

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

J.M. Huber Corporation
Reservoir Creek

ENVIRONMENTAL ASSESSMENT –WY-070-07-058

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize J.M. Huber Corporation’s Reservoir Creek Coal Bed Natural Gas (CBNG) POD comprised of the following 10 Applications for Permit to Drill (APDs), as follows:

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	RESERVOIR CREEK MANIGAULT	11LW-14*	NESW	14	56N	75W	WYW130088
2	RESERVOIR CREEK MANIGAULT	13LW-14	SWSW	14	56N	75W	WYW130088
3	RESERVOIR CREEK MANIGAULT	3LW-23	NENW	23	56N	75W	WYW130088
4	RESERVOIR CREEK MANIGAULT	5LW-23	SWNW	23	56N	75W	WYW130088
5	RESERVOIR CREEK MANIGAULT	11LW-23	NESW	23	56N	75W	WYW130088
6	RESERVOIR CREEK MANIGAULT	13LW-23	SWSW	23	56N	75W	WYW130088
7	RESERVOIR CREEK MANIGAULT	1CKW-26	NENE	26	56N	75W	WYW144528
8	RESERVOIR CREEK MANIGAULT	3CKW-26	NENW	26	56N	75W	WYW130618
9	RESERVOIR CREEK MANIGAULT	7CKW-26	SWNE	26	56N	75W	WYW144528
10	RESERVOIR CREEK MANIGAULT	11CKW-26	NESW	26	56N	75W	WYW144528

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Lease Number	Outfall Number
1	Golden Eagle	NENE	26	56N	75W	WYW144528	WY0040347-002
2	Brewton	NWNE	13	56N	75W	WYW144528	WY0040347-005
3	Ancient Warrior	NENE	26	56N	75W	WYW130088	WY0040347-004
4	Randy’s Pond	NESW	26	56N	75W	WYW144528	WY004037-007
5	Duck Pond—PIT	NWSW	29	56N	75W	FEE	WY0049557-004

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

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

1. The Operator, in their POD, has committed to:
 - Comply with all applicable Federal, State and Local laws and regulations.
 - Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
 - Provide water well agreements to the owners of record for permitted water wells within the area of influence of the action.

- Provide water analysis from a designated reference well in each coal zone.
2. The Operator has certified that a Surface Use Agreement has been reached with the Landowner(s).
 3. Alternative C will not result in any undue or unnecessary environmental degradation.
 4. It is in the public interest to approve these wells, as the leases are being drained of federal gas, resulting in a loss of revenue for the government.
 5. Mitigation measures applied by the BLM will alleviate or minimize environmental impacts.
 6. Alternative C is the environmentally-preferred Alternative.
 7. The proposed action is in conformance with the PRB FEIS and the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001.

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

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

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

Field Manager: _____ Date: _____

**BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
J.M. Huber Corporation
Reservoir Creek
PLAN OF DEVELOPMENT
WY-070-07-058**

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to define and produce coal bed natural gas (CBNG) on three valid federal oil and gas mineral leases issued to the applicant by the BLM. Analysis has determined that federal CBNG is being drained from the federal leases by surrounding fee or state mineral well development. The need exists because without approval of the Applications for Permit to Drill (APDs), federal lease royalties will be lost and the lessee will be deprived of the federal gas they have the rights to develop.

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

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

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternative A - No Action

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

2.2. Alternative B Proposed Action

Proposed Action Title/Type: J.M. Huber Corporation’s Reservoir Creek Plan of Development (POD) for 10 coal bed natural gas well APD’s and associated infrastructure.

Proposed Well Information: There are 10 wells proposed within this POD, as follows:

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease #
1	RESERVOIR CREEK MANIGAULT	11LW-14*	NESW	14	56N	75W	WYW130088
2	RESERVOIR CREEK MANIGAULT	13LW-14	SWSW	14	56N	75W	WYW130088
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5	Duck Pond—PIT	NWSW	29	56N	75W	FEE	WY0049557-004

County: Campbell

Applicant: J.M. Huber Corporation

Surface Owners: Manigault Ranch

Project Description:

The proposed action involves the development of the project, which includes the following:

- Drilling of 10 total federal CBM wells in Lower Cook, Wall, Cache, Canyon and Pawnee coal zones to a depth of 990 to 1115 feet respectively.
- An unimproved and improved road network.
- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 2 proposed and 3 existing discharge points, 4 on-channel and 1 off channel impoundments, all existing and all located within the Middle Powder River watershed.
- A buried gas, water and power line network.

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

Implementation of committed mitigation measures contained in the 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. Provide water well agreements to the owners of record for permitted water wells within the area of influence of the action.
4. Provide water analysis from a designated reference well in each coal zone.

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

2.3. Alternative C – Environmentally Preferred

Alternative C represents a modification of Alternative B based on the operator and BLM working cooperatively to reduce environmental impacts. The description of Alternative C is the same as Alternative B with the addition of 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 ensure that potential impacts to natural resources would be minimized. 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. 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 or minimize environmental effects of the operator’s proposal. The specific changes identified for the Reservoir Creek POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well #	Qtr/Qtr	Sec	T/R	Onsite Notes
11LW-14	NESW	14	56/75	Moved well approximately 150 yards SE into grassland habitat. Moving the well will conserve sagebrush habitat and shorten the length of the road and pipeline corridor resulting in less disturbance. A 100x20 slot will be required for drilling and the pit will be lined due to close proximity to drainage. Operator will stake slot before pre-construction meeting.
13LW-14	SWSW	14	56/75	Operator will line the pit due to close proximity to drainage.
5LW-23	SWNW	23	56/75	Operator will line the pit due to close proximity to drainage.
13LW-23	SWSW	23	56/75	No pad. Operator will build a 100x20 slot for the drilling rig and the frac tanks. Operator will stake slot before pre-construction meeting.
1CKW-26	NENE	26	56/75	Operator will line the pit due to close proximity to drainage. Stock tank will be added at outfall. Location will be a designed pad as submitted.

Well #	Qtr/Qtr	Sec	T/R	Onsite Notes
3CKW-26	NENW	26	56/75	No pad. Spoil from the pit will be used to help in leveling the tanks. Pit will be lined due to close proximity to LX Bar Creek.
7CKW-26	SWNE	26	56/75	No pad. Operator will build a 100x20 slot for the drilling rig and the frac tanks. Operator will stake slot before pre-construction meeting.
11CKW-26	NESW	26	56/75	Operator will line the pit due to close proximity to reservoir/drainage. Operator will submit plans for installing culverts in access road. Stock tank will be added at outfall.
				Operator will update maps to include existing infrastructure within POD Boundary.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved September, 2006. For WYPDES permits received by DEQ after the August 1st effective date, the BLM requires that operators comply with the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

2.3.2.2. Surface Water

1. Channel Crossings:
 - a) Minimize channel disturbance as much as possible by limiting pipeline and road crossings.
 - b) Avoid running pipelines and access roads within floodplains or parallel to a stream channel.
 - c) Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
 - d) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.
3. Concerns regarding the quality of the discharged CBM water on downstream irrigation use may require operators to increase the amount of storage of CBM water during the irrigation months and allow more surface discharge during the non-irrigation months.

2.3.2.3. Soils

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

2.3.2.4. Vegetation

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

2.3.2.5. Wetland/Riparian

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

2.3.2.6. Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.
2. Containment impoundments will be fenced to exclude wildlife and livestock. If they are not fenced, they will be designed and constructed to prevent entrapment and drowning.
3. All stock tanks shall include a ramp to enable trapped small birds and mammals to escape. See Idaho BLM Technical Bulletin 89-4 entitled Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations.

