase in flow resulting from the discharge of project CBNG water would be more noticeable during the late summer months or winter months when the mean monthly flow is smaller than during the remainder of the year. The flow attributable to project produced water is very small relative to storm flows. Peak flow estimates for the river range from 3,560 cfs for a two year storm event to 18,065 cfs for a 100-year storm event. Addition of the produced water would facilitate beneficial uses such as livestock supply and irrigation supply during the late summer and winter months when the naturally occurring flow is diminished.

The volume of water permitted for direct discharge is based upon the water quality effects related to irrigation downstream in Montana. The flow rate is permitted to mimic seasonal highs and lows and adjusted accordingly.

4.2.2.3. Aquatics Cumulative effects

WDEQ is aware of the concerns about the effects of water quality and flows relative to discharge of water directly into the Powder River. They are taking a conservative approach to permitting until more information can be obtained. 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).

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

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

The use of the proposed water treatment facilities can increase the potential for migratory bird mortality in the evaporation ponds that receive a backwash stream from the conditioning ponds. This evaporation pond will contain a concentrated brine solution. Birds entering this pond can ingest the brine and die from sodium toxicity. Salt toxicosis has been reported in ponds with sodium concentrations over 17,000 mg/L. Ingestion of water containing high sodium levels can chronically affect aquatic birds, especially if a source of fresh water is not available nearby. Aquatic birds ingesting hypersaline water can be more susceptible to avian botulism. During cooler temperatures, sodium in the hypersaline water can crystallize on the feathers, affecting thermoregulatory and buoyancy functions, and causing the bird to die of hypothermia or drowning (Windingstad et al. 2004). Effective wildlife exclusionary devices, such as netting, will be required to prevent access by migratory birds, or other options should be utilized to contain and dispose of the brine solution should sodium concentrations rise over 17,000 mg/L.

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same affects as sage-grouse and raptor species. Though no timing restrictions are

typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Migratory Birds Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235. Site specific conditions of approval have been applied as needed.

4.2.4. Raptors Direct and Indirect Effects

Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to overheating or chilling of eggs or chicks. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation.

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

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.

Table 4.3. Infrastructure within close proximity (0.5 mile) to documented raptor nests within the Quarter Circle 9 Beta POD project area (Timing limitations will apply to this infrastructure).

BLM ID#	Infrastructure	DISTANCE (miles)
448	SDI Site 39 Utility corridor	0.04 0.25
2652	QC9 42-25-5179 well location	0.42
3445	SDI Site 21	Adjacent to the site.
3448	Utility Corridor & SDI Site 54	0.08

BLM ID#	Infrastructure	DISTANCE (miles)
3449	SDI Site 21	0.41
3452	SDI Site 19	Adjacent to the site.
3453	SDI Site 19	0.12
3454	SDI Site 19	0.05
3792	QC9 13-14-5179 well location	0.15
3794	Access road with corridor	0.1
4050	SDI Site 39 Utility corridor	0.04 0.25
4051	Utility Corridor SDI Site 32	0.05 0.11
4052	SDI Site 38	0.03
4053	QC9 31-14-5179 well location	0.19
4054	SDI water pipeline	0.02
4055	SDI Site 48	Adjacent to the site.
4116	SDI Site 15	0.16
4117	SDI Site 13	0.03
4118	SDI Site 23	0.1
4473	SDI Site 53	0.1
4474	SDI water pipeline	0.03
4762	SDI Site 39 Utility corridor	0.04 0.25
5130	Utility Corridor & SDI Site 54 SDI Site 40	0.18 0.40
5154	SDI Site 24	0.02

Where surface disturbing activity is proposed within the 0.5 mile of raptor nests, the effects will be minimized by maintaining surface occupancy out of line of sight from the nests.

Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

4.2.4.1. Raptors Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, page 4-221. Conditions of approval have been applied as needed.

4.2.5. Threatened and Endangered and Sensitive Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.2.5.1. Threatened and Endangered Species potentially affected by the proposed project area are further discussed following the table.

4.2.5.1. Threatened and Endangered Species

Table 4.4 Summary of Threatened and Endangered Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (<i>Mustela nigripes</i>)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NS	NLAA	No documented populations within the project area.
Threatened				
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Riparian areas with permanent water	NS	NLAA	No documented populations within the project area.

Presence

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

Project Effects

- LAA** Likely to adversely affect
- NE** No Effect.
- NLAA** May Affect, not likely to adversely affect individuals or habitat.

