FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Pennaco Energy, INC a subsidiary of Marathon Oil
Dow 2
ENVIRONMENTAL ASSESSMENT –WY-070-EA08-168

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Pennaco Energy, INC 's Dow 2 PODCoal Bed Natural Gas (CBNG) POD comprised of the following 12 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	DOW 2 CHASE FARMS	1-6MZCR	NENE	6	57N	81W	WYW155746
2	DOW 2 CHASE FARMS	3-6MZCR	NENW	6	57N	81W	WYW155746
3	DOW 2 DOW	11-3MZCR	NESW	3	57N	82W	WYW145646
4	DOW 2 DOW	15-3MZCR	SWSE	3	57N	82W	WYW145646
5	DOW 2 DOW	9-4MZCR	NESE	4	57N	82W	WYW145646
6	DOW 2 DOW	1-10MZCR	NENE	10	57N	82W	WYW145646
7	DOW 2 DOW	3-11MZCR	NENW	11	57N	82W	WYW116641
8	DOW 2 DOW	7-11MZCR	SWNE	11	57N	82W	WYW116641
9	DOW 2 CHASE FARMS	15-26MZCR	SWSE	26	58N	82W	WYW145650
10	DOW 2 CHASE FARMS	1-35MZCR	NENE	35	58N	82W	WYW145650
11	DOW 2 CHASE FARMS	7-35MZCR	SWNE	35	58N	82W	WYW145650
12	DOW 2 CHASE FARMS	9-35MZCR	NESE	35	58N	82W	WYW145650

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
Pennaco Energy, INC a subsidiary of Marathon Oil
Dow 2
PLAN OF DEVELOPMENT
WY-070-EA08-168

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 4 federal oil and gas mineral leases issued to the applicant by the BLM.

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: Pennaco Energy, INC's Dow 2 Plan of Development (POD) for 12coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There were 12 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 6 co-mingled coal seams. There will be no well house used. Instead, Pennaco has their surface equipment 'skid' mounted and heat traced with an insulated blanket wrap. The approx. dimensions of this surface equipment are 2' x 6' x 2', with the control unit mounted on a post inside the fenced enclosure. Proposed wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	DOW 2 CHASE FARMS	1-6MZCR	NENE	6	57N	81W	WYW155746
2	DOW 2 CHASE FARMS	3-6MZCR	NENW	6	57N	81W	WYW155746
3	DOW 2 DOW	11-3MZCR	NESW	3	57N	82W	WYW145646
4	DOW 2 DOW	15-3MZCR	SWSE	3	57N	82W	WYW145646
5	DOW 2 DOW	9-4MZCR	NESE	4	57N	82W	WYW145646
6	DOW 2 DOW	1-10MZCR	NENE	10	57N	82W	WYW145646
7	DOW 2 DOW	3-11MZCR	NENW	11	57N	82W	WYW116641
8	DOW 2 DOW	7-11MZCR	SWNE	11	57N	82W	WYW116641
9	DOW 2 CHASE FARMS	15-26MZCR	SWSE	26	58N	82W	WYW145650
10	DOW 2 CHASE FARMS	1-35MZCR	NENE	35	58N	82W	WYW145650
11	DOW 2 CHASE FARMS	7-35MZCR	SWNE	35	58N	82W	WYW145650
12	DOW 2 CHASE FARMS	9-35MZCR	NESE	35	58N	82W	WYW145650

County: Sheridan

Applicant: Pennaco Energy, INC a subsidiary of Marathon Oil

Surface Owners: Bert Dow, Chase Farms dba NX Bar Ranch, Donald and Sheila Sales

The proposed action involves the following:

- Drilling of 12 total federal CBM wells by co-mingling production from 6 coal seams: Smith, Lower Smith, Dietz 1, Dietz 3, Monarch, and Carney coal zones to depths of approximately 553, 673, 770, 990, 1110, and 1233 feet respectively.

- 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 telemetry, central metering facility and well visitation. Metering would entail 1 visit per week to each well/central metering facility.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 340 acres of land with an existing Sub-surface drip irrigation (SDI) system, a form of produced water injection under the jurisdiction of the Wyoming Department of Environmental Quality (WDEQ). This facility is under UIC permit numbers UIC 06-390 and UIC 07-459, both for facility number WYS-33-153.

- An unimproved and improved road network.

- An above ground power line network is already in place and was constructed by Powder River Energy Corporation. No future above ground power line is proposed. All proposed power will be run below ground. If the proposed route is altered, then the new route will be proposed via

sundry application and analyzed in a separate NEPA action.

- A buried gas, water and power line network, with a variable number of compressors on 1 existing 2 acre compression facility. Big Horn Gas Gathering will be providing the compression facilities, and they use mobile systems to allow for the varying levels of gas production in coal bed methane fields. Once the level of production for this project is determined, the appropriate number of compressors will be brought in to the project area and placed on the existing fee/state compressor site, no additional compressor sites are anticipated. As production then declines, compressors will be removed from the compression facility.

For a detailed description of design features, construction practices and water management strategies associated with the proposed action, refer to the Master Surface Use Plan (MSUP), Drilling Plan and WMP in the POD and individual APDs. Also see the subject POD 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 Dow 2 POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well	Aliquot	Section	T/R	Notes
11-3	NESW	3	57/82	Well moved approx. 65 feet northeast to avoid a steep draw near edge of well pad. The proposed template road to this well

Well	Aliquot	Section	T/R	Notes
				was limited to a max disturbance width (including pipeline disturbance) of 25 feet to maintain sagebrush habitat.
15-3	SWSE	3	57/82	Well moved approx. 600 feet northwest to avoid highly erosive soils and a complex section of engineered road.
9-4	NESE	4	57/82	To limit disturbance to soils which are unstable, have low reclamation potential and side slopes exceeding 30%, full engineering of the existing road was downgraded to allow for only minor realignments. Proposed culverts were downgraded to rolling dips. Pipeline was rerouted to stay within cut portions of the disturbance.
3-6	NENW	6	57/81	Well moved out of a draw and reoriented just off the shoulder of a fee road. The engineered well pad was dropped.
1-6	NENE	6	57/81	The engineered road was rerouted and downgraded to a template road.
1-10	NENE	10	57/82	The template portion of the access road was rerouted to leave fee well Dow 9-3 and follow the land contours along the base of a ridge. This will minimize visual impact of cutting straight across the grass pasture. The engineered section or the access road from the 6 foot (or larger) culvert will receive silt fencing delineating the edge of disturbance on knife ridge.
15-26	SWSE	26	58/82	Well moved approx. 110 feet southeast to a grassy saddle to avoid a constructed well pad. Engineered road was dropped and a primitive road will be used to access the well.
7-35	SWNE	35	58/82	The land owner requested the well be moved approx. 145 feet northwest to avoid a food plot. The creation of a template road will be used to access the well
9-35	NESE	35	58/82	Well moved approx 35 feet north to avoid an existing SDI water line. To minimize additional surface disturbance the proposed pipeline was re-oriented to follow an existing SDI water line. This will maintain forage and minimize visual impact of cutting straight across the grass pasture.

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

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ 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.

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. 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 geomorphologic configuration and properly stabilized.

4. Reclamation of disturbed wetland/riparian areas will begin immediately after project activities are complete.

2.3.2.5. 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.

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

1. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of Sundry Notices.

2. Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to bald eagles or their habitat.

2.3.2.6.2. Ute Ladies'-tresses Orchid

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

2.3.2.7. Visual Resources

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

2.3.2.8. Noise

1. Noise mufflers will be installed on the exhaust of compressor engines to reduce the exhaust noise.

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

2.3.2.9. Air Quality

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

2.3.3. Site specific mitigation measures

General

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

2. Please contact Travis Kern, Natural Resource Specialist, @ (307) 684-1074, Bureau of Land Management, Buffalo, if there are any questions concerning these COAs.

Surface Use

1. 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 Dow 2 POD is Covert Green, 18-0617 TPX (Pantone for Architecture).

2. Provide 4" of aggregate where grades exceed 8%.

3. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or waterbars shall be placed according to the following spacing:

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

4. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

Species - *Cultivar*	**Full Seeding (lbs/ac PLS)**	**% in Mix**	**Lbs PLS**
Western Wheatgrass - *Rosana*	12	20	2.4
Bluebunch wheatgrass – *Secar or P-7*	14	30	4.2
Idaho fescue - *Joseph*	8	30	2.4
American vetch **OR** Cicer Milkvetch - *Lutana*	14	10	1.4
Winterfat – *Open Range*	16	5	.80
Lewis - *Appar*, Blue, or Scarlet flax	8	5	.40
Totals		**100%**	**11.6 lbs/acre**

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

5. The following well locations and access road/corridor in the project area have been identified to have limited reclamation potential that will require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, etc.) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within **30 days** of the initiation of construction activities.