2.3.2.7. Threatened, Endangered, or Sensitive Species

2.3.2.7.1. Bald Eagle

1. 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.

2. 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.
3. A year-round disturbance-free buffer zone of 1/2 mile will be established for all bald eagle winter roost sites. These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.
4. 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).

2.3.2.7.2. Mountain Plover

1. A disturbance-free buffer zone of 0.25 mile will be established around all occupied mountain plover nesting areas between March 15 and July 31.
2. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover will not be constructed within ¼ mile of known mountain plover nest sites.
3. Construction of ancillary facilities (for example, compressor stations, processing plants) will not be located within ½ mile of known nesting areas. The threats of vehicle collision to adult plovers and their broods will be minimized, especially within breeding aggregation areas.
4. Where possible, roads will be located outside of plover nesting areas.
5. 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.
6. 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.
7. When above ground markers are used on capped and abandoned wells they will be identified with markers no taller than four feet with perch inhibiting devices on the top to avoid creation of raptor hunting perches within 0.5 mile of nesting areas.
8. Reclamation of areas of previously suitable mountain plover habitat will include the seeding of vegetation to produce suitable habitat for mountain plover.

2.3.2.7.3. Ute Ladies'-tresses Orchid

1. Moist soils near wetlands, streams, lakes, or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.
2. 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.

2.3.2.8. Visual Resources

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

2.3.2.9. Noise

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

2.3.2.10. Air Quality

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

2.3.3. Site specific mitigation measures

General

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

Surface Use

1. Due to close proximity to drainages, the Operator will line the drilling pits at the following well locations: 11-14, 13-14, 5-23, 1-26, 3-26, and 11-26.
2. The 1-26 well location will require an engineered pad. The 11-14, 13-23 and 7-26 well locations will require 100 x 20 foot slot areas for the frac tanks.
3. 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 Reservoir Creek POD is Carlsbad Canyon, 2.5Y 6/2.
4. Provide 4" of aggregate where grades exceed 8% for stability and erosion prevention.
5. The culvert locations will be staked prior to construction. The culvert invert grade and finished road grade will be clearly indicated on the stakes. Culverts will be installed on natural ground, or on a designed flow line of a ditch. The minimum cover over culverts will be 12" or one-half the diameter whichever is greater. Drainage laterals in the form of culverts or water bars shall be placed according to the following spacing:

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

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

Reclamation Standards:

- C.3. The reclaimed area shall be stable and exhibit none of the following characteristics:
- Large rills or gullies.
 - Perceptible soil movement or head cutting in drainages.
 - Slope instability on, or adjacent to, the reclaimed area in question.
- C.4. The soil surface must be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt. Additional short-term measures, such as the application of mulch, shall be used to reduce surface soil movement.
- C.5. Vegetation canopy cover (on unforested sites), production and species diversity (including shrubs) shall approximate the surrounding undisturbed area. The vegetation shall stabilize the site and support the planned post disturbance land use, provide for natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
- Successful onsite establishment of species included in the planting mixture or other desirable species.
 - Evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.
- C.6. The reclaimed landscape shall have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features and meet the needs of the planned post disturbance land use.
7. 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. In lieu of a different specific mix desired by the surface owner, use the following:

Loamy/Shallow Loamy Seed Mix

Species	% in Mix	Lbs PLS*
Western wheatgrass (<i>Pascopyrum smithii</i>)	30	3.6
Bluebunch wheatgrass (<i>Pseudoroegneria spicata ssp. Spicata</i>)	20	2.4
Green needlegrass (<i>Nassella viridula</i>)	20	2.4
Thickspike wheatgrass (<i>Elymus lanceolatus ssp. lanceolatus</i>)	15	1.8

Species	% in Mix	Lbs PLS*
Prairie coneflower (<i>Ratibida columnifera</i>)	5	0.6
White or purple prairie clover (<i>Dalea candidum, purpureum</i>)	5	0.6
American vetch (<i>Vicia americana</i>)	5	0.6
Total	100%	12 lbs/acre

*PLS = pure live seed

*Northern Plains adapted species

*Double this rate if broadcast seeding

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

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

Wildlife

1. No surface disturbing activity shall occur within one mile of bald eagle habitat (LX Bar Creek) annually from November 1 through April 1 (CM9), prior to a winter roost survey. This affects the following wells and their associated infrastructure:

Township/Range	Section	Wells and Infrastructure
T56N R75W6N W	23	13LW-23
T56N R75W	26	1CKW-26, 3CKW-26, 7CKW-26, 11CKW-26

Note: The timing limitation area was reduced based on topographic features to the LX Bar floodplain and reservoirs.

- a. If a roost is identified and construction has not been completed, a year round disturbance-free buffer zone of 0.5 mile will be established for all bald eagle winter roost sites (November 1 - April 1). Additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 AM and 3:00 PM may be necessary to prevent disturbance.
 - b. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.
2. The following conditions will minimize the impacts to raptors:
 - a. No surface disturbing activity will be allowed within ½ mile of the documented nest sites from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. The timing restriction may be removed from inactive nests upon consultation with BLM. This timing restriction affects the following wells as well as nearby reservoirs and infrastructure:

Nest	Township/Range	Section	Proposed Wells and Infrastructure Affected
3	T 56N R75W	23	5LW-23, 11LW-23, 13LW-23
4,5,6	T56N, R75W	26	7CKW-26
7,8,10	T56N, R75W	26	7CKW-26, 11CKW-26

- b. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
- c. Well metering, maintenance and other site visits within 0.5 miles of raptor nests shall be minimized as much as possible during the breeding season (February 1 – July 31), and restricted to between 0900 and 1500 hours.
- d. Nest productivity checks shall be completed for all raptor nests within the Reservoir Creek POD listed in the table below. The productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success/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.

T-JS ID	UTM E	UTM N	Species	2006 Activity
3	432075	4962748	COHA	Active
9	431752	4960869	RTHA	Active

- 3. The following conditions will minimize the impacts to mountain plovers:
 - a. No surface disturbing activities are permitted in suitable mountain plover habitat from March 15-July 31, unless a mountain plover nesting survey has been conducted during the current breeding season. This affects the following areas: LX Bar Creek floodplain.
 - b. Mountain plover nesting surveys shall be conducted by a Bureau approved biologist following the most current U.S. Fish and Wildlife Service Mountain Plover Survey Guidelines (the survey period is May 1-June 15). All survey results must be submitted in writing to the BFO and approved prior to initiation of surface disturbing activities.
 - c. If a mountain plover is identified, then a seasonal disturbance-free buffer of ¼ mile shall be maintained between March 15 and July 31. If no mountain plovers are identified, then surface disturbing activities may be permitted within suitable habitat until the following breeding season.