4.2.5.1.1. Black-Footed Ferret Direct and Indirect Effects

Suitable habitat is not of sufficient size to support a black-footed ferret population nor is the project area in and/or adjacent to the Arvada complex. No surveys for ferrets were required or conducted. It is extremely unlikely that any black-footed ferret is present in the project area. However, if any become present, the proposed action will most likely make portions of the project area unsuitable for ferret inhabitation. Implementation of the proposed development “may affect, but is not likely to adversely affect” the black-footed ferret.

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

The Ute ladies’-tresses orchid is threatened by energy developments, noxious weeds, and water

developments. Prolonged idle conditions in the absence of disturbance (flooding, grazing, mowing) may be a threat just as repeated mowing and grazing during flowering may lead to decline (Hazlett 1996, 1997, Heidel 2007). Heavy equipment used in energy development construction could dig up plants. Invasive weeds transplanted by vehicle and foot traffic in habitat could outcompete this fragile species. Restricting work from areas of Ute ladies'-tresses orchid habitat reduces these impacts.

Suitable habitat is present within the Quarter Circle 9 Beta project area along Crazy Woman Creek and its confluence with Headgate Draw. The subsurface drip irrigation system including buried pipeline to as many as 48 irrigation sites is proposed within close proximity to this perennial water sources.

Seepage that may result from irrigation along the perennial stream may provide suitable habitat for Ute ladies'-tresses orchids, however no historic seed source is present within the project area. For this reason, implementation of the proposed coal bed natural gas project “*may affect, but is not likely to adversely affect*” the Ute ladies'-tresses orchid with suitable habitat present.

A condition of approval has been applied requiring the operator to survey those areas of suitable habitat within proximity of proposed surface disturbing activities for Ute ladies'-tresses orchid. The operator has acknowledged in their plan that they will complete surveys if required by BLM. Without the surveys it is cannot be know if there are populations that exist within the suitable habitat. If Ute ladies'-tresses are documented, additional mitigation may be required.

4.2.5.2. Sensitive Species Direct and Indirect Effects

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

4.2.5.2.1. Prairie dog colony obligates

Wells, roads, pipelines and other infrastructure associated with energy development constructed within prairie dog colonies will directly remove habitat for prairie dog colony obligate species. Activities that disturb these species could lead to temporary or even long-term or permanent abandonment. Direct loss of species may also occur from vehicle traffic. Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

4.2.5.2.2. Sagebrush obligates

Shrubland and grassland birds are declining faster than any other group of species in North America (Knick et al. 2003). In Wyoming, existing oil and gas wells are located primarily in landscapes dominated by sagebrush, causing direct loss of this habitat. Associated road networks, pipelines, and powerline transmission corridors also influence vegetation dynamics by fragmenting habitats or by creating soil conditions facilitating the spread of invasive species (Braun 1998, Gelbard and Belnap 2003). Density of sagebrush-obligate birds within 100 m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001). Increased numbers of corvids and raptors associated with powerlines (Steenhof et al. 1993, Knight and Kawashima 1993, Vander Haegen et al. 2002) increases the potential predation impact on sage-grouse and other sagebrush-breeding birds (Knick et al. 2003)

Fragmentation of shrubsteppe habitat is a major disruption that has consequences for sagebrush-obligate

species (Braun et al. 1976; Rotenberry & Wiens 1980a). In fragmented habitats, suitable habitat area remains only as a remnant surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). Populations of sagebrush-obligate species decline because areas of suitable habitat decrease (Temple & Cary 1988), because of lower reproduction, and/or because of higher mortality in remaining habitats (Robinson 1992; Porneluzi et al. 1993). Fragmentation of shrubsteppe has the further potential to affect the conservation of shrub-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Due to this, sagebrush obligate species may not return until after habitat reestablishment.

Table 4.5 Summary of Sensitive Species Habitat and Project Effects.

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage sparrow (<i>Amphispiza billneata</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	K	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

4.2.5.2.3. Bald eagle Direct and Indirect Effects

Approximately 4,581 acres of the Quarter Circle 9 Beta project area falls within bald eagle winter roosting habitat. A gallery forest of mature cottonwoods along the banks of Crazy Woman Creek provide perches for bald eagle with consistent use documented in Big Horn Environmental Consultants wildlife surveys as well as WGFD and BLM databases. The presence of a perennial stream supports prey species for bald eagles and other raptors. One documented bald eagle nest located SENW section 29 T51N/R79W is 1.7 mile outside the project area. Two bald eagle roost site have been identified within the project area at the locations listed below in proximity of propose development.