Lease	**Well #**	**Aliquot**	**Sec**	**T**	**R**
WYW145646	9-4	NESE	4	57N	82W
WYW145646	15-3	SWSE	3	57N	82W
WYW145646	11-3	NESW	3	57N	82W

Lease	Well #	Aliquot	Sec	T	R
WYW155746	3-6	NENW	6	57N	81W
WYW145646	1-10	NENE	10	57N	82W
WYW116641	3-11	NENW	11	57N	82W

6. 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.

7. The operator will maintain all existing improved roads in the Dow 2 POD in accordance with guidelines contained in the BLM/FS Gold Book, 4th Edition "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development," and/or the Road Standards in the BLM Manual 9113.

8. Pipeline corridor disturbance shall not exceed the approved disturbance width for road construction.

9. CBNG-related traffic will be restricted to the authorized/permitted access roads only. Signs will be posted to restrict vehicle use along reclaimed corridors.

10. The operator will maintain well drilling, completion and associated construction operations within the staked area at the well location.

11. The operator is responsible for having a licensed professional engineer certify that the actual construction of roads meets the design criteria and is constructed to BLM standards.

Wildlife

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
57/82	11	The proposed pipeline corridor in the NENE of this section.

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
57/81	6	Wells: Chase Farms Fed: 3-6-57-81MZ/CR and 1-6-57-81MZ/CR All proposed access / pipeline corridors in the NE and NENW of this section.
57/82	3	Wells: Dow Fed: 11-3-57-82MZ/CR and 15-3-57-82MZ/CR All proposed access / pipeline corridors in the E, NENW, and SENW of this section.
57/82	10	Well: Dow Fed 1-10-57-82MZ/CR All proposed access / pipeline corridors in the NENE of this section.
57/82	11	Wells: Dow Fed 3-11-57-82MZ/CR and Dow Fed 7-11-57-82MZ/CR All proposed access / pipeline corridors in the NE and NENW 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 annually through 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 nests in Table 4 of this EA.

b. 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.
c. 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).

Sharp-tailed Grouse

1. The following conditions will alleviate impacts to sharp-tailed grouse:
    a. No surface disturbing activities are permitted SENW, NESW, and NESE Section 3, T57N, R82W between April 1 and May 31**. This condition will be implemented on an annual basis for the duration of surface disturbing activities.**
    b. Sharp-tailed grouse surveys are required throughout the project area for the current breeding season and results reviewed by a BLM biologist. If an active lek is identified during the survey, the 0.64 mile timing restriction (April 1 to May 31) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 0.5 mile buffer until the following breeding season (April 1). The required sharp-tailed grouse survey will be conducted by a biologist following WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist.

2.4. Alternatives considered but not analyzed in detail

The operator considered on and off-channel reservoirs, but rejected that option because of a lack of suitable locations. Direct discharge was considered but rejected due to water quality constraints for discharge to the Tongue River. Deep injection was considered but rejected because of the lack of

beneficial use resulting from that option. For a detailed explanation, see page 8 of the Dow 2 water management plan.

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

The proposed Dow 2 is located Sheridan County, Wyoming. The Unit covers the majority of the sections in T57N R82W as well as Sections 26 and 35 in T58N R82W, an area of approximately 9,856 acres. Existing energy development in the Unit includes Fee, and State CBNG wells and associated infrastructure.

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	42	12	12
Total Locations	42	12	12
Nonconstructed Pads		2	4
Slotted Pads		0	0
Constructed Pads		10	8
Conventional Wells	0	0	0
Gather/Metering Facilities	2	3	3
Compressors	2	6	6
Monitor Wells	0	0	0
Impoundments			
On-channel	0	0	0
Off-channel	0	0	0
Water Discharge Points	0	0	0
Treatment Facilities	1	0	0
Improved Roads	12	5.87	3.87
No Corridor		1.85	1.92
With Corridor		4.02	1.95
2-Track Roads	0.84	1.58	1.58
No Corridor		0.69	0.69
With Corridor		0.89	0.89
Buried Utilities	18	0	0
No Corridor		0	0

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
With Corridor		0	0
Overhead Powerlines	24	0	0
Communication Sites	0	0	0
Staging/Storage Areas	0	3	3
SDI	340	0	0
Acres of Disturbance	471.73	21.01	19.93

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on November 20 2007. Field inspections of the proposed Dow 2 POD CBNG project were conducted on 06/17/2008 and 06/18/2008 by:

NAME	TITLE	AGENCY
Ben Adams	Hydrologist	Bureau of Land Management
Jeb Beacham	Adv. Regulatory Comp. Rep.	Marathon/Pennaco
G.L. "Buck" Damone III	Archeologist	Bureau of Land Management
Jim Enochs	Project Manager	Marathon Oil
Casey Freise	Natural Resource Specialist	Bureau of Land Management
Ted Hamersma	Engineering Technician	Bureau of Land Management
Arnie Irwin	Soil Scientist	Bureau of Land Management
Scott Jawors	Wildlife Biologist	Bureau of Land Management
Travis Kern	Natural Resource Specialist	Bureau of Land Management
Harry Kessner	Surveyor	William H. Smith & Associates
Eric Kessner	Surveyor	William H. Smith & Associates
Mary Maddux	Natural Resource Specialist	Bureau of Land Management
Annette Mathis	Asst. Regulatory Comp. Tech.	Marathon/Pennaco
Hilaire Peck	Road Engineer	Bureau of Land Management
Kristine Philips	Legal Instruments Examiner	Bureau of Land Management
Gregg Putman	Pipeline Construction Supervisor	Marathon Oil

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

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

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species		X		Jennifer Morton
Floodplains	X			Ben Adams
Wilderness Values			X	Travis Kern

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
ACECs			X	Travis Kern
Water Resources	X			Ben Adams
Air Quality		X		Travis Kern
Cultural or Historical Values			X	G.L. "Buck" Damone III
Prime or Unique Farmlands			X	Travis Kern
Wild & Scenic Rivers			X	Travis Kern
Wetland/Riparian	X			Ben Adams
Native American Religious Concerns			X	G.L. "Buck" Damone III
Hazardous Wastes or Solids			X	Travis Kern
Invasive, Nonnative Species	X			Travis Kern
Environmental Justice			X	Travis Kern

3.1. Topographic Characteristics of Project Area

The Dow 2 project is located within Sheridan County, Wyoming. The project is situated 13.3 miles northeast of Sheridan, in Sheridan County, Wyoming. The Dow 2 project encompasses 15.4 mi^2 or 9,856 acres.

Elevations within the project area range from approximately 3,560 to 4,640 feet above sea level. Topography throughout the area varies from relatively level along the Badger Creek floodplain to broken and very steep rugged ridgelines in the Badger Hills. The Hills host numerous areas of steep terrain including cliffs, and draws. Areas of exposed scoria and bentonite are located along the more precipitous ridges and hills throughout the project area. The climate is semi-arid, averaging 15 inches of precipitation annually, about 79% of which occurs between April and October. The 50-year mean maximum and minimum temperature in July and January were 88º and 6º F, respectively. A network of existing roads within the project area will be used to access wells in the Dow 2 POD. These roads were constructed or improved to accommodate the existing fee and state CBNG production and development.

The major drainage within the project area, Badger Creek (an ephemeral tributary of the Tongue River) traverses the POD from the southeast to the northwest, emptying into Tongue River 5.0 miles northwest of the POD.

Current Land uses within the project area include livestock grazing, elk (*Cervus elaphus*) ranching, crop and hay production, and more recently, Pennaco's Dow 2 "A" fee and state CBNG development.

3.2. Vegetation & Soils

The area is comprised of 4% grasslands, 35% sagebrush-grasslands, 8% woodlands (primarily junipers), 5% cultivated fields, 2% greasewood grasslands, and 3% other (bare rock or soil, water, roads, residences). Grasslands were most prevalent along the Badger Creek flood plain and onto the other areas of more level terrain while sagebrush-grasslands extended into upland areas. Woodland habitats occur along number of drainages and the slopes above Badger Creek.

