FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
Pennaco Energy, INC a subsidiary of Marathon Oil
Sales 14
ENVIRONMENTAL ASSESSMENT –WY-070-EA09-94

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Pennaco Energy, INC's Sales 14 Coal Bed Natural Gas (CBNG) POD comprised of the following 18 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	DOW FED	3-10MZCR*	NENW	10	57N	82W	WYW145646
2	RUCKI FED	5-10MZCR	SWNW	10	57N	82W	WYW145646
3	DOW FED	7-10MZCR	SWNE	10	57N	82W	WYW145646
4	DOW FED	9-10MZCR	NESE	10	57N	82W	WYW145646
5	RUCKI FED	11-10MZCR	NESW	10	57N	82W	WYW145646
6	DOW FED	13-11MZCR	SWSW	11	57N	82W	WYW149996
7	DOW FED	15-11MZCR	SWSE	11	57N	82W	WYW149996
8	SALES FED	13-12MZCR	SWSW	12	57N	82W	WYW143068
9	SALES FED	3-13MZCR	NENW	13	57N	82W	WYW143068
10	SALES FED	5-13MZCR	SWNW	13	57N	82W	WYW143068
11	SALES FED	1-14MZCR	NENE	14	57N	82W	WYW145647
12	SALES FED	3-14MZCR	NENW	14	57N	82W	WYW145647
13	SALES FED	7-14MZCR	SWNE	14	57N	82W	WYW145647
14	SALES FED	11-14MZCR	NESW	14	57N	82W	WYW145647
15	SALES FED	15-14MZCR	SWSE	14	57N	82W	WYW145647
16	SALES FED	1-23MZCR	NENE	23	57N	82W	WYW145648
17	SALES FED	5-24MZCR	SWNW	24	57N	82W	WYW143068
18	SALES FED	7-24MZCR	SWNE	24	57N	82W	WYW143068

The following APD's are not approved.

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	SALES FED	11-13MZCR	NESW	13	57N	82W	WYW143068
2	SALES FED	13-13MZCR	SWSW	13	57N	82W	WYW143068

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 Final 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.

The existing fee road which is proposed to access Fed Well 11-13 and Fed Well 13-13 does not meet the minimum road standards as outlined in the BLM Manual 9113, BLM Manual 9113 WYSO Supplement, the Gold Book, or the Buffalo Field Office Oil and Gas Road Guidelines for APD's.
The existing fee road is approximately 11' wide and follows a narrow finger ridge with grades in excess of 20%. Side slopes along the finger ridge are in excess of 40%. The road was originally flat bladed with light surfacing material added along the entire length of the road. There is no crown in the road and no drainage control features to divert runoff away from the road. Mid way down the finger ridge there is a switch back curve to try and lessen the road grade. The road is currently a ranch road used to access 2 fee wells.

The BLM Manual 9113 WYSO Supplement provides a standard for a low volume resource road that allows the full surfaced travel way width to be a minimum of 12' with a sub-base width of 16' and a design speed to 10 mph. The existing road would need to be widened an average of one foot the entire length of the road to meet the minimum travel way width requirement. Next the steepest road grade measured in the field was approximately 22%. The BLM Manual 9113 states that the preferred maximum road grade is 8% for a resource road but may increase to 16% for short segments. The Gold Book goes into further detail to explain that a resource road can exceed 8% up to 16% for 300 LF or less to minimize environmental effects. The existing road would need to be lowered in grade by lengthening the road alignment. Third, the Powder River Basin EIS states that there will be no surface occupancy on side slopes in excess of 25%. Please show how this can be mitigated. Fourth, flat bladed roads are not permitted by the BLM Manual 9113 WYSO Supplemental as well as in the BFO Oil and Gas Road Guidelines for APD's. Drainage control must be provided to ensure a safe and drivable road that minimizes erosion and sedimentation production. Finally, switch back curves are not recommended by the BLM Manual 9113 as this is a safety hazard.

The road in its existing state does not meet the BLM minimum road standards; therefore, please provide an alternate route or an alternate design of the existing road.

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. I have further determined that there are no significant impacts beyond those analyzed in the PRB FEIS to which this Environmental Assessment EA is tiered.

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.

Acting Field Manager: Brian T. Cox Date: 8/24/2009

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Pennaco Energy, INC a subsidiary of Marathon Oil
Sales 14
PLAN OF DEVELOPMENT
WY-070-EA09-94

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 and need of the proposed action is to determine how and under what conditions, to allow the operator to exercise lease rights granted by the United States to develop the oil and gas resources on federal leaseholds.

Development of the Sales 14 POD wells would return royalties to the federal Treasury as well as stimulate local economies.

The BLM recognizes the extraction of natural gas is essential to meeting the nation's future needs for energy. As a result, private exploration and development of federal gas reserves are integral to the agencies' oil and gas leasing programs under the authority of the Mineral Leasing Act of 1920, as amended, and the Federal Land Policy Management Act (FLPMA) of 1976. The oil and gas leasing program managed by BLM encourages the development of domestic oil and gas reserves and reduction of the U.S. dependence on foreign sources of energy.

This action responds to the goals and objectives outlined in the Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001 and the Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment (PRB FEIS) approved April 30, 2003. This action helps move the Project Area toward desired conditions for mineral development with appropriate mitigation consistent with the goals, objectives and decisions outlined in these two documents.

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

This alternative would consist of no new federal wells. The Department of Interior's authority to implement a "no action" alternative that precluded development is limited. 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." The No Action Alternative is further described in the PRB FEIS, Volume 1, pages 2-54 through 2-62.

2.2. Alternative B Proposed Action

Proposed Action Title/Type: Pennaco Energy, INC's Sales 14 Plan of Development (POD) for 20 coal bed natural gas well APD`s and associated infrastructure.

1. Proposed Well Information: There were 20 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 coal seams. There will be no well house used. Instead, Pennaco has surface equipment 'skid' mounted and freeze protected 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. Well surface equipment color is The color selected for the Sales 14 POD is Covert Green, 18-0617 TPX (Pantone for Architecture), selected to blend with the surrounding vegetation. Proposed wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	DOW FED	3-10MZCR*	NENW	10	57N	82W	WYW145646
2	RUCKI FED	5-10MZCR	SWNW	10	57N	82W	WYW145646
3	DOW FED	7-10MZCR	SWNE	10	57N	82W	WYW145646
4	DOW FED	9-10MZCR	NESE	10	57N	82W	WYW145646
5	RUCKI FED	11-10MZCR	NESW	10	57N	82W	WYW145646
6	DOW FED	13-11MZCR	SWSW	11	57N	82W	WYW149996
7	DOW FED	15-11MZCR	SWSE	11	57N	82W	WYW149996
8	SALES FED	13-12MZCR	SWSW	12	57N	82W	WYW143068
9	SALES FED	3-13MZCR	NENW	13	57N	82W	WYW143068
10	SALES FED	5-13MZCR	SWNW	13	57N	82W	WYW143068
11	SALES FED	11-13 MZCR	NESW	13	57N	82W	WYW143068
12	SALES FED	13-13 MZCR	SWSW	13	57N	82W	WYW143068
13	SALES FED	1-14MZCR	NENE	14	57N	82W	WYW145647
14	SALES FED	3-14MZCR	NENW	14	57N	82W	WYW145647
15	SALES FED	7-14MZCR	SWNE	14	57N	82W	WYW145647
16	SALES FED	11-14MZCR	NESW	14	57N	82W	WYW145647
17	SALES FED	15-14MZCR	SWSE	14	57N	82W	WYW145647
18	SALES FED	1-23MZCR	NENE	23	57N	82W	WYW145648
19	SALES FED	5-24MZCR	SWNW	24	57N	82W	WYW143068
20	SALES FED	7-24MZCR	SWNE	24	57N	82W	WYW143068

County: Sheridan

Applicant: Pennaco Energy, INC.

Surface Owners: Donald and Sheila Sales, Bert Dow, Oscar and Camile Rucki, David Kane

Project Description:
The proposed action involves the following:

- Drilling of 20 total federal CBNG 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 of the wells will commence when each well is put into production. The first week to 10 days each well will probably be visited daily until such time as the operator is satisfied that all of the controls are adjusted and operating correctly. Then the daily checks will decline to a normal schedule of a well visit every week to 10 days.

- 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. One float operated tire tank by the Rucki Fed 11-10-57-82MZCR well on Oscar Rucki's property.

- The operator shall develop a set of CBNG deep groundwater monitor wells. (See Appendix A)

- 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. This project was originally submitted to BLM on March 7, 2008. Many modifications were made at the initial on-site, however due to outstanding deficiencies and ongoing negotiations between Pennaco and multiple surface owners, BLM made the decision to return Sales 14 on November 24, 2008 to allow Pennaco Energy, INC to resubmit the project at a later date. The changes made to the project are only those made by BLM and the operator after the Sales 14 was re-submitted on January 14, 2009. 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 Sales 14 POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites after re-submittal on January 14, 2009

Well	Aliquot	Section	T/R	Notes
3-10	NENW	10	57/82	The working area was shifted the west to avoid potential damage to junipers and mature sage brush. The work area will be staked 130 x150 feet and a best fit mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential.
5-10	SWNW	10	57/82	An engineered pad 130 x 150 feet was redesigned to avoid catch points on the cut side (south) to be beyond the highest point of the ridgeline. A ramp down to an existing ranch road was added to the design to facilitate ranch use. 30 day stabilization required at this location due to poor reclamation potential. This well pad will be used for a staging area.
7-10	SWNE	10	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential.
9-10	NESE	10	57/82	The working area will be staked 130 x 150 feet and a best fit

Well	Aliquot	Section	T/R	Notes
				mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential.
11-10	NESW	10	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential. This well location will be used for a staging area. The entire work area will be fenced
13-11	SWSW	11	57/82	An engineered pad of 135 x 150 feet was redesigned to better fit the topography and reduce amount of cut/fill. Pipeline route was rerouted to follow and existing pipeline. 30 day stabilization required at this location due to poor reclamation potential. Two wire gates will be installed in property fence.
15-11	SWSE	11	57/82	Engineered access road was moved off an existing pipeline to a route which would provide less dirt work. Existing road on pipeline route will be reclaimed. A water diversion ditch was added above the pad to prevent water surface flow from coming onto the working area.
13-12	SWSW	12	57/82	Low water crossing added at intersection. The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location.
3-13	NENW	13	57/82	A best fit mowing radius applied at this native pad location. Work area will be staked at 92 x150 feet to avoid areas where no vehicles should drive. 30 day stabilization required at this location due to poor reclamation potential.
5-13	SWNW	13	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location.
11-13	NESW	13	57/82	Because of excessive grades (20%) and narrow road widths this access is not approvable by BLM standards at this time. A plan for the existing road to meet BLM standards or an alternate route will be reviewed if presented to BLM staff.
13-13	SWSW	13	57/82	Because of excessive grades (20%) and narrow road widths this access is not approvable by BLM standards at this time. A plan for the existing road to meet BLM standards or an alternate route will be reviewed if presented to BLM staff.
1-14	NENE	14	57/82	This route is not the BLM preferred route because it does not follow the general lay of the land and requires unnecessary disturbance. It will require a site specific description of the methods used to reduce soil erosion along the access road as well as a description of why the route was chosen rather than the preferred route. The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location.
3-14	NENW	14	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location. Culvert near the well location was changed to a wing ditch. 30 day stabilization required at this location due to poor reclamation potential.
7-14	SWNE	14	57/82	The working area will be staked 130 x 150 feet and a best fit

Well	Aliquot	Section	T/R	Notes
				mowing radius applied at this native pad location. Staging area near this site will be staked 150 x 150 feet.
11-14	NESW	14	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential.
15-14	SWSE	14	57/82	The working area will be staked 130 x 150 feet and a best fit mowing radius applied at this native pad location. 30 day stabilization required at this location due to poor reclamation potential. The pipeline route will have water bars run at a diagonal to prevent erosion of the pipeline trench.
1-23	NENE	23	57/82	This engineered pad was reduced in size to 120x150 feet for this location to facilitate working around a high pressure gas line and visibility issues brought up by the surface owner. This new will minimize cut/fill and reduce visual impact.
7-24	SWNE	24	57/82	The access road was rerouted to come in from David Kane property and made to follow an existing pipeline route. The access road will require one minor deviation from the pipeline route to facilitate some road grade issues.

Description of Mitigation Measures (applied as Conditions of Approval):
The operator is responsible for the COAs attached to this EA and will be issued an Incident of Non-Compliance if found to be in violation of any COA.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

2. 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.
3. 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 SDI sites and associated 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 geomorphological 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 construct power lines to minimize the potential for raptor collisions with the lines. Potential modifications include burying the lines, avoiding areas of high avian use (for example, wetlands, prairie dog towns, and grouse leks), and increasing the visibility of the individual conductors.

3. The Companies will locate aboveground power lines, where practical, at least 0.5 mile from any sage grouse breeding or nesting grounds to prevent raptor predation and sage grouse collision with the conductors. Power poles within 0.5 mile of any sage grouse breeding ground will be raptor-proofed to prevent raptors from perching on the poles.

4. The Companies will limit the construction of aboveground power lines near streams, water bodies, and wetlands to minimize the potential for waterfowl colliding with power lines.

5. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

2.3.2.6. Threatened, Endangered, or Sensitive Species

2.3.2.6.1. Bald Eagle

1. Site-specific project areas will be evaluated for suitable bald eagle nesting and roosting habitat prior to permit approval. Suitable nesting habitat is any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Suitable roosting habitat is defined as any mature stands of conifer or cottonwood trees.

2. Special habitats for raptors, including wintering bald eagles, will be identified and considered during the review of the APD/POD or Sundry Notices.

3. Surveys for active bald eagle nests and winter roost sites will be conducted within suitable habitat by a BLM approved biologist. Surface disturbing activities will not be permitted within one mile of suitable habitat prior to survey completion.

4. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle nest sites. A seasonal minimal disturbance buffer zone of one mile will be established for all bald eagle nest sites (February 15 – August 15).

5. A disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) will be established year-round for all bald eagle winter roost sites. A seasonal minimal disturbance buffer zone of 1 mile will be established for all bald eagle winter roost sites (November 1 – April 1). These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.

6. Within ½ mile of bald eagle winter roost sites additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 and 3:00 may be necessary to prevent disturbance (November 1 – April 1).

7. 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. Black-footed Ferret

1. If any black-footed ferrets are located, the USFWS will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.

2. Additional mitigation measure may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to black-footed ferrets or their habitat. In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.

2.3.2.6.3. Mountain Plover

1. A mountain plover nesting survey shall be conducted following U.S. Fish and Wildlife Service protocol within occupied black-tailed prairie dog colonies prior to permit authorization.

2. Outside of occupied black-tailed prairie dog colonies, a mountain plover nesting survey following U.S. Fish and Wildlife Service protocol is encouraged prior to construction initiation, as project modifications can be made if necessary to protect nesting plovers and natural gas production. If requested in writing, then authorization may be granted for construction activities to occur between August 1 and March 15, outside the mountain plover breeding season.

3. A mountain plover nesting survey following U.S. Fish and Wildlife Service protocol shall be conducted during the first available survey period (May 1 – June 15). Additional measures such as monitoring and activity restrictions may be applied if mountain plovers are documented.

4. A disturbance-free buffer zone of 0.25 mile will be established around all occupied mountain plover nesting habitat between March 15 and July 31.

5. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ½ mile of occupied mountain plover nesting habitat.

6. Work schedules and shift changes will be set to avoid the periods from 30 minutes before to 30 minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.

7. Creation of hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas will be avoided by burying power lines, using the lowest possible structures for fences and other structures and by incorporating perch-inhibiting devices into their design.

2.3.2.6.4. Ute Ladies'-tresses Orchid

1. Site-specific project areas will be evaluated for suitable Ute ladies'-tresses orchid habitat prior to permit approval. Suitable habitat is characterized by moist soils near springs, lakes, or perennial streams; most occurrences are in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows in the floodplains of perennial streams (USFWS 1995).

2. Suitable habitat will be avoided wherever possible.

3. If suitable habitat for Ute ladies'-tresses cannot be avoided, surveys will be conducted in compliance with USFWS standards (USFWS 1995) by a BLM approved biologist or botanist. Surveys can only be conducted between July 20 and August 31.

4. 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.