Bald Eagle Roost Location	Infrastructure	DISTANCE (miles)
NWSE Sec. 16 T51N/79W	SDI Site 48	0.09
	SDI pump station	0.79
NENE Sec. 10 T51N/79W	SDI Site 35	0.11
	QC9 14-15-5179	0.61

The Quarter Circle 9 Beta POD does not propose any surface occupancy within 0.5 mile of either roost. Bald eagles are sensitive to human activities and can abandon an area due to the activity. To reduce the risk of decreased productivity or nest failure, BLM BFO requires a 0.5 mile no surface occupancy radius and a one mile radius timing limitation of all activity during the breeding season around active bald eagle nests. To reduce the risk of disruption to the winter roosting activities of bald eagles, the BLM BFO requires a 0.5 mile no surface occupancy radius and a one mile radius timing limitation of all winter roosts (either communal or consistent use) and winter roosting habitat.

Approximately 9.8 miles of overhead power lines exist within the bald eagle winter roosting habitat of the project area. The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the Powder River Basin particularly during the winter when migrant eagles join the small number of resident eagles. Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003, through December 28, 2006, Service Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls and 4 unidentified raptors were electrocuted on power poles within the Powder River Basin Oil and Gas Project area (USFWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, two golden eagles and a Cooper’s hawk were killed in apparent mid span collisions with powerlines (USFWS 2006a). Power lines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them; the Service has developed additional specifications improving upon the APLIC suggestions. Constructing power lines to the APLIC suggestions and Service standards minimizes but does not eliminate electrocution risk.

Typically two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses the BLM Buffalo Field Office reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; eagles (bald and golden) were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads do not affect bald eagles.

4.2.5.2.4. Black-tailed prairie dog Direct and Indirect Effects

Lance Oil & Gas Company Inc. planned to avoid black-tailed prairie dog colonies over federal surface included in the Quarter Circle Nine Beta POD. Those prairie dog colonies located on the private surface within the project area will be impacted by the SDI water pump station with surge pond, water pipelines

and irrigation system. The SDI water pump station and surge pond will occupy approximately 12 acres of prairie dog colony but the remaining disturbance related to the installation of the water pipelines and irrigation systems will be short term disturbance that prairie dogs will likely reoccupy following construction activities.

Individuals that survive the excavation process but whose burrows were destroyed will be displaced. As the prairie dog town grows in size, prairie dogs move from an area of high population density to an area of low population density. Male prairie dogs resort to either long-distance dispersal to new colonies (mostly as yearlings, rarely as adults) or short distance within the home colony. Female prairie dogs disperse over long distances to other colonies (as either yearlings or adults). Short-distance dispersal of females within the home colony almost never occurs (Hoogland 1995). Dispersal of prairie dogs occurs as single individuals. Both male and female prairie dogs prefer to move into an existing colony or one that has been abandoned rather than start a completely new colony. Coterie (small family group within the colony) members resist attempted invasions by conspecifics including immigrants. Dispersing prairie dogs have increased stress levels, higher exposure to predators, and are unlikely to be accepted by other colonies if they even encounter one. Both males and females actively protect their coterie territories from invading males and females (Hoogland 1995).

Unlike roads and pipelines, the construction and operation of facilities including reservoirs will permanently remove habitat. By the time the facilities are no longer needed, the facilities may become hard-pan, soil that has hardened due to mineral deposits and evaporation. Prairie dogs may be unable to burrow in this type of soil compaction. The presence of a reservoir will limit colony expansion. Well houses and power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the adjacent roads may result in prairie dog road mortalities. During construction of these facilities, there is the possibility that prairie dogs within these colonies may be killed as a direct result of the earth moving equipment. Constant noise and movement of equipment and the destruction of burrows puts considerable stress on the animals and will cause an increase in prairie dog mortalities. During the construction of these facilities individuals are exposed more frequently to predators and have less protective cover.

4.2.5.2.5. Burrowing owl Direct and Indirect Effects

Two burrowing owl nests were documented by Big Horn Environmental Consultants in their wildlife survey report as well as BLM database. The nest are listed below in proximity to the propose development.

BLM ID#	Infrastructure	DISTANCE (miles)
58	SDI Site 44	0.02
	SDI Site 43	0.06
69	SDI Site 44	0.02
	SDI Site 43	0.06

No surface occupancy is proposed within 0.5 miles of the nests. Surface disturbance related to the installation of the irrigation system will be short term.