Common grasses within the project area include: cheatgrass (*Bromus tectorum),* native wheatgrasses (*Agropyron* and *Pascopyron* spp.), crested wheatgrass (*Agropyron cristatum)*, needle-and-thread

(*Hesperostipa comate*), junegrass (*Koeleria macrantha),* Japanese brome (*Bromus japonicas),* bluegrass (*Poa spp.),* redtop (*Agrostis stolonifera),* and blue grama (*Bouteloua gracilis)*. At the peak of the growing season, grasses were of moderate height (~6 to 30 inches, averaging 12 inches) and density throughout the majority of the project area.

Wyoming big sagebrush (*Artemisia tridentata wyomingensis)*, the primary shrub, occurred over the project area in a patchy mosaic of sparse to moderately dense stands, interspersed primarily with grasslands, but also found intermixed with junipers (*Juniperus spp.*). The majority of sagebrush stands were sparse or very sparse and primarily situated along the steeper portions of the POD. Sagebrush height varied from 12-30 inches (averaging 18 inches) with larger plants often occurring in the denser stands or bordering wooded draws.

Trees (primarily junipers) were most prevalent in the northeastern and southwestern portions of the project area along the draws and some slopes of the higher hills. Junipers were the dominant species, occurring as scattered individuals to dense stands averaging approximately 12 feet in height (range 3 to 18 feet). A few lone individuals and small stands of cottonwoods (*Populus spp.*), boxelder (*Acer negundo*) and green ash (*Fraxinus pennsylvanica*) were scattered along Badger Creek and an unnamed tributary in section 12.

Soils have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams. Soils have surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics. 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. Approximately 27% or 1,461 acres within the pod are defined as being highly erosive soils. Reclamation potential of soils also varies throughout the project area. Approximately 2,211 acres or 40% of the area within the POD boundary have been identified as having low reclamation potential utilizing Soil Survey Geographical Data (SSURGO). The proponent planned their project and the BLM made further recommendations on the onsite to avoid those areas. Disturbances approved within these areas require the programmatic/standard COA's be complimented with a site specific performance based reclamation related COA.

Soils within the project area were identified from the *North Sheridan County Survey Area, Wyoming (WY633).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

The map unit symbols within this project area were filtered and map units representing 4.0% or greater in extent within the pod boundary are displayed. Dominant soil map units are listed in the table below with their individual acreage and percentage of the area within the POD boundary.

Dominant soils affected by the proposed action include:

Map Unit	Map Unit Name	Acres	Percent
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	1025.3	19%
313	WYARNO CLAY LOAM, DRY, 3 TO 6 PERCENT SLOPES	620.7	11%

Map Unit	Map Unit Name	Acres	Percent
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	522.4	10%
160	HAVERDAD-WORTHENTON COMPLEX, 0 TO 3 PERCENT SLOPES	515.1	9%
260	SHINGLE-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	435.7	8%
236	RENOHILL-ULM, DRY, ASSOCIATION, 6 TO 15 PERCENT SLOPES	400.5	7%
317	ZIGWEID-KISHONA-CAMBRIA COMPLEX, 6 TO 15 PERCENT SLOPES	353.2	6%
305	WORFKA-SHINGLE-SAMDAY COMPLEX, MOIST, 6 TO 30 PERCENT SLOPES	256.2	5%
304	WORFKA-SHINGLE-SAMDAY COMPLEX, 6 TO 30 PERCENT SLOPES	242.7	4%
201	PARMLEED-BIDMAN ASSOCIATION, 3 TO 15 PERCENT SLOPES	215.4	4%
112	BIDMAN-ARVADA FINE SANDY LOAMS, 0 TO 6 PERCENT SLOPES	201.7	4%

For more detailed soil information, see the NRCS Soil Survey 633 – North Sheridan County. 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 site 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 for the soils identified above and the associated ecological sites for the identified soil map unit symbols found within the POD boundary are listed in the table below.

Map Unit	Ecological Site
261	SHALLOW LOAMY (15-19 NP)
313	Clayey 10-14" Northern Plains
269	LOAMY (15-19 NP)
160	LOWLAND (10-14 NP)
260	SHALLOW LOAMY (10-14 NP)
236	Clayey 10-14" Northern Plains
317	Loamy 10-14" Northern Plains
305	SHALLOW LOAMY (15-19 NP)
304	SHALLOW LOAMY (10-14 NP)
201	Loamy 10-14" Northern Plains
112	Loamy 10-14" Northern Plains

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure are predominately a mosaic of shallow loamy, clayey and loamy sites.

Shallow Loamy sites occur on steep slopes and ridge tops, but may occur on all slopes, on landforms

which include hill sides, ridges and escarpments in the 10-14 inch precipitation zone. The soils of this site are shallow (less than 20"to bedrock) well-drained soils formed in alluvium over residuum or residuum derived from sandstone and shale. These soils have moderate permeability and may occur on all slopes. The bedrock may be any kind which is virtually impenetrable to plant roots, except igneous. The main soil limitations include the depth to bedrock. The present plant community is a Mixed Sagebrush/Grass. Wyoming big sagebrush is a significant component of this Mixed Sagebrush/Grass plant community. Cool-season mid-grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant grasses include bluebunch wheatgrass, rhizomatous wheatgrass, blue grama, and little bluestem. Other grasses occurring on the state include Cusick's and Sandberg bluegrass, and prairie junegrass. Cheatgrass has invaded the state. Other vegetative species identified at onsite include: pricklypear and fringed sagewort.

Clayey Sites occur on nearly level to steep slopes on landforms which include hill sides, alluvial fans and stream terraces in the 10-14" precipitation zone. The soils of this site are moderately deep to very deep (greater than 20" to bedrock), well-drained soils that formed in alluvium or alluvium over residuum derived calcareous shale. These soils have slow permeability. The bedrock is clay shale which is virtually impenetrable to plant roots. The present plant community is a Mixed Sagebrush/Grass.
Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone.
These soils are moderately deep to very deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from sandstone and shale. These soils have moderate permeability.
The present plant community is a Mixed Sagebrush/Grass.
A summary of the ecological sites within the project area are listed in the table below along with the individual acreage and the percentage of the total area identified within the POD boundary.

Summary of Ecological Sites

Ecological site	Acres	Percent
SHALLOW LOAMY (10-14 NP)	1959.8	36%
Clayey 10-14" Northern Plains	1214.3	22%
Loamy 10-14" Northern Plains	1170.1	21%
LOAMY (15-19 NP)	535.2	10%
LOWLAND (10-14 NP)	515.1	9%
CLAYEY (15-19 NP)	36.7	1%
SHALLOW SANDY (15-19 NP)	25.5	<1%
SALINE LOWLAND (10-14 NP)	12.1	<1%

3.2.1. Wetlands/Riparian/Floodplains

The area within the project boundary contains limited wetland areas.

The existing Subsurface Drip Irrigation (SDI) areas which are in the project boundary lie primarily on the first terrace above Badger Creek's floodplain. Badger Creek itself is a very large watershed which, under natural conditions, would be ephemeral to intermittent. .

Badger Creek's floodplain is broad and flat within the project area. A number of spreader dikes have been built to provide for spreading of floodwaters onto the floodplain, thus enhancing vegetative growth for hay production and livestock grazing. In many places, the SDI fields have been developed to the edge of the first terrace, anywhere from 8-15 feet above the floodplain.

3.2.2. Invasive Species

The following state-listed noxious weeds and/or weed species of concern infestations were discovered by a search of inventory databases on the Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info) as well as phone conversations with Sheridan County Weed and Pest Control Council (307-672-3740):

- leafy spurge
- Canada thistle

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. The operator and BLM confirmed leafy spurge and Canada thistle infestations during subsequent field investigations:

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

3.3. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by ICF Jones and Stokes (IFC) (2007, 2008). IFC 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 2005, 2006, 2007, and 2008. Surveys were conducted for Ute ladies'-tresses orchid habitat in 2005 and 2008. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits on June 17, 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 Dow 2 project area include pronghorn antelope, mule deer, white-tailed deer, and elk. Elk were observed by the BLM biologist within the project area during the onsite visit. The WGFD has determined that the project area contains yearlong range for pronghorn antelope and white-tailed deer, and winter-yearlong range for mule deer. Elk within the project area likely escaped from the herd managed by the Padlock Ranch. The WGFD is not managing for an elk population in this area.