2.4. Alternatives considered but not analyzed in detail

The operator evaluated and rejected Land Application Disposal (irrigation) of produced water for this POD. For a complete discussion of why this alternative was rejected refer to page L-1 of the Water Management Plan.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on July 17, 2006. Field inspections of the proposed Reservoir Creek CBM project were conducted on 12/20/2006 by: Ace Armann - Field Operations Superintendent, Larry Bridger – Civil Engineer, Rick Estes - Civil Engineer (permitting specialist), Dale Hoffman - Civil Engineer, Terry Kruse - Technical Manager, Doug Masters - Construction Supervisor, and John Vasein - Environmental/Permitting Specialist – J.M Huber/Baker Energy representatives; Kendall Cox – Manigault Ranch Representative; Brent Sobotka – Hydrologist SWCA; Ben Adams, Kathy Brus, Thomas Bills, B. J. Earle, Theresa Gulbrandson, and Lee Harrelson - 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			Thomas Bills
Floodplains	X			Ben Adams
Wilderness Values			X	Theresa Gulbrandson
ACECs			X	Theresa Gulbrandson
Water Resources	X			Ben Adams
Air Quality		X		Theresa Gulbrandson
Cultural or Historical Values			X	B.J. Earle
Prime or Unique Farmlands			X	Theresa Gulbrandson
Wild & Scenic Rivers			X	Theresa Gulbrandson
Wetland/Riparian	X			Ben Adams
Native American Religious Concerns			X	B.J. Earle
Hazardous Wastes or Solids		X		Theresa Gulbrandson
Invasive, Nonnative Species	X			Theresa Gulbrandson
Environmental Justice		X		Theresa Gulbrandson

3.1. Topographic Characteristics of Project Area

The Reservoir Creek POD is located north of Spotted Horse in northwest Campbell County, in Township 56N, Range 75W, Sections 14, 23 and 26. Topography in the project area ranges from relatively flat plateaus and gently sloping drainage bottoms to steep valley walls, featuring outcrops, ledges, and cliff faces along LX Bar Creek and tributaries. Elevations in the area range from 3,800 feet along LX Bar Creek to 4,240 feet on the ridge tops and mesas. LX Bar Creek and its tributary Reservoir Creek are the primary drainages within the project area, with a small portion of the project area draining towards SA Creek. Historic uses of the area are primarily associated with livestock grazing. More recently, this has become an area of oil and gas development although livestock grazing still occurs. Many of the roads that will be used by the operator for the development of this project are already in place.

3.2. Vegetation & Soils

3.2.1. Soils

Soils within the project area were identified from the *North Campbell County Survey Area, Wyoming (WY705)*. The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards and published in 2004. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

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

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

Table 3.2 – Soil Map Unit Types

Map Unit Symbol	Map Unit Name	Musym Acres	Musym %
134	DEEKAY-OLDWOLF LOAMS, 0 TO 6 PERCENT SLOPES	266	20%
277	FAIRBURN-MITTENBUTTE-BADLAND COMPLEX, 3 TO 60 PERCENT SLOPES	233	18%
278	FAIRBURN-SAMSIL-BADLAND COMPLEX, 10 TO 45 PERCENT SLOPES	180	14%
299	OLDWOLF-FAIRBURN LOAMS, 3 TO 15 PERCENT SLOPES	115	9%
311	ROCKYPOINT-BORUFF COMPLEX, 0 TO 3 PERCENT SLOPES	90	7%
216	THEEDLE-KISHONA-SHINGLE LOAMS, 3 TO 30 PERCENT SLOPES	68	5%
248	ZIGGY-IWAIT LOAMS, 0 TO 6 PERCENT SLOPES	56	4%
224	UCROSS-IWAIT LOAMS, 0 TO 6 PERCENT SLOPES	54	4%
262	CAMBRIA-KISHONA-ZIGWEID LOAMS, 0 TO 6 PERCENT SLOPES	36	3%
267	CROMACK-SAMSIL CLAY LOAMS, 3 TO 15 PERCENT SLOPES	34	3%
339	ZIGWEID-KISHONA-CAMBRIA COMPLEX, 6 TO 15 PERCENT SLOPES	32	2%
283	GATESON-XEMA-MITTENBUTTE FINE SANDY LOAMS, WOODED, 3 TO 30 PERCENT SLOPES	31	2%
132	DEEKAY-MOORHEAD LOAMS, 0 TO 6 PERCENT SLOPES	25	2%
279	FAIRBURN-SAMSIL-BADLAND COMPLEX, WOODED, 6 TO 50 PERCENT SLOPES	24	2%
323	UCROSS-FAIRBURN LOAMS, 3 TO 15 PERCENT SLOPES	13	1%
217	THEEDLE-SHINGLE LOAMS, 3 TO 30 PERCENT SLOPES	13	1%
225	UCROSS-IWAIT-FAIRBURN LOAMS, 3 TO 30 PERCENT SLOPES	13	1%
309	PITCHDRAW-ASHOLLOW-MITTENBUTTE FINE SANDY LOAMS, 3 TO 20 PERCENT SLOPES	11	1%
334	VONALF-XEMA-MITTENBUTTE FINE SANDY LOAMS, 3 TO 30 PERCENT SLOPES	2	<1%
291	IRONBUTTE-FAIRBURN-MITTENBUTTE COMPLEX, WOODED, 3 TO 60 PERCENT SLOPES	<1	<1%
Total		1298	100%

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

3.2.2. Vegetation

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

Table 3.3 – Map Units and Ecological Sites

Map Unit Symbol	Ecological Site
134	LOAMY (15-17NP)
277	SHALLOW LOAMY (15-17NP)
278	SHALLOW LOAMY (15-17NP)
299	LOAMY (15-17NP)
311	LOWLAND (15-17NP)
216	LOAMY (10-14NP)
248	LOAMY (15-17NP)

Map Unit Symbol	Ecological Site
224	LOAMY (15-17NP)
262	LOAMY (10-14NP)
267	CLAYEY (15-17NP)
339	LOAMY (10-14NP)
283	Ponderosa Pine and Little Bluestem
132	LOAMY (15-17NP)
279	Ponderosa Pine and Little Bluestem
323	LOAMY (15-17NP)
217	LOAMY (10-14NP)
225	LOAMY (15-17NP)
309	SANDY (15-17NP)
334	SANDY (15-17NP)
291	Ponderosa Pine and Little Bluestem

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

Loamy Sites:

This site occurs on land nearly level up to 50% slopes on landforms which include hill slopes and the associated alluvial fans and stream terraces, in the 15-17 inch precipitation zone.

The soils of this site are moderately deep to deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from unspecified sandstone. These soils have moderate permeability and may occur on all slopes.

The Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Rhizomatous Wheatgrasses/Needleandthread/Big Bluestem Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. A mix of warm and cool season mid-grasses dominate the state.

The present plant community is a *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses have decreased.

Dominant grasses identified include: blue grama, prairie junegrass, needleandthread, western wheatgrass, and cheat grass. Other vegetative species identified at onsite: Wyoming big sagebrush, rabbitbrush, prickly pear cactus, scarlet globemallow, fringed sagewort, ponderosa pine, and thistle.

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

Shallow Loamy Sites:

This site occurs on steep slopes and ridge tops, but may occur on all slopes on landforms which include hill sides, ridges and escarpments, in the 15-17 inch precipitation zone.

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

The Historic Climax Plant Community for this site would be a Rhizomatous Wheatgrasses/Needleandthread/Big Bluestem Plant Community. A description of this plant community is described above.