5. Companies operating in areas identified with weed infestations or suitable Ute ladies'- tresses orchid habitat will be required to submit an integrated pest management plan prior to APD approval. Mitigation will be determined on a site-specific basis and may include such measures as spraying herbicides prior to entering areas and washing vehicles before leaving infested areas. Infestation areas of noxious weeds have been identified through the county Weed and Pest Districts and are available at the Buffalo BLM office.

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. 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 Sales 14 POD is Covert Green, 18-0617 TPX (Pantone for Architecture).
2. Provide a minimum 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	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.

2. 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	3-10	NENW	10	57N	82W
WYW145646	5-10	SWNW	10	57N	82W
WYW145646	7-10	SWNE	10	57N	82W
WYW145646	9-10	NESE	10	57N	82W
WYW155746	11-10	NESW	10	57N	82W
WYW149996	13-11	SWSW	11	57N	82W
WYW143068	3-13	NENW	13	57N	82W
WYW145647	3-14	NENW	14	57N	82W
WYW145647	11-14	NESW	14	57N	82W
WYW145647	15-14	SWSE	14	57N	82W
WYW145648	1-23	NENE	23	57N	82W
WYW143068	5-24	SWNW	24	57N	82W

3. Non-constructed well pads will have grass and brush mowing not to exceed 35 foot radius around the well bore (or approx 4,000 sq. feet.) A best fit oval radius is permitted to allow grass and brush to be cleared under equipment to reduce fire hazard.
4. Non-constructed well pad disturbances (e.g. driving on sage brush) will be kept to a 130 x 150 or smaller to reduce impacts to sage brush.
5. Well 15-14 Cross country pipe line installed parallel to a steep side slope (20-24 % slope) will require the use of an appropriate sized trencher to minimize trench size and erosion matting to prevent water flow in the trench.
6. The operator agreed to set aside the rock encountered during construction. The rock will be stored in an appropriate manner that has low visual impact.
7. 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.
8. The operator will maintain all existing improved roads in the Sales 14 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.
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. When construction is complete, a post construction inspection form will be filled out by a licensed professional engineer and submitted to the BLM for review.

Wildlife

Raptors

The following conditions will alleviate impacts to raptors:

1. 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
T57N R82W	S12	Well 11-12, 12-12, 13-12 and associated infrastructure
	S13	3-13, 5-13 and associated infrastructure
	S14	1-14, 3-14, 7-14, 11-14, 15-14 and associated infrastructure
	S24	7-24 and associated infrastructure

   a. 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.

   b. Nest occupancy and productivity checks shall be completed for nests within a 0.5 mile of any surface disturbing activities (e.g., well drilling or pipeline installation) across the entire POD for as long as the POD is under construction. Once construction of the POD has ceased, nest occupancy and productivity checks shall continue for the first five years on all nests that are within a 0.5 mile of locations where any surface-disturbing activities took place. Productivity checks shall be completed only on those nests that were verified to be occupied during the initial occupancy check of that year. 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. In 2009, this applies to the nest(s) listed and is subject to change each year after that, pending surveys.

2. 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.

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

Sage Grouse

The following conditions will alleviate impacts to sage-grouse:

1. No surface disturbing activities are permitted for the locations listed below between March 1 and June 15. This condition will be implemented on an annual basis for the duration of surface disturbing activities. This timing limitation will affect the following:
   a. Sales Federal Wells 13-12, 3-13, 5-13, 1-14, 7-14

2. A sage-grouse lek survey will be conducted for all known leks within 2 miles of the POD by a biologist following the most current WGFD protocol. All survey results shall be submitted annually, in writing, to a Buffalo BLM biologist by 31 July. Currently, this applies to the PPL and Badger Creek leks, but will include any new leks discovered over the life of the project.

3. If an active lek is identified within 0.25 miles of any project-related activities, no surface disturbing activities will be allowed within 0.25 miles of the lek between 1 March and 15 June.

Water

1. All stock tanks receiving federal water will be fitted with float valve devices to prevent overflow, and shall be equipped with escape ramps to avoid trapping wildlife.
2. The operator shall develop a set of CBNG deep groundwater monitor wells. (See Appendix A)

Cultural

1. All surface disturbing activity in the following areas will be monitored by BLM cultural resource use permit (CRUP) holder or permitted crew chief. These areas were identified as having poor surface visibility by the BLM. The submission of two copies of a monitoring report to BFO is required within 30 days of the completion of all monitoring work. However, if the surface visibility changes (70% of the dirt surface is visible) prior to commencement of the project, contact the BLM Archaeologist 72 hrs before dirt-work begins. The BLM will complete the field verification at that time and monitoring may not be necessary.

2. All surface disturbing activity associated with the construction of the following wells and associated infrastructure, starting from the existing road:

Lease	Well #	Aliquot	Sec	T	R
WYW145646	3-10	NENW	10	57N	82W
WYW145646	7-10	SWNE	10	57N	82W
WYW149996	13-11	SWSW	11	57N	82W
WYW149996	15-11	SWSE	11	57N	82W
WYW145647	1-14	NENE	14	57N	82W

2.4. Summary of Alternatives

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

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	19	20	18
Well Locations			
Unconstructed		16	14
Constructed		4	4

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
Slot		0	0
Conventional Wells	0	0	0
Gather/Metering Facilities	2	0	0
Compressors	1	0	0
Ancillary (Staging/Storage Areas)	0	3	2
Template/Spot Upgrade Roads No Corridor With Corridor	0	2.5 1.74 0.76	2.5 1.74 0.76
Engineered Roads No Corridor With Corridor	17.47	1.75 0.54 1.21	1.75 0.54 1.21
Primitive Roads No Corridor With Corridor	0	0.28 .14 .14	0.28 .14 .14
Buried Utilities No Corridor With Corridor	0	5.0 0.4 4.6	5.0 0.4 4.6
Overhead Powerlines	8.8	0	0
Communication Sites	0	0	0
Monitor Wells	0	0	2
Land Application Disposal			
Subsurface Drip Irrigation	340	0	0
Treatment Facilities	1	0	0
Impoundments On-channel Off-channel Lined Unlined	 0 0 0 0	 0 0 0 0	 0 0 0 0
Water Discharge Points	1	0	0
Channel Disturbance Headcut Mitigation Channel Modification	0	0	0
TOTAL ACRES DISTURBANCE	**425.35**	**34.40**	**32.6**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on January 14, 2009. Field inspections of the proposed Sales 14 CBNG project were conducted on April 21, May 7, 2009 by:

NAME	TITLE	AGENCY
Chris Durham	Biologist	BLM
Harry Kessner	Surveyor	William H. Smith & Associates
Dan Conley	Construction Supervisor	DRG
Gregg Putman	Construction Supervisor	Marathon Oil Company
Eric Kessner	Surveyor	William H. Smith & Associates
Jeff Simmons	Ranch Manager	Dow Ranch
Jeb Beacham	Adv. Reg. Compliance Rep.	Marathon/Pennaco
Jim Enochs	Project Manager	Marathon Oil Company
J. Bunderson	Civil Engineer	BLM – Casper Office
Stacy Gunderson	Civil Engineer	BLM
Seth Lambert	Archeologist	BLM
Travis Kern	Natural Resource Specialist	BLM

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

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

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species	X			Chris Durham
Floodplains	X			Travis Kern
Wilderness Values			X	Travis Kern
ACECs			X	Travis Kern
Water Resources	X			Travis Kern
Air Quality		X		Travis Kern
Cultural or Historical Values			X	Seth Lambert
Prime or Unique Farmlands			X	Travis Kern
Wild & Scenic Rivers			X	Travis Kern
Wetland/Riparian	X			Travis Kern
Native American Religious Concerns			X	Seth Lambert
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 Sales 14 project is located within Sheridan County, Wyoming. The project is situated 14.5 miles northeast of Sheridan, in Sheridan County, Wyoming. The Sales 14 project encompasses 5.8 mi^2 or 3,712 acres.

Elevations within the project area range from approximately 3,680 to 4,415 feet above sea level.

Topography throughout the area varies from relatively level along the Little Badger Creek floodplain to rough broken terrain featuring several rugged draws, ridges, and cliffs throughout the remainder of the Sales 14 POD. 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 Sales 14 POD. These roads were constructed or improved to accommodate the existing fee and state CBNG production and development.

The Sales 14 project covers parts of Badger Creek and Little Badger Creek (ephemeral tributaries of the Tongue River). Badger Creek and Little Badger Creek both travel parallel to the POD on the northeast (Sections 7 and 12) and southwest (Sections 9, 10, 14, 15, 23, and 24), respectively, both emptying into the Tongue River approximately 5.0 miles northwest of the POD. No infrastructure development is proposed in Little Badger Creek, although 7 federal and 4 fee wells are proposed or drilled along the divide between Little Badger and Badger creeks.

Current Land uses within the project area include livestock grazing, elk (*Cervus elaphus*) ranching, crop and hay production, and more recently, Pennaco's Sales 14 "A" fee and state CBNG development.

3.2. Vegetation & Soils

Vegetation

The project are is comprised of approximately 42 % sagebrush-grasslands, 35% grasslands, 18% woodlands(primarily junipers), 2% bare rock or soil, 3% other (bare rock or soil, water, roads, residences). Grasslands were most prevalent along the Little Badger Creek flood plain, along the steep slopes in the west, while sagebrush-grasslands more commonly existed on the hillsides of rugged terrain in the east and along the ridge tops in the west. Within the Sales 14 POD, deciduous trees such as boxelder trees (*Acer negundo*) and green ash (*Fraxinus* pennsylvanica) occurred along Little Badger Creek, and throughout the minor drainages.

Common Grasses within the project area include: wheatgrasses (*Agropyron* and *Pascopyron* spp.), crested wheatgrass (*Agropyron cristatum)*, needle-and-thread (*Hesperostipa comate*), junegrass (*Koeleria macrantha)*, field brome (*Brojus arvensis,)* bluegrass (*Poa spp.)*, cheatgrass (*Bromus tectorum*), blue grama (*Bouteloua gracilis)* and prairie chord-grass (*Spartina pectinata*). Grasses were moderately tall (3 to 16 inches, averaging 10 inches) and moderately dense on ridge tops throughout most 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) Moderately dense stands of sagebrush were present thought the southeastern region of the project area while sparse stands were situated along the more rugged, exposed hillsides within the Sales 14 project area. Wyoming big sagebrush was generally absent from the bottom lands.

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). Very dense stands exist along the ridges and draws of Section 10, T57N:R82W.

Soils

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. Reclamation potential of soils also varies throughout the project area. The main soil limitations in the project area include: depth to bedrock, low organic matter content, and high erosion potential especially in areas of steep slopes. Many of the soils and landforms of this area present distinct challenges for development. Approximately 56 percent of the area within the boundary of the proposed action contains soil mapping units identified as being highly erosive, 41% of the area has slopes greater than 25% and 70% of the POD area is comprised of soils having poor reclamation suitability, making reclamation challenging if not impossible. The proponent planned their project and the BLM made further recommendations on the onsite to avoid those areas where possible. 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 *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 3.0% or greater in extent within the pod boundary are displayed. Dominate soil map units are listed in the table below with their individual acreage and percentage of the area within the POD boundary.

Table 3.2 Dominate soils affected by the proposed action include:

Map Unit	Map Unit Name	Acres	%
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	2027.0	56
305	WORFKA-SHINGLE-SAMDAY COMPLEX, MOIST, 6 TO 30 PERCENT SLOPES	856.3	24
208	PARMLEED-WORFKA ASSOCIATION, MOIST, 0 TO 9 PERCENT SLOPES	221.5	6
209	PARMLEED-WORFKA ASSOCIATION, MOIST, 9 TO 25 PERCENT SLOPES	172.6	5
169	JONPOL-PLATMAK ASSOCIATION, 0 TO 9 PERCENT SLOPES	129.9	4
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	93.6	3

For more detailed soil information, see the NRCS Soil Survey 633 – Sheridan County.

Additional site specific soil information is included in the Ecological Site interpretations.

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.

Table 3.3 Map Units and Ecological Sites

Map Unit	Ecological Site
261	SHALLOW LOAMY (15-19 NP)
305	SHALLOW LOAMY (15-19 NP)
208	LOAMY (15-19 NP)
209	LOAMY (15-19 NP)
169	LOAMY (15-19 NP)
269	LOAMY (15-19 NP)

Dominate Ecological Sites and Plant Communities identified in this POD and its infrastructure are predominately Shallow Loamy and Loamy sites.

The soils vary throughout the project area. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 3 inches on ridges to 12 inches in bottomland. Erosion potential varies from to depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area.

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

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Loss of soil vegetation cover, biologic crusts, organic matter and productivity. 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 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.
- Modification of hill slope hydrology.
- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are predominantly composed of cyanobacteria, green and brown algae, mosses and lichens. They are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

There are road sections that, due to the lack of reclamation potential, the BLM would have relocated to more desirable locations, or would have dropped. However, the landowner insisted that the routes be permitted as proposed. Some of the proposed roads would follow existing primitive roadways used for ranch access. These primitive roads are in disrepair and eroding, and will require substantial upgrading to accommodate CBNG development. The recommendation of the BLM Natural Resource Specialist is that additional disturbance along these routes would be difficult to reclaim, meeting the requirements of the Wyoming State Reclamation Policy, and stabilization measures of the WYDEQ SWWPPP requirements.
The amount of disturbance created by road construction depends upon its design standard, steepness of slope, and total length of road. These sections of roads cross steep topography of varying degrees of stability, and will be a major source of erosion. On steep topography, roads undercut upslope soils and may alter the natural drainage from the hillside. By exposing formerly buried material to weathering, roads may also change slope strength. Road fills place additional weight on the underlying soil mass and are frequently over-steepened and are prone to failure. On unstable geological formations, roads can trigger mass movements even on less steep topography. Consequently, roads are frequently associated with landslides.

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

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

The operator will follow the guidance provided in the Wyoming Policy on Reclamation (IM WY-90-231). BLM reclamation goals emphasize 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 using interim reclamation measures to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. The seed mix for the Big Corral Jewell Draw POD are determined based on soil map unit types, the dominant ecological sites found within the project area, and the mixing of soil horizons in disturbed areas. A shallow loamy and loamy seed mix was recommended for the entire POD (see site specific COAs). In addition, the operator will adhere to COAs which limit the surface disturbance to that which was approved for construction and improvements.

3.2.1. Wetlands/Riparian

The area within the project boundary contains limited wetland areas.

The existing Subsurface Drip Irrigation (SDI) areas lie primarily outside the POD boundary and are generally on the first and second terraces above Badger Creek's floodplain. Badger Creek itself has a very large watershed which, under natural conditions, would be ephemeral to intermittent.

Badger Creek's floodplain is broad and flat with a well incised primary channel winding its way through the bottom. 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.

Cottonwood trees occur as scattered individuals within the project area. Groups of trees become more evident as Badger Creek gets closer to the Tongue River. True "Gallery forests of mature cottonwood trees…" do not occur until one reaches the Tongue River's 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. Additionally, the operator or BLM confirmed the following WRIC identified infestations and/or documented additional weed species during subsequent field investigations:

- leafy spurge
- Canada thistle

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

3.3. Wildlife

A habitat assessment and wildlife inventory surveys for the Sales 14 Plan of Development were performed by ICF/Jones and Stokes (ICF) in 2008 and 2009 (ICF 2008, 2009). ICF performed surveys for bald eagle roosts and nests, other raptor nests, greater sage-grouse, sharp-tailed grouse, black-tailed prairie dog colonies, and breeding mountain plovers. All surveys were conducted according to the Powder River Basin Interagency Working Group's protocols (available on the BFO internet web site at http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html).

A BLM biologist conducted field visits on August 19, 2008, and April 21, 2009. During that time, the biologist verified the wildlife survey information, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

3.3.1. Big Game

Big game species expected to occur within the Sales 14 project area include pronghorn and mule deer. WGFD data indicate that the project area contains yearlong range for pronghorn and winter-yearlong range for mule deer. 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 and mule deer within their respective hunt areas are above WGFD objectives. The most current big game range maps are available from WGFD.

The affected environment for pronghorn is discussed in the PRB FEIS on pp. 3-117 to 3-122 and for mule deer on pp. 3-127 to 3-132.

3.3.2. Aquatics

The project area is drained by ephemeral tributaries of Badger Creek, which is a tributary of the Tongue River subbasin that make up the Powder River Basin.