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. **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. 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 major drainage within the project area, Badger Creek (an ephemeral tributary of the Tongue River), traverses the project area from southeast to northwest, emptying into the Tongue River, 5 miles northwest of the POD. Small pools and stretches of water were present along portions of Badger Creek through mid-June in 2005 through 2007. Historic impoundments and stock ponds exist in several side drainages within the study area, most were dry during most surveys. Discharge water from recent CBNG development was present in July at newly constructed reservoirs within the northern portion of the project area. Fish that have been identified in the Tongue River watershed are listed in the PRB FEIS (3-156-159).

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 IFC and/or the BLM biologist include mountain bluebird, Brewer's sparrow, and loggerhead shrike.

3.3.4. Raptors

Raptors species expected to occur in suitable habitats within the project area 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. Most 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.

Seventeen raptor nest sites were identified by IFC (2007, 2008) and BLM within 0.5 mile of the project area. Of these, three nests were active in 2008.

Table 4. Documented raptor nests within the Dow 2 project area.

BLM_ID	UTMs	Legal Location	Substrate	Year	Condition	Status	Species
4303	365302E 4982097N	T58N R82W S26	Ponderosa pine, live	2008	Gone	Inactive	
				2007	Fair	Inactive	
				2006	Good	Inactive	
				2005	Good	Inactive	
4304	363215E 4980453N	T58N R82W S34	Box elder, live	2008	Poor	Inactive	
				2007	Poor	Inactive	
				2006	Good	Inactive	
				2005	Good	Inactive	

BLM_ID	UTMs	Legal Location	Substrate	Year	Condition	Status	Species
4305	363362E 4979959N	T58N R82W S34	Box elder, live	2008	Good	Active	Red-tailed Hawk
				2007	Good	Active	Great-horned Owl
				2006	Unknown	Active	Great-horned Owl
				2005	Unknown	Active	Great-horned Owl
4306	363367E 4979929N	T58N R82W S34	Cottonwood, live	2008	Gone	Inactive	
				2007	Gone	Inactive	
				2006	Remnants	Active	Red-tailed Hawk
5382	364696E 4978942N	T57N R82W S2	Cottonwood, live	2008	Fair	Inactive	
				2007	Fair	Active	Great-horned Owl
				2006	Unknown	Unknown	
				2005	Fair	Active	Golden Eagle
5383	365052E 4978486N	T57N R82W S2	Ground, hillside	2008	Gone	Inactive	
				2007	Gone	Inactive	
				2006	Unknown	Active	Short-eared owl
5384	368999E 4978391N	T57N R81W S6	Juniper, live	2008	Poor	Inactive	
				2007	Fair	Inactive	
				2006	Fair	Inactive	
5385	369161E 4978367N	T57N R81W S5	Juniper, live	2008	Good	Inactive	
				2007	Good	Inactive	
				2006	Good	Inactive	
5386	368714E 4978361N	T57N R81W S6	Juniper, live	2008	Good	Inactive	
				2007	Good	Inactive	
5387	368868E 4978360N	T57N R81W S6	Cottonwood, live	2008	Unknown	Unknown	
				2007	Fair	Inactive	
				2005	Fair	Active	Red-tailed Hawk
5390	366553E 4977495N	T57N R82W S12	Cottonwood, live	2008	Fair	Inactive	
				2007	Good	Active	Red-tailed Hawk
				2006	Good	Active	Red-tailed Hawk
				2005	Unknown	Inactive	
5392	365702E 4976042N	T57N R82W S11	Box elder, live	2007	Fair	Active	Great-horned Owl
				2006	Good	Active	Great-horned Owl
				2005	Unknown	Unknown	
5393	365702E 4976042N	T57N R82W S11	Box elder, live	2008	Poor	Inactive	
				2007	Poor	Inactive	
				2005	Unknown	Inactive	

BLM_ID	UTMs	Legal Location	Substrate	Year	Condition	Status	Species
5394	365707E 4976038N	T57N R82W S11	Box elder, live	2008	Good	Inactive	
				2007	Good	Active	Red-tailed Hawk
				2005	Good	Active	Red-tailed Hawk
5899	365391E 4977170N	T57N R82W S11	Juniper, live	2008	Fair	Inactive	
				2007	Fair	Active	Great-horned Owl
				2006		Active	Great-horned Owl
6211	368959E 4978410N	T57N R81W S6	Box elder, live	2008	Fair	Inactive	
6212	367176E 4979658N	T58N R82W S36	Cliff	2008	Unknown	Active	Prairie Falcon
				2007	Unknown	Active	Prairie Falcon
				2006	Unknown	Active	Prairie Falcon

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, separated by no more than 1.5km, 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).

Seven black-tailed prairie dog colonies were identified during site visits by IFC within the project area (Table 5).

Table 5. Black-tailed prairie dog colonies within the Dow 2 project area.

Legal Location	Size (Acres)	Status
SENW S27, T58N, R82W	7.3	Not occupied
SWSW S27, T58N, R82W	0.9	Occupied
NW S4, T57N, R82W	161.6	Occupied
NE and NESE S3, T57N, R82W	117.3	Occupied

NENW S1, T57N, R82W	7.5	Occupied
NENE S1, T57N, R82W	7.5	Occupied
NWNW and NENW S12, T57N, R82W	73.1	Occupied
Total	**375.2**	

These colonies and 29 additional colonies, separated by no more than 1.5km of each other, cover a total of 1163.9 acres. The project area is located approximately nine miles from the Sheridan complex, the nearest potential reintroduction area. Black-footed ferret habitat is present within and surrounding the Dow 2 project area.

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.

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).

Badger Creek is intermittent, while its tributaries are ephemeral. No springs were documented within the project area. IFC conducted a Ute ladies-tresses orchid survey on September 17, 2008, along the entire stretch of Badger Creek within Sections 1 and 2, T57N, R82W. Soil samples collected from Badger Creek were primarily composed of loam and clay loams. Badger Creek contained no flowing water during the time of the survey, but several stagnant pools with less than 4 inches of water were scattered throughout the creek. The creek bed primarily consisted of dense upland vegetation including tall wheatgrass and prairie cordgrass, but sedges and foxtail barley were also prevalent in a few areas. Grasses along the banks of the creek were extremely dense and tall (over 6 feet). The creek bed was significantly entrenched in most areas and provided few locations for suitable orchid habitat, most banks were relatively steep with an abrupt transition between wetland and upland habitats. Futhermore, the areas of the creek that hosted standing water were bordered by a significant saline crust. Suitable orchid habitat is not present within the Dow 2 project area.

3.3.5.2. Sensitive Species

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. 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*).

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, and sage thrasher. 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. 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, pronghorn antelope, and sagebrush lizard.

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.

Due to the lack of large stands of mature cottonwoods on or within one mile of the Dow 2 project area, no good quality bald eagle nesting or winter roosting habitat is present. Existing woodlands within the

project area are dominated by junipers that are not of sufficient size (most less than 18 feet) to host a nest or eagles. One adult was observed on December 11, 2006 approximately 0.7 mile west of the project area in SESE Section 32, T58N, R82W.

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 that 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).

Seven black-tailed prairie dog colonies, totaling approximately 375.2 acres were identified during site visits by IFC within the project area (Table 5).

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 survey information provided by IFC indicates four burrowing owl nests were present within the Dow 2 project area in 2006. In 2008, only one nest was documented. This nest is located in SENW Section 27, T58N, R82W and was documented as active in 2006 and inactive in both 2007 and 2008.

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 within the project area. Moderately dense stands of sagebrush are present in Section 25, 26, and 36, T58N, R82W and Sections 1 and the south half of Section 12, T57N, R82W. These areas are suitable for nesting, summer, brood rearing, and winter habitat. Sage-grouse habitat models indicate that approximately 50 percent of the project area contains high quality sage-grouse nesting habitat and approximately 20 percent of the project area contains high quality sage-grouse wintering habitat (Walker et al. 2007). BLM records identified two sage-grouse leks within four miles of the project area. The 4-mile distance was recommended by the State wildlife agencies' ad hoc committee for consideration of oil and gas development effects to nesting habitat (WGFD 2008). These 2 lek sites are identified below (Table 6).