The dramatic reduction of prairie habitat in the United States has been linked to reduction of burrowing owl populations (Klute et al. 2003). Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. Overhead power lines provide perch sites for larger raptors that could potentially result in increased burrowing owl predation. CBNG infrastructure such as roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USDAFS Thunder Basin National Grasslands in Campbell County, WY, whom cooperated with the

BLM in the creation of the 2003 PRB EIS, recommends a 0.25 mile timing restriction buffer zone for burrowing nest locations during their nesting season (April 15 to August 31). Instruction Memorandum No. 2006-197, directs the field offices to “use the least restrictive stipulations that effectively accomplish the resource objectives or uses.” Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months (See Chapter 3 for breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

4.2.5.2.6. Grouse

4.2.5.2.6.1. Greater sage-grouse Direct and Indirect Effects

Twenty-five greater sage-grouse leks occur within four miles of the project area. The proposed action will adversely impact breeding, nesting, brood rearing, late summer, and winter habitat. Proposed project elements that are anticipated to negatively impact grouse are approximately: 46 CBNG wells, 18.4 miles of new roads, 4 miles of new pipelines, increased vehicle traffic on established roads and increased noise from generators and heavy equipment. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse habitat loss will be 8,026 acres from roads, and 723 acres from 46 well locations. These numbers are not additive since each well location has an associated road and power and in many cases wells are closer than 0.6 miles to each other. Therefore, the above numbers over-represent anticipated impacts within the project area if totaled, however since most well locations are within 0.6 miles of each other the entire project area (all 8,256 acres within the POD boundaries) can be considered affected.

Based on the best available science, which is summarized below, the proposed action will most likely result in the extirpation of the local grouse population and subsequent abandonment of the three leks within the project area (Fleetwood Draw, Frank and Alvaro leks).

- The operator plans to mitigate the effects to sage-grouse in the following ways:
- Lance originally proposed 14 impoundments within the 2 mile TLS buffer from the Fleetwood Draw lek in quality sage brush habitat. As a result of the onsite all 14 impoundments were withdrawn by the operator in an effort to minimize effects to sage-grouse.
- Lance also agreed to restrict heavy truck traffic through the 32-15 engineered road (Engineered #9) in order to avoid heavy use of the primitive road (Template #22) going through the Fleetwood lek.
- The operator has made a commitment to aid funding the Lake DeSmet Conservation District and NRCS sage-grouse habitat conservation plan on the Quarter Circle 9 ranch property and federal grazing lease hold. During the breeding season, Lance agreed to restrict access to the wells near the Fleetwood Draw lek before 9 am and after 3 pm unless there is an emergency. This is in conjunction with minimizing the improvements of these existing primitive roads. It must be noted that the operator did look at alternate route in an effort to avoid disturbance within 0.25 of the Fleetwood Draw lek but none were identified.
- If appropriate, Lance will modify the seed mix to include more forbs that provide sage-grouse forage.

4.2.5.2.6.2. Greater sage-grouse Cumulative Effects

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development. The sage-grouse cumulative impact area for the POD encompasses the 25 sage-grouse leks located within four miles of proposed project facilities. There are approximately 310 existing wells and associated infrastructure within four miles of the Fleetwood Draw lek. Due to this level of development

(2.2 wells/acre) there is potential that the lek will become extirpated without the federal development.

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development. The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from 25 sage-grouse leks (See Table 3.5). As of July 28, 2008, there are approximately 473 existing wells and associated infrastructure within four miles of the 25 leks - an area of 266 square miles. The existing well density is approximately 1.8 wells/section.. Due to this level of development (well density > 1 well/section) there is a potential that the population(s) breeding at these leks may become extirpated without the federal development.

There are 275 proposed wells (46 are the wells from this project) within four miles of the 25 leks. With the addition of the 229 proposed wells that are not associated with this proposed action, the well density within four miles of the 25 leks increases to 2.6 wells/section. With approval of alternative C (46 proposed well locations), the total well number increases to 748 and the well density increases to 2.8 wells/section.

CBNG is a recent development, with the first well drilled in 1987 (Braun et al. 2002). In February 1998 there were 420 producing wells primarily restricted to eastern Campbell County (BFO 1999). By May 2003 there were 26,718 CBNG wells permitted within the BFO area (WGFD 2004). The PRB FEIS estimated 51,000 additional CBNG wells to be drilled over a ten year period beginning in 2003 (BFO 2003).

The Powder River Basin Oil and Gas Project FEIS (BLM 2003) concluded that “Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: (1) increased direct mortality (including legal hunting, poaching, and collision with power lines and vehicles); (2) the introduction of new perches for raptors and thus the potential change in rate of predation; (3) direct loss or degradation of habitats; (4) indirect disturbance resulting from human activity (including harassment, displacement, and noise); (5) habitat fragmentation (particularly through construction of roads); and (6) changes in population (pg. 4-257).” The FEIS goes on to state that “implementation of several mitigation measures would reduce the extent of each impact addressed by those measures. Despite these measures, the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270).”

The Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) included a Mitigation Monitoring and Reporting Plan (MMRP). The uncertainties as to where and at what level development was to proceed as well as the uncertainties associated with the assumptions that were used to predict impacts suggests that one-time determination of impacts that is included in the EIS may not occur as projected. The MMRP helps to continually assess the effects of the project and the adequacy of the mitigation. Such a plan/process provides a mechanism for continuously modify management practices in order to allow development while continuing to protect the environment (E-1).” In other words, development pace and patterns may not occur as predicted, and so the BLM may use the adaptive management process provided for in the BFO RMP.

Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (WGFD 2004). Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, powerlines, reservoirs and other infrastructure in the Powder River Basin (WGFD 2005, WGFD 2004). Sage-grouse avoidance of CBNG infrastructure results

in even greater indirect habitat loss. In southwestern Wyoming, yearling female greater sage-grouse avoid nesting in areas within 0.6 miles of producing well pads (Holloran et al. 2007), and in southern Alberta, brood-rearing females avoid areas within 0.6 miles of producing wells (Aldridge and Boyce 2007). Doherty et al. (2008) demonstrated that sage-grouse in the Powder River Basin avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied. The WGFD 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). As interpreted by coordinated effort with state fish and wildlife agencies from Montana, Colorado, Utah, South Dakota, North Dakota and Wyoming, (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008), research indicates that oil or gas development exceeding approximately 1 well pad per square mile with the associated infrastructure, results in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (Holloran 2005, Walker et al. 2007)

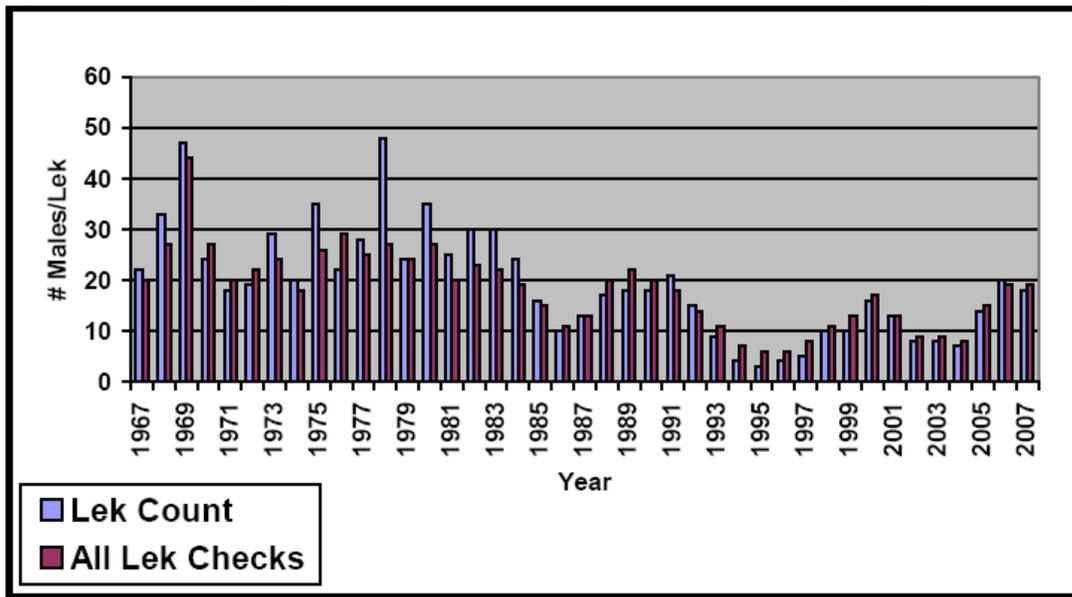
Noise can affect sage-grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). In a study of greater sage-grouse population response to natural gas field development in western Wyoming, Holloran (2005) concluded that increased noise intensity, associated with active drilling rigs within 5 km (3.1 miles) of leks, negatively influenced male lek attendance. In 2002, Braun et al. documented approximately 200 CBNG facilities within one mile of sage-grouse leks. Sage-grouse numbers were found to be consistently lower for these leks than for leks without this disturbance. Direct habitat losses from the facilities themselves, roads and traffic, and the associated noise were found to be the likely reason for this finding.

Vegetation communities within the Powder River Basin are naturally fragmented, as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. A sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within the Powder River Basin to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size has decreased by more than 63% in the past forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005). The existing land use (grazing) wildfire and cheat grass invasion within the cumulative impacts assessment area has fragmented the sage-grouse habitat. Disturbance created by this project will contribute to additional fragmentation.

