

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

**Storm Cat Energy
East Bitter Creek**

ENVIRONMENTAL ASSESSMENT –WY-070-08-065

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize Storm Cat Energy’s East Bitter Creek Coal Bed Natural Gas (CBNG) POD comprised of the following 21 Applications for Permit to Drill (APDs):

	Well Name	Well #	Qtr/Qtr	Sec	TWP	RNG	Lease #
1	E BITTERCREEK FEDERAL	02CW-34	NWNE	34	57N	74W	WYW144521
2	E BITTERCREEK FEDERAL	03CW-34	NENW	34	57N	74W	WYW144521
3	E BITTERCREEK FEDERAL	05CW-35	SWNW	35	57N	74W	WYW139674
4	E BITTERCREEK FEDERAL	09CW-27	NESE	27	57N	74W	WYW144521
5	E BITTER CREEK OEDEKOVEN	01CW-27	NENE	27	57N	74W	WYW144521
6	E BITTER CREEK OEDEKOVEN	01CW-33	NENE	33	57N	74W	WYW144521
7	E BITTER CREEK OEDEKOVEN	02CW-27	NWNE	27	57N	74W	WYW144521
8	E BITTER CREEK OEDEKOVEN	05CW-27	SWNW	27	57N	74W	WYW144521
9	E BITTER CREEK OEDEKOVEN	05CW-3*	SWNW	3	57N	74W	WYW144520
10	E BITTER CREEK OEDEKOVEN	05CW-34	SWNW	34	57N	74W	WYW144521
11	E BITTER CREEK OEDEKOVEN	06CW-27	SENE	27	57N	74W	WYW144521
12	E BITTER CREEK OEDEKOVEN	07CW-33	SWNE	33	57N	74W	WYW144521
13	E BITTER CREEK OEDEKOVEN	07CW-34	SWNE	34	57N	74W	WYW144521
14	E BITTER CREEK OEDEKOVEN	10CW-3	NWSE	3	57N	74W	WYW144520
15	E BITTER CREEK OEDEKOVEN	11CW-27	NESW	27	57N	74W	WYW144521
16	E BITTER CREEK OEDEKOVEN	12CW-22	NWSW	22	57N	74W	WYW144521
17	E BITTER CREEK OEDEKOVEN	12CW-3	NWSW	3	57N	74W	WYW144520
18	E BITTER CREEK OEDEKOVEN	13CW-27	SWSW	27	57N	74W	WYW144521
19	E BITTER CREEK OEDEKOVEN	14CW-22	SESW	22	57N	74W	WYW144521
20	E BITTER CREEK OEDEKOVEN	16CW-22	SESE	22	57N	74W	WYW144521
21	E BITTER CREEK OEDEKOVEN	01CW-10	NENE	10	57N	74W	WYW144520

The following impoundment locations were inspected and approved for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Qtr	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbe d (Acres)	Lease #
1	Oedekoven 15-16 57-74	SWSE	16	57	74	15.2	3.82	Fee
2	Oedekoven 11-22 57-74	NESW	22	57	74	29.9	3.44	WYW144521
3	Oedekoven 16-22 57-74	SESE	22	57	74	13.0	5.60	Fee
4	Oedekoven 13-27 57-74	SWSW	27	57	74	14.4	2.15	WYW144521
5	Oedekoven 11-34 57-74	NWSW	34	57	74	5.8	2.65	WW59610
6	Oedekoven 4-23 57-74	NWNW	23	57	74	10.0	Existing	Fee
7	Cutler 5-15 Reservoir	SWNW	15	57	74	27.3	Existing	Fee

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

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

1. The Operator, in their POD, has committed to:
 - Comply with all applicable Federal, State and Local laws and regulations.
 - Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
 - Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD.
 - Provide water analysis from a designated reference well in each coal zone.
2. The Operator has certified that a Surface Use Agreement has been reached with the Landowner(s).
3. Alternative C will not result in any undue or unnecessary environmental degradation.
4. It is in the public interest to approve these wells, as the leases are being drained of federal gas, resulting in a loss of revenue for the government.
5. Mitigation measures applied by the BLM will alleviate or minimize environmental impacts.
6. Alternative C is the environmentally-preferred Alternative.
7. The proposed action is in conformance with the PRB FEIS and the Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management (BLM), Buffalo Field Office, April 2001.