Table 6. **Sage-grouse leks surrounding the Dow 2 project area.**

LEK NAME	LEGAL LOCATION	OCCUPANCY STATUS	DISTANCE FROM PROJECT AREA
PPL	SWSW S30, T58N, R82W	Occupied	2.3
Badger Creek	NESW S16, T57N, R81W	Occupied	2.6

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 Dow 2 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. Berries from chokecherry, snowberry, rose, and skunkbush sumac could provide a food source from late summer through the winter. Cottonwoods, box elder, and junipers could provide buds and berries, respectively, to sustain grouse through the winter. The BLM biologist observed a sharp-tailed grouse nest, containing three broken eggshells, in a large sagebrush stand in SENW Section 3, T57N, R82W.

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 not present within the project area. Rough topography, the presence of trees, and general density and height (6-8) inches of grasses within the project area provide for little suitable habitat within the project area. Heavily grazed portions of the prairie dog colony in NENE Section 11, T57N, R82W, provide limited habitat, but is surrounded by ridges and draws, likely making it undesirable for mountain plover nesting.

3.4. West Nile Virus

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

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

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

Table 3.4 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007*	155	22	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 the Upper Tongue River drainage system. It is drained by Badger Creek, a tributary to the Tongue River. The tributaries to Badger Creek are all ephemeral draws. Badger Creek itself is ephemeral to intermittent under natural conditions.

The Tongue River is a clear, free-flowing river until it enters the Tongue River Reservoir a short distance downstream of Badger Creek's confluence with it. Water quality issues have led to controversy among landowners who irrigate from the river and between the states of Wyoming and Montana. CBNG development and discharge of produced water, into reservoirs, Tongue River tributaries, and into surface and subsurface irrigation systems, has been occurring along the Upper Tongue's watershed for a number of years.

3.5.1. Groundwater

Wyoming Department of Environmental Quality (WDEQ) water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for Total Dissolved Solids (TDS) and the classes of groundwater; 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 PRB EIS Record of Decision 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 related to groundwater, the plan identified the following (PRB EIS ROD page E-4):

- The effects of infiltrating waters on the water quality of existing shallow groundwater aquifers are not well documented at this time
- Potential impacts will be 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
- Shallow groundwater wells would be installed and monitored where necessary

As stated in the MMRP, an Interagency Working Group was established to implement an adaptive management approach. BLM is working with the WDEQ and the Interagency Working Group regarding the monitoring information being collected and assessed to determine if changes in mitigation are warranted.

The BLM 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 had a battery of nineteen wells which were installed and monitored jointly by the BLM and USGS starting in August of 2003. Water quality data has been sampled from these wells on a regular basis. That impoundment site, which has since been reclaimed, 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 indicated 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's Office (WSEO) Ground Water Rights Database for this area showed 10 registered stock and domestic water wells within 1 mile of proposed federal CBNG wells in the POD with depths ranging from 80 to 520 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 Upper Tongue River drainage system. It is drained by Badger Creek, a tributary to the Tongue River. The tributaries to Badger Creek are all ephemeral draws (flowing only in response to a precipitation event or snow melt). These draws are short (generally less than 5 miles from their heads to their confluences with Badger Creek) and grade from very steep, highly erosive gully systems to a broad flat outwash bench where they join the upper terraces above Badger Creek. Badger Creek itself is ephemeral to intermittent under natural conditions (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). It is characterized by a relatively well incised main channel and a broad, flat-bottomed floodplain. The floodplain on both sides of Badger Creek is bounded by a series of terraces exhibiting various steps as they move up to the feet of the boundary ridges.

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

The operator stated that no natural springs were identified within this POD's boundary.

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 inventory was conducted for the Dow II project prior to on-the-ground project work (BFO project no. 70080087). Foothills Archaeological Services 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. G.L. "Buck" Damone III, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. There are no cultural resources located within the project area.

3.7. Air Quality

Existing air quality throughout most of the Powder River Basin is in attainment with all ambient air quality standards. Although specific air quality monitoring is not conducted throughout most of the Powder River Basin, air quality conditions in rural areas are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations.

Existing air pollutant emission sources within the region include following:

- Exhaust emissions (primarily CO and nitrogen oxides [NOx]) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- Dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas and road sanding during the winter months;
- Transport of air pollutants from emission sources located outside the region;
- Dust (particulate matter) from coal mines;
- NOx, particulate matter, and other emissions from diesel trains and,
- SO2 and NOx from power plants.

For a complete description of the existing air quality conditions in the Powder River Basin, please refer to

the PRB Final EIS Volume 1, Chapter 3, pages 3-291 through 3-299.

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. Under this alternative, 12 wells would be drilled at 12 locations to Federal minerals on 80 acre spacing. For the most part, the operator utilized existing primitive and improved roads as infrastructure for this POD. The wells have been sited so that construction will disturb a minimum area. There are some well locations and other areas along the access routes that cross highly erosive soils and will require expedient or extraordinary stabilization to reduce erosion potential.

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 12 proposed well locations, 4 can be drilled without a well pad being constructed and 8 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 4 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 15x 15 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 4 wells would involve approximately 0.40 acre/well for 1.6 total acres. The other 8 wells requiring cut & fill pad construction would disturb approximately 0.45 acre/well pads for a total of 3.6 acres. The total estimated disturbance for all 12 wells would be 5.2 acres.

Approximately 4.1 miles of improved roads would be constructed to provide access to various well locations. Approximately 1.0 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 1.5 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, culverts, rip-rap, silt fences, hydro seeding and erosion matting.) would ensure land productivity/stability is regained and maximized.

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	8	0.40/acre	3.2	Long Term
Constructed Pad	4	.45/acre	1.8	Long Term
Gather/Metering Facilities	3	1 acre	3	Long Term
Screw Compressors	3	Site Specific	0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments				
On-channel	0	Site Specific	0.0	Long Term
Off-channel	0	Site Specific	0.0	
Water Discharge Points	0	Site Specific	0	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads	4.1			
No Corridor	0	40’ Width	19.88	Long Term
With Corridor	4.1			
2-Track Roads	1.0			
No Corridor	0	20’ Width	3.03	Long Term
With Corridor	1.0			
Pipelines	21.6			
No Corridor	1.5	20’ Width	3.64	Short Term
With Corridor	20.1		52.12	
Overhead Powerlines	0	15’ Width	0	Long Term
Staging Areas	3	.5/acre	1.5	Short Term
SDI	1	0	340 acres	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. Soils

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 results in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This may change the ecological integrity

of the site and the recommended seed mix.

- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery. Compaction may be remediated by plowing or ripping.
- Loss of soil vegetation cover, organic matter and productivity. With expedient reclamation, productivity and stability should be regained in the shortest time frame.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil productivity would be eliminated along improved roads and severely restricted along two track trails until successful final reclamation is achieved.
- Modification of hill slope hydrology.

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

Soil disturbances other than permanent facilities would be short term with expedient, successful interim reclamation and site stabilization. In locations of highly erosive soils, the operator will be required to stabilize the disturbed surface within 30 days of the initial disturbance. 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, wing ditches, culverts, rip-rap, etc) would ensure land productivity/stability is regained and maximized. In addition, the operator will adhere to COAs which limit the surface disturbance allowable for construction and improvements.

Areas identified as having a low reclamation potential were identified at the onsite and avoided wherever possible. However, some areas of low reclamation potential will be affected by the proposed action. As a result, site specific mitigation measures such as mulching, matting, soil amendments, etc, will be applied to the access roads and wells at the following locations: 9-4, 15-3, 11-3, 3-6, 1-10, 3-1. To reduce susceptibility to degradation and enhance reclamation potential these measures will be finished within **30 days** of the initiation of construction activities.

The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). The Wyoming Reclamation Policy applies to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to or better than that which existed before it was disturbed. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.

Cumulative Effects:
Most soil disturbances would be short term impacts with expedient, successful interim reclamation and site stabilization, as committed to by the operator in their POD Surface Use Plan and as required by BLM in COAs.

4.1.2. Wetland/Riparian/Floodplains

The water management strategy for this plan of development is to inject the produced water into the alluvium and colluvium within the upper terraces of Badger Creek. by Bene Terra, the owner and operator

of the SDI (Subsurface Drip Irrigation) system. Bene Terra proposes that injection will only occur at rates that can be transpired by the planted vegetation and absorbed by the soil, without flowing into Badger Creek. However, injection of produced water is planned to continue year-round. There is potential for the shallow groundwater table to rise closer to the surface in the terraces below the application areas. There is also potential that injected water could migrate laterally within the substrate and eventually find egress into Badger Creek. This cropping out of water in the stream would constitute a violation of Bene Terra's WDEQ issued "Injection" permit and a violation of the actions authorized in this document. It is not likely that flows would be high enough to cause water to leave the primary channel. However, winter ice jams could form dams, thus creating a diversion of CBNG water onto the floodplain of Badger Creek. "Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

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

4.1.3. 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. Administer herbicides.
2. Incorporate weed prevention and control measures infrastructure maintenance activities (for specifics see Integrated Pest Management Plan (IPMP) in the POD.
3. Initiate a weed education policy to assist contractors and field employees in the identification of noxious weeds and to create an awareness of the impacts of noxious weeds and invasive plants

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.