A summary of the ecological sites within the project area are listed in the table below along with the individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.4 – Summary of Ecological Sites

Ecological Site	Acres	Percent
LOAMY (15-17NP)	543	42%
SHALLOW LOAMY (15-17NP)	413	32%
LOAMY (10-14NP)	150	12%
LOWLAND (15-17NP)	90	7%
Ponderosa Pine and Little Bluestem	56	4%
CLAYEY (15-17NP)	34	3%
SANDY (15-17NP)	14	1%
Total	1298	100%

3.2.3. Wetlands/Riparian

A reach of LX Bar Creek is included within this POD’s boundary. This reach is characteristic of major ephemeral drainages in the Powder River Basin, with well established individuals and occasional stands of cottonwood trees, willows and other riparian area species. This reach of LX Bar Creek is fairly sinuous and did not have continuous flow at the time of the onsite. Potholes within the creek channel hold water for periods, and those that are deep enough can have a connection to the drainage’s shallow groundwater table. Wetland areas have developed below leaking reservoirs with plant communities of sedges and rushes. While these are not naturally occurring wetlands, they presently provide valuable habitat for wetland dependent flora and fauna and also provide valuable filtering of effluent seeping from impoundments.

3.2.4. Invasive Species

A search of the inventory maps and databases compiled by the University of Wyoming through cooperation between the BLM and Johnson County Weed and Pest revealed the possible presence of state-listed noxious weeds and invasive/exotic plant infestations. Populations of leafy spurge are found less than one-mile to the west of the project area. Leafy spurge is a perennial weed that grows in nearly all soil types and habitats, spreads rapidly, and is difficult to control. In addition, populations of field bindweed, an invasive perennial vine, exist approximately 4 miles to the northwest of the POD. Russian knapweed, leafy spurge and salt cedar populations are found along the Powder River, approximately 10 miles to the west of the project area. Cheat grass and thistle (not identified to species) were observed throughout the project area during the onsites.

3.3. Wildlife

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

A habitat assessment and initial wildlife inventory surveys were performed by Thunderbird-Jones & Stokes biologists (Wilsey 2006). Surveys for bald eagle winter roosts were conducted during winter 2005-2006; all woodland habitats within the project area including a one-mile perimeter were searched.

Surveys for sage-grouse leks, mountain plovers, raptor nests, and prairie dog colonies were conducted in spring 2006.

A BLM biologist conducted a field visit on December 20, 2006. During this time, he reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

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

3.3.1. Big Game

Big game species expected to be within the Reservoir Creek project area include mule deer and pronghorn antelope. Approximately 150 Mule deer were encountered throughout the project area during the BLM field review in December 2006. The WGFD has designated the entire Reservoir Creek area as winter-yearlong range. Mule deer belong to the Powder River herd unit, which includes the entire Powder River Basin oil and gas project area north of Interstate 90. The 2004 estimated herd population was 56,000 with a population objective of 52,000 (WGFD 2004). The Powder River mule deer herd exhibited a dramatic population decrease between 2000 and 2002, with a low estimate of 38,574 in 2002. Severe summer drought was the primary factor in the population decline, being displayed through poor fawn survival and adult deer entering winter in poor body condition (WGFD 2004). Habitat fragmentation resulting from CBNG development was also identified as a factor in the population decline. Better range conditions in 2003 allowed for increased fawn survival in 2003 which with favorable weather conditions the population increase was predicted to continue (WGFD 2004).

The WGFD has designated the northern three quarters of the project area as winter range and the southern half of section 26 as yearlong range for pronghorn antelope. The project area is within the Gillette pronghorn antelope herd unit which is bordered by WY59 on the east, the Montana state line on the north, the Powder River on the west, and I90 on the south. The 2004 estimated herd population was 13,985 with a population objective of 11,000 (WGFD 2004). No pronghorn were observed during the December 2006 onsite.

Populations of pronghorn and both deer species within their respective hunt areas are above WGFD objectives.

Winter-Yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions. **Winter** range is when a population or portion of a population of animals uses the documented suitable habitat sites within this range annually, in substantial numbers only during the winter period. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The drainages within the Reservoir Creek POD including LX Bar Creek were historically ephemeral and did not support aquatic fauna. The existing reservoirs and LX Bar Creek now contain water year-round and may be able to support aquatic fauna.

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them.

3.3.3. Migratory Birds

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

3.3.4. Raptors

The Reservoir Creek project area and a one-half mile buffer were searched for raptor nests (Wilsey 2006). Thirteen nests were identified within the survey area; two were active in 2006. One active nest was occupied by Cooper’s hawks and the other by red-tailed hawks.

Thunderbird ID (BLM ID)	UTM East	UTM North	Species	Substrate	Activity 2006	Condition
1 (4121)	431821	4964483	COHA	PON	INAC	Good
2	433014	4962886	RTHA	PON	INAC	Poor
3	432075	4962748	COHA	PON	ACT	Good
4	433838	4962100	GOEA	PON	INAC	Good
5	433953	4961788	RTHA	PON	INAC	Fair
6 (3191)	434007	4961585	UNK	PON	INAC	Good
7	432642	4961021	RTHA	PON	INAC	Poor
8	432720	4960878	RTHA	PON	INAC	Fair
9	431752	4960869	RTHA	PON	ACTF	Good
10 (3192)	432767	4960849	RTHA	PON	INAC	Poor
11	432426	4960373	RTHA	PON	INAC	Poor
12	431929	4960247	UNK	CTL	INAC	Good
13 (2948)	432317	4960096	RTHA	PON	INAC	Poor

Codes used in the nest table are identified in the Powder River Basin Interagency Working Group Wildlife Taskforce’s Wildlife Survey Protocol document.

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

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

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

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

Five occupied prairie dog colonies are present within the project area, with a total area of 100 acres.

3.3.5.1.2. Bald eagle

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

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

Cottonwoods along LX Bar Creek and ponderosa pines in the uplands provide suitable roosting habitat; and five occupied prairie dog colonies totaling 100 acres provide a reliable prey base. Although mature, neither the cottonwoods nor ponderosa pines are very large stature and would not be very attractive for nesting. Winter surveys by Thunderbird – Jones & Stokes (Wilsey 2006) did not identify any eagles. No bald eagle nests were identified during raptor nesting surveys. Three bald eagles were observed by BLM and Huber representatives during the December 20, 2006 field visit along LX Bar Creek.

3.3.5.1.3. Ute's Ladies Tresses Orchid

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

A habitat assessment was conducted by Thunderbird – Jones & Stokes; topographic, soils, and hydrologic data were used to determine potential habitat in accordance with the Powder River Basin Interagency Working Group's habitat models. Pedestrian surveys were conducted along drainages with proposed outfalls, culverts, and water crossings. LX Bar Creek was the only drainage identified with appropriate hydrology. However the habitat along LX Bar Creek was determined to be unsuitable, as the herbaceous

vegetation was primarily upland species (wheatgrasses, Indian rice grass, and cheatgrass).

3.3.5.2. Sensitive Species

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

3.3.5.2.1. Black-tailed prairie dog

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

Five occupied prairie dog colonies are present within the project area, which total 100 acres.

3.3.5.2.2. Greater sage-grouse

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

Suitable sage grouse habitat is present in limited quantities scattered through out the Reservoir Creek project area. The nearest documented lek is Recluse, 4.2 miles east of the POD. Recluse is classified as unoccupied by the WGFD. The nearest documented occupied lek is the SA Creek lek over five miles east of the Reservoir Creek POD.

3.3.5.2.3. Mountain plover

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

Mountain plover breeding and nesting habitat exists within the prairie dog colonies and LX Bar Creek floodplain. Thunderbird – Jones & Stokes (Wilsey 2006) conducted mountain plover nesting surveys in spring 2006 but did not locate any plovers.