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

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

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

Field Manager: _____

Date: _____

**BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Storm Cat Energy
East Bitter Creek
PLAN OF DEVELOPMENT
WY-070-08-065**

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to 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: Storm Cat Energy’s East Bitter Creek Plan of Development (POD) for 21 coal bed natural gas well APD’s and associated infrastructure.

Proposed Well Information: There are 21 wells proposed within this POD, the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from the Cook, Wall, and Pawnee coal seams as they are present. Proposed well house dimensions are 4 ft wide x 4 ft length x 4 ft height. Well house color is covert green, selected to blend with the surrounding vegetation. Wells are located as follows:

	Well Name	Well #	Qtr/Qtr	Sec	TWP	RNG	Lease #
1	E BITTERCREEK FEDERAL	02CW-34	NWNE	34	57N	74W	WYW144521
2	E BITTERCREEK FEDERAL	03CW-34	NENW	34	57N	74W	WYW144521
3	E BITTERCREEK FEDERAL	05CW-35	SWNW	35	57N	74W	WYW139674
4	E BITTERCREEK FEDERAL	09CW-27	NESE	27	57N	74W	WYW144521
5	E BITTER CREEK OEDEKOVEN	01CW-27	NENE	27	57N	74W	WYW144521
6	E BITTER CREEK OEDEKOVEN	01CW-33	NENE	33	57N	74W	WYW144521
7	E BITTER CREEK OEDEKOVEN	02CW-27	NWNE	27	57N	74W	WYW144521
8	E BITTER CREEK OEDEKOVEN	05CW-27	SWNW	27	57N	74W	WYW144521
9	E BITTER CREEK OEDEKOVEN	05CW-3*	SWNW	3	57N	74W	WYW144520
10	E BITTER CREEK OEDEKOVEN	05CW-34	SWNW	34	57N	74W	WYW144521
11	E BITTER CREEK OEDEKOVEN	06CW-27	SENE	27	57N	74W	WYW144521
12	E BITTER CREEK OEDEKOVEN	07CW-33	SWNE	33	57N	74W	WYW144521
13	E BITTER CREEK OEDEKOVEN	07CW-34	SWNE	34	57N	74W	WYW144521
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16	E BITTER CREEK OEDEKOVEN	12CW-22	NWSW	22	57N	74W	WYW144521
17	E BITTER CREEK OEDEKOVEN	12CW-3	NWSW	3	57N	74W	WYW144520
18	E BITTER CREEK OEDEKOVEN	13CW-27	SWSW	27	57N	74W	WYW144521
19	E BITTER CREEK OEDEKOVEN	14CW-22	SESW	22	57N	74W	WYW144521
20	E BITTER CREEK OEDEKOVEN	16CW-22	SESE	22	57N	74W	WYW144521
21	E BITTER CREEK OEDEKOVEN	01CW-10	NENE	10	57N	74W	WYW144520

Water Management Proposal: The following impoundments were proposed for use in association with the water management strategy for the POD.

	IMPOUNDMENT Name / Number	Qtr/Quarter	Section	TWP	RNG	Capacity (Acre Feet)	Surface Disturbed (Acres)	Lease #
1	Oedekoven 15-16 57-74	SWSE	16	57	74	15.2	3.82	Fee
2	Oedekoven 11-22 57-74	NESW	22	57	74	29.9	3.44	WYW144521
3	Oedekoven 16-22 57-74	SESE	22	57	74	13.0	5.60	Fee
4	Oedekoven 13-27 57-74	SWSW	27	57	74	14.4	2.15	WYW144521
5	Oedekoven 11-34 57-74	NWSW	34	57	74	5.8	2.65	WW59610
6	Oedekoven 4-23 57-74	NWNW	23	57	74	10.0	Existing	Fee
7	Cutler 5-15 Reservoir	SWNW	15	57	74	27.3	Existing	Fee
8	Oedekoven 2-22 57-74	NWNE	22	57	74	30.7	4.5	Na
9	Oedekoven 10-22 57-74	NWSE	22	57	74	8.8	2.0	Na
10	Oedekoven 14-22 57-74	SESW	22	57	74	6.8	2.0	Na

County: **Campbell**

Applicant: Storm Cat Energy

Surface Owners: Fred and Jason Oedekoven, Gabrielle Maniguault

Project Description:

The proposed action involves the following:

- Drilling of 21 total federal CBM wells in Cook/Wall/Pawnee coal zones to depths of approximately 300, 550, and 700 feet, respectively. Multiple seams will be produced by **co-mingling production** (a single well per location capable of producing from multiple coal seams).
- Drilling and construction activities are anticipated to be completed within two years, the term of an APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days, but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners may impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire POD.