4.1.4. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Upper Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 51% of that total (see section 4.4.2.1).
- The WMP for the Dow 2 POD proposes that produced water will not contribute significantly to flows downstream and the UIC permit UIC 07-459, on page 4, specifically states that "Water migrating from the drip irrigation system shall not enter into Badger Creek".
- The commitment by the operator to monitor the volume of water flowing into Badger Creek and WDEQ conditions of approval for Bene Terra's injection permit.

Additional mitigation measures may be required as this POD and future PODs are developed within this area by this and other operators.

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

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD 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 not only do mule deer avoid mineral activities, but 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.

CBNG 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 discharged into an existing system of subsurface drip irrigation. Run-off from this system is likely to eventually change the hydrology of Badger creek and potentially the Tongue River to the west. Produced water may eventually reach a fish-bearing stream, though this is unlikely, and 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 Tongue River could harm native fish species that inhabit the Tongue 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 Tongue River (Hubert 1993).

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 establish 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.

Change in Water Quantity

Native fauna in the Tongue 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 Tongue 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. 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.

4.2.2.1. Aquatics Cumulative effects

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

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area 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.

CBNG 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 consequences 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.

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. No additional mitigation measures are required.

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.

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 5. Infrastructure proposed within close proximity to documented raptor nests within the Dow 2 project area.

BLM ID#	**AMOUNT AND TYPE OF INFRASTRUCTURE**	
	Within 0.25 mile	*Within 0.25 to 0.5 mile*
5385	1 template road	1 pipeline corridor
5384	1 well (Chase Farms Fed 1-6-57-81 MZ/CR), 1 template road, 1 pipeline corridor	1 pipeline corridor, 1 tire tank
6211	1 well (Chase Farms Fed 1-6-57-81 MZ/CR), 1 template road, 1 pipeline corridor	1 pipeline corridor, 1 tire tank
5387	1 well (Chase Farms Fed 1-6-57-81 MZ/CR), 1 template road, 1 pipeline corridor	1 pipeline corridor, 1 template road, 1 tire tank
5386	1 well (Chase Farms Fed 1-6-57-81 MZ/CR), 1 template road, 1 pipeline corridor, 1 tire tank	1 well (Chase Farms Fed 3-6-57-81 MZ/CR), 1 pipeline corridor, 1 access / pipeline corridor, 1 template road
159	1 template road/ pipeline corridor, 1 engineered road / pipeline corridor	3 wells (Dow Fed 11-37-57-82 MZ/CR, Dow Fed 15-3-57-82 MZ/CR, Dow Fed 1-10-57-82 MZ/CR), 3 access / pipeline corridors

BLM ID#	AMOUNT AND TYPE OF INFRASTRUCTURE	
	Within 0.25 mile	*Within 0.25 to 0.5 mile*
5899	1 well (Dow Fed 7-11-57-82MZ/CR, 1 pipeline corridor	1 well (Dow Fed 3-11-57-82 MZ/CR), 1 access / pipeline corridor

No attempts were made at the onsite visit to remove wells and / or infrastructure from within 0.25 mile of any raptor nests. The Dow Fed 7-11-57-82MZ/CR well is out of line-of-sight of the Great-horned owl nest located approximately 1.8 mile northeast of the well. The Chase Farms Fed 1-6-57-81MZ/CR well is out of line-of-sight of the majority of the nests within the cluster of nests (5384, 6211, 5387, 5386, and 5385) located within the drainage south of this well. Two nests remain in line-of-sight of this well (nests 5386 and 5387). These two nests are also in line-of-sight and within close proximity to an existing network of ranch roads. Additional impacts to these nests from the addition of this well and access are likely negligible.

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 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.

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.

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

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

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

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 of sufficient size to support a black-footed ferret population and the project area is approximately 9.2 miles from the Sheridan 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 inhabitance. 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

Suitable habitat is not present within the (POD name) project area. Implementation of the proposed coal bed natural gas project will have "***no effect***" on the Ute ladies'- tresses orchid.

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 6840.22Astates: "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 remnants 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 4.3 Summary of Sensitive Species Habitat and Project Effects.

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

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Plants				
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	NP	NI	Habitat not present.
William's wafer parsnip (*Cymopterus williamsii*)	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.
MIIH May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.
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

Based on the raptor nesting and bald eagle winter roost surveys and lack of suitable habitat, it is unlikely bald eagles nest or roost within the Dow 2 project area. The proposed project should not affect bald eagle nesting or winter roosting. Project activities will impact foraging habitat and prey.

There are 24 miles of existing overhead three-phase distribution lines within the project area. The wire spacing is likely in compliance with the Avian Power Line Interaction Committee's (1996) suggested practices and with the Service's standards (USFWS 2002); however other features may not be in compliance. Pennaco is proposing no additional overhead three-phase distribution lines. There are currently 2.3 miles of improved roads within the project area, with 3.5 miles proposed.

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.

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

A pipeline corridor will be installed along an existing access route adjacent to the prairie dog colony in Sections 11 and 12, T57N, R82W. An access / pipeline corridor will be constructed within outlying portions of the prairie dog colony in Section 3, T57N, R82W. No attempts were made during the onsite visit to remove this infrastructure from the prairie dog towns.

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.

Unlike roads and pipelines, the construction and operation of the subsurface drip irrigation (SDI) system has likely permanently removed habitat. Crops are planted in these areas. Prairie dogs need short vegetation throughout the colony so that they can see other individuals and warn others of danger. The long-term effects associated with the SDI system may include tunnel collapse and colony displacement. 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

See Black-tailed prairie dog Direct and Indirect Effects for described impacts to burrowing owl habitat. Of the four nests within and immediately surrounding the Dow 2 project area, three were destroyed in 2007 by the installation of the SDI systems.

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

The landowner has treated sagebrush for removal throughout the project area. The BLM biologist did not recommend any changes to the project to reduce impacts to sage-grouse. The Badger Creek and PPL sage-grouse leks are located within four miles of the Dow 2 project area. The proposed action will adversely impact sage-grouse nesting, brood rearing, late summer, and winter habitat. Proposed project elements that are anticipated to negatively impact grouse are approximately: 12 CBNG wells on 12 locations, 7.7 miles of new roads, 1.6 miles of new pipelines, increased vehicle traffic on established roads and increased noise from compressor stations. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse winter habitat loss will be approximately 2798 acres and effective sage-grouse nesting habitat loss will be approximately 5223 acres from roads and well locations.

Based on the best available science, which is summarized below, the proposed action will most likely affect the local grouse population and contribute to the subsequent abandonment of the two leks within four miles of the project.

4.2.5.2.6.1.1. 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 assessment area for this project encompasses a four mile radius from the Badger Creek and PPL sage-grouse leks. As of September 2, 2008, there are approximately 874 existing wells and associated infrastructure within four miles of the 2 leks - an area of 100 square miles. The existing well density is approximately 8.7 wells/section. Due to this level of development there is a strong potential that the population(s) breeding at these leks may become extirpated without the federal development.