Another concern with CBNG development is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (WGFD 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). In northeastern Wyoming and southeastern Montana, West Nile virus-related mortality during the summer resulted in an average decline in annual female survival of 5% from 2003 to 2006 (Walker et al. 2007). Powder River Basin sage-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 sage-grouse population within northeast Wyoming is exhibiting a steady long term downward trend (Figure 1) (WGFD 2005). The figure illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Long-term harvest trends are similar to that of lek attendance (WGFD 2005).

Figure 4.1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2007.



The BFO Resource Management Plan (BLM 2001) and the Powder River Basin Oil and Gas Project Record of Decision (BLM 2003) include a two-mile timing limitation within sage-grouse nesting habitat. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). BLM Wyoming adopted the two-mile recommendation in 1990 (BLM 1990). The two-mile recommendation was based on early research which indicated between 59 and 87 percent of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within prime, contiguous sage-grouse habitat such as Idaho’s Snake River plain.

Additional studies, across more of the sage-grouse’s range, indicate that many populations nest much farther than two miles from the breeding lek (BLM 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage-grouse hens nested within 3 km (1.86 mi) of the capture lek. Moynahan and Lindberg (2004) found only 36% of their grouse nesting within 3 km of the capture lek. Moynahan’s study area was north-central Montana in an area of mixed-grass prairie and sagebrush steppe, with Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) being the dominant shrub species (Moynahan et al. 2007). Habitat conditions and sage-grouse biology within the Buffalo Field Office are more similar to Moynahan’s north-central Montana study area than the Upper Green River area.

A two-mile timing limitation, given the long-term population decline and that less than 50% of sage-grouse are expected to nest within the limitation area, is insufficient to reverse the population decline. Moynahan and Lindberg (2004) like WAFWA (Connelly et al. 2000), recommend increasing the protective distance around sage-grouse leks. The BLM and University of Montana are currently researching nest location and other sage-grouse questions and relationships between grouse and coalbed natural gas development. Thus far, this research suggests that impacts to leks from energy development are discernable out to a minimum of four miles, and that some leks within this radius have been extirpated as a direct result of energy development (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008). Even with a timing limitation on construction activities, sage-grouse may avoid nesting within CBNG fields because of the activities associated with operation and production. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007).

Walker et al, 2007 indicates the size of a no-development buffer sufficient to protect leks would depend on the amount of suitable habitat around the lek and the population impact deemed acceptable. Also, rather than limiting mitigation to only timing restrictions, research suggests more effective mitigation strategies include, at a minimum, burying power lines (Connelly et al. 2000 b); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and Anderson 2003, Holloran 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector West Nile Virus in sage grouse habitat (Walker et al 2007).

The multi-state recommendations presented to the WGFD for identification of core sage grouse areas acknowledges there may be times when development in important sage grouse breeding, summer, and winter habitats cannot be avoided. In those instances they recommend, "...infrastructure should be minimized and the area should be managed in a manner that effectively conserves sagebrush habitats (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008).

LOG has committed to support the Lake DeSmet Conservation District (LDCD) and Natural Resources Conservation Service (NRCS) sage-grouse habitat enhancement goals for the Quarter Circle 9 ranch properties within the Quarter Circle 9 Unit and Stewart Draw PODs. This will result in expediting habitat enhancements and develop a grazing strategy for each property that landowners commit to for three years. Most landowners continue to practice these grazing strategies once they experience the economic benefits, resulting in long-term benefits for rangeland and wildlife. Grazing deferments are achieved through incentives to the landowners and will result in establishment of forbs within treated areas and provide better escape cover for prey species such as sage-grouse. Grazing deferments could also assist with reclamation of disturbed areas within these PODs with good planning, preventing invasive weeds. This plan further develops conservation partnerships with industry, landowners, and agencies on large acreages. Please refer to the publication documenting results (*Evaluating Habitat Aeration Treatments in Wyoming's Northern Johnson County – Northern Rolling High Plains*) available at: www.wy.usda.nrcs.gov. (BLM-BFO is a cooperator to the sage grouse conservation plan and supports the LDCD but it must be stressed that where the federal authority lies, the plan will be analyzed through the NEPA process.)

4.2.5.2.7. Sharp-tailed grouse Direct and Indirect Effects

Effects to sharp-tailed grouse are likely to be similar to those of sage-grouse.

4.2.5.2.8. Mountain plover Direct and Indirect Effects

Suitable mountain plover habitat is present within the project area. The project should not impact mountain plovers as no populations have been documented within the project area and the project layout avoids the habitat where possible.

Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may be attractive to plovers, while human activities within one-quarter mile may be disruptive. To reduce impacts to nesting mountain plovers, the BLM BFO requires a 0.25 mile timing limitation for potential nesting habitat prior to nest survey completion and a 0.25 mile timing limitation for all occupied nesting habitat for the entire nesting season.

Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. Limiting travel speed to 25mph provides drivers an opportunity to notice and avoid mountain plovers and allows mountain plovers time to escape from approaching vehicles. Even if a nesting plover flushes in time, the nest likely would still be destroyed. Overhead power lines provide perch sites for raptors that could result in increased mountain plover predation. CBNG infrastructure such as well houses, roads, pipeline corridors, and nearby metering facilities may provide shelter and den sites for

ground predators such as skunks and foxes.

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominately prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995). An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.2.5.2.9. Sensitive Species Cumulative effects

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

4.3. West Nile Virus Direct and Indirect Effects

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 Crazy Woman Creek watershed and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies. Produced water will be managed by the following strategies:

Subsurface drip irrigation, discharge from the Bear Draw water treatment facility, piped to Midwest, WY for reinjection to the Madison formation, and containment by impoundments authorized within the Quarter Circle 9 and Stewart Draw PODs.

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 15.0 gpm per well or 690.0 gpm (1.54 cfs or 1,113 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 Crazy Woman Creek drainage, the projected volume produced within the watershed area was 21,1036 acre-feet in 2006 (maximum production is estimated in 2006 at 21,135 acre-feet). As such, the volume of water resulting from the production of these wells is 5.3% 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 43% to groundwater aquifers and coal zones in the Crazy Woman Creek drainage area (PRB FEIS pg 4-5). However, since the 14 impoundments are secondary and the water management will likely be treatment, injection, or subsurface drip irrigation infiltration in impoundments will not be analyzed.

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 72 to 770 feet compared to 1,950 to 2,350 feet to the Big George. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

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

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

Shallow ground water monitoring is ongoing at impoundment sites across the basin. Due to the limited data available from these sites, the still uncertain overall fate or extent of change that is occurring due to infiltration at those sites, and the extensive variable site characteristics both surface and subsurface, it is not reliable at this time to infer that findings from these monitoring wells should be directly applied to other impoundment locations across the basin.

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

4.4.1.1. Groundwater Cumulative Effects:

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

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

4.4.2. Surface Water

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

Table 4.6 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Predicted Values	TDS, mg/l	SAR	EC, μmhos/cm
Most Restrictive Proposed Limit –		2.0	1,000
Least Restrictive Proposed Limit		10.0	3,200
Primary Watershed near Arvada Gauging station			
Historic Data Average at Maximum Flow		2.3	1,937
Historic Data Average at Minimum Flow		6.5	2,159
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
Predicted Produced Water Quality			

Predicted Values	TDS, mg/l	SAR	EC, μmhos/cm
Big George Coal Zone	2,550	52.9	4,050

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 2550.0 mg/l TDS which is not within the WDEQ criteria for agricultural use (2000 mg/l TDS).

A proposed method to dispose of federally produced water is by subsurface drip irrigation (SDI) at 48 sites (approximately 612 acres) within Township 51 North Range 79 West; sections 1, 2, 3, 9, 10, 11, 16, 17 and 20 (WDEQ permit # UIC 07-135; UIC Facility number WYS-019-00224). These fields are located in the northern portion of the POD along Crazy Woman Creek in uncultivated field areas which have been seeded with a mixture of perennial introduced grasses. Sub-surface investigations have been conducted to determine the quality of and depth to shallow groundwater at both locations, as well as the soil characteristics. The operator is required to monitor the area surrounding the SDI fields for water re-surfacing. There is potential that the chemistry of the CBNG produced water (high SAR) may negatively impact the soils in the area which contain clay components. The operator has proposed to monitor the soil condition and mitigate any degradation if necessary.

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

Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

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

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

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

In-channel downstream impacts are addressed in the WMP (p. 27) for the Quarter Circle 9 Beta POD prepared by Western Water Consultants for Lance Oil & Gas.