Gas flow from individual wells will be measured at the wellhead with electronic flow meters.. Telemetry equipment will also be installed. Measurement records will be kept on a computer and backed up appropriately for all wells connected to the system. Meter and production data will be accessible to authorized BLM personnel during normal business hours. The measurement design will comply with NTL2004-1 Standards.

Two communication towers were added to the POD, near the 12-3 and the 5-27 wells. These will allow the operator to use a SCADA (Supervisory Control And Data Acquisition) system to send well information to their field office. Storm Cat anticipates visiting each well approximately 12 times per month.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: 9 discharge points and 7 stock water impoundments and an EMIT water treatment facility within the **Middle Powder River** watershed.. Water produced in this POD will either be stored in impoundments or discharged to Bitter Creek after being treated in the EMIT facility.
- An unimproved and improved road network.
- An above ground power line network to be constructed by PRECORP. The proposed route **has** been reviewed by the contractor. If the proposed route is altered, then the new route will be proposed via sundry application and analyzed in a separate NEPA action. Power line construction **has not** been scheduled and **will not** be completed before the CBNG wells are producing. If the power line network is not completed before the wells are in production, then up to 6 temporary diesel generators shall be placed at the proposed power drops.

A storage tank of 1000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 6 months. Fuel deliveries are anticipated to be **once** per week. The generators to be used are rated at 40-150 KW and 320 KW. The 150 KW model measures 78 db at 10' away and 50 db at 150 yards away. The 320 KW model measures 50 db at 200 yards away. "Quiet Packs" can be rented for locations close to residences or wildlife areas of concern. The manufacturer's rating is 63-73 db at 23' away.

- A buried gas, water and power line network and 1 compression facility.

For a detailed description of design features, construction practices and water management strategies

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

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

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

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

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

2.3. Alternative C – Environmentally Preferred

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

2.3.1. Changes as a result of the on-sites

1. 05CW-3 well: A stock tank was added at this well at the Jason Oedeokoven's request.
2. 02CW-10 well: **Well name changed to 1CW-10**. This well did not have an APD submitted as of the onsite. The APD was submitted January 25, 2008, and the filing fee was submitted January 30. A stock tank was added at this well at the J. Oedekoven's request. 02CW-10 well:
3. A stock tank was added at this well at J. Oedekoven's request.
4. 02CW-27 well: This location was originally proposed as a slot, but was changed to a 100' x 150' pad to ensure a safe, adequately sized, contained work area.
5. 13CW-27 well: This location was originally proposed as a slot, but was changed to a 100' x 150' pad to ensure a safe, adequately sized, contained work area.

6. 01CW-33 well: The pipeline utility corridor to this well from the 07CW-33 is one of the few not corrodored in a road. The route was changed to follow a less direct line, staying higher on a ridge in gentler topography, which avoids going up and down through a series of small depressions.
7. 05CW-34 well: This well is on an old conventional location, and the access road was re-routed to follow the original conventional well access road.
8. 05CW-35 well: The access road was re-routed to avoid crossing sandy areas that will not stabilize easily, and to comply with the landowner's request to stay out of a deep drainage that gets heavy snow in the winter. The new location will be approximately 1000' south of the originally proposed road, follow the contour around the hillside, and cross a small drainage following a cattle trail.
9. 07CW-33 well: J. Oedekoven requested the water pipeline be stubbed out here, so he will have a way to get water to this area when the CBM play is over.
10. 09CW-2 and 05CW35 wells: Scott Crockett, the grazing lessee for these locations, has requested water tanks at these wells.
11. Three impoundments (Oedekoven 2-22 57-74, Oedekoven 10-22 57-74, and Oedekoven 14-22 57-74) were dropped from the WMP.
12. Landowner access to springs was attained for future seasonal sampling.

2.3.2. Programmatic mitigation measures identified in the PRB FEIS ROD

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

2.3.2.1. Groundwater

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

2.3.2.2. Surface Water

1. Channel Crossings:
 - a) Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow.
 - b) Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.
3. The operator will supply a copy of the complete approved SW-4, SW-3, or SW-CBNG permits to

BLM as they are issued by WSEO for impoundments.

4. The operator will supply a copy of the complete approved Chapter 3 permit to construct associated with treatment facilities to BLM as they are issued by WDEQ.