There are 82 proposed wells (6 are the wells from this project) within four miles of the 2 leks. With the addition of the 12 proposed wells that are not associated with this proposed action, the well density within four miles of the 2 leks increases to 9.5 wells/section. With approval of alternative C (6 proposed well locations) the well density increases to 9.6 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 to 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)

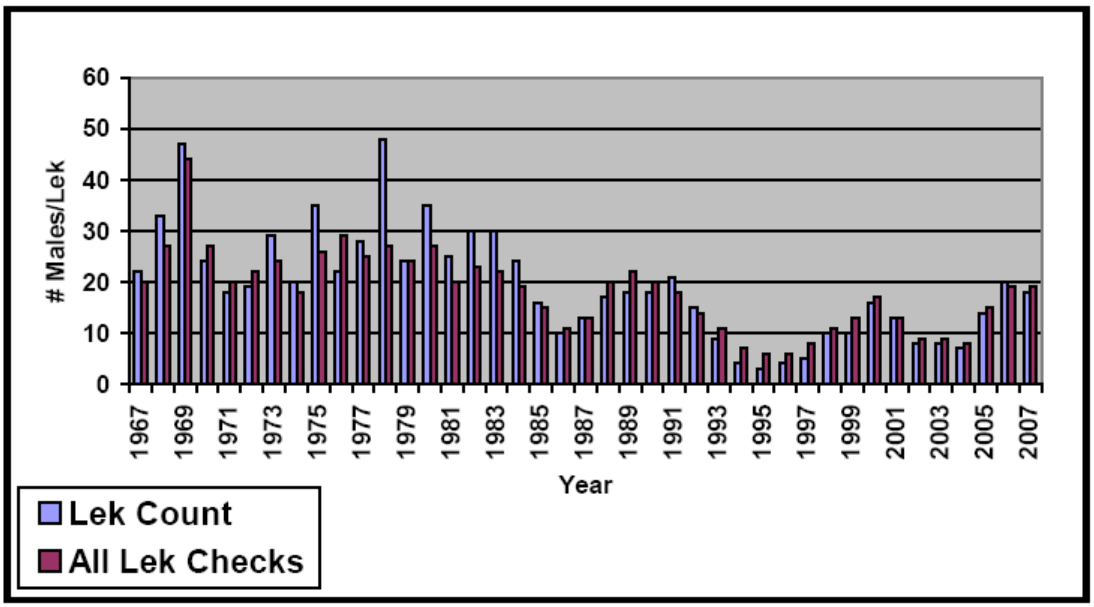
Noise can affect sage-grouse by preventing vocalizations that influence reproduction and other behaviors (WGFD 2003). In a study of greater sage-grouse population response to natural gas field development in western Wyoming, Holloran (2005) concluded that increased noise intensity, associated with active 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 development within the cumulative impacts assessment area has further 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 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).

4.2.5.2.7. Sharp-tailed grouse Direct and Indirect Effects

Effects to sharp-tailed grouse within the Dow 2 project area are similar to sage-grouse with addition of the following direct impact: The BLM biologist observed a sharp-tailed grouse nest along the proposed routes to the Dow Fed 11-3-57-82MZ/CR and 15-3-57-82MZ/CR wells. The biologist asked that these routes be reconsidered to avoid impacts to this occupied sharp-tailed grouse habitat. Extensive consideration was given to the possibility of other routes to these wells. All indentified alternative routes were deemed to be more disturbing to the habitat. The BLM biologist recommended a timing restriction during nesting season for these two wells and the access leading to them. Pennaco agreed to this. The BLM biologist also recommended as mitigation that Pennaco commit to utilizing the telemetry system to its full extent during sharp-tailed grouse nesting season by visiting these wells only once a month and to notify the BLM by phone if more frequent visits would be necessary. Pennaco would commit to weekly visits, but not monthly. The BLM biologist recommended this to reduce the amount of visits to these locations during nesting season, and thus, reducing disturbance to nesting sharp-tailed grouse and feels that without the once monthly visit commitment, sharp-tailed grouse are not likely to continue to nest within this habitat.

4.2.5.2.8. Mountain plover Direct and Indirect Effects

Suitable mountain plover habitat is not present within the project area. The project should not impact mountain plovers.

4.2.5.3. 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 Upper Tongue River watershed and a commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists developed the water management plan. Adherence with the plan, in addition to BLM and WDEQ applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies. The water management strategy for this POD is to dispose all the water produced in association with Federal minerals at an existing subsurface drip irrigation site.

The WDEQ has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state.

The maximum water production is predicted to be 15.0 gpm per well or 180 gpm (0.4 cfs or 290 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Tongue River drainage, the projected volume produced within the watershed area was 20,282 acre-feet in 2008 (maximum production was expected to occur in 2006 at 22,351 acre-feet). As such, the volume of water resulting from the production of these wells is less than 2% of the total volume projected for 2008. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 39% to groundwater aquifers and coal zones in the Upper Tongue River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 70 gpm will infiltrate below the SDI application sites (113 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "…the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). However, there is potential for infiltration of produced water to influence the quality of the antecedent groundwater.

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 80 to 520 feet compared to 405 to 1390 feet to the 5 Co-Mingled coal zones. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells

within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells (WMP page 4).

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 targeted coal zones. 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 analyses submitted for the pre-approval evaluation, the operator has committed to designate a reference well within the POD boundary. The well will be capable of being sampled at the wellhead. A sample will be collected at the wellhead for analysis within sixty days of initial production. A copy of the water analysis will be submitted to the BLM Authorizing Officer.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ 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 have been approved June of 2006.

As of April, 2008, approximately 1774 impoundment sites have been investigated. These sites had more than 1988 borings. Of those impoundments, 259 met the criteria to provide compliance monitoring data if constructed and used for CBNG water containment. Only 109 monitored impoundments are currently in use. As of the 1st quarter of 2008, only 16 monitored impoundments exceeded groundwater class of use limits (Fischer, 2008). The BLM requires that operators comply with the DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

While no impoundments are proposed in this water management plan, the potential for infiltration to shallow groundwater aquifers exists. The WDEQ regulates this type of produced water disposal under their Underground Injection Control (UIC) program as a "Class V" water injection well. The operator has obtained the proper permit from the WDEQ for this operation (Appendix 2 of the WMP).

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 the level of TDS, SAR and EC found in the POD's representative water sample.

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	2500
Tongue River at State Line near Decker, WY Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 0.36 0.86	 318 731
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
Predicted Produced Water Quality Co-mingled Smith, Dietz 1, Dietz 3, Monarch, Carney	 Not Stated	 60.7	 2440

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder and Tongue River Basins is the irrigation of crops (PRB FEIS pg 4-69). The TDS expected from this project was not provided by the operator. However, the SAR of 60.7 would very likely contribute to forming an impenetrable cap over soils to which it was applied (surface irrigation). The operator has proposed to use SDI, which uses subsurface buffering of calcium, magnesium, etc, and thus is not detrimental to the soil or plant growth.

According to Wyoming State Water Law (W.S. 41-3-101) the water extracted in the production of CBNG belongs to the state; BLM policy 1982 directs the BLM's cooperation and full compliance with State water laws. Subsurface Drip Irrigation (SDI) is permitted and regulated by the Wyoming Department of Environmental Quality (WDEQ) through the Underground Injection Control (UIC) program, requiring a WDEQ 5C5 UIC permit. The BLM is responsible for analyzing the proposed action with available data provided in the WMP for the POD and disclose potential impacts of the proposed action. Responsibility, liability, monitoring, mitigation measures and reclamation should be addressed in the surface use agreement (SUA).

SDI systems are designed to utilize cations present in the soils to mitigate the impact of the quality of CBNG water on soils. The irrigation quality of the CBNG "produced water" and the variability of soils and the range in characteristics (RIC) of their physical and chemical properties within the project area, have the potential to cause long term soil impacts.

Literature review of soils and soil primary soil characterization lab data collected by the NRCS indicates wide variability within the Powder River Basin. Variability or RIC of soil features and properties of the identified soils include:

- soil depth
- available water holding capacity
- saturated hydraulic conductivity
- amount, depth to base and the mineralogy of clays present
- highly variable chemical properties found in alluvial and colluvial soils within the Powder River Basin.

CBNG "produced water" has a moderate to high salinity hazard and often has a very high sodium hazard based on standards used for irrigation suitability. The sodium hazard of CBNG "produced water" may affect the soil resource. Sodic irrigation water causes dispersion of clays and clogging of soil pores thereby impairing soil hydraulic conductivity, affecting water availability and reducing soil aeration, all of which are important to long term soil health and productivity. Elevated sodium concentrations can harm some plants due to direct toxicity as it is taken up by the root cells. Sodium can also indirectly affect crop growth by causing calcium, potassium, and magnesium deficiencies.

With time, salts from CBNG water can accumulate in the root zone in concentrations that will affect plant growth and water utilization. Semi arid and arid climates create the potential for upward movement of salts into the root zone. Proper plant selection for deep roots and salt tolerance is important. Germination of these plant species may require special management practices to prevent negative impacts to soils.

With yearlong water disposal at volumes above the desirable leaching fraction, there is a potential for injected water to affect shallow aquifers. The characteristics of the water impacting shallow ground water may be very difficult to predict and model. Based on the "Skewed Reservoir" experience, there is a potential for migration of low quality water to adversely affect the subsurface environment.