3.4. West Nile Virus

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

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

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

Table 3.4 Historical West Nile Virus Information

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

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

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

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

The most common pesticide treatment is to place larvicidal briquettes in small standing water pools along drainages or every 100 feet along the shoreline of reservoirs and ponds. It is generally accepted that it is not necessary to place the briquettes in the main water body because wave action prevents this environment from being optimum mosquito breeding habitat. Follow-up treatment of adult mosquitoes with malathion may be needed every 3 to 4 days to control adults following application of larvicide (Mooney, personal conversation). These treatment methods seem to be effective when focused on specific target areas, especially near communities, however they have not been applied over large areas

nor have they been used to treat a wide range of potential mosquito breeding habitat such as that associated with CBNG development.

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

3.5. Water Resources

The project area's impoundments drain to LX Bar Creek and SA Creek, both of which are tributaries to the Powder River and lie within the Middle Powder River drainage system.

3.5.1. Groundwater

Wyoming Department of Environmental Quality (WDEQ) water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) define the following limits for Total Dissolved Solids (TDS) and the classes of groundwater; 500 mg/l TDS for drinking water (Class I), 2000 mg/l for Agricultural Use (Class II) and 5000 mg/l for Livestock Use (Class III).

The PRB EIS Record of Decision includes a Monitoring, Mitigation and Reporting Plan (MMRP). The objective of the plan is to monitor those elements of the analysis where there was limited information available during the preparation of the EIS. The MMRP called for the use of adaptive management where changes could be made based on monitoring data collected during implementation. Specifically related to groundwater, the plan identified the following (PRB EIS ROD page E-4):

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

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

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

inorganic constituents over a six month period resulting in changes from the initial WDEQ classifications.

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

The WDEQ implemented requirements for monitoring shallow groundwater of Class III or better quality under unlined CBNG water impoundments effective August 1, 2004. The intent is to identify locations where the impoundment of water could potentially degrade any existing shallow groundwater aquifers. These investigations are conducted where discharged water will be detained in existing or proposed impoundments. If shallow groundwater is detected and the water quality is determined to fall within the Class III or better class of use (WDEQ Chapter 8 classifications for livestock use), operators are required to install batteries of 1 to 3 wells, develop a monitoring plan and monitor water levels and quality. The results of these investigations have yet to be analyzed and interpreted.

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 1 registered stock water well within the POD boundary with a depth of 80 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 mostly within the LX Bar Creek drainage which is a tributary to the Middle Powder River watershed. A small portion of the project area and Duck Pond Pit flow to SA Creek, which is also a tributary to the Middle Powder River watershed. All drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt – PRB FEIS Chapter 9 Glossary). The LX Bar Creek channel within the POD boundary has a fairly well defined flow channel with well defined bed and bank incised into a well developed flood plain system. It supports individuals and stands of cottonwoods, willows and other vegetation characteristic of large ephemeral drainage systems. LX Bar Creek flows approximately 16 miles from the POD boundary before it joins the Powder River. SA Creek exhibits similar characteristics, but was not directly visited during the onsite. SA Creek flows approximately 20 miles from the POD before it joins the Powder River.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in $\mu\text{mhos/cm}$) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters “...illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area” (PRB FEIS page 3-48). For the Middle Powder River, the EC ranges from 1421 $\mu\text{mhos/cm}$ at Maximum monthly flow to 2154 $\mu\text{mhos/cm}$ at Low monthly flow and the SAR ranges from 3.92 at Maximum monthly flow to 4.62 at Low monthly flow. These values were determined at the USGS station located on the Powder River at Moorhead, Montana. (PRB FEIS page 3-49).

The operator has identified a natural spring within this POD boundary in the SW quarter of the NW quarter of Sec35, T56N, R75W. The flow at this spring, Coones Spring #1, was not measurable at the time of data collection. Hence, no water was collected for analysis. A seep was identified during the onsite located down gradient of the Duck Pond pit. The landowner stated that the seep has always been there. Most likely it is a result of water infiltrating from the original playa and cropping out along the sandstone faces in the area.

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 inventories BFO No.70040085, ACR for Yates: Dawn Coalbed Methane POD Waterline and 70060252, ACR for Baker Energy: Reservoir Creek POD, were completed, reviewed and approved (December 7, 2006). Two cultural sites were located in the block inventory conducted for this POD. The CBM POD is superimposed on a previously developed CBM field, in addition to extensive conventional development. Much of the field infrastructure is already in place as a result of the earlier development.

No Paleontological resources are known to be located in this area. No resources of interest to Native American cultural groups or Traditional Cultural Properties are known to occur in the project area.

Table 3.6 Cultural Resources Inventory Results

Site Number	Site Type	Eligibility
48 CA 4014	Historic site	Not eligible
48 CA 5991	Prehistoric site	Not eligible

3.7. Foot Rot

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

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

Overall impacts to vegetation and soils from surface disturbance will be reduced based on the operator's plans and BLM applied mitigation. Of the 10 proposed well locations, 6 can be drilled without a well pad being constructed, 3 will require slots, and 1 will definitely require a constructed (cut & fill) well pad. As such, surface disturbance would occur with the drilling of the nine wells without constructed pads. This disturbance would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 16 x 18 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with the 6 wells not requiring slots or a pad would involve approximately 0.3 acre/well for 1.8 total acres. Estimated disturbance associated with the 3 wells requiring slots would involve approximately 0.3 acre/well 0.9 total acres. The other 1 well requiring cut & fill pad construction would disturb approximately 0.53 acres. The total estimated disturbance for all 10 wells would be 3.23 acres. This would be a short-term impact with expedient, successful reclamation and site-stabilization, as committed to by the operator in their POD MSUP and as

required by BLM in COAs.

Approximately 3.1 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 0.5 miles of pipeline would be constructed outside of corridors.

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

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

Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized. Seed mixes for the Reservoir Creek POD were determined based on soil map unit types, the dominant ecological sites found within the project area, and the mixing of soil horizons in disturbed areas. A shallow loamy/loamy seed mix was created for the entire POD (see site specific COAs).

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

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

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	9	0.3/acre	2.7	Long Term
Constructed Pad	1	or Site Specific	0.53	
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Impoundments*	0		0.0	Long Term
On-channel	0	Site Specific	0.0	
Off-channel	0	Site Specific	0.0	
Water Discharge Points**	2	Site Specific or 0.01 ac/WDP	0.1	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads	3.1	40' Width or Site Specific	20.4	Long Term
No Corridor	0.6		2.7	
With Corridor	2.5		17.7	
2-Track Roads	0.2	12' Width or Site Specific	0.3	Long Term
No Corridor	0.2		0.3	
With Corridor	0	20' Width or Site Specific	0	
Pipelines	2.3	20' Width or Site Specific	5.9	Short Term
No Corridor	0.5		1.2	
With Corridor	1.8		4.7	
Buried Power Cable	Miles Buried	12' Width or Site Specific	0	Short Term
No Corridor	Power Not within Corridor		0	
Overhead Powerlines	0.0	15' Width	0	Long Term
Additional Disturbance engineered section of road	0.2	Site Specific	1.05	Long Term
		Total	25.08	Long Term
		Total	5.9	Short Term

* Four on-channel and one off-channel impoundment were reviewed. All were existing at the time of the onsite.

** Three of the five outfalls were already existing and in use at the time of the onsite. Two proposed outfalls were evaluated.

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 PRB FEIS identified effects to wetlands and riparian areas, especially to cottonwood trees, stating that “... may be lost by bank undercutting caused by the increased surface water flows in channels.” Undercutting of existing cottonwood trees because of this action is not likely because of the operator’s commitment to contain all effluent in reservoirs, and because the gradient of LX Bar Creek is very shallow in this area. 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).

“Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would 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).

In general, flows added to LX Bar and SA creeks due to this action will be from increased seepage under the existing impoundments.

4.1.2. Invasive Species

The Operator has a comprehensive weed management program that will focus on preventing the introduction of noxious weeds and other identified weedy species, and/or controlling previously established infestations during the construction, operation, and reclamation of the Reservoir Creek POD. This plan includes education of employees and contractors, prevention through inspections and monitoring, and control using chemical and mechanical methods. For more information see Reservoir Creek POD, Appendix 10 of the MSUP.

Utilization of existing facilities and surface disturbance associated with construction of proposed access roads, pipelines, water management infrastructure, produced water discharge points and related facilities would present opportunities for weed invasion and spread. Produced CBNG water would likely continue to modify existing soil moisture and soil chemistry regimes in the areas of water release and storage. 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 ensure that potential impacts from noxious weeds and invasive plants will be minimal.

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 anticipated to be 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 Middle Powder River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 41% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into LX Bar Creek and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water from flowing into the Middle Powder River Watershed.
- The WMP for the Reservoir Creek POD proposes that produced water will not contribute significantly to flows downstream.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

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

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

Big game animals are expected to return to the project area following construction; however, populations will likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. The Pinedale Anticline study suggests mule deer do not readily habituate to human activities. 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). Mule deer are typically more sensitive to disturbance and human activities than pronghorn.

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. In order to survive below the maintenance level, requires behavior that emphasizes energy conservation. Canfield et al. (1999) pointed out that forced activity caused by human disturbance exacts

an energetic disadvantage, while inactivity provides an energetic advantage for animals. Geist (1978) further defined effects of human disturbance in terms of increased metabolism, which could result in illness, decreased reproduction, and even death.

Winter CBNG development is of particular concern for the Reservoir Creek project area as three-fourths of the project area is winter range for pronghorn and the entire project area is winter-yearlong range for mule deer. Approximately 150 mule deer were observed during the onsite, demonstrating the importance of the project area to wintering mule deer. No pronghorn were observed during the December onsite, but winter conditions prior to the onsite had been mild. During severe winter weather pronghorn and possibly more mule deer may rely on the project area. Construction activities during winter may preclude big-game use of the project area increasing their stress levels and mortality levels as discussed above.

4.2.1.1. Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

Produced water will be released into ephemeral tributaries flowing into existing reservoirs. There are no known aquatic resources within the Reservoir Creek project area. If a reservoir were to discharge, it is unlikely produced water would reach a fish-bearing stream.

The Wyoming Department of Environmental Quality (DEQ) regulates effluent discharge through the National Pollution Discharge Elimination System (NPDES) in compliance with the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act. The Wyoming DEQ established effluent limits for the protection of game and non-game fish, aquatic life other than fish, wildlife and other water uses. Downstream species should not be affected.

4.2.2.1. Cumulative effects

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

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area will impact migratory birds. Native habitats are being lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Human activities displace migratory birds farther than simply the physical habitat disturbance. Ingelfinger (2004) reported decreases in the density of breeding Brewer's sparrows and sage sparrows within 100m of active natural gas field roads. The observed effects occurred along roads with light traffic volume (<12 vehicles per day).

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).

Overhead power lines may affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation.

Stock tanks provide attractive watering sites for migratory birds, which can become trapped within the tanks and drown. Ramps or similar structures within the tanks can provide a means for trapped birds to escape. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Cumulative effects

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

4.2.4. Raptors Direct and Indirect Effects

Wells are proposed within one-half mile of 12 raptor nests; with three nests being less than one-quarter mile from proposed wells. The wells (13LW-14, 11LW-23, 13LW-23, and 11CKW-26) proposed within one-quarter mile of raptor nests are all near the edge of the buffer and out of sight from the nests, BLM did not recommend moving any wells. Given the proximity of development activities to the nests discussed above operation and maintenance activities during subsequent nesting seasons may disturb nesting raptors but because of the distance and visual screening it is unlikely to result in nest abandonment.

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

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

4.2.4.1. Cumulative effects

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

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.1. Threatened and Endangered and Sensitive Species

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
<u>ENDANGERED</u>				
Black-footed ferret (<i>Mustela nigripes</i>)	At least 1000 acres of black-tailed prairie dog colony, separated by no more than 1.5 km.	NP	NE	Sufficient habitat not present.
<u>THREATENED</u>				
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Mature forest cover often within one mile of large water body.	K	NLAA	Overhead electricity & roosting habitat present.
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Riparian areas with permanent water	NP	NE	Potential habitat not present.

Presence

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

Effects Determinations

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

4.2.5.1.1. Black-footed ferret

Well 13LW-23 is proposed on the edge of an occupied prairie dog colony with the access through the colony. No other facilities are proposed within prairie dog colonies. The well location was not removed from the prairie dog colony at request of the landowner's representative.

Because the suitable habitat is not sufficient to sustain a ferret population, implementation of the proposed development will have "**no effect**" on the black-footed ferret.

4.2.5.1.2. Bald eagle

Existing overhead electrical power lines are present throughout the project area. The existing overhead lines are three-phase lines. The three-phase wire spacing is likely in compliance with the Avian Power Line Interaction Committee's (1996) suggested practices, but other factors such as insulation may not be.

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

Although there are no documented communal roosts within the Reservoir Creek project area, suitable habitat is present and winter bald eagle use has been documented in the project area. Timing limitations for winter roosting will be applied to the Reservoir Creek project as suitable habitat is present and winter bald eagle use has been documented. Nest timing limitations are not being applied as the cottonwood and ponderosa pines present are small-statured and not likely to be attractive for nesting. Properly timed surveys for bald eagle winter roosting and raptor nesting should identify any bald eagle nest initiations.

The proposed project may affect "**not likely to adversely affect**" bald eagles due to the electrocution potential when perching on existing overhead power lines and the presence of suitable winter roosting habitat.

4.2.5.1.3. Ute's Ladies Tresses Orchid

Implementation of the proposed coal bed natural gas project should have "**no effect**" on the Ute ladies'-tresses orchid as suitable habitat is not present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

Table 4.4 Summary of Sensitive Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (<i>Rana pipiens</i>)	Beaver ponds, permanent water in plains and foothills	S	MIIH	Discharge points & reservoirs provide habitat. Prairie not mountain habitat.
Spotted frog (<i>Ranus pretiosa</i>)	Ponds, sloughs, small streams	NP	NI	
Birds				
Baird's sparrow (<i>Ammodramus bairdii</i>)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Brewer's sparrow (<i>Spizella breweri</i>)	Basin-prairie shrub	S	MIIH	
Burrowing owl (<i>Athene cunicularia</i>)	Grasslands, basin-prairie shrub	S	MIIH	Prairie dog colonies present.
Ferruginous hawk (<i>Buteo regalis</i>)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Grassland and shrubland habitats will be affected.
Greater sage-grouse (<i>Centrocercus urophasianus</i>)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Sagebrush cover will be affected.
Long-billed curlew (<i>Numenius americanus</i>)	Grasslands, plains, foothills, wet meadows	S	MIIH	Grasslands will be affected.
Mountain plover (<i>Charadrius montanus</i>)	Short-grass prairie with slopes < 5%	S	MIIH	Prairie dog colonies present.
Northern goshawk (<i>Accipiter gentilis</i>)	Conifer and deciduous forests	S	MIIH	Forest habitat present.
Peregrine falcon (<i>Falco peregrinus</i>)	cliffs	NP	NI	No nesting habitat present.