Aquatic invertebrate communities, which can be indicators of the quality of aquatic environments (Peterson 1990), are discussed in the PRB FEIS (pp. 3-153 to 3-154). Perennial streams within

northeastern Wyoming were sampled by USGS between 1980 and 1981, and generally supported invertebrate communities that included taxa adapted to flowing water. Ephemeral stream communities generally were composed of taxa adapted to standing water (Peterson 1990).
Table 3.5 lists the fish that occur in the Upper Powder River subbasin and their WGFD Native Species Status (NSS) designation, if applicable. WGFD has identified Species of Greatest Conservation Need (SGCN) within the state, all of which are given NSS designations. Seven of the species that may occur in the Upper Powder River subbasin are designated as either NSS 1, 2, or 3 species. Species in these designations are considered to be species of concern, in need of more immediate management attention, and more likely to be petitioned for listing under the Endangered Species Act (ESA). For these species, WGFD recommends that no loss of habitat function occur. WGFD allows for some modification of the habitat, provided that habitat function is maintained (i.e., the location, essential features, and species supported are unchanged). NSS 4-7 refers to populations that are widely distributed throughout their native range and are stable or expanding. Habitats are also stable. There is no special concern for these species.

The Powder River Basin ecosystem and fishery is discussed in further detail in the PRB FEIS (pp. 3-155 to 3-166). The sturgeon chub is considered a Wyoming BLM sensitive species, according to Wyoming BLM Sensitive Species Policy, and will be discussed in more detail later in this document.

Table 3.4 Fish that occur in the Upper Powder River Subbasin

Wyoming Native Species Status	Species	Wyoming BLM Sensitive
NSS1	Sturgeon chub	Yes
NSS2	Goldeye	
	Sauger	
NSS3	Black bullhead	
	Flathead chub	
	Mountain sucker	
	Plains minnow	
NSS4	Channel catfish	
	Northern redhorse	
	Quillback	
	River carpsucker	
	Stonecat	
NSS6	Fathead minnow	
	Plains killifish	
NSS7	Longnose dace	
	Sand shiner	
	White sucker	
None	Common carp	
	Rock bass	
	Shovelnose sturgeon	

Amphibian and reptile species (herpetiles) occur throughout the Basin. WGFD conducted a baseline inventory of herpetiles along the Powder River and its major tributaries from 2004-2006 (Turner 2007). WYNDD has completed the first year of a three-year herpetological study in the Power River Basin in order to detect impacts from CBNG development (Griscom et al. 2009). Herpetiles expected to occur in the Powder River Basin, according to these studies, are listed in Table 3.6 (Turner 2007, Griscom et al. 2009). Eight of the species listed are classified by WGFD as SGCNs, all with a rating of NSS4, indicating that they are widely distributed throughout their native ranges, and populations are stable. Of the species listed in Table 3.6, WYNDD reported that, for 2008 surveys, boreal chorus frogs were the most abundant

amphibian in the PRB and were located in a variety of habitats. The second most abundant amphibian was Woodhouse's toad, which occurred along rivers, temporary ponds, and in CBNG reservoirs. Plains spadefoot and Great Basin toads were the least common species, occurring primarily in temporary ponds fed by rainstorms. Relatively few observations were made for reptile species. Bull snakes and sagebrush lizards were most commonly seen. Turtles were rarely observed, due to their almost exclusive occurrence in deep backwaters. Two of the herpetiles listed in Table 3.6, northern leopard frog and Columbia spotted frog, are Wyoming BLM sensitive species and will be discussed in detail later in this document.

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

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

3.3.3. Migratory Birds

Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year. According to Instruction Memorandum No. 2008-050, BLM must include migratory birds in every NEPA analysis of actions that have the potential to affect migratory bird species of concern in order to fulfill its obligations under the Migratory Bird Treaty Act.

The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified three groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest. Vegetation types that occur in the project area include shortgrass prairie and shrub-steppe. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds have declined more consistently in the last 30 years than any other ecological association of birds (WY 2009). Species that may occur in these vegetation types, according to the Wyoming Bird Conservation Plan, are listed in Table XXX and are grouped by Level as identified in the Plan.

Table 3.7 Wyoming Bird Conservation Plan Species within Project Area

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
	Ferruginous hawk	Yes
	Greater sage-grouse	Yes
	Long-billed curlew	Yes
	McCown's longspur	
	Mountain plover	Yes
	Sage sparrow	Yes
	Short-eared owl	
	Upland sandpiper	
	Western burrowing owl	Yes
Level II	Black-chinned hummingbird	
	Bobolink	
	Chestnut-collared longspur	
	Dickcissel	
	Grasshopper sparrow	
	Lark bunting	
	Lark sparrow	
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	
Level III	Common poorwill	
	Say's phoebe	

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153). This discussion includes a list of habitat requirements and foraging patterns for the species listed above, with the exception of upland sandpipers, common poorwills, and Say's phoebes, which are discussed here. Upland sandpipers prefer Great Plains grasslands, dryland grass pastures, hayfields, and alfalfa fields. They nest in grass-lined depressions in the ground and feed on insects and seeds on the ground where grasses are low and open. Common poorwills inhabit sparse, rocky sagebrush; open prairies; mountain-foothills shrublands; juniper woodlands; brushy, rocky canyons; and ponderosa pine woodlands. They prefer clearings, such as grassy meadows, riparian zones, and forest edges for foraging. They lay eggs directly on gravelly ground, flat rock, or litter of woodland floor. Nests are often placed near logs, rocks, shrubs, or grass for some shade. They feed exclusively on insects, catching them by leaping from the ground or a perch, or picking them up from the ground. Say's phoebes inhabit arid, open country with sparse vegetation, including shrub-steppe, grasslands, shrublands, and juniper woodlands. They nest on a variety of substrates such as cliff ledges, banks, bridges, eaves, and road culverts and often reuse nests in successive years. They eat mostly insects and berries.

3.3.4. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Four raptor species are known to have used nests within 0.5 miles of the project area: golden eagles, red-tailed hawks, great-horned owls, and western burrowing owls. Western burrowing owl, which is a Wyoming BLM sensitive species, will be discussed in more detail later in this document.

The affected environment for golden eagles is discussed in the PRB FEIS on pp. 3-145 to 3-146. Golden eagles are listed as a Bird of Conservation Concern (BCC) by USFWS for Region 17, which encompasses the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need

for additional ESA bird listings by implementing proactive management and conservation actions. Golden eagles were also identified as a Level III species in the Wyoming Bird Conservation Plan. Golden eagles are sensitive to extensive human activity around nest sites and are threatened by loss of nesting habitat to industrial development, powerline executions, and other factors (Nicholoff 2003). The WGFD Wyoming Bird Conservation Plan habitat objectives for golden eagles include maintaining open country to provide habitat for small mammals as a food source. Recommendations for management include restricting human activities near nests during peak breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories.

The affected environment for red-tailed hawks and great-horned owls are discussed in the PRB FEIS (pp. 3-146 to 3-148).
Twenty-two raptor nest sites have been identified by ICF during the 2007, 2008 and 2009 survey seasons, with one nest found to be destroyed in 2009 (ICF 2008a, 2008b, 2009) and BLM within 0.5 mile of the project boundary. These are listed in the table below. With the exception of the western burrowing owl nest, raptor nests are located in live cottonwood, box elder, juniper and green ash.

Table 3.8 Documented Raptor Nests within the Sales 14 Project Area

BLM ID	UTMs	Legal	Sub-strate[1]	Year	Condition	Status[2]	Species[3]
188	367183E 4970445N	S36 T57N R82W	CTL	2009	Unknown	UNK	n/a
189	367199E 4970503N	S36 T57N R82W	CTL	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
3555	362401E 4976215N	S9 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2005	Good	ACTI	RETA
				2004	Gone	INAC	n/a
5390	366553E 4977495N	S12 T57N R82W	CTL	2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Good	ACTI	RETA
				2006	Good	ACTI	RETA
				2005	Unknown	INAC	n/a
5391	365867E 4977218N	S12 T57N R82W	ACB	2009	Gone	INAC	n/a
				2008	Gone	INAC	n/a
				2007	Unknown	INAC	n/a
				2006	Unknown	ACTI	BUOW
				2006	Unknown	OCCU	BUOW
5392[4]	365702E 4976042N	S11 T57N R82W	BOX	2009	Remnants	INAC	n/a
				2007	Fair	ACTI	GRHO
				2006	Good	ACTI	GRHO
				2005	Unknown	UNK	n/a
5393[4]	365702E 4976042N	S11 T57N R82W	BOX	2008	Poor	INAC	n/a
				2007	Poor	INAC	n/a
				2005	Unknown	INAC	n/a
5394	365707E 4976038N	S11 T57N R82W	BOX	2009	Poor	INAC	n/a
				2008	Good	INAC	n/a
				2007	Good	ACTI	RETA

BLM ID	UTMs	Legal	Sub-strate[1]	Year	Condition	Status [2]	Species [3]
				2005	Good	ACTI	RETA
5899	365391E 4977170N	S11 T57N R82W	JUN	2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Fair	ACTI	GRHO
				2006	Unknown	ACTI	GRHO
5900	362662E 4975917N	S10 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5901	365613E 4975710N	S14 T57N R82W	BOX	2009	Good	INAC	n/a
				2008	Good	INAC	n/a
5903	364545E 4974117N	S23 T57N R82W	BOX	2009	Good	INAC	n/a
				2008	Good	ACTI	GOEA
5904	365085E 4973379N	S23 T57N R82W	BOX	2009	Good	INAC	n/a
				2008	Good	ACTF	UNRA
5905	367166E 4973488N	S24 T57N R82W	GRE	2009	Poor	INAC	n/a
				2008	Good	ACTI	RETA
5906	365112E 4973043N	S23 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5907	365360E 4972840N	S23 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5908	365915E 4972004N	S25 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5909	367833E 4970602N	S31 T57N R81W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5910	367165E 4970556N	S36 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Unknown	UNK	n/a
5911	365600E 4975900N	S11 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Good	ACTI	RETA
5912	365164E 4975329N	S14 T57N R82W	BOX	2009	Unknown	UNK	n/a
				2008	Fair	INAC	n/a
5913	364750E 4973750N	S23 T57N R82W	BOX	2009	Poor	INAC	n/a
				2008	Good	ACTI	RETA

Notes:

1 ACB = Active burrow; BOX = Boxelder tree; CTL = Cottonwood tree (live); GRE = Green ash; JUN = Juniper tree

2 ACTI = Active; INAC = Inactive; OCCU = Occupied; UNK = Unknown

3 BUOW = Burrowing owl; GOEA = Golden eagle; GRHO = Great-horned owl; RETA = Red-tailed hawk; UNRA = Unknown raptor

4 Nests 5392 and 5393 have the same UTMs, as reported by Jones & Stokes. In the 2009 report for Sales 14, Jones & Stokes reported that 5393 is a duplicate of 5292, but in the 2007 report for the Dow 2 POD, Jones & Stokes reported different activity for these nests. Because of this ambiguity, both nests are being maintained in the BLM database.

Of the nests documented in or adjacent to the project area, one red tailed hawk nest was active in 2009, though nest productivity could not be recorded.

3.3.5. Plains Sharp-tailed Grouse

Plains sharp-tailed grouse are discussed in this document because specific concerns for this species were identified during the scoping process for the PRB FEIS. The affected environment for plains sharp-tailed grouse is discussed in the PRB FEIS on pp. 3-148 to 3-150.

Habitats within the Sales 14 project area have potential to support sharp-tailed grouse. The mosaic of grasslands and sagebrush-grasslands that occurs in the area may provide nesting and brood-rearing habitat, wooded draws, seasonally wet meadows, and appropriate shrubs may provide for other seasonal requirements of plains sharp-tailed grouse. The nearest known plains sharp-tailed grouse lek is approximately 0.8 miles to the northeast of the project area. No plains sharp-tailed grouse were noted in the project area by ICF or by the BLM biologist.

3.3.6. Sagebrush Obligates

Sagebrush communities occur in various densities and elevations throughout the project area. Sagebrush ecosystems support a variety of species, including migratory birds, raptors, big game, reptiles, and small mammals. Several Wyoming BLM sensitive species are associated with sagebrush ecosystems. These include ferruginous hawk, loggerhead shrike, Townsend's big-eared bat, and western burrowing owl.

Sagebrush obligates are species that require sagebrush for some part of their life cycle and cannot survive without it. Sagebrush obligate species within the Powder River Basin that are listed as sensitive species by Wyoming BLM include Brewer's sparrow, sage thrasher, sage sparrow, and greater sage-grouse. All of these bird species require sagebrush for nesting, with nests typically located within or under the sagebrush canopy.

The most extensive sagebrush communities in the Sales 14 project area occurs in section 12, 13 & 14 T57N:R82W. are fragmented by existing infrastructure for developed fee minerals. Infrastructure includes well locations, overhead power, one large compressor, and access roads. The landowner has historically burned or treated large patches of sagebrush in support of an active cattle ranching operation.

3.3.7. Threatened and Endangered Species

Within the BLM BFO there are two species listed as Threatened or Endangered under the Endangered Species Act: the black-footed ferret and the Ute ladies'-tresses orchid.

3.3.7.1. Black-footed ferret

The black-footed ferret is listed as Endangered under the ESA. The affected environment for black-footed ferrets is discussed in the PRB FEIS on pg. 3-175.

A black-footed ferret population requires at least 1,000 acres of prairie dog colonies, separated by no more than 1.5 km, for survival (USFWS 1989). Black-tailed prairie dog colonies exist within 0.25 miles of the project boundary in S11, S12 & S1; T57N, R82W. These colonies have been mapped by several different consultants and WGFD over a range of years. Most recently, ICF reported three active colonies in 2009 within 0.25 miles of the project boundary. The individual mapped colonies range in size from 1.6 acres to 9.3 acres. Because no black-tailed prairie dog colonies meet the criteria described above, black-footed ferret habitat is not present within or adjacent to the Sales 14 project area.

In 2004, WGFD identified seven prairie dog complexes, located partially or wholly within the BFO administrative area, as potential black-footed ferret reintroduction sites (Grenier et al. 2004). The Sales 14 project area is located approximately 9 miles northeast of the Sheridan complex, the nearest potential reintroduction area.

3.3.7.2. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is listed as Threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS on pg. 3-175.

The PRB FEIS reported that only four orchid populations had been documented within Wyoming, but since the writing of that document, 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 Wind Creek and 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.

Surveys for Ute -ladies' tresses were conducted by ICF on September 17, 2008. These surveys targeted areas along Badger Creek in S1&2; T57N:R82W. No Ute ladies' -tresses orchids were documented within the survey area.

3.3.8. Sensitive Species

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

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

This section lists those species on the Wyoming BLM sensitive species list that, according to the PRB FEIS, may occur in the Powder River Basin Oil and Gas Project Area, which includes the Sales 14 POD project area. The following discussion for each of those sensitive species includes an analysis of whether the species is likely to occur in or be affected by the proposed Sales 14 POD. According to the PRB FEIS, spotted bats were not likely to be affected by the Powder River Basin Oil and Gas Project, and are therefore not discussed in this section. The authority for the sensitive species 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.

3.3.8.1. Northern Leopard Frog

The affected environment for northern leopard frog is discussed in the PRB FEIS on pg. 3-181. This is a WGFD Species of Greatest Conservation Need (SGCN), with a rating of NSS4, indicating that the species is common (widely distributed throughout its native range and populations are stable) and habitat is stable.

Northern leopard frog habitat is present along stretches of Badger Creek near and adjacent to the project area. No components of the Sales 14 POD will impact leopard frog habitat.

3.3.8.2. Columbia Spotted Frog

The affected environment for the Columbia spotted frog is discussed in the PRB FEIS on pg. 3-193. This is a WGFD SGCN, with a rating of NSS4, indicating that the species is common (widely distributed throughout its native range and populations are stable) and habitat is stable.

Within the BFO administrative area, the Columbia spotted frog is confined to the headwaters of the South Tongue River drainage. The project area is not located within this drainage and is thus outside the species' range. Columbia spotted frogs are not expected to occur in the project area.

3.3.8.3. Sturgeon Chub

The sturgeon chub was petitioned for listing under the ESA in 2000, but, in 2001, it was determined that the listing was not warranted, due to the population being more abundant and better distributed throughout its range than previously believed. According to Wyoming BLM Sensitive Species policy, because this species has been petitioned for listing, it remains on the sensitive species list. The affected environment for this species is discussed in the PRB FEIS on pg. 3-165. Sturgeon chub is listed by WGFD as a SGCN with a rating of NSS1, indicating that the species is rare (populations are physically isolated and/or it occurs in extremely low densities throughout its historic range and that extirpation appears possible), and habitat is declining or vulnerable.