2.3.2.3. Soils

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

2.3.2.4. 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 is not possible 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 in riparian areas, floodplains, or in natural drainage ways.
4. 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 geomorphological configuration and properly stabilized.
6. Reclamation of disturbed wetland/riparian areas will begin immediately after project activities are complete.

2.3.2.5. Wildlife

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

2.3.2.6. Visual Resources

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

2.3.2.7. 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.

2.3.2.8. Air Quality

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

2.3.3. Site specific mitigation measures

Surface Use

1. 1CW-10 (Well name was changed from 02CW-10.)
Access road is through sandy soils and will require stabilization measures where it passes through an existing cut.

At the landowner's request, any trees removed to build the access road to this well will be brought to the road, chipped, and scattered.
2. All changes made at the onsite will be followed. They have all been incorporated into the operator's plan of development.
3. Confine all equipment and vehicles to the access roads, pads, and areas specified in the approved APD or POD.
4. Construction and drilling activity will not be conducted using frozen or saturated soil material during periods when watershed damage or excessive rutting is likely to occur.
5. Maintain a minimum 20-foot undisturbed vegetative border between toe-of-fill of pad and/or pit areas and the edge of adjacent drainages, unless otherwise directed by the BLM Authorized Officer.
6. All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the East Bitter Creek POD is Desert Brown, 10YR 6/3.
7. The approval of this project does not grant authority to use off lease federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective on the date in which the right-of-way grant is signed by the authorized officer of the BLM.
8. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

Species - <i>Cultivar</i>	Full Seeding (lbs/ac PLS)
Western Wheatgrass - <i>Rosana</i>	4
Green needlegrass - <i>Lodorm</i>	4
Slender Wheatgrass	2
Lewis - <i>Appar</i> , Blue, or Scarlet flax	1

This is the landowner’s recommended seed mix.

Please contact Melanie Hunter Natural Resource Specialist, @ (307) 684-1138, Bureau of Land Management, Buffalo, if there are any questions concerning these surface use COAs.

Wildlife

1. Any suitable Ute ladies’-tresses habitat that will receive produced water shall be protocol surveyed. Survey results shall be reported to the BLM for verification of the plant prior to any produced water reaching these habitats.

1. The following conditions will minimize impacts to raptors;
 - a. No surface disturbing activity shall occur within ½ mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. This affects the following infrastructure:

Blm ID#	SPECIES	Location	AFFECTED WELL / PIT NUMBER
4387	Great-horned owl	440409 4971668	5-27, 6-27, 11-27, 13-27. Road corridor construction between 5-27 and 13-27
5148	Unknown	440900 4972000	2-27, 5-27, 6-27, 11-27, 14-27, staging area, overhead power in SW section 22

- b. Surveys to document nest occupancy shall be conducted by a biologist following BLM protocol, between April 15 and June 30. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities. Surveys outside this window may not depict nesting activity. If a survey identifies active raptor nests, a ½ mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within ½ mile of occupied raptor nests from February 1 to July 31.
- c. Nest productivity checks shall be completed for the first five years following project completion. The productivity checks shall be conducted no earlier than June 1 or later than June 30 and any evidence of nesting success or production shall be recorded. Survey results will be submitted to a Buffalo BLM biologist in writing no later than July 31 of each survey year. This applies to:

BLM ID#	Species	UTM (NAD 83)	Legal location T57N,R74W	Substrate	Condition	2007 status
4385	Unknown	438718x 4972785y	SWSW 21	Live Ponderosa	Poor	Inactive
4387	Great-horned owl	440409 4971668	SWNW 27	Live Ponderosa	Good	Active
51475	Red-tailed Hawk	438140 4975740	SWSE 8	Live Ponderosa	Good	Active
51486	Unknown	440900 4972000	NENW 27	Live Ponderosa	Fair	Inactive

2.4. Summary of Alternatives

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

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	27	21	21
Total Locations	Information not provided	21	21
Nonconstructed Pads		18	18
Slotted Pads		2	0
Constructed Pads		1	3
Conventional Wells	24	0	0
Gather/Metering Facilities	0	0	0
Compressors	0	1 (2.06 acres)	1 (2.06 acres)
Monitor Wells	0	0	0
Impoundments		9	7
On-channel	2	4	3
Off-channel		5	4
Water Discharge Points	5	9	9