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

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

Presence

K Known, documented observation within project area.

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

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

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

Project Effects

NI No Impact.

MIH May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.

WIPV Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

BI Beneficial Impact

4.2.5.2.1. Black-tailed prairie dog

Well 13LW-23 is proposed on the edge of an occupied prairie dog colony with the access through the colony. No other facilities are proposed within prairie dog colonies. The well location was not removed from the prairie dog colony at request of the landowner's representative. There will be direct habitat loss from the well and road. The well house and nearby power poles may provide habitats for mammal and avian predators increasing prairie dog predation. Mineral related traffic on the access road may result in prairie dog road mortalities.

4.2.5.2.2. Greater sage-grouse

Suitable sage-grouse habitat is limited within the project area. The nearest documented occupied lek is over five miles east of the POD. Sage-grouse are expected to use the project area but not to any substantial degree.

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

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

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

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

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

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

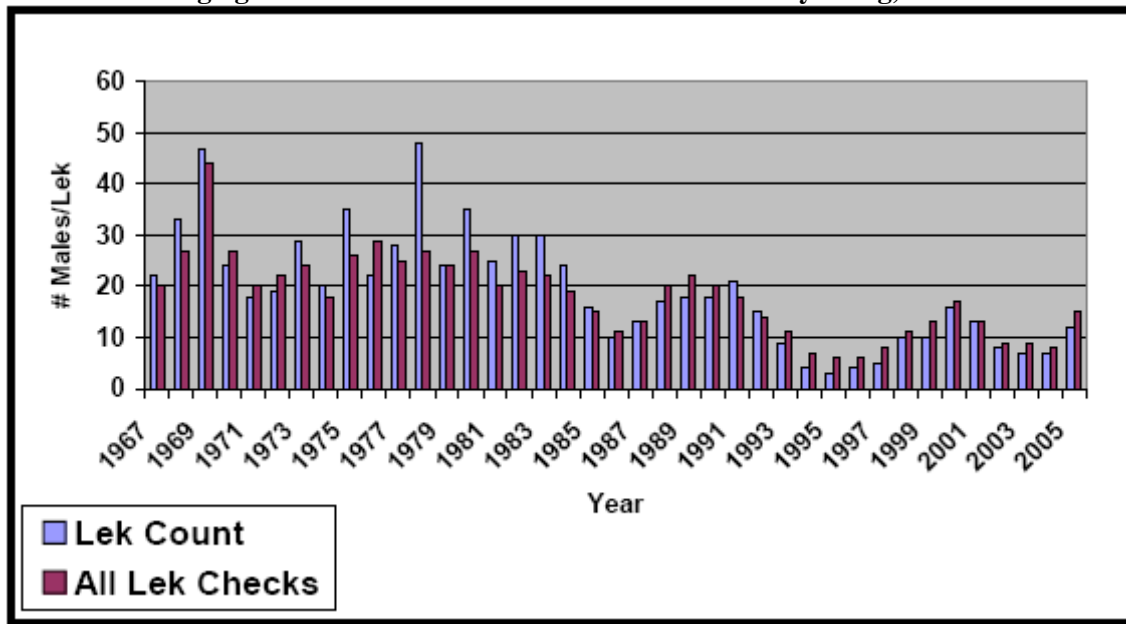
Additional studies, across more of the sage-grouse's range, indicate that many populations nest much farther than two miles from the lek of breeding (Bennett 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported only 45% of their sage grouse hens nested within 3 km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

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

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

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

Figure 4.1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2005.



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

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

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

4.2.5.2.3. Mountain plover

Mountain plover breeding and nesting habitat exists within the prairie dog colonies and LX Bar Creek floodplain. Mineral development may have mixed effects on mountain plovers. Disturbed ground such as buried pipe line corridors and roads may be attractive to plovers while human activities within one-quarter mile may be disruptive. Use of roads and pipe line corridors by mountain plovers may increase

their vulnerability to vehicle collision. The existing overhead power lines provide perch sites for raptors potentially resulting in increased mountain plover predation. CBNG infrastructure such as the well houses, roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes. An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.2.5.3. Cumulative effects

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

4.3. West Nile Virus

The PRB FEIS and ROD included a programmatic mitigation measure that states, “The BLM will consult with appropriate state agencies regarding WNV. If determined to be necessary, a COA will be applied at the time of APD approval to treat mosquitoes for any CBM discharge waters that become stagnant.” This project is likely to result in standing surface water which may potentially increase mosquito breeding habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNV species and its effects in Wyoming.

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

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

BLM will keep monitoring this issue by continuing to consult with the State agencies and the researchers working in the area in order to stay abreast of the most current developments and any need to apply mitigation. Based on current information, we determined that no significant impacts in the spread of WNV would occur from the implementation of this project.

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 Middle Powder River watershed and a commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), should minimize project area and downstream potential impacts from the proposed water management strategy.

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 6.0 gpm per well or 60.0 gpm (0.13 cfs or 94 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 Middle Powder River drainage, the projected volume produced within the watershed area was 9,897 acre-feet in 2007 (maximum production was estimated for 2005 at 12,328 acre-feet). As such, the volume of water resulting from the production of these wells is 0.9% of the total volume projected for 2007. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 37% to groundwater aquifers and coal zones in the Middle Powder River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 22 gpm will infiltrate at or near the discharge points and impoundments (11,668,320 gallons per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "...the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). However, there is potential for infiltration of produced water to influence the quality of the antecedent groundwater. The WDEQ requires that operators determine initial groundwater quality below impoundments to be used for CBNG produced water storage. If high quality water is detected (Class 3 or better) the operator is required to establish a groundwater monitoring program at those impoundments.

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

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004) which can be accessed on their website. This guidance document became effective August 1, 2004. The Wyoming DEQ has also established an Impoundment Task Force which is in the process of drafting an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow ground water. WYPDES permits received by DEQ prior to August 1, 2004, for discharging to impoundments will be assessed through the "Impoundment Monitoring Plan". For WYPDES permits received by DEQ after August 1, 2004, the BLM will require that operators comply with the requirements outlined in the DEQ compliance monitoring guidance document (June 14, 2004) prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

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 water wells in the area. The permitted water well in the area produces from a water bearing zone approximately 80 feet below the ground surface. The targeted coal zones range from 990 to 1115 feet below ground surface. 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 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 analyses submitted for the pre-approval evaluation, the operator has committed to designate a reference well within the POD boundary. The well will be capable of being sampled at the wellhead. A sample will be collected at the wellhead for analysis within sixty days of initial production. A copy of the water analysis will be submitted to the BLM Authorizing Officer.

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 CBM 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 CBM 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 Middle Powder River watershed for SAR, and EC, the average value measured at selected USGS gaging stations at high and low monthly flows, and Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water. It also shows 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 –		2	1000
Least Restrictive Proposed Limit		10	3200
Powder River at Moorhead, MT, Gauging station			
Historic Data Average at Maximum Flow		3.92	1421
Historic Data Average at Minimum Flow		4.62	2154
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Requirement for WYPDES Permit # WY0049557			

Predicted Values	TDS, mg/l	SAR	EC, µmhos/cm
At discharge point	5000	None	7500
WDEQ Water Quality Requirement for WYPDES Permit # WY0040347			
At discharge point	5000	None	7500
At the Irrigation Compliance Point	5000	6	2000
Predicted Produced Water Quality			
Pawnee	1190	34.6	1900
Lower Cook & Wall	1290	35.1	2080
Canyon & Cache	1250	25.6	1990

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is 1290.0 mg/l TDS which is/ within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the Lower Cook, Wall, Pawnee, Canyon and Cache coal zones from these wells is predicted to be similar to the water quality of the samples collected from locations near the POD. A maximum of 6.0 gallons per minute (gpm) is projected is to be produced from these 10 wells, for a total of 60.0 gpm for the POD. (See Table 4.5.)