Sites should be closely monitored to assure long term soil health and productivity is maintained. Specific soil chemical and physical property action levels should be established to ensure that the soil is not measurably impacted and that remedial actions can be implemented before irreversible soil damage occurs. These thresholds should be based on soil type, vegetation, water quality, soil and/or water amendments used, potential land use, beneficial use goals and landowner requests. Monitoring of the SDI site should include an evaluation of soil chemical and physical properties, runoff and erosion, water quantity and quality, and vegetative performance.

The long term impacts and mitigation success are unknown at this time. Impacts are subjective and not well defined and long term effects will depend on the success of applied soil amendments and intense monitoring, management and immediate site mitigation. Reclamation or mitigation practices may be difficult to achieve, are expensive and are the responsibility of the operator, contractor and landowner, and should be addressed in the Surface Use Agreement (SUA).

Bene Terra and the operator have approximately 688 acres of land in SDI for "disposal" of water produced from fee development. They have proposed that water produced from this federal action will be "disposed of" through this SDI system, which has been permitted by the WYDEQ. According to personnel at Bene Terra, Inc, the owners and managers of the SDI, they expect that the fields in the Badger Creek will accept approximately 65 BWPD/Acre, or 1300 gallons per minute. This will adequately address the operator's expected production from the federal portion of this development.

The quality for the water produced by development of the 5 Co-Mingled coal zones through these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 15.0 gallons per minute (gpm) is expected to be produced from these 12 wells, for a total of 180 gpm for the POD. See Table 4.5.

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

The SDI has been evaluated for best management practices. The influent pit has a single heavy liner which should prevent seepage from the terrace to the floodplain and stream channel.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-93). The predicted maximum discharge rate from these 12 wells is anticipated to be a total of 180 gpm or 0.4 cfs to subsurface drip irrigation. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74), the produced water re-surfacing in Badger Creek from this action (0.1 cfs) may add a maximum 0.05 cfs to the Upper Tongue River flows, or just under 1% of the predicted total CBNG produced water contribution. This incremental increase in flow is statistically below the measurement capabilities for flow in Tongue River (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator did not provide an analysis of the potential development in the watershed above the project area. Based on the proposed water management strategy and the fact that there are no proposed impoundments for this plan, the operator chose not to perform this analysis. Future submissions of development plans will require this analysis, as the Badger Creek watershed is only recently being opened up to CBNG development.

No WYPDES permit was required for this POD. Instead, a UIC permit was required and is part of the water management plan submitted with this plan. UIC permit 06-390 was modified by UIC 07-459 and applied to UIC Facility Number WYS-033-153.

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 boundary. This will be the first well drilled in this POD and will be capable of having a water sample collected at the wellhead. This 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 not addressed by the operator because no water will be discharged to impoundments or into the channel. The WMP was prepared for Marathon Oil Company by ARCADIS US.

4.4.2.1. Surface Water Cumulative Effects

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

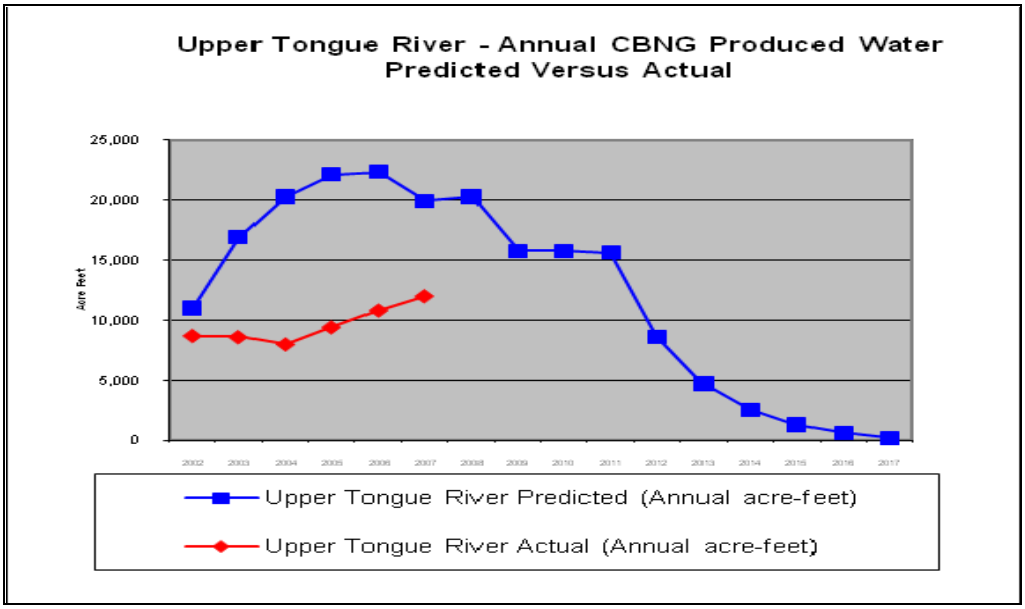
As of December 2007, all producing CBNG wells in the Upper Tongue River watershed have discharged a cumulative volume of 57,396 acre-ft of water compared to the predicted 112,670 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6

following. This volume is 51% of the total predicted produced water analyzed in the PRB FEIS for the Upper Tongue River watershed.

Table 4.6 Actual vs predicted water production in the Upper Tongue River watershed *2007 Data Update 3-08-08*

Year	Upper Tongue River Predicted (Annual acre-feet)	Upper Tongue River Predicted (Cum acre-feet from 2002)	Upper Tongue River Actual (Annual acre-feet)		Upper Tongue River Actual (Cumulative acre-feet beginning 2002)	
			Ac-ft	% of Predicted	Ac-ft	% of Predicted
2002	11,019	11,019	8,675	78.7	8,675	78.7
2003	16,950	27,969	8,574	50.6	17,248	61.7
2004	20,272	48,241	7,971	39.3	25,220	52.3
2005	22,133	70,374	9,397	42.5	34,617	49.2
2006	22,351	92,725	10,795	48.3	45,412	49.0
2007	19,945	112,670	11,984	60.1	57,396	50.9
2008	20,282	132,952				
2009	15,782	148,734				
2010	15,782	164,516				
2011	15,654	180,170				
2012	8,646	188,816				
2013	4,721	193,537				
2014	2,522	196,059				
2015	1,290	197,349				
2016	601	197,950				
2017	214	198,164				
Total	**198,164**		**57,396**			

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



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

The PRB FEIS states, "Modeling indicates that the suitability of the Tongue River for irrigation may be compromised by the surface discharge of CBM produced water during maximum CBM development in both states (Wyoming and Montana). However, existing interstate agreements have been developed to minimize impacts until protective standards are put in place and the assimilative capacity is equitably divided among the states and the tribes. Surface discharge to the Tongue River from CBM development in both states currently is controlled by the two state DEQs. These agencies have agreed to an interim 'no new discharge' policy that would not authorize untreated surface discharge of CBM waters to the Tongue River unless the water quality was at or near the existing level in the Tongue River." (PRB FEIS page 4-116.) Water leaving the SDI sites as re-surfacing flow could have such quality as to violate standards currently in place.

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 Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 51% of that total (see section 4.4.2.1).
2. The WDEQ enforcement of the terms and conditions of the UIC permit that are designed to protect irrigation downstream.
3. The commitments by the operator to monitor the volume of water discharged and insure that none enters Badger Creek.

Additional mitigation measures may be required as this and subsequent PODs are developed by this and other operators in the Badger Creek watershed.

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

4.5. Cultural Resources

No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 9/17/08 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).

4.6. Air Quality

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Air quality impacts modeled in the PRB FEIS concluded that projected oil & gas development would not violate any local, state, tribal or federal air quality standards. Based on additional material supplied by Marathon Oil: Cost Benefit Analysis of Scoria vs. WYDOT Grade W Road Base Gravel. The Pennaco has chosen to use scoria as a surfacing material on all proposed access roads and for road maintenance. Pennaco has projected to spend $12,000 dollars annually on dust abatement on this project. Roughly, twice that required for dust abatement on roads surfaced with WYDOT Grade W gravel.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Bert Dow	Land Owner	Dow Ranch	No
Jeff Simons	Dow Ranch Manager	Dow Ranch	No
Bill Prichard	Facilities Supervisor	Marathon Oil	No
Mary Hopkins	Interim Wyoming SHPO	Wyoming SHPO	No

6. OTHER PERMITS REQUIRED

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

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