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Treatment Facilities	0	1 (Drake)	1 (EMITs)
Improved Roads			
No Corridor	8.6 acres	2.55 acres	3.18 acres
With Corridor	21.13 acres	34.04 acres	31.31 acres
2-Track Roads			
No Corridor	0	0	0
With Corridor	0	7.68 acres	7.68 acres
Buried Utilities			
No Corridor	0	2.74 acres	2.28 acres
With Corridor	0	7.72 acres	7.72 acres
Overhead Powerlines	43287' (14.9 acres)	6697' (2.31 acres)	6697' (2.31 acres)
Communication Sites	0	2	2
Staging/Storage Areas	0	2 (4.13 acres)	2 (4.13 acres)
Other Disturbance		6 stock tanks (0.06 acres)	11 stock tanks (0.11 acres)
Acres of Disturbance			

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on **May 8, 2007**. Field inspections of the proposed **East Bitter Creek** CBNG project were conducted on **October 23 and 24, 2007** by

DATE	NAME	TITLE	AGENCY
10/23-24	John Steir	Production Supervisor	Storm Cat Energy
10/23-24	Don Camino	Field Operations Supervisor	Baker Energy
10/23	Ace Arman	Drilling Supervisor	Baker Energy
10/24	James Hansen	Operations Supervisor	Storm Cat Energy
10/23-24	Seth Lambert	Environmental Consultant	Bison Environmental
10/23	Chris Brown	Civil Engineer	Bison Environmental
10/23	Fred Oedekoven	Landowner	
10/23	Jason Oedekoven	Landowner	
10/23	Kendall Cox	Landowner Representative	Manigualt Ranch
10/23	Scott Crockett	Landowner	Crockett Cattle Company
10/23	Chris Williams	Hydrologist	BLM
10/23	Bill Ostheimer	Wildlife Biologist	BLM
10/23-24	Wendy Sutton	Archaeologist	BLM
10/23-24	Melanie Hunter	Natural Resource Specialist	BLM

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

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

Mandatory Item	Potentially Impacted	No Impact	Not Present On Site	BLM Evaluator
Threatened and Endangered Species	X			Bill Ostheimer
Floodplains		X		Melanie Hunter, Chris Williams
Wilderness Values		X		Melanie Hunter
ACECs			X	Melanie Hunter
Water Resources	X			Melanie Hunter, Chris Williams
Air Quality	X			Melanie Hunter
Cultural or Historical Values		X		Wendy Sutton
Prime or Unique Farmlands			X	Melanie Hunter
Wild & Scenic Rivers			X	Melanie Hunter
Wetland/Riparian		X		Melanie Hunter, Chris Williams
Native American Religious Concerns		X		Wendy Sutton
Hazardous Wastes or Solids		X		Melanie Hunter
Invasive, Nonnative Species	X			Melanie Hunter
Environmental Justice		X		Melanie Hunter

3.1. Topographic Characteristics of Project Area

The project area topography includes steep-sided sandy ridges with sandstone outcrops, pine-covered bluffs broken by steep ravines, and gently sloped open fields and bottomlands near Bitter Creek. Elevations in the project area range from 3600 feet to 4100 feet.

3.2. Vegetation & Soils

The project area varies from steep uplands to gentle sloping floodplains and can be broken into 4 different ecological sites, all of which are relatively stable soils. These sites include loamy, sandy loamy, clay loam, and three wells are located on predisturbed or go back land.

The primary ecological site consists of loamy gentle slopes and swales that are vegetated with big sagebrush, rubber rabbitbrush, western, blue bunch & crested wheat grasses, blue gramma, needleandthread grass, and cheat grass. The slopes are flat to moderate with topsoil having a depth of 4 to 6 inches and a fair amount of organic material. Erosion potential is moderate due to limited topsoil and slope gradient. Site specific areas may require extra mitigation measures. This ecological site varies from fair to good condition, based on its potential climatic condition.

The second ecological site is sandy loam. This ecological site was found on flat benches or ridge tops. The areas are vegetated by blue bunch wheatgrass, little bluestem, needleandthread grass, prairie sandreed, yucca, and ponderosa pine. The topsoil varies from <4 to 4". Erosion potential is high due to lack of topsoil. Topsoil salvage will be critical in order to get the disturbed areas reclaimed. Additional mitigation measures will be necessary. This ecological site varies from fair to good condition, based on its potential climatic condition.

The third ecological site is clay loam. This ecological site was found on gentle slopes and upper drainage swales. Vegetation present included; western and blue bunch wheat grass, sage brush, prickly pear cactus,

and cheat grass. The topsoil is typically 6”+ in depth. This ecological site varies from fair to good condition, based on its potential climatic condition. These sites should reclaim well due to the deep topsoil and fair amount of organic material along with gentle slopes.