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

There are 2 proposed and 3 existing discharge points detailed in this project. They have been appropriately sited and utilize appropriate water erosion dissipation designs. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water 5 existing impoundments (214 acre-feet) will be used within the project area. These impoundments have disturbed approximately 45 acres including the dam structures. Of these water impoundments, 4 are on-channel reservoirs disturbing approximately 15 acres, and 1 is an off-channel pond disturbing approximately 30 acres. Monitoring may be required based upon WYDEQ findings relative to “Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” (June 14, 2004). Existing impoundments have been upgraded to meet minimum WSEO, WDEQ and landowner requirements. All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.02 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2005 with a total contribution to the mainstem of the Middle Powder River watershed of 86 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 10 wells is anticipated to be a total of 60.0 gpm or 0.13 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in the Powder River from this action (0.02 cfs) may add a maximum 0.016 cfs to the Middle Powder River flows, or 0.02% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the normal measurement capabilities for the volume of flow in the Powder 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). The addition of the water produced from these wells will not impact the water quantity in the mainstem of the Middle Powder River. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

The operator did not provide an analysis of the potential development in the watershed above the project area. However, based on the area of the tributaries to LX Bar Creek (5290 acres) and an assumed density of one well per location every 80 acres, the potential exists for the development of 66 wells which could produce a maximum flow rate of 660 gpm of water (1.5 cfs, using 10 gpm per well). The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 1.5 cfs, is much less than the volume of runoff estimated from the 2-year storm event for these two tributaries to LX Bar Creek.

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

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

Permit effluent limits were set in the permits, Part I, page 1):

	WY0049557	WY0040347
Total Petroleum Hydrocarbons	10 mg/l max	10 mg/l
pH	6.5 to 8.5	6.5 – 8.5
TDS	5000 mg/l max	5000 mg/l
Specific Conductance	7500 µS/cm	2000-7500 µS/cm
Sulfates	3000 mg/l max	3000 mg/l
Radium 226	1 pCi/l max	
Dissolved iron	299 µg/l max	1000 µg/l
Dissolved manganese	629 µg/l max	630 µg/l
Total Barium	1800 µg/l max	1800 µg/l
Total Arsenic	7 µg/l max	7 µg/l
Chlorides	46 mg/l	46 mg/l
Sodium Absorption Ratio		6 at ICP
Total Recoverable Aluminum		750 µg/l

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated point of compliance identified for the permits is the end of the pipe. The irrigation compliance point is located on LX Bar Creek in the NW quarter of the SE quarter of section 14, township 57 north, range 76 west.

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

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

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

In-channel downstream impacts are addressed in the WMP for the Reservoir Creek POD prepared by SWCA Environmental Consultants for J.M.Huber Corporation.

4.4.2.1. Surface Water Cumulative Effects

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

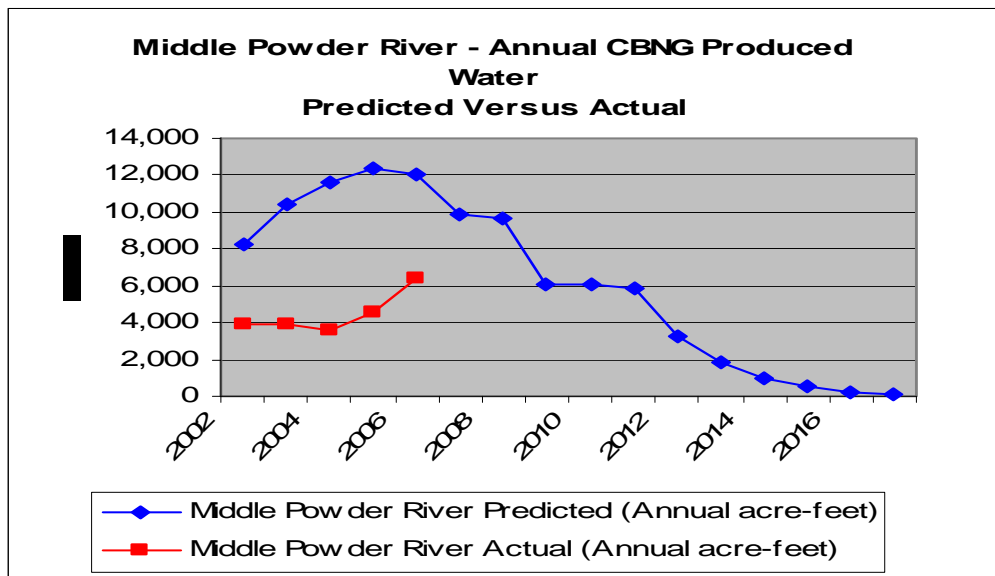
As of December 2006, all producing CBNG wells in the Middle Powder River watershed have discharged a cumulative volume of 22,292 acre-ft of water compared to the predicted 54,690 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 41 % of the total predicted produced water analyzed in the PRB FEIS for the Middle Powder River watershed.

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

Year	Middle Powder River Predicted (Annual acre-feet)	Middle Powder River Predicted (Cumulative acre-feet from 2002)	Middle Powder River Actual (Annual acre-feet)		Middle Powder River Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2002	8,257	8,257	3,929	47.6	3,929	47.6
2003	10,421	18,678	3,860	37.0	7,789	41.7
2004	11,640	30,318	3,547	30.5	11,336	37.4
2005	12,328	42,646	4,588	37.2	15,924	37.3
2006	12,044	54,690	6,368	52.9	22,292	40.8
2007	9,897	64,587				
2008	9,689	74,276				
2009	6,030	80,306				

Year	Middle Powder River Predicted (Annual acre-feet)	Middle Powder River Predicted (Cumulative acre-feet from 2002)	Middle Powder River Actual (Annual acre-feet)		Middle Powder River Actual (Cumulative acre-feet from 2002)	
			Actual Ac-ft	% of Predicted	Cum Ac-ft	% of Predicted
2010	6,030	86,336				
2011	5,899	92,235				
2012	3,276	95,511				
2013	1,797	97,308				
2014	964	98,272				
2015	495	98,767				
2016	231	98,998				
2017	82	99,080				
Total	99,080		22,292			

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



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

The PRB FEIS states, “Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim Memorandum of Cooperation (MOC) that the Montana and Wyoming DEQ’s (Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the two states develop a better understanding of the effects of CBM discharges through the

enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, through the implementation of in-stream monitoring and adaptive management, water quality standards and interstate agreements can be met.” (PRB FEIS page 4-117)

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur as a result of discharged produced CBNG water. The cumulative effects relative to this project are anticipated to be 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 Middle Powder River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 41% of that total (see section 4.4.2.1).
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

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

4.5. Cultural Resources

No historic cultural properties will be affected by this development as proposed and cultural clearance is recommended for this undertaking.

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

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
John Vaselein	Environmental/Permit Specialist	Baker Energy	Yes
Paul Woody	Project Manager	JM Huber	Yes
Kendall Cox	Landowner Representative	Manigault Ranch	Yes

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

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