Discharge from the proposed project will not flow into the Powder River, where this species is known to occur.

3.3.8.4. Yellowstone Cutthroat Trout

The affected environment for Yellowstone cutthroat trout is discussed in the PRB FEIS on pg. 3-192. Within the BFO administrative area, this species may occur in the Upper Tongue sub-watershed. The project area is located outside of this watershed and is thus outside the species' range. Yellowstone cutthroat trout is not expected to occur in the project area.

3.3.8.5. Baird's Sparrow

The affected environment for Baird's sparrow is discussed in the PRB FEIS on pg. 3-188. In addition to being listed as a Wyoming BLM sensitive species, Baird's sparrows are listed by USFWS as a BCC for Region 17. Suitable habitat may be present in the project area in the shortgrass prairie that occurs in southeastern portion of the Sales 14 POD.

3.3.8.6. Bald Eagle

The affected environment for bald eagles is described in the PRB FEIS on pg. 3-175. At the time the PRB FEIS was written, the bald eagle was listed as a threatened species under the ESA. Due to successful recovery efforts, it was removed from the ESA on 8 August 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In order to avoid violation of these laws and uphold the BLM's commitment to avoid any future listing of this species, BLM shall continue to comply with conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (PRB Oil & Gas Project BO), #WY07F0075) (USFWS 2007).

In addition to being listed as a Wyoming BLM sensitive species, bald eagles are a WGFD SGCN with a NSS2 rating, due to populations being restricted in numbers and distribution, ongoing significant loss of habitat, and sensitivity to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region17.

Bald eagle nesting and roosting habitat may be present within one mile of the Sales 14 POD, though the existing woodlands in and adjacent to the project area are dominated by juniper. Large galleries of mature cottonwoods are not present, though small cottonwood stands are found along Badger Creek, Little Badger Creek and in SESE S11, T57N, R82W. Prairie dog colonies (described in Section 3.3.7.1) in and adjacent to the project area are small and impacted by subsurface drip irrigation systems, reducing potential forage for bald eagles.

Between 2005 and 2009, one bald eagle was observed within one mile the project area, in SESE S32, T58N:R82W. This observation was recorded by ICF on December 11, 2006 (ICF 2008).

3.3.8.7. Brewer's Sparrow

The affected environment for Brewer's sparrow is discussed in the PRB FEIS on pg. 3-200. In addition to being listed as a BLM Wyoming sensitive species, Brewer's sparrows are a WGFD SGCN, with a rating of NSS4 because populations are declining, habitat is vulnerable with no ongoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

Brewer's sparrow habitat is present throughout the project area, and this species is suspected to occur.

3.3.8.8. Ferruginous Hawk

The affected environment for ferruginous hawk is discussed in the PRB FEIS on pg. 3-183. In addition to being listed as a Wyoming BLM sensitive species, ferruginous hawks are a WGFD SGCN, with a rating of NSS3 because the species is widely distributed, population status and trends are unknown but are suspected to be stable, they are experiencing ongoing loss of habitat, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17. Though ferruginous hawk nests are located throughout the Powder River Basin, no nests are recorded in or adjacent to the project area. Foraging habitat and prey is available throughout the project area, and ferruginous hawks may occur.

3.3.8.9. Greater Sage-Grouse

The affected environment for greater sage-grouse (herein referred to as sage-grouse) is discussed in the PRB FEIS (pg. 3-194 to 3-199). In addition to being listed as a Wyoming BLM sensitive species, sage-grouse are listed as a WGFD SGCN, with a rating of NSS2, because populations are declining, and they are experiencing ongoing significant loss of habitat. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

In recent years, several petitions have been submitted to USFWS to list sage-grouse as threatened or endangered under the ESA. On January 12th, 2005, 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 USFWS's decision-making process was flawed and ordered USFWS to conduct a new Status Review (Winmill Decision Case No. CV-06-277-E-BLW, December 2007).

The BFO has taken several steps to consider the evolving information on impacts to sage-grouse which could result from development activities on federal lands. These steps include:

- February 2008: BFO consolidated research and data to identify high-quality sage-grouse habitat in the Powder River Basin. University of Montana developed models indicating quality of habitat using topographic and vegetative criteria and habitat selection by radio-collared birds to identify areas with high potential for use by nesting/wintering birds. The models are divided into habitat categories of 1 through 5. Categories 1 & 2 are not considered suitable habitat. Category 3 may have the vegetative components necessary for suitable habitat. Categories 4 & 5 have the vegetative components for suitable habitat, and meet criteria for topography, slope and other landscape level characteristics that were indicated through analysis of radio-collared sage-grouse. The 4 and 5 categories of habitats are considered "high-quality".
- March 2008: BFO, Wyoming State Office (WYSO) and Washington Office (WO) established the need for a Resource Management Plan (RMP) approach to evaluate impacts to sage-grouse and habitat. A RMP amendment or revision was discussed. The decision to begin a RMP revision was approved two years ahead of the originally scheduled date.

- May 28, 2008: BFO conducted a public meeting to present habitat information developed through research in the Powder River Basin. BFO solicited additional information from the public and energy development companies to refine sage-grouse habitat maps. The objective was to establish areas of interim management for sage-grouse to preserve decision space during the RMP process.

- August 13, 2008: BFO released its *Guidance for general management actions during BFO Resource Management Plan Revision* and a map identifying the Focus Areas. The guidance contained criteria for any proposed development in Focus Areas (Appendix A). For fluid mineral development inside Focus Areas, this guidance includes the following requirement; "The proponent will be asked to demonstrate that the proposal can be managed in a manner that effectively conserves sage-grouse habitats affected by the proposal." The guidance also states that "Efforts will be made to assure that the impacts of surface disturbing projects will be consistent with a well pad density of 640 acres."

  Efforts to minimize impacts to high-quality sage-grouse habitats outside the Focus Areas will be far less restrictive, with well densities up to 80-acre spacing, but may include site-specific mitigating measures suggested by the best available science.

- August 1, 2008: Concurrent with BFO efforts, the Governor of the State of Wyoming issued an Executive Order (EO 2008-2) mandating special management for all lands within sage-grouse Core Population Areas. Lands for special management were identified by the Wyoming Governor's Sage-Grouse Implementation Team, and generally followed the boundaries of the majority of the Focus Areas identified by the BFO. This team also recommended stipulations to be placed on development activities on state lands to ensure existing habitat function is maintained within those areas. EO 2008-2 also identifies objectives outside of Core Areas, including that "…development scenarios should be designed and managed to maintain populations, habitats and essential migration routes outside core population areas."

- August 13, 2008 to the Present: BFO crafted an updated impacts assessment to be included in all project analyses affecting sage-grouse habitat. This analysis included research conducted in the Powder River Basin and other sage-grouse research published since the 2003 PRB FEIS and ROD. The analysis explicitly tied impacts to the impacts accepted under the 2003 ROD.

- October 1, 2008: BFO officially began the RMP revision. This process was accelerated by two years to more rapidly assess impacts to sage-grouse.

- April 14, 2009: BFO/WYSO entered into an agreement with the University of Montana and the Miles City Field Office to conduct a population viability analysis in the Powder River Basin. The emphasis will be on the adequacy of BFO Focus Areas for maintenance of a persistent sage-grouse population. Information gathered will be used in developing alternatives for the RMP revision.

- May, 2009: The WGFD released an updated version of its *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats*, which further described management objectives for sage-grouse outside Core Areas: "Non-core areas should not be construed as "sacrifice areas" since this conservation strategy requires habitat connectivity and movement between populations in core areas. The goal in non-core areas is to maintain habitat conditions that will sustain at least a 50% probability of lek persistence over the long term."

In conformance with Appendix E of the PRB FEIS BLM BFO has initiated actions within the PRB FEIS analysis area in response to additional information regarding impacts to sage-grouse. These measures include:

- Early initiation of a RMP revision, based on the evaluation of monitoring data generated under the mitigation monitoring and reporting plan (MMRP) in the PRB FEIS Record of Decision.

- Establishment of sage-grouse Focus Areas, encompassing approximately 1 million acres of sage-grouse habitat. These areas are managed under strict guidelines designed to preserve sage-grouse habitat for development of alternatives during the RMP process (Appendix A).

- Initiation of a population viability analysis in the Powder River Basin. This is a 24-month project involving the USGS, BLM Miles City Field Office, BLM BFO, and the University of Montana.

- Development of alternatives that modify the proposed action to reflect the best available science in sage-grouse management.

- Development of conditions of approval, specific to sage-grouse management, that incorporate some recommendations from recent research, the NE Local Sage-grouse Working Group, and the Petroleum Association of Wyoming.

The 2003 PRB EIS significance threshold and population viability assumptions are based on the analysis that sufficient functioning habitat for sage grouse will remain to support population viability within the project area. The six areas identified as BFO sage-grouse Focus Areas assume that a sufficient amount of sage-grouse habitat remains unfragmented by energy or other man-made infrastructure. It is also assumed that the fragmented portions in the energy areas of sage-grouse habitat provide for the necessary breeding, feeding, and sheltering components to sustain sage-grouse habitat connectivity between the six Focus Areas.

Suitable sage-grouse habitat is present in the Sales 14 project area. Continuous stands of sparsely to moderately dense sagebrush are present in patches throughout. Sections 12, 13 & 14 T57N R82W contains the largest and most contiguous stands of sagebrush on moderate topography. Stands of sagebrush located near moist draws throughout the project area provide brood rearing and late summer habitat. Sage-grouse habitat models indicate that approximately 27% of the project area contains high quality sage-grouse nesting habitat (Doherty 2008) and approximately 7% of the project area contains high quality sage-grouse wintering habitat (Doherty et al. 2007).

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

Table 3.9 Sage-grouse leks within 4 miles of the Sales 14 project area

Lek Name	Legal Location	Distance from Project Area (mi)	Occupied?
PPL	SWSW 30, 58:82	2.8	Y
Badger Creek	SWNE 16, 57:81	2.4	Y

3.3.8.10. Loggerhead Shrike

The affected environment for loggerhead shrike is discussed in the PRB FEIS on pg. 3-187. In addition to being listed as a Wyoming BLM sensitive species, loggerhead shrikes are listed by USFWS as a BCC for Region 17. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating they are in need of monitoring. Loggerhead shrike habitat is present throughout the project area, and the species is suspected to occur.

3.3.8.11. Long-billed Curlew

The affected environment for long-billed curlew is discussed in the PRB FEIS on pg. 3-184. In addition to being listed as a Wyoming BLM sensitive species, long-billed curlews are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, and habitat is vulnerable but not undergoing significant loss. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

Long-billed curlew habitat is present throughout the project area, and the species may occur.

3.3.8.12. Mountain Plover

The affected environment for mountain plover is discussed in the PRB FEIS on pg. 3-177 to 3-178. At the time the PRB FEIS was written, the mountain plover was proposed for listing as a threatened species under the ESA. In 2003, USFWS withdrew the proposal, finding that the population was larger than had been thought and was no longer declining. In addition to being listed as a Wyoming BLM sensitive species, mountain plovers are a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected to be stable, habitat is vulnerable without ongoing significant loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

Suitable mountain plover habitat, in the form of prairie dog colonies, is present within 0.25 miles of the project area. Though the prairie dog colonies in S1, 11, & 12 T57N R82W are located on flat terrain with no surrounding trees, vegetation height may exceed four-inches during the growing season, and the prairie dog colonies have been impacted by the installation of subsurface drip irrigation systems. Mountain plover were not observed during surveys in 2009 (ICF 2009).

3.3.8.13. Northern Goshawk

The affected environment for northern goshawk is discussed in the PRB FEIS on pg. 3-193 to 3-194. In addition to being listed as a Wyoming BLM sensitive species, northern goshawks are a WGFD SGCN, with a rating of NSS4, because the species is widely distributed, population status and trends are unknown but are suspected to be stable, habitat is vulnerable but not undergoing any significant loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action.

No forest habitat is located within or adjacent to the project area. Suitable northern goshawk habitat is not present in the project area, and this species is not likely to occur.

3.3.8.14. Peregrine Falcon

The affected environment for peregrine falcon is discussed in the PRB FEIS on pg. 3-194. In addition to being listed as a Wyoming BLM sensitive species, peregrine falcons are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, habitat is restricted but not undergoing significant loss, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

The northwestern project boundary is defined by cliffs overlooking agricultural ponds and seasonal wetlands that lie outside of the project boundary. Though no peregrine falcon nests are recorded within or adjacent to the project area, the topographic relief in at the project's northwest boundary may provide suitable nesting habitat.

3.3.8.15. Sage Sparrow

The affected environment for sage sparrow is discussed in the PRB FEIS on pg. 3-200 to 3-201. Sage sparrows are a WGFD SGCN, with a rating of NSS3, because populations are restricted in distribution, habitat is restricted but not undergoing significant loss, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

Although sage sparrows prefer to nest in areas characterized by dense, tall shrub cover, the areas of moderately dense shrub cover and smaller stature shrubs that occur throughout the project area may be selected for nesting habitat.

3.3.8.16. Sage Thrasher

The affected environment for sage thrasher is discussed in the PRB FEIS on pg. 3-199 to 3-200. In addition to being listed as a Wyoming BLM sensitive species, sage thrashers are a WGFD SGCN, with a rating of NSS4, because populations are declining, habitat is vulnerable but not undergoing loss, and the species is not sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level II species, indicating the action and focus should be on monitoring and because Wyoming has a high percentage of and responsibility for the breeding population. They are also listed by USFWS as a BCC for Region 17.

The project area contains marginal habitat for sage thrashers, due to the presence of only moderately dense sagebrush stands. Although they prefer dense stands of shrubs for nesting, sage thrashers may occur throughout the project area.

3.3.8.17. Trumpeter Swan

The affected environment for trumpeter swan is discussed in the PRB FEIS on pg. 3-193. In addition to being listed as a Wyoming BLM sensitive species, trumpeter swans are a WGFD SGCN, with a rating of NSS2, because populations are restricted in numbers and distribution, they are experiencing ongoing and significant loss of habitat, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. Issues, management strategies, and population goals are addressed in the Trumpeter Swan Recovery Plans (Pacific Flyway Study Committee 2002, Patla 2001, Subcommittee on Rocky Mountain Trumpeter Swans 1998).

The project area does not contain lakes and ponds with developed aquatic vegetation that trumpeter swans prefer. This species is not suspected to occur in the project area.

3.3.8.18. Western Burrowing Owl

The affected environment for western burrowing owl (burrowing owl) is discussed in the PRB FEIS on pg. 3-186. In addition to being listed as a Wyoming BLM sensitive species, burrowing owls are a WGFD SGCN, with a rating of NSS4 because the species is widely distributed, population status and trends are unknown but are suspected to be stable, habitat is restricted or vulnerable without recent or on-going significant loss, and it may be sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action, and they are also a USFWS BCC in Region 17.

Current population estimates for the United States are not well known but trend data suggest declines throughout the burrowing owls North American range (McDonald et al. 2004). Primary threats are habitat

loss and fragmentation, mostly due to intensive agricultural and urban development and habitat degradation, due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

The BFO database indicates that one burrowing owl nest has been reported within 0.25 mile of the Sales 14 project area. This nest was located in NWNW S12 T57N R82W in a prairie dog burrow by ICF, and reported as active in 2006. The prairie dog colony identified containing the 2006 nest has been impacted by subsurface drip irrigation installation and operation. ICF has continued to conduct surveys for burrowing owls but has not located any additional nest locations (ICF 2008a, ICF 2008b, ICF 2009).

3.3.8.19. White-faced Ibis

The affected environment for white-faced ibis is discussed in the PRB FEIS on pg. 3-182. In addition to being listed as a Wyoming BLM sensitive species, the white-faced ibis is a WGFD SGCN, with a rating of NSS3, because populations are restricted in numbers and distribution, habitat is restricted and vulnerable but not undergoing significant loss, and they are sensitive to human disturbance.

The project area does not contain any water bodies with islands of tall emergent vegetation, nor does it include wet hay meadows, flooded agricultural croplands, or marshes. Suitable white-faced ibis nesting habitat is not present in the project area, and the species is not expected to occur.

3.3.8.20. Yellow-billed Cuckoo

The affected environment for yellow-billed cuckoo is discussed in the PRB FEIS on pg. 3-185. In addition to being listed as a Wyoming BLM sensitive species, the yellow-billed cuckoo is a WGFD SGCN, with a rating of NSS2, because populations are restricted in numbers and distribution and they are experiencing ongoing significant loss of habitat.