The fourth ecological site is predisturbed or “go back” land. These sites were specifically found on plugged and abandoned oil wells, and in the open agricultural fields in the Bitter Creek valley. Vegetation present included; crested wheatgrass, bluebunch wheatgrass, Wyoming big sagebrush, and curly cup gumweed. This ecological site is in fair condition, based on its potential climatic condition.

3.2.1. Wetlands/Riparian

Wetland vegetation is present along the margins of Bitter Creek and in the channels downstream of the two springs identified in the POD area. Cottonwood trees were not observed in riparian areas within the POD area. Strips of enhanced riparian vegetation are present along the larger channels in the POD area.

3.2.2. Invasive Species

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

- Salt Cedar
- Russian Knapweed

The WERIC database was created cooperatively by the University of Wyoming, BLM and county Weed and Pest offices. Due to the time of year that the onsite were conducted, the operator or BLM did not confirm any additional weed species during subsequent field investigations.

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

3.3. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by Jones and Stokes (J&S 2007) for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests and prairie dog colonies according to protocol in 2007. Surveys were conducted for Ute ladies’-tresses orchid by the same contractor (J&S 2007b).

A BLM biologist conducted field visits on 10/23 and 10/24/2007. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project adjustment recommendations where wildlife issues arose.

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

3.3.1. Big Game

The East Bitter Creek project area provides habitat for mule deer, white-tailed deer and antelope. For the deer species, the area provides winter-yearlong range for both. The area provides spring-summer-fall

range for antelope.

Summer or Spring-Summer-Fall use is when a population or portion of a population of animals uses the documented habitats within this range annually from the end of previous winter to the onset of persistent winter conditions. **Winter-Yearlong** use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges.

The project area is part of the Gillette pronghorn antelope herd unit. The 2006 estimated herd population was 18,600 with a population objective of 11,000 (WGFD 2005).

Mule deer belong to the Powder River herd unit. Mule deer populations have been increasing since 1998 with a 2006 population estimate of 58,300 animals, and a herd objective of 52,000 (WGFD 2005).

White-tailed deer within the project area belong to the Powder River herd unit. The 2006 proposed estimate herd population is 10,655 with a population objective of 8000. Populations of pronghorn antelope, mule deer, and white-tailed deer within their respective hunt areas are above WGFD objectives. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area does not support aquatic species; it is drained by ephemeral tributaries of **East Bitter Creek, a tributary to the Powder River**. Fish that have been identified in the Powder River watershed are listed in the PRB FEIS (3-156-159).

3.3.3. Migratory Birds

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

3.3.4. Raptors

Four raptor nest sites were identified by **Jones and Stokes (J&S 2006, 2007)** and BLM within 0.5 mile of the project area, of these **two** nests were active in 2007.

Table 4. Documented raptor nests within the project area in 2007.

BLM ID#	Species	UTM (NAD 83)	Legal location T57N,R74W	Substrate	Condition	2007 status
4385	Unknown	438718x 4972785y	SWSW 21	Live Ponderosa	Poor	Inactive
4387	Great-horned owl	440409 4971668	SWNW 27	Live Ponderosa	Good	Active
51475	Red-tailed Hawk	438140 4975740	SWSE 8	Live Ponderosa	Good	Active
51486	Unknown	440900 4972000	NENW 27	Live Ponderosa	Fair	Inactive

3.3.5. Threatened and Endangered and Sensitive Species

3.3.5.1. Threatened and Endangered Species

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

3.3.5.1.1. Black-footed ferret

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

Two black-tailed prairie dog colonies were identified during site visits within the project area (J&S 2006, 2007). One 26 acre colony was located in SWSW section 34, and a 27 acre colony was located in the NW of section 26. Despite the limited prairie dog acreage in the project area, it is within the Recluse complex, a potential reintroduction area. The project area does not provide sufficient black-footed ferret habitat.

3.3.5.1.2. Ute’s Ladies Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near

lakes or perennial streams that become inundated during large precipitation events. Prior to 2005, only four orchid populations had been documented within Wyoming. Five additional sites were located in 2005 (Heidel pers. Comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County.

Bitter Creek is intermittent having sustained flow during wet years, while its tributaries are mostly ephemeral. Suitable orchid habitat **was identified by the wildlife consultant** in portions of the project area, along Bitter Creek and Quarter Circle Prong.