4.4.2.1. Surface Water Cumulative Effects

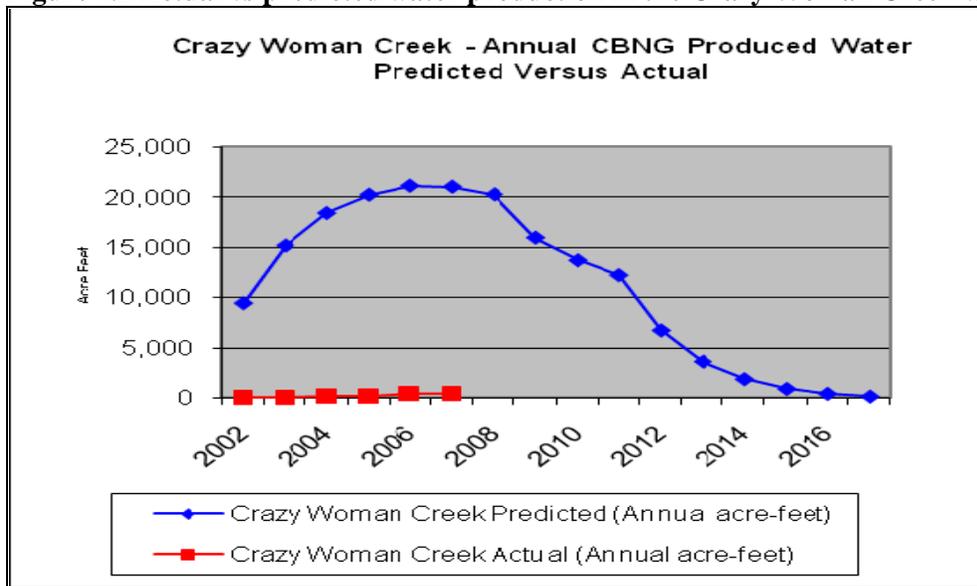
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Crazy Woman Creek watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of March 2008, all producing CBNG wells in the Crazy Woman Creek watershed have discharged a cumulative volume of 984 acre-ft of water in 2007 compared to the predicted 105,463 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 0.9 % of the total predicted produced water analyzed in the PRB FEIS for the Crazy Woman Creek watershed in 2007.

Table 4.7 Actual vs predicted water production in the Crazy Woman Creek watershed 2007 Data Update 3-08-08

Year	Crazy Woman Creek Predicted (Annual acre-feet)	Crazy Woman Creek Predicted (Cumulative acre-feet from 2002)	Crazy Woman Creek Actual (Annual acre-feet)		Crazy Woman Creek Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	9,449	9,449	4	0.0	4	0.0
2003	15,185	24,634	1	0.0	5	0.0
2004	18,418	43,052	126	0.7	130	0.3
2005	20,240	63,292	113	0.6	243	0.4
2006	21,135	84,427	392	1.9	635	0.8
2007	21,036	105,463	349	1.7	984	0.9
2008	20,279	125,742				
2009	15,962	141,704				
2010	13,716	155,420				
2011	12,240	167,660				
2012	6,731	174,391				
2013	3,629	178,020				
2014	1,881	179,901				
2015	910	180,811				
2016	422	181,233				
2017	150	181,383				
Total	181,383		984			

Figure 4.2 Actual vs predicted water production in the Crazy Woman Creek watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. Electrical Conductivity (EC) and SAR are the parameters of concern for suitability of irrigation

water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from existing wells within each of the ten primary watersheds in the Powder River Basin. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

The PRB FEIS states, “Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ’s (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. However, this MOC has expired and has not been renewed. The EPA has approved the Montana Surface Water Standards for EC and SAR and as such the WDEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met.” (PRB FEIS page 4-117)

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

1. They are proportional to the actual amount of cumulatively produced water in the Crazy Woman Creek drainage, which is approximately 0.9% of the total predicted in the PRB FEIS in 2007.
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 Crazy Woman Creek watershed and page 117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

Non eligible sites 48JO3086 will be impacted by the proposed project.

Monitoring will be required as a condition of approval for SDI development associated with this project during construction activities due to the potential for buried sites. The specific areas are listed in the site specific COA section. Standard Class III surface inventories are inadequate for locating deeply buried archeological sites. Installation of an SDI system can completely destroy buried archeological sites. Due to the nature of SDI installation; construction monitoring may be fruitless since sediments are disturbed *in situ*, and there is little associated subsurface visibility. BLM cannot approve the disposal of federally produced water into the SDI system associated with the Quarter Circle Nine POD until BFO and the Wyoming SHPO decide upon an adequate inventory strategy. The inventory strategy will likely involve subsurface testing to determine the possibility of impacts to buried cultural resources. It is assumed that BFO and SHPO will come to a consensus over this issue by mid-August, 2008. Additional fieldwork may or may not be necessary before BFO can approve the disposal of federally produced water into the SDI system associated with this POD.

Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 7/30/08 that no historic properties exist within the APE. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the *Standard COA* (General)(A)(1).

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Tom Maechtle	Lead Biologist	Big Horn Environmental Consultants	No
Phil Gonzales	Sage Grouse Coordinator	Natural Resources Conservation Service	No
Jennifer Morton	Wildlife Biologist	BLM-BFO	No
Courtney Frost	Wildlife Biologist	BLM-BFO	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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