The project area does not contain mature cottonwood riparian habitats, and the species is not expected to occur.

3.3.8.21. Black-tailed Prairie Dog

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS (pg 3-179). At the time the PRB FEIS was written, the black-tailed prairie dog was added to the list of candidate species for federal listing in 2000 (USFWS 2000). It was removed from the list in 2004. Wyoming BLM considers black-tailed prairie dogs a sensitive species and continues to afford this species the protections described in the PRB FEIS. The black-tailed prairie dog is a WGFD SGCN, with a rating of NSS3, because populations are declining, and habitat is vulnerable but not undergoing significant loss.

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

No prairie dog colonies are located within in the Sales 14 project boundary, but there are three colonies, totaling 20.4 acres documented within 0.25 miles of the project area, as discussed in Section 3.3.7.1.

3.3.8.22. Fringed Myotis

The affected environment for fringed myotis is discussed in the PRB FEIS on pg. 3-188 to 3-189. In

addition to being listed as a BLM WY sensitive species, the fringed myotis is a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. The fringed myotis occupies a variety of habitats, including grasslands and basin-prairie shrublands, usually in proximity of drinking water (Hester and Grenier 2005). After feeding, it uses night roosts, which may include buildings, rock crevices, and bridges (Hester and Grenier 2005), all of which occur in the vicinity of the project area. Fringed myotis may occur in the project area.

3.3.8.23. Long-eared Myotis

The affected environment for long-eared myotis is discussed in the PRB FEIS on pg. 3-201. In addition to being listed as a BLM WY sensitive species, the long-eared myotis is a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. Although long-eared myotis primarily inhabit coniferous forest and woodland, they are occasionally found in cottonwood riparian areas and sagebrush grasslands where roost sites are available (Hester and Grenier 2005). Roosts include cavities in snags, under loose bark, stumps, buildings, and rock crevices (Hester and Grenier 2005), all of which may occur in the vicinity of the project area. Because of its proximity to areas agricultural ponds and the potential for available roost sites, long-eared myotis may occur in the Sales 14 project area.

3.3.8.24. Swift Fox

The affected environment for swift fox is discussed in the PRB FEIS on pg. 3-189. In addition to being listed as a BLM WY sensitive species, swift fox is also listed as a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected to be stable, and habitat is vulnerable but is not undergoing significant loss.

The project area does not contain suitable swift fox habitat. Patches of grassland are available, but they are smaller in size and do not dominate the landscape. The overall rolling terrain precludes the availability of den sites that would provide good views of the surrounding area. No occurrences of swift fox have been reported in the vicinity of the project area. Swift fox are not expected to occur in the project area.

3.3.8.25. Townsend's Big-eared Bat

The affected environment for Townsend's big-eared bat is discussed in the PRB FEIS on pg. 3-189. In addition to being listed as a BLM WY sensitive species, Townsend's big-eared bat is listed as a WGFD SGCN, with a rating of NSS2, because populations are restricted in distribution, they are experiencing ongoing significant loss of habitat, and they are sensitive to human disturbance. Townsend's big-eared bats occur in sagebrush and other shrublands, and roosts include rock outcrops and buildings, which occur in the vicinity of the project area. It may be limited to areas with reliable, accessible sources of drinking water (Hester and Grenier 2005), such as the Powder River. Foraging areas include riparian corridors (Hester and Grenier 2005). Townsend's big-eared bat may occur in the project area because of its proximity to potential roost sites and foraging along Badger Creek and seasonally wet meadows.

3.3.8.26. Porter's Sagebrush

The affected environment for Porter's Sagebrush is discussed in the PRB FEIS on pg. 3-190. The Sales 14 project area does not contain suitable habitat for this species, and it is not expected to occur.

3.3.8.27. Williams' Wafer-Parsnip

The affected environment for William's wafer-parsnip is discussed in the PRB FEIS on pg. 3-191 to 3-192. The Sales 14 project area is outside of this species' range, and it is not expected to occur.

3.4. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection.

Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals.

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

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

Table 3.10 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007*	155	22	Unk	1
2008*	10	0	0	0

*Wyoming Department of Health Records

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 Little Badger Creek and Badger Creek, both ephemeral tributaries to the Tongue River. The tributaries to Little Badger and Badger creeks are steep ephemeral gullies, exhibiting active and ongoing erosion typical of this type of terrain.

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.

Subsurface Drip Irrigation (SDI) is a relatively new (within the last 5 years) development within the Powder River Structural Basin as a disposal method for CBNG produced water. Water is first pumped into a large lined pit for temporary storage. From there, water is pumped to field laterals. Any chemicals required for water enhancement and soil protection are injected at the main pump. Drip lines are "shanked" (plowed) into the fields at depths from 3-5 feet. These lines are connected to the field laterals and distribute water to the soil.

Some of the stated benefits of this system are:

- Water can be disposed of year-round without the winter related problems of surface discharge.
- The irrigation produces excellent hay.
- The makeup of the soils at the injection depths provide for natural buffering of the produced water, making it unnecessary to add soil amendments that are needed for surface application.
- The operator of the SDI system is Bene Terra, Inc., which relieves the CBNG operator of liability for long term damages which may result from this process.

Some concerns about this disposal method are:

- Lateral migration of water could impact Badger Creek. This would be a violation of the company's UIC (Underground Injection Control) permit, which was issued by WDEQ.
- The total buffering capacity of the soil (how many gallons of water can be treated by a given soil volume) has never been stated.
- The long term (50+ years) degradation of the soil profile could be insidious and catastrophic, not manifesting itself until long after the end of coalbed methane mining.

3.5.1. Groundwater

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

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

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

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

The BLM 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 20 to 200 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 drained by Badger Creek, a tributary to the Tongue River. The divide between Little Badger and Badger creeks is slated for development, but all water related infrastructure will flow to Badger Creek. The tributaries to Little Badger and Badger creeks are all ephemeral (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. Little Badger Creek and Badger Creek are 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). Badger Creek is characterized by a relatively well incised sinuous 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 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 state line near Decker, Wyoming (PRB FEIS page 3-49).

The operator has stated that no natural springs were identified within this POD boundary. However, one of the identified permitted water wells, located at T57N, R82W, SWNE portion of Sec 14, is named "Sales Spring #1.

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 performed for the Sales 14 POD prior to on-the-ground project work (BFO project no. 70080130). Foothills Archaeological Consultants conducted a block class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports*. Seth Lambert, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. No archeological sites were identified in the area of potential effect. During several BLM onsites, surface visibility was inadequate to identify surficial cultural resources due to dense vegetation.

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 therefore only the environmental consequences of Alternative C are described below.

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 18 proposed well locations, 16 can be drilled without a well pad being constructed and 2 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 16 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 12 x12 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 16 wells would involve approximately 0.6 acre/well for 9.6 total acres. The other 2 wells requiring cut & fill pad construction would disturb approximately 0.6 acres/well pad for a total of 1.2 acres. The total estimated disturbance for all 18 wells would be 10.8 acres.

Approximately 2.1 miles of improved roads would be constructed to provide access to various well locations. Approximately 0.2 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 0.18 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, hydro seeding and erosion matting) would ensure land productivity/stability is regained and maximized.

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

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

growth, limit permeability of gases and moisture, and make tillage difficult." (PRB FEIS page 4-144).

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Unconstructed Pad Constructed Pad	16 2	0.6/acre or Site Specific	10.8	Long Term
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Monitor Wells	1	0.6/acre	0.6	Long Term
Impoundments On-channel Off-channel Water Discharge Points	 0 0 0	 Site Specific Site Specific Site Specific or 0.01 ac/WDP	 0 0 0	Long Term
Channel Disturbance Headcut Mitigation* Channel Modification	 0 0	 Site Specific Site Specific	 0 0	
Improved Roads No Corridor With Corridor	4.25 2.28 1.97	40' Width or Site Specific	20.6	Long Term
2-Track Roads No Corridor With Corridor	.28 .14 .14	15' Width or Site Specific 28' Width or Site Specific	.40	Long Term
Pipelines No Corridor With Corridor	5.0 .4 4.6	20' Width or Site Specific	0 0.96 6.69	Short Term
Buried Power Cable No Corridor	Miles Buried Power Not within Corridor	12' Width or Site Specific		Short Term
Overhead Powerlines	0	15' Width	0	Long Term

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

4.1.1. Wetland/Riparian

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. The owner and operator of the SDI

(Subsurface Drip Irrigation) system is Bene Terra. 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 its way into Badger Creek. This introduction of water into 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 down gradient 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).

4.1.2. Invasive Species

The operator has committed to the control of noxious weeds and species of concern using the following measures identified in their Integrated Pest Management Plan (IPMP):

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.

4.1.3. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Upper Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 53% of that total (see section 4.4.2.1).
- The WMP for the Sales 14 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 (Alternative C – Environmentally Preferred)

EFFECTS ANALYSIS

During the environmental analysis process, the BLM identified project modifications resulting in an environmentally preferred alternative (Alternative C). At the on-sites, all areas of proposed surface disturbance were inspected to ensure that potential impacts to natural resources would be reduced. 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 or minimize environmental impacts.

4.2.1. Wildlife

4.2.1.1. Big Game Direct and Indirect Effects

Impacts to big game are discussed in the PRB FEIS on pp. 4-181 to 4-215. As discussed in that document, impacts to mule deer and pronghorn would occur through alterations in hunting and/or poaching, increased vehicle collisions, harassment and displacement, increased noise, increased dust, alterations in nutritional status and reproductive success, increased fragmentation, loss or degradation of habitats, reduction in habitat effectiveness, and declines in populations. Impacts to pronghorn would also occur through addition of barbed wire fences.

Additional studies support the impacts discussed in the PRB FEIS. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). WGFD has determined thresholds for high and extreme impacts that range from greater than two wells per square mile for mule deer and greater than five wells per square mile for pronghorn 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 do 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, because human activities associated with operation and maintenance will continue to displace big game. Mule deer are more sensitive to operation

and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not readily habituate. A study in North Dakota stated "Although the population (mule deer) had over seven years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer have even been documented to avoid dirt roads that were used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997).

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

Reclamation and other 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.

4.2.1.1.1. 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, refer to the PRB FEIS, pg. 4-181 to 4-215.

4.2.1.2. Aquatics Direct and Indirect Effects

Impacts to aquatics are discussed in the PRB FEIS on pp. 4-235 to 4-247.

Produced water is to be discharged into an existing system of subsurface drip irrigation, previously analyzed in the Dow 2 POD (EA# WY-070-EA08-168). Because the Sales 14 POD does not include any changes to existing or approved water management, no additional impacts to aquatic communities are expected to occur as a result of implementation of the Sales 14 POD.

4.2.1.2.1. 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, refer to the PRB FEIS, (pp. 4-247 to 4-249). No additional mitigation measures are required.

4.2.1.3. Migratory Birds Direct and Indirect Effects

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

Disturbance of habitat within the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of wells, roads, and pipelines. Reclamation and other activities that occur in the spring may be detrimental to migratory bird survival. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Activities will likely displace migratory birds farther than the immediate area of physical disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

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

losses through displacement were much greater than the direct physical habitat losses.

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

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

4.2.1.3.1. 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, refer to the PRB FEIS, pg. 4-235. No additional mitigation measures are required.

4.2.1.4. 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 and can result in egg or chick mortality. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Routine human activities near these nests can also draw increased predator activity to the area and resulting in increased nest predation.

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests and recommends all infrastructure requiring human visitation be located in such a way as to provide adequate biologic buffer for nesting raptors. A biologic buffer is a combination of distance and visual screening that provides nesting raptors with security such that they will not be flushed by routine activities.

The following modifications were made to the originally proposed action to reduce impacts to raptors. Those modifications identified at the original on-site were included by Pennaco, Inc. in the revised submission of the Sales 14 POD.

Well 1-14: Well moved 418 feet south to reduce disturbance and to move away from active raptor nests 5901 and 5911, and to place location and access out of line-of-sight. Relocation also moved well out of line-of-sight of nest 5912. This move also eliminated 418 feet of template road proposed within ¼ mile of three raptor nests.

Well 7-14: Well moved 100 feet east to reduce disturbance, stay next to overhead power/existing road, and to move location out of line-of-sight of nest 5912. This modification also eliminated 100 feet of primitive access that was proposed within ¼ mile of the nest.

Table 4.2 Proposed and existing infrastructure within 0.5 mile of documented raptor nests within the Sales 14 POD project area

BLM ID	Infrastructure
188	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
189	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
3555	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5390	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5391	• Burrowing owl nest not within 0.25 miles of POD boundary
5392	• Well 13-12, 5-13, 1-14 and associated infrastructure
5393	• Well 13-12, 5-13, 1-14 and associated infrastructure
5394	• Well 11-12, 13-12, 1-14 and associated infrastructure
5899	• Utility corridor
5900	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5901	• Well 13-12, 3-13, 5-13, 7-14, 1-14 and associated infrastructure
5902	• Well 11-14 and associated infrastructure
5903	• Well 15-14 and associated infrastructure
5904	• Utility corridor
5905	• Well 7-24 and associated infrastructure
5906	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5907	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5908	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5910	• Nest falls within 0.5 miles of the POD boundary but does not have infrastructure proposed within 0.5 miles
5911	• Well 12-12, 1-14, 5-13 and associated infrastructure
5912	• Well 1-14, 7-14, 3-14, 11-14 and associated infrastructure
5913	• Utility corridor

4.2.1.4.1. Raptors Cumulative Effects

The cumulative effects associated with Alternatives C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-221. No additional mitigation measures are required.

There is current development of fee wells and infrastructure occurring in the vicinity of raptor nests identified in the Sales 14 project area. A main access road, two overhead power lines, a compressor location and storage area currently operate within ½ mile of six nests in Sections 11 & 14, T57N:R82W. During both on-sites, the compressor could be heard up to 1 mile from the compressor location in section 14.

Nest activity in the project area has decreased during survey periods from 2006 to 2009.

Survey Year	Active Nests Documented
2006	9
2007	6
2008	5
2009	1

4.2.1.5. Plains Sharp-tailed Grouse Effects

Sharp-tailed grouse are not expected to be impacted by the proposed project because the project area has limited potential to support them.

4.2.1.6. Sagebrush Obligates Direct and Indirect Effects

Construction and maintenance activities associated with development of the Sales 14 project are likely to cause a decline in sagebrush obligate species. 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 100m of roads constructed for natural gas development in Wyoming was 50% lower than at greater distances (Ingelfinger 2001).

4.2.1.6.1. Sagebrush Obligates Cumulative Effects

Fragmentation of shrub-steppe 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 remnants surrounded by unusable environments (Urban and Shugart 1984; Fahrig & Paloheimo 1988). 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 shrub-steppe has the further potential to affect the conservation of sagebrush-obligate species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Due to this, sagebrush obligate species may not return for many years after reclamation activities are completed.

4.2.1.7. Threatened and Endangered Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.3.

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (Mustela nigripes)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	NE	No suitable habitat present.
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.				

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
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.				

4.2.1.7.1. Black-Footed Ferret Direct and Indirect Effects

Direct and indirect effects to black-footed ferret are discussed in the PRB FEIS (pg. 4-251).

Suitable habitat is of sufficient size to support a black-footed ferret population. The project area is 13 miles from the Pleasantdale reintroduction area. 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 black-footed ferret became present, the proposed action would likely make portions of the project area unsuitable for ferret inhabitance because it would further fragment existing colonies and impose permanent barriers between prairie dog towns. Implementation of the proposed development will have no effect on the black-footed ferret because the species is not likely to occur.

4.2.1.7.2. Ute Ladies'-Tresses Orchid Direct and Indirect Effects

Suitable habitat is not present within the proposed Sales 14 project area. Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial; however, no historic seed source is present within the project area. Implementation of the proposed coal bed natural gas project will have no effect on the Ute ladies'- tresses orchid.

4.2.1.7.3. Threatened and Endangered 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, refer to the PRB FEIS, pp. 4-250 to 4-257. No additional mitigation measures are required.

4.2.1.8. Sensitive Species

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

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Table 4.3 summarizes the habitat requirements and potential impacts of the Sales 14 project on all Wyoming BLM sensitive species that occur in the BFO administrative area. Some sensitive species are of particular concern in the project area, due to their demonstrated or suspected sensitivity to CBNG development or because they were recently considered for listing under the ESA. These species include bald eagle, black-tailed prairie dog, greater sage-grouse, mountain plover, and western burrowing owl and are discussed in further detail in this section.