3.3.5.2. Sensitive Species

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

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

In South Dakota, forty percent of the wildlife taxa (134 vertebrate species) are associated with prairie dog colonies (Agnew 1983, Apa 1985, Mac Cracken 1985, Agnew 1986, Uresk 1986, Deisch 1989). Of those species regularly associated with prairie dog colonies, six are on the Wyoming BLM sensitive species list. The species of concern are swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*).

3.3.5.2.1. Bald eagle

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

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

No nesting or roosting has been documented within the immediate project area or extending one mile from proposed activities. Nesting and roosting habitat in the project area is marginal at best due to the lack of a sufficient food source. The closest bald eagle location identified in the BLM database was one flying individual in 2006 four miles to the southwest.

3.3.5.2.2. 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.

Two black-tailed prairie dog colonies were identified during site visits within the project area (J&S 2006, 2007). One 26 acre colony was located in SWSW section 34, and a 27 acre colony was located in the NW of section 26.

3.3.5.2.3. Greater sage-grouse

Sage-grouse are listed as a sensitive species by BLM (Wyoming). In recent years, seven petitions have been submitted to the U.S. Fish and Wildlife Service (FWS) to list greater sage-grouse as threatened or endangered. On January 12th, 2005, the USFWS issued a decision that the listing of the greater sage-grouse was "not warranted" following a Status Review. The decision document supporting this outcome noted the need to continue or expand all conservation efforts to conserve sage-grouse.

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 the southern portion of the project area where the pine forest gives way to sage-steppe. BLM records identified no sage grouse leks within 3 miles of the POD. The closest lek is the Three-bees lek approximately 3.4 miles to the south.

3.3.5.2.4. 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.

Suitable mountain plover habitat will not be affected; the 53 acres of prairie dog colonies are all more than ¼ mile from any proposed infrastructure.

3.4. West Nile Virus

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

Since its discovery in 1999 in New York, WNV has become firmly established and spread across the United States. Birds are the natural vector host and serve not only to amplify the virus, but to spread it.

Though less than 1% of mosquitoes are infected with WNV, they still are very effective in transmitting the virus to humans, horses, and wildlife. *Culex tarsalis* appears to be the most common mosquito to vector, WNV.

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

Table 3.4 Historical West Nile Virus Information

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

*Wyoming Department of Health Records September 12, 2007.

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

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

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

The most common pesticide treatment is to place larvicidal briquettes in small standing water pools along

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

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

3.5. Water Resources

The project area is within the **Middle Powder River** drainage system. All of the POD area is within the Bitter Creek drainage, which has a well defined floodplain with hay fields and is a major tributary of the Powder River. Several ephemeral tributaries to Bitter Creek drain the POD area, including Quarter Circle Prong of Bitter Creek and Swartz Draw along with several other unnamed drainages. Smaller tributaries and headwater channel reaches in the area are generally narrow with steep channel gradients formed into steep topography, and they sometimes appear as incised gullies.

3.5.1. Groundwater

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

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

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

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

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 7 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 10 to 430 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

3.5.2. Surface Water

The project area is within the **Bitter Creek** drainage which is tributary to the Middle Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). Upper reaches of channels are primarily well vegetated grassy swales without defined bed and bank, while lower reaches generally become well formed channels that are sometimes incised.

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 1,421 at Maximum monthly flow to 2,154 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 at Moorhead, MT (PRB FEIS page 3-49).

The operator has identified two natural springs within this POD boundary at **T57N, R74W, Sec 34 (Homestead Spring)** and **T57 R74 Sec 28 (unamed)**. The estimated flow of the spring for each spring was 2 to 3 gpm and 1 to 2 gpm respectively with a water quality of **5850 $\mu\text{mhos/cm}$ conductivity, 5620 mg/l TDS and 6 SAR** for the Homestead spring.

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the East Bitter Creek POD project, following the Secretary of the Interior’s Guidelines and Standards. A Class III inventory specifically for the project was conducted by Quality Services (BLM project no. 70070129). The inventory covered approximately 693 acres; this inventory recorded 4 sites and 6 isolates. Previous inventory was also consulted (BLM# 70040095). Sites and isolates are defined as specified by the *2006 State Protocol between the Wyoming Bureau of Land Management State Director and the Wyoming State Historic Preservation Officer*. The following cultural resources are located in or near the APE (area of potential effect).

Table 3.5 Cultural Resources Inventory Results Site Number	Site Type	National Register Eligibility
48CA6580	Historic	NE
48CA6581	Historic	NE
48CA6855	Prehistoric	NE
48CA6873	Historic	NE
48IR2	Prehistoric Isolate	NE
48IR4	Prehistoric Isolate	NE

Table 3.5 Cultural Resources Inventory Results Site Number	Site Type	National Register Eligibility
48IR5	Prehistoric Isolate	NE
48IR6	Prehistoric Isolate	NE
48IR7	Prehistoric Isolate	NE
48IR8	Prehistoric Isolate	NE

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 21 proposed well locations, 1 is on a reclaimed conventional well pad, 17 can be drilled without a well pad being constructed and 3 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 18 wells without constructed pads would involve digging-out of rig wheel wells (for leveling drill rig on minor slopes), reserve pit construction (estimated approximate size of 12 x 24 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 18 wells would involve approximately 0.2 acre/well for 3.6 total acres. Initially, the surface disturbance associated with these 18 wells will be somewhat higher, up to 0.5 acre/well, defining disturbance as area where the vegetation is flattened or destroyed. The other 3 wells requiring cut & fill pad construction would disturb approximately 0.5 acre/well pad for a total of 1.5 acres. The total estimated disturbance for all 21 wells would be 5.1 acres.

Approximately 6.2 miles of improved roads would be constructed to provide access to various well locations. Approximately 1.6 miles of new and existing two-track trails would be utilized to access well sites. The majority of proposed pipelines (gas and water) have been located in "disturbance corridors." Disturbance corridors involve the combining of 2 or more utility lines (water, gas, power) in a common trench, usually along access routes. This practice results in less surface disturbance and overall environmental impacts. Approximately 2.1 miles of corridor is proposed to be built along existing roads, and approximately 0.75 miles of pipeline would be constructed outside of corridors. Expedient reclamation of disturbed land with stockpiled topsoil, proper seedbed preparation techniques, and appropriate seed mixes, along with utilization of erosion control measures (e.g., waterbars, water wings, culverts, rip-rap, gabions etc.) would ensure land productivity/stability is regained and maximized.

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

The PRB FEIS made predictions regarding the potential impact of produced water to the various soil types found throughout the Basin, in addition to physical disturbance effects. "Government soil experts state that SAR values of 13 or more cause potentially irreversible changes to soil structure, especially in

clayey soil types, that reduce permeability for infiltration of rainfall and surface water flows, restrict root growth, limit permeability of gases and moisture, and make tillage difficult.” (PRB FEIS page 4-144).

Table 4.1 summarizes the proposed surface disturbance.

Table 4.1 - SUMMARY OF DISTURBANCE

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
Nonconstructed Pad	18	0.2 acre	3.6	Long Term
Constructed Pad	3	0.5 acre	1.5	
Gather/Metering Facilities	0	Site Specific	0.0	Long Term
Screw Compressors	1	Site Specific	2.0	Long Term
Monitor Wells	0	0.1/acre	0	Long Term
Impoundments	7	Site Specific Site Specific Site Specific or 0.01 ac/WDP	17.66	Long Term
On-channel	3		9.42	
Off-channel	4		8.24	
Water Discharge Points	9		0.18	
Channel Disturbance				
Headcut Mitigation*	0	Site Specific	0.0	
Channel Modification	0	Site Specific	0.0	
Improved Roads				Long Term
No Corridor	1.0	25' Width	3.18	
With Corridor	5.2	50' Width	31.55	
2-Track Roads		12' Width or Site Specific		Long Term
No Corridor	0			
With Corridor	1.6	40' Width	7.76	
Pipelines				Short Term
No Corridor	0.75	20' Width	1.86	
With Corridor	2.12	30' Width	7.72	
Buried Power Cable	0	12' Width or Site Specific		Short Term
No Corridor	Power Not within Corridor			
Overhead Powerlines	1.3	15' Width	2.3	Long Term
Additional Disturbance	2 staging areas	300'x300'	4.13	Project life
Additional Disturbance	2 communication sites	50' tall, 2' diameter hole, 4' deep for each tower	>0.1	Long Term

The designation of the duration of disturbance is defined in the PRB FEIS (pg 4-1 and 4-151). “For this EIS, short-term effects are defined as occurring during the construction and drilling/completion phases.

Long-term effects are caused by construction and operations that would remain longer”.

4.1.1. Wetland/Riparian