Table 4.4 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 and cattail marshes from plains to montane zones.	S	MIIH	Additional water will affect existing waterways and alter habitat conditions.
Columbia spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	NP	NI	The project area is outside the species' range, and the species is not expected to occur .
Fish				
Sturgeon chub (*Macrhybopsis gelida)*	Swift, rocky riffles throughout the Powder River.	S	NI	Amount of water discharged to the Powder River not of sufficient magnitude to have impacts to this species. Changes in water quality not expected to have an impact.
Yellowstone cutthroat trout (*Oncoryhynchus clarki bouvieri*)	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	NP	NI	The project area is outside the species' range, and the species is not expected to occur .
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	S	MIIH	Shortgrass prairie and sagebrush cover will be affected.
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body with reliable prey source nearby.	S	MIIH	Infrastructure within one mile of mature cottonwood galleries.
Brewer's sparrow (*Spizella breweri*)	Sagebrush shrubland	S	MIIH	Sagebrush cover will be affected.
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Nesting habitat will be impacted and human activities will increase
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	S	WIPV	Sagebrush cover will be affected.
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	S	MIIH	Grasslands, meadows will be impacted
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NS	MIIH	Infrastructure within 0.25 miles of prairie dog colonies and suitable habitat will be impacted.
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.
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	S	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	NP	NI	Habitat not present.
Western Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	K	MIIH	Infrastructure within 0.25 miles of prairie dog colonies, thus may impact nesting individuals or selection of nest sites.
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.
Mammals				
Black-tailed prairie dog (*Cynomys ludovicianus*)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Infrastructure within 0.25 miles of prairie dog towns will be affected.
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	S	MIIH	Roosting areas, potential foraging areas present.
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	S	MIIH	Roosting areas, potential foraging areas 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.	S	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	Project area outside of species' range.

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

4.2.1.8.1. Bald Eagle Direct and Indirect Effects

Marginal habitat that exists for bald eagle may be impacted by increased activity in the project area. Disturbance would likely displace individual bald eagles that may occur in the project area.

Impacts to bald eagles are discussed in the PRB FEIS on pg. 4-251 to 4-253. A more recent study completed in 2004 suggests that two-tracks and improved project roads pose minimal collision risk to bald eagles. In one year of monitoring road-side carcasses the BLM BFO 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; bald and golden eagles 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.

4.2.1.8.2. Black-tailed Prairie Dog Direct and Indirect Effects

None of the proposed infrastructure will directly affect prairie dog colonies. Two prairie dog colonies were identified within .25 miles of the Sales 14 project area; however, since 2007, these prairie dog colonies have been impacted by the installation of a subsurface drip irrigation system. Since 2007 the total acreage of active prairie dog colonies in the project area has been reduced from 49.6 acres to 20.4 acres. Construction may cause increased stress on prairie dogs as they attempt to disperse and may result in avoidance of colonies in close proximity to such activities.

Additional impacts to black-tailed prairie dogs are discussed in the PRB FEIS on pg. 4-255 to 4-256.

4.2.1.8.3. Greater Sage-grouse

4.2.1.8.3.1. Greater Sage-grouse Direct and Indirect Effects

The proposed action will adversely impact nesting, brood rearing, late summer, and winter habitat, both through loss of habitat and avoidance of habitat in proximity to the development. Proposed project elements that are anticipated to negatively impact grouse include 18 CBNG wells on 18 locations, 4.53 miles of new roads, and increased vehicle traffic on established roads.

The following modifications were made to the originally proposed action to reduce impacts to greater sage-grouse. Those modifications identified at the original on-site were included by Pennaco, Inc. in the revised submission of the Sales 14 POD.

Well 1-14: Well moved 418 feet south to reduce disturbance and to move away from active raptor nests and reduce fragmentation to sagebrush habitat. This move consolidated proposed disturbance with an existing road and overhead power line and eliminated 418 feet of template road proposed in sagebrush.
Well 7-14: Well moved 100 feet east to reduce disturbance, stay next to overhead power/existing road, and to reduce impacts to sagebrush and raptor nests. This modification also eliminated 100 feet of primitive access.

Direct and indirect impacts to sage-grouse are discussed in more detail in the PRB FEIS on pg. 4-257 to 4-273.

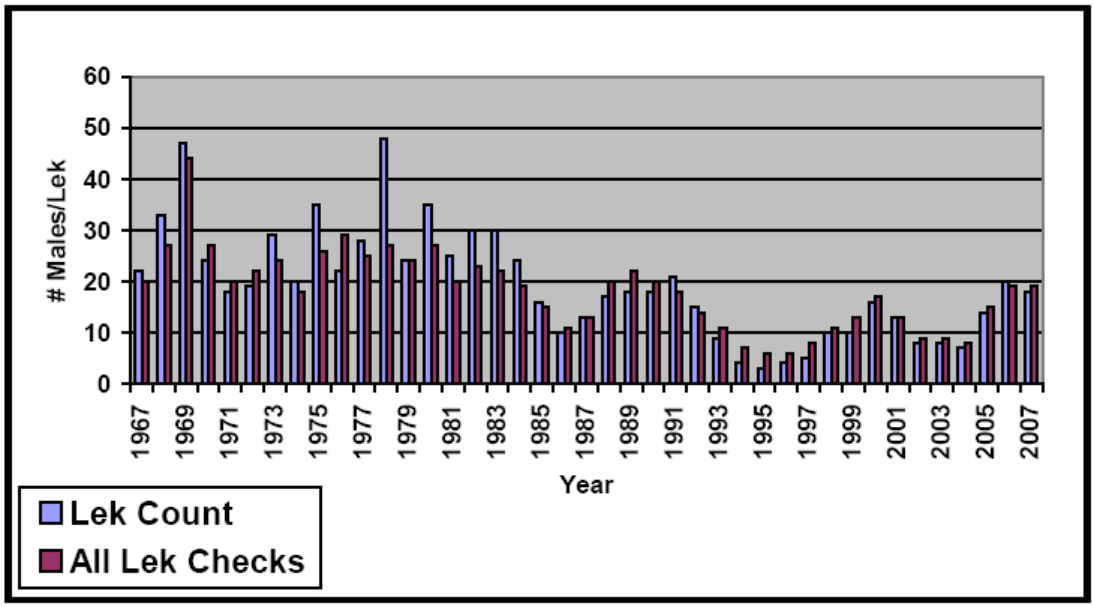
4.2.1.8.3.2. Greater Sage-grouse Cumulative Effects

Recent research suggests that the cumulative and synergistic effects of current and foreseeable CBNG development within the vicinity of the project area are likely to impact the local sage-grouse population, cause declines in lek attendance, and may result in local extirpation. The cumulative impact assessment area for this project encompasses a four mile radius from four sage-grouse leks that occur within four miles of the project boundary. Analysis of impacts up to four miles was recommended by the State

Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008).

The sage-grouse population within northeast Wyoming has been exhibiting a steady long term downward trend, as measured by lek attendance (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). The research described below suggests that these declines may be a result, in part, of CBNG development in this region of Wyoming and that the leks within the cumulative impact assessment area may experience similar declines.

Figure 1 Male sage-grouse lek attendance within northeastern Wyoming, 1967-2007.



Research has shown that declines in lek attendance are correlated with oil and gas development. Several studies have shown that well density can be used as a metric for evaluating impacts to sage-grouse, as measured by declines in lek attendance (Braun et al. 2002, Holloran et al. 2005, and Walker et al. 2007). These studies indicated that oil or gas development exceeding approximately one well pad per square mile, resulted in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development 2008).

There are currently 892 wells (Wyoming Oil and Gas Conservation Commission [WOGCC] 08/2009) within the portion of the cumulative impact assessment area that falls within the BFO administrative area. A total of about 10 square miles of the cumulative impacts assessment area is located in Montana and this portion of the cumulative impacts assessment area is not included in the following analysis. The existing well density within the BFO administrative area amounts to approximately 9.9 wells per square mile. Currently, there are approximately 146 proposed wells in Wyoming (Automated Fluid Minerals Support System [AFMSS] 08/2009) (18 including the from this project) within four miles of the two leks. With the addition of the 128 proposed wells that are not associated with this proposed action, the well density within four miles of the leks increases to 11.3 wells per section. With approval of alternative C (18 proposed well locations) the well density in Wyoming increases to 11.5 wells per section, well above the one well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development.

In its *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (2009), WGFD categorized levels of oil and gas development into thresholds that correspond to moderate, high, and extreme impacts to habitat effectiveness for various species of wildlife, based on well pad densities and acreages of disturbance. All three levels of impact result in a loss of habitat function by directly eliminating habitat; disrupting wildlife access to, or use of habitat; or causing avoidance and stress to wildlife. Impacts to sage-grouse are categorized by number of well pad locations per square mile within two miles of a lek and within identified nesting/brood-rearing habitats greater than two miles from a lek. Moderate impacts occur when well density is between one and two well pad locations per square mile or where there is less than 20 acres of disturbance per square mile. High impacts occur when well density is between two and three well pad locations per square mile or when there are between 20 and 60 acres of disturbance per square mile. Extreme impacts occur when well density exceeds three well pad locations per square mile or when there are greater than 60 acres of disturbance per square mile. Extreme impacts mean those where the function of an important wildlife habitat is substantially impaired or lost
The Red Draw lek is the only sage-grouse lek within two miles of the project boundary. There are currently 53 wells within two miles of this lek, an area of 12.6 square miles, for a total well density of 4.2 wells per square mile, indicating that impacts to this lek as a result of existing oil and gas development are considered by WGFD to be extreme. Eighty-two additional wells are proposed within two miles of the Red Draw lek. Six are from this project. If only the six Sales 14 wells were to be drilled, well density would increase by 12% to 4.7 wells per square mile within two miles of the Red Draw lek. With the addition of the 76 wells not associated with the Sales 14 project, well density within two miles of this lek would increase to 10.7 wells per square mile, well above the threshold of 3 wells per square mile for extreme impacts.

Declines in lek attendance associated with oil and gas development may be a result of a suite of factors including avoidance (Holloran et al. 2005, Holloran et al. 2007, Aldridge and Boyce 2007, Walker et al. 2007, Doherty et al. 2008, WGFD 2009), loss and fragmentation of habitat (Connelly et al. 2000, Braun et al. 2002, Connelly et al. 2004, WGFD 2004a, Rowland et al. 2005, WGFD 2005, Naugle et al. in press), reductions in habitat quality (Braun et al. 2002, WGFD 2003, Connelly et al. 2004, Holloran et al. 2005) and changes in disease mechanisms (Naugle et al. 2004, WGFD 2004b, Walker et al. 2007, Cornish pers. comm.).

The BFO Resource Management Plan (BLM 2001) and the PRB FEIS Record of Decision (BLM 2003) included a two-mile timing limitation on surface-disturbing activities around sage-grouse leks. The two-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). Wyoming BLM adopted the two-mile recommendation in 1990 (BLM 1990).

The two-mile recommendation was based on early research which indicated between 59% and 87% of sage-grouse nests were located within two miles of a lek (BLM 2004). These studies were conducted within vast contiguous stands of sagebrush, such as those that occur in Idaho's Snake River plain. Additional research across more of the sage-grouse's range have since indicated that nesting may occur much farther than two miles from the breeding lek (BLM 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported that only 45% of their sage-grouse hens nested within 1.9 miles of the capture lek. Moynahan and Lindberg (2004) found that only 36% of their sage-grouse hens nested within 1.9 miles of the capture lek. Habitat conditions, and, thus, sage-grouse biology, within the BFO are more similar to Moynahan's north-central Montana study area than the Upper Green River area. Moynahan's study area occurred in mixed-grass prairie and sagebrush steppe, dominated by Wyoming big sagebrush (Moynahan et al. 2007). 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). Recent research in the Powder River Basin 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 (Walker et al. 2007,

Walker 2008, Naugle et al. *In press*). Based on these studies, the BLM has determined that a two-mile timing limitation is insufficient to reverse the population decline.

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. A timing limitation does nothing to mitigate loss and fragmentation of habitat and changes in disease mechanisms. Rather than limiting mitigation to only timing restrictions, more effective mitigation strategies may include, at a minimum, burying power lines (Connelly et al. 2000b); 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). Walker et al. (2007) recommend maintaining extensive stands of sagebrush habitat over large areas (at least one mile in size) around leks to ensure sage-grouse persistence. The size of such a no-development buffer would depend on the amount of suitable habitat around the lek and the population impact deemed acceptable. Connelly et al. (2000) recommended locating all energy-related facilities at least two miles from active leks. Other researchers have recommended avoiding areas within four miles of a lek and within areas of mapped nesting and brood-rearing habitat outside the four-mile perimeter (Walker et al. 2007, Walker 2008, Naugle et al. *In press*).

Several guidance documents are available that recommend practices that would reduce impacts of development on greater sage-grouse. These include *Northeast Wyoming Sage-Grouse Conservation Plan* (Northeast Wyoming Sage-grouse Working Group 2006), *Sage-Grouse Habitat Management Guidelines for Wyoming* (Bohne et al. 2007), *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (WGFD 2009), *Bureau of Land Management National Sage-Grouse Habitat Conservation Strategy* (USDI 2004), and *Greater Sage-Grouse Comprehensive Conservation Strategy* (Stiver et al. 2006).

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

The Powder River Basin Oil and Gas Project FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270)." Based on the impacts described in the Powder River Basin Oil and Gas Project FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the five leks that occur within four miles of the project area, and, potentially, extirpation of the local grouse population.

4.2.1.8.4. Mountain Plover Direct and Indirect Effects

An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (pp. 4-254 to 4-255).

Occupied mountain plover habitat is present within 0.25 miles of the project area. The project may impact mountain plovers.

Mountain plovers have been forced to seek habitat with similar qualities that may be poor quality habitat when loss or alteration of their natural breeding habitat (predominantly prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and

hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. Recent analysis of the USWFS Breeding Bird Survey (BBS) data suggests that mountain plover populations have declined at an annual rate of 3.7 % over the last 30 years which represents a cumulative decline of 63% during the last 25 years (Knopf and Rupert 1995).

Use of roads and pipeline corridors by mountain plovers may increase their vulnerability to vehicle collision. Limiting travel speed to 25mph provides drivers an opportunity to notice and avoid mountain plovers and allows mountain plovers sufficient time to escape from approaching vehicles. Even if a nesting plover flushes in time, the nest likely would still be destroyed. To reduce impacts to nesting mountain plovers, the BLM BFO requires a 0.25 mile timing limitation for potential nesting habitat prior to nest survey completion and a 0.25 mile timing limitation for all occupied nesting habitat for the entire nesting season.

4.2.1.8.5. Western Burrowing Owl Direct and Indirect Effects

Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision. CBNG infrastructure such as well houses, compressors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes.

The USFS Thunder Basin National Grasslands in Campbell County, WY, (who cooperated with the BLM in the creation of the PRB FEIS), recommends a 0.25 mile timing restriction buffer zone for burrowing owl 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 from six and one half months and from 0.5 mile to 0.25 mile.

4.2.1.8.6. Sensitive Species Cumulative Effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS (pp. 4-257 to 4-273).

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 malathion, on a site specific or basin-wide scale will have any effect on the overall spread of the disease. The State agencies have not instituted state-wide treatment for mosquitoes due to WNv, nor are they requiring any mitigation specific to permitting for CBM operations.

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

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

4.4. Water Resources

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

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

The maximum water production is predicted to be 15.0 gpm per well or 270 gpm (0.6 cfs or 435 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 15,782 acre-feet in 2009 (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 3% of the total volume projected for 2009. 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 105 gpm will infiltrate at or near the discharge points and impoundments (169 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 20 to 200 feet compared to depths of approximately 553, 673, 770, 990, 1110, and 1233 feet to the 6 coal seams: Smith, Lower Smith, Dietz 1, Dietz 3, Monarch, and Carney coal zones respectively. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

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

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

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 pollutant limits for TDS, SAR and EC detailed in the WDEQ's WYPDES permit, and the levels found in the POD's representative water sample.

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	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			

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** μmhos/cm
Co-mingled Smith, Dietz 1, Dietz 3, Monarch, Carney (range from 3 reference wells)	949-6790	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). Based on three reference well samples the TDS from this project is expected to be between 949 and 6790 mg/L. The SAR of 60.7 would very likely be highly conducive to forming an impenetrable cap over soils to which it was applied (surface irrigation). The operator has proposed to use SDI, which allegedly uses subsurface buffering of calcium, magnesium, etc, and thus is not detrimental to the soil or plant growth.

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 18 wells, for a total of 270 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 main stem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-93). The predicted maximum discharge rate from these 18 wells is anticipated to be a total of 270 gpm or 0.6 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 0.07 cfs to the Upper Tongue River flows, or just over 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. Badger Creek is a relatively large watershed.

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.

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

As stated previously, the operator has committed to offer water well agreements to properly permit 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.

Subsurface Drip Irrigation (SDI)

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 in excess of the storage in the two reservoirs will be "disposed of" through this SDI system, which has been permitted by the WDEQ. 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.

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).

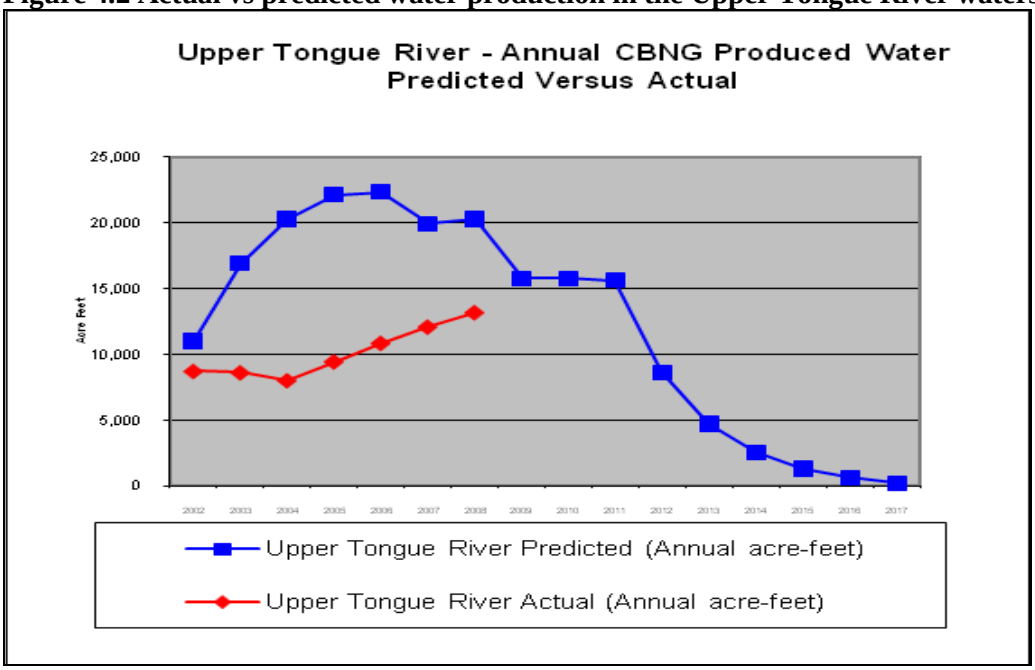
As of December 2007, all producing CBNG wells in the Upper Tongue River watershed have discharged a cumulative volume of 70,558 acre-ft of water compared to the predicted 132,952 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.2 and Table 4.6 following. This volume is 53.1% 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 *2008 Data Update 06-08-09*

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	13,114	64.7	70,558	53.1
2009	15,782	148,734				
2010	15,782	164,516				

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
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**		**70,558**			

Figure 4.2 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 53% 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

Due to the presence of dense vegetation that prevented adequate surface visibility, the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COA's. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance.

No historic properties will be impacted by the proposed project as planned. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 07/30/09 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.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Don Sales	Land Owner	Sales Ranch	Yes
Bert Dow	Land Owner	Dow Ranch	No
Oscar Rucki	Land Owner	Rucki Ranch	No
Jeff Simons	Dow Ranch Manager	Dow Ranch	Yes
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.

7. REFERENCES AND AUTHORITIES

Agnew, W. D. 1983. Flora and Fauna Associated with Prairie Dog Ecosystems. Unpublished thesis. Colorado State University, Fort Collins. 47pp.

Agnew, W. D. 1988. Arthropod Consumption by Small Mammals on Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Eighth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM 154. pgs. 81-87.

Agnew, W., D. W. Uresk. and R. M. Mansen. 1986. Flora and Fauna Associated with Prairie Dog Colonies and Adjacent Ungrazed Mixed-grass Prairie in Western South Dakota. Journal of Range Management 39, pgs 135-139

AHPIS, Animal and Plant Health Inspection Service. 2002. General information available online at http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html.

Aldridge, C. L., and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: a habitat-based approach for endangered greater sage-grouse. Ecological Applications 17:508-526.

Apa, A. D. 1985. Efficiency of Two Black-tailed Prairie Dog Rodenticides and Their Impacts on Non-target Bird Species. Unpublished thesis, South Dakota State University Brookings. 71pp.

Avian Power Line Interaction Committee (APLIC) 2006. R. Harness, contributing author to: Suggested Practices for Avian Protection on Power Lines: State of the Art in 2006. 207pp.

Bills, Thomas E. 2004. Powder River Basin Oil & Gas Project Semi-Annual Report: May 1, 2003 – October 31, 2003. BLM Buffalo Field Office. Buffalo, WY. 8pp.

Big Horn Environmental Consultants. 2008. Powder Valley Unit – Delta POD Wildlife Survey and Habitat Report. Sheridan, WY. 11pp.

Braun C. E. 1998. Sage-grouse declines in western North America: what are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies. 67:134–144.

Braun C. E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin. 88:165–171.

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and Gas Development in Western north America: Effects on Sagebrush Steppe Avifauna with Particular Emphasis on Sage Grouse. In: Transactions of the 67th North American Wildlife and Natural Resources Conference. pp337-349.

Bureau of Land Management. 2004. Instruction Memorandum No. WY-2005-057: Statement of Policy Regarding Sage-Grouse Management Definitions, and Use of Protective Stipulations, and Conditions of Approval. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Bureau of Land Management. 2008. Fact Sheet Greater Sage-Grouse Buffalo Field Office RMP Amendment. May 28, 2008

Bureau of Land Management. 1990. Instruction Memorandum No. WY-90-564: Resource Management Plan Action and Wyoming BLM Standard Mitigation Guidelines for Surface Disturbing Activities. Bureau of Land Management, Wyoming State Office. Cheyenne, WY.

Campbell, Thomas and Tim Clark. 1981. Colony Characteristics and Vertebrate Associates of White-tailed and Black-tailed Prairie Dogs. American Midland Naturalist, Vol. 105, No. 2 (April 1981). pgs 269-276.

Canfield, J. E., L. J. Lyon, J. M. Hillis, and M. J. Thompson. 1999. Ungulates. Chapter 6 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coordinated by G. Joslin and H. Youmans. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Clark, T. W., T. M. Campbell, D. G. Socha, and D. E. Casey. 1982. Prairie Dog Colony attributes and Associated Vertebrate Species. Great Basin Naturalist 42: 572-582.

Code of Federal Regulations (CFR)

- 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of July 1, 2004.
- 43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of October 1, 2006.

Confluence Consulting, Inc. 2004. Powder River Biological Survey and Implications for Coalbed Methane Development. Bozeman, MT. 179pp.

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines for management of sage grouse populations and habitats. Wildlife Society Bulletin 28:967-985.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.

Cornish, Todd; Terry Creekmore; Walter Cook; and Elizabeth Williams. 2003. "West Nile Virus - Wildlife Mortality in Wyoming 2002-2003". In: The Wildlife Society Wyoming Chapter Program and Abstracts for the Annual Meeting at the Inn in Lander, WY November 18-21, 2003. Wildlife Society Wyoming Chapter. 17pp.

Cornish, Todd. Personal Communication. Wyoming State Veterinary Laboratory, University of Wyoming. Laramie, WY. (307) 742-6638. tcornish@uwyo.edu.

Dantzker, M. S., Deane, G. B. & Bradbury, J. W. 1999. Directional acoustic radiation in the strut display of male sage grouse Centrocercus urophasianus. Journal of Experimental Biology, 202, 2893–2909.

Danvir, Rick E. 2002. Sage Grouse Ecology and Management in Northern Utah Sagebrush-Steppe: A Deseret Land and Livestock Wildlife Research Report. Deseret Land and Livestock Ranch and the Utah Foundation for Quality Resource Management. Woodruff, UT.

Deisch, M. S., D. W. Uresk, and R. L. Lindor. 1989. Effects of Two Prairie Dog Rodenticides on Ground Dwelling Invertebrates in Western South Dakota. Ninth Great Plains Wildlife Damage Control Workshop Proceedings. USDA Forest Service General Technical Report RM. Pgs 171-181.

Dobkin D. S. 1994. *Conservation and management of Neotropical migrant landbirds in the northern Rockies and Great Plains*. University of Idaho Press, Moscow, ID.

Doherty, K.E., D.E. Naugle, B.L. Walker, J.M. Graham. 2008. Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management. In press.

Fahrig, L., and J. Paloheimo. 1988. Determinations of local population size in patchy habitats. Theoretical Population Biology 34:194-213.

Fertig, W. 2000. *Status Review of the Ute Ladies Tresses (Spiranthes diluvialis) in Wyoming*. Wyoming Natural Diversity Database, Laramie, Wyoming.

Geist, V. 1978. Behavior. Big Game of North America; ecology and management. Stackpole Books, Harrisburg, Pennsylvania.

Gelbard J. L., and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. Conservation Biology. 17:420–432.

Gibson, R. M. 1989. Field playback of male display attracts females in lek breeding Sage Grouse. Behavioral Ecology and Sociobiology 24: 439-443.

Gibson, R. M. and J. W. Bradbury. 1986. *Male and female mating strategies on sage grouse leks*. Pp. 379-398 in Ecological aspects of social evolution: birds and mammals (D. I. Rubenstein and R. W. Wrangham, eds.). Princeton Univ. Press, Princeton, New Jersey.

Grenier, M., B. Oakleaf, K. Taylor, and M. Hymas. 2004. *Inventory and Mapping of Black tailed Prairie Dogs in Wyoming – An Estimate of Acreage Completion Report*.

Grenier, M. 2003. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department. Lander, WY. 16pp

Haug, E. A. and L. W. Oliphant. 1985. Movements, Activity Patterns, and Habitat Use of Burrowing Owls in Saskatchewan. Journal of Wildlife Management. 54(1):27-35.

Hazlett, D.L. 1996. *The discovery of Spiranthes diluvialis along the Niobrara River in Wyoming and Nebraska*. Report prepared for the Bureau of Land Management Wyoming State Office.

Hazlett, D.L. 1997. *A 1997 search for Spiranthes diluvialis in southeastern Wyoming and western Nebraska*. Report prepared for the Bureau of Land Management Wyoming State Office.

Heidel, Bonnie. Botanist. Wyoming Natural Diversity Database. University of Wyoming. Laramie, WY

Hiat, G.S. and D. Baker. 1981. Effects of oil/gas drilling on elk and mule deer winter distributions on Crooks Mountain, Wyoming. Wyoming Game and Fish Department.

Holloran, M. J, and S. H. Anderson. 2005. Spatial distribution of Greater Sage-Grouse nests in relatively contiguous sagebrush habitats. Condor 107:742-752.

Holloran, M J.; B. J. Heath; A. G. Lyon; S. J. Slater; J. L. Kuppiers; and S. H. Anderson. 2005. Greater sage-grouse nesting habitat selection and success in Wyoming. J. Wildl. Manage. 69(2):638-649.

Holloran, M. J., R. C. Kaiser, and W. A. Hubert. 2007. Population Response of yearling greater sage-grouse to the infrastructure of natural gas fields in southwestern Wyoming. Completion report. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY, USA. 34pp.

Hoogland, J. 1995. *The black-tailed prairie dog: Social life of a burrowing mammal*. Chicago: Chicago University Press.

Hubert, W. A. 1993. *The Powder River: a relatively pristine stream on the Great Plains*. Pages 387-395 in L. W. Hesse, C. B. Stalnaker, N. G. Benson, and J. R. Zuboy, editors. Restoration planning for the rivers of the Mississippi River ecosystem. Biological Report 19, National Biological Survey, Washington, D.C.

ICF/Jones and Stokes. 2008. *Pennaco Energy Inc., Sales 14 Plan of Development, Wildlife Surveys and Habitat Assessment.* Gillette, WY. 15 pp.

ICF/Jones and Stokes. 2008. *Pennaco Energy Inc., Sales 14 Plan of Development, Wildlife Surveys and Habitat Assessment; Addendum A.* Gillette, WY. 13 pp.

ICF/Jones and Stokes. 2009. *Pennaco Energy Inc., Sales 14 Plan of Development, Wildlife Surveys and Habitat Assessment; Addendum B.* Gillette, WY. 11 pp.

Ingelfinger, F., and S. Anderson. 2004. Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. Western North American Naturalist 64:385-395

Ingelfinger F. 2001. *The effects of natural gas development on sagebrush steppe passerines in Sublette County, Wyoming*. M.Sc. thesis, University of Wyoming, Laramie, WY.

Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature. Arc Wildlife Services Ltd., Calgary, Alberta, Canada.

Jellison, Bert. 2005. Sage-Grouse Restoration Project: Lake DeSmet Conservation District. Wyoming Game and Fish Department. Sheridan, WY.

Kelly Brian T. 2004. Letter to interested parties: Black-footed ferret clearance surveys. U.S. Fish and Wildlife Service (February 2, 2004). Cheyenne, WY. 4pp.

King, J. A. 1955. Social Behavior, Social Organization and Population Dynamics in a Black-tailed Prairie Dog Town in the Black Hills of South Dakota. Contr. Lab. Vert. Biol., University of Michigan. 67pp.

Klute, D. S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. U.S. Department of the Interior; Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C.

Knick, S. T., and J. T. Rotenberry. 1995. Landscape characteristics of fragmented shrub-steppe habitats and breeding passerine birds. Conservation Biology 9:1059-1071.

Knick S. T., D. S. Dobkin, J. T. Rotenberry, M. A. Schroeder, W. M. Vander Haegen, and C. van Riper III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor. 105:611–634.

Knight R. L., and J. Y. Kawashima. 1993. Responses of raven and Red-tailed Hawk populations to linear right-of-ways. Journal of Wildlife Management. 57:266–271.

Knopf F.L. and J.R Rupert. 1995. Habits and habitats of Mountain Plovers in California. Condor 97:743-751.

Landry, R.E. 1979. *Growth and development of the Burrowing Owl*. M.S. thesis, California State University, Long Beach, CA.

Litzel, R. 2004. Personal communication [January 6 phone conversation with Jim Sparks]. Johnson County Weed and Pest District.

Lowham, H.W. Streamflows in Wyoming WRIR 88-4045 U.S. Geological Survey 1988

Lustig, Thomas D., March. 2003. Where Would You Like the Holes Drilled into Your Crucial Winter Range? Transactions of the 67th North American Wildlife and Natural Resources Conference.

Marra PP, Griffing SM, McLean RG. West Nile virus and wildlife health. Emerg Infect Dis [serial online] 2003 Jul. Available from: URL: http://www.cdc.gov/ncidod/vol9no7/03-0277.htm.

McCraken, J. G., D. W. Uresk and R. M. Mansen. 1985. Burrowing Owl Foods in Conata Basin, South Dakota. Great Basin Naturalist 45: 287-290.

McDonald, D., N.M. Korfanta, and S.J. Lantz. 2004. *The Burrowing Owl (Athene cunicularia): a technical conservation assessment*. USDA Forest Service, Rocky Mountain Region.

Meffe, G.K. and C.R. Carroll. 1994. *Principles of Conservation Biology*. Sinauer Associates, Inc. Sunderland, MA.

Miller, K.A Peak-Flow Characteristics of Wyoming Streams WRIR 03-4107 U.S. Geological Survey 2003

Mooney, A. 2004. Personal Communication [January 6 phone conversation with Jim Sparks]. Campbell County Weed and Pest District.

Moynahan, B. J. and M. S. Lindberg. 2004. *Nest Locations of Greater Sage-Grouse in Relation to Leks in North-Central Montana*. *Presented at* Montana Sage-Grouse Workshop, Montana Chapter of The Wildlife Society, Billings.

Moynahan, B. J.; M. S. Lindberg; J. J. Rotella; and J. W. Thomas. 2005. Factors Affecting Nest Survival of Greater Sage-Grouse in Northcentral Montana. J. Wildl. Manage.

Moynahan, B. J., M. S. Lindberg, J. J. Rotella, and J. W. Thomas. 2007. Factors affecting nest survival of greater sage-grouse in north-central Montana. Journal of Wildlife Management 71:1773-1783.

Naugle, D. E.; C. L. Aldridge; B. L. Walker; T. E. Cornish; B. J. Moynahan; M. J. Holloran; K. Brown; G. D. Johnson; E. T. Schmidtmann; R. T. Mayer; C. Y. Kato; M. R. Matchett; T. J. Christiansen; W. E. Cook; T. Creekmore; R. D. Falise; E. T. Rinkes; and M. S. Boyce. 2004. West Nile virus: Pending Crisis of Greater Sage-grouse. Ecology Letters. 7:704-713.

Naugle, David E.; Brett L. Walker; and Kevin E. Doherty. 2006. Sage Grouse Population Response to Coal-bed Natural Gas Development in the Powder River Basin: Interim Progress Report on Region-wide Lek Analyses. May 26, 2006. University of Montana. Missoula, MT. 10pp.

Noss, R. F. and A. Cooperrider. 1994. *Saving Nature's Legacy: Protecting and Restoring Biodiversity*. Defenders of Wildlife and Island Press, Washington, D. C.

Oakleaf, Bob. January 13, 1988. Letter to BFAT: Preliminary BFF Reintroduction Site Analysis, Meeteetse Management Plan Assignments. Wyoming Game and Fish Department. Lander, WY. 10pp.

Olenick, B. E. 1990. *Breeding biology of burrowing owls using artificial nest burrows in southeastern Idaho*. Thesis, Idaho State University, Pocatello, Idaho, USA.

Paige, C., and S. A. Ritter. 1999. *Birds in a sagebrush sea: managing sagebrush habitats for bird communities*. Partners in Western Flight working group, Boise, ID.

Patterson, C. T. and S. H. Anderson. 1985. Distributions of Eagles and a Survey for Habitat Characteristics of Communal Roosts of Bald Eagles (Haliaeetus leucocephalus) Wintering in Northeastern Wyoming. Wyoming Cooperative Fishery and Wildlife Research Unit. University of Wyoming. Laramie, WY.

Porneluzi, P, J. C. Bednarz, L. J. Goodrich, N. Zawada, and J. Hoover. 1993. Reproductive performance of territorial Ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. Conservation Biology 7:618-622.

Primack, R.B. 1993. Essentials of conservation biology. Sinauer Associates, Sunderland, Massachusetts, USA.

Reading, R. P., S. R. Beissinger, J. J. Grensten, and T. W. Clark. 1989. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. Attributes of Black-tailed Prairie Dog Colonies in North Central Montana with Management Recommendations for the Conservation of Biodiversity. pgs 13-28.

Reading, R., and Randy Matchet. 1997. Attributes of Black-tailed Prairie Dog Colonies in Northcentral Montana. Journal of Wildlife Management 61(3): 664-673.

Rinkes, T. 2003. Personal communication [Draft notes from Annual Sage-Grouse and Sagebrush Species of Concern Meeting]. Bureau of land Management Wildlife Biologist/Sage Grouse Coordinator.

Robinson, S. K. 1992. *Population dynamics of breeding birds in a fragmented Illinois landscape*. Pages 408-418 in J. Hagan and D. W. Johnston, editors. Ecology and conservation of neotropical migrant land birds. Smithsonian Institution press, Washington, D. C.

Rogers, Brad. Personal Communication. Fish and Wildlife Biologist. U.S. Fish and Wildlife Service, Cheyenne Field Office. Cheyenne, WY.

Romin, Laura A., and Muck, James A. May 1999. Utah Field Office Guidelines For Raptor Protection From Human And Land Use Disturbances. U.S. Fish and Wildlife Service, Salt Lake City, Utah

Rotenberry J. T., and J. A. Wiens. 1980a. Habitat structure, patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. Ecology. 61:1228–1250.

Rowland, M. M., M. Leu, , S. P. Finn, S. Hanser, L. H. Suring, J. M. Boyd, C. W. Meinke, S. T. Knick, and M. J. Wisdom. 2005. Assessment of threats to sagebrush habitats and associated species of concern in the Wyoming Basins. Version 1.1, June 2005, unpublished report on file at USGS Biological Resources Discipline, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Rowland, M. M., M. Leu, , S. P. Finn, S. Hanser, L. H. Suring, J. M. Boyd, C. W. Meinke, S. T. Knick, and M. J. Wisdom. 2005. Assessment of threats to sagebrush habitats and associated species of concern in the Wyoming Basins. Version 1.1, June 2005, unpublished report on file at USGS Biological Resources Discipline, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebs, K.S. McKelvey, and J.R. Squires. 1999. The Scientific Basis for Lynx Conservation: Qualified Insights. Ch16. USDA Forest Service Technical Report RMRS-GTR-30.

Saab, V., and T. Rich. 1997. *Large-scale conservation assessment for neotropical migratory landbirds in the Interior Columbia River Basin*. USDA Forest Service General Technical Report PNW-GTR-399, Portland, Oregon, USA.

State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development. 2008. Using the best available science to coordinate conservation actions that benefit greater sage-grouse across states affected by oil and gas development in Management Zones I-II (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming). Unpublished report. Colorado Division of Wildlife, Denver; Montana Fish, Wildlife and Parks, Helena; North Dakota Game and Fish Department, Bismarck; Utah Division of Wildlife Resources, Salt Lake City; Wyoming Game and Fish Department, Cheyenne.

Steenhof K., M. N. Kochert, and J. A. Roppe. 1993. Nesting by raptors and Common Ravens on electrical transmission line towers. Journal of Wildlife Management. 57:272–281.

Stinson, D. W., D. W. Hays, and M. A. Schroeder. 2004. Washington State Recovery Plan for the Sage-grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 109 pages.

Temple S. A. 1986. Predicting impacts of habitat fragmentation on forest birds: A comparison of two models. Pages 301-304 in Wildlife 2000 (J. Verner, C. J. Ralph, and M. L. Morrison, Eds.). Univ. Wisconsin Press, Madison.

Temple S.A., and J. R. Cary. 1988. Modeling dynamics of habitat-interior bird populations in fragmented landscapes Conserv. Biol.2 :340-347.

Temple, S.A., and B.A. Wilcox. 1986. Introduction: Predicting effects of habitat patchiness and fragmentation. In *Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates*, ed. J. Verner, M.L. Morrison, and C.J. Ralph, 261-62. Madison: University of Wisconsin Press.

The National Environmental Policy Act of 1969 (NEPA), as amended (Pub. L. 91-90, 42 U.S.C. 4321 et seq.).

Urban, D. L., and H. H. Shugart, Jr. 1984. Avian demography in mosaic landscapes: modeling paradigm and preliminary results. Pages 273-280 in J. Verner, M. L. Morrison, and C. J. Ralph editors. Wildlife 2000: Modeling habitat relationships of terrestrial vertebrates. University of Wisconsin Press, Madison.

U.S. Department of the Interior, Bureau of Land Management and Office of the Solicitor (editors). 2001. The Federal Land Policy and Management Act, as amended. Public Law 94-579.

U.S. Department of the Interior 2001, Bureau of Land Management, Buffalo Field Office. Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office April 2001.

U.S. Department of the Interior 2003, Bureau of Land Management. Powder River Oil and Gas Project Environmental Impact Statement and Resource Management Plan Amendment. April 30, 2003.

U.S. Department of the Interior 2007, US Fish and Wildlife Service. Reinitiation of Formal Consultation for Powder River Oil and Gas Project. March 23, 2007

U.S. Department of the Interior, Fish and Wildlife Service. 2002. Final Biological and Conference Opinion for the Powder River Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties (WY6633). U.S. Fish and Wildlife Service. December 17, 2002. Cheyenne, WY. 58pp.

U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 1989. Black-footed ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, CO and Albuquerque, NM.

Vander Haegen, W. M., F. C. Dobler, and D. J. Pierce. 2000. Shrub-steppe bird response to habitat and landscape variables in eastern Washington, USA. Conservation Biology 14:1145-1160.

Walker B, Naugle D, Rinkes T. 2003. The Response of Sage Grouse to Coal-bed Methane Development and West Nile virus in the Powder River Basin: Is There a Link ? Page 6 in: Program and Abstracts for the Annual Wildlife Society Meeting, Wyoming Chapter.

Walker, B.L., D. E. Naugle, and K.E. Doherty. 2007. Greater sage-grouse population response to energy development and habitat loss. Journal of Wildlife Management 71:2644-2654.

WDEQ, June 14, 2004. Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments

Windingstad, R. M., F. X. Kartch, R. K. Stroud, and M. R. Smith. 1987. Salt toxicosis in waterfowl in North Dakota. Jour. Wildlife Diseases 23(3):443-446.

Wyoming Game and Fish Department (WGFD). 2004. Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands. WGFD. Cheyenne, WY

WGFD. 2003. Wyoming Greater Sage-Grouse Conservation Plan. WGFD. Cheyenne, WY

WGFD. 2004. Sheridan Region Wyoming Game and Fish Department: Annual Sage-Grouse Completion Report for 2004. Wyoming Game and Fish Department. Gillette, WY.

WGFD. 2005. Northeast Wyoming Local Working Group Area: Annual Sage-Grouse Completion Report for 2005. Wyoming Game and Fish Department. Buffalo, WY. 42pp.

WGFD. 2008. Hunting and Sage-Grouse: A Technical Review of Harvest Management On a Species of Concern in Wyoming. Wyoming Game and Fish Department. Green River, WY. 21pp.

8. LIST OF INTERDISCIPLINARY TEAM PREPARERS AND REVIEWERS

Travis Kern, Natural Resource Specialist
Casey Freise, Supervisory Natural Resource Specialist
Travis Kern, Hydrologist
Mathew Warren, Petroleum Engineer
Kristine Phillips, Legal Instruments Examiner
Seth Lambert, Archaeologist
Chris Durham, Wildlife Biologist
Jerry Queen, Kerry Aggen Geologist
Duane W. Spencer, Field Manager

Interdisciplinary Team Lead: Travis Kern

Appendix A.

Monitor Well Drilling Guidelines

As part of the approval of this POD, the operator will be responsible for drilling, completing, and equipping a set of monitoring wells, as described below. The specific location will be determined in consultation with the BLM, and may only be drilled in a location where the oil and gas mineral estate is owned by the Federal Government.

USBLM CBNG groundwater monitoring sites in the Powder River Basin generally consist of two types of wells and a common data collection platform. The two types of wells are: 1) coal or production zone completion(s) and 2) under- or over-burden sand zone completions. Descriptions of these three components are as follows:

1. Coal Zone Monitor Wells
   There could be one or more of these wells at each monitor site, depending on the number of CBNG producing zones. Because of the presence of methane, and potential for significant well head pressure, these wells must be shut in (not open to the atmosphere). These wells are completed the same as actual production wells and are subject to the same Conditions of Approval (COA) associated with CBNG production wells. The finished well will include the following:

   The well(s) will be drilled to the top of the production zone(s) and 5 1/2" OD (minimum) API steel casing will be set and cemented from the top of coal to the surface. The coal will then be drilled out, leaving an open-hole completion. The well will then be circulated with fresh water to remove any remaining drilling fluids and solids, and air lifted to get a yield estimate. If the coal doesn't appear to be making water during the cleanup of the well bore, water enhancement (and possibly under reaming) may be required. The well must be completed on top with a standard well head, i.e. KVF 'Gillette Special' well head (2x2 or 2x4 with a 2", centered tubing port and threaded auxiliary access port in the mandrel).

   Standard equipment includes:
   a. KVF wellhead as described above
   b. downhole transducer to measure total head (gas + water) - we are currently using Druck PTX1835, 250 psig pressure transmitters
   c. wellhead pressure transducer to measure well head pressure (this allows separation of gas and water pressures) - we are currently using Druck PTX621 transmitters (10, 100, up to 900 psig, depending on anticipated well head pressure)
   d. an airline consisting of 1/8" ID by 3/8" OD poly tubing, running from the surface to near the bottom of the hole, suspending a weight to keep the line taught. This arrangement allows verification measurements without opening the wellbore.
   e. access ports to allow for pressure testing, sampling (gas and water), and detection of methane.

2. Sand Zone Monitor Wells
   There could be one or more of these wells at each monitor site, depending on parameters of interest, local concerns, etc. Typically there is a well completed in an overburden sand to monitor leakage of the shallower, generally more accessible sands. Wells are completed in under-burden sands when the under-burden sands are of more local interest or are of more significant thickness and quality, and some sites are established with wells in each of the sands from the surface down to the production zone to study recharge/discharge relationships, inter-aquifer communication,

and changes in water quality. In addition, some sites will require shallow alluvial wells along ephemeral drainages receiving CBM discharge water - again to look at recharge. These wells are completed as follows:

The depth of the sand well(s) will be determined in the field utilizing the geophysical logs from the adjacent coal well(s). On wells where coal is penetrated (as determined from the logs from the adjacent coal well(s)) and on wells greater than 500 feet in depth, drilling and casing will be done as described above for the coal zone well(s). One of two completion methods may be used. The decision on which method to use will be determined by the authorized officer depending on the objectives and use of the well.

Method 1: Steel casing will be set through the sand zone, cemented to surface, and perforated, 4 shots per foot, through the sand zone.

Method 2: On wells where water quality sampling is a primary concern, steel casing will be set above the sand zone and cemented to the surface. The sand zone will then be drilled out and a screened or slotted casing string set through the sand zone. This screened casing string can either be placed using packers (i.e. K-packer) or hung on a string of casing from the surface.

On wells not penetrating coals and less than 500 feet (and optionally on wells from 500 to approximately 700 feet), the hole must be drilled with a minimum of a 9" bit to accommodate SDR17, 5 inch ID (minimum) PVC casing and 1" (minimum) flush joint tremie pipe allowing for proper placement of gravel pack and bentonite grout. If larger casing is used, a larger hole will have to be drilled. Upon completion of drilling, geophysical logs will be run to determine the exact placement of the well screen. The well casing will include 10 to 20 feet of blank pipe on the bottom (capped), .020 slot well screen open to the selected sand zone, and blank pipe to the surface. The well will then be gravel packed with 10-20 silica sand to cover the well screen (and associated sand zone).

On very shallow wells (less than 200 feet) the annulus above the gravel pack will be backfilled with bentonite gravel (or pellets) to the surface. On wells from 200 to approximately 700 feet total depth, the annulus above the gravel pack must be grouted from the bottom to the surface using a tremie. The top of the well casing must have threads (slip to thread adapter) and a vented cap.

The well(s) will then be cleaned up by air lifting until all drilling fluids and solids are removed, clear water is produced, and a yield is estimated.

Standard equipment includes:

Either a submersible transducer as in the coal wells (we generally use these if depth to water is greater than 400 feet or so) or a shaft encoder (Handar, Sutron, Stevens) and float-tape-weight arrangement.

3. Data collection platform and miscellaneous support equipment.

All wells are linked to a central data logger (Campbell CR10 or CR510) located in a central shelter and powered via 12 volt batteries and solar modules.

All wells are enclosed in secure, weather proof shelters and fenced in to protect from livestock and wildlife damage.

Attached are photo examples of two and four well setups.

Other Requirements:

1. Equipment Funding: The methane operator will be required to provide the BLM with $5000 for each monitoring well bore (i.e. $10,000 for a typical two well setup, $15,000 for a three well setup, etc.).

2. Schedule: Wells must be completed and funding provided 30 days prior to initiating pumping of production wells in proximity of the monitoring wells.

3. Access: If no public access exists to the monitor well site, the CBM operator must provide access in the form of a right of way or access agreement with the private landowners involved.

4. The operator shall submit APDs to BLM for the monitor wells. The APDs should include the completed APD cover sheet (Form 3160-3), survey plats, a drilling plan and a surface use plan (including a map). The monitor wells will require a cultural inventory. In addition, they are subject to the same spud notification requirements and completion report requirements as regular federal wells (see General Conditions of Approval). If you have any questions concerning this stipulation and for information on locating and equipping of the wells, please contact Mike Brogan, BLM Hydrologist, at (307) 261-7600.

5. Monitor wells are subject to the same standard COA applied to CBNG production wells.

6. Prior to installation of monitoring equipment by the BLM, the operator will submit to the BLM copies of the following:
    - State Engineers Well Permit (U.W. 5) and Well Completion (U.W. 6) forms
    - Signed landowner access agreement (if applicable)
    - Final copies of all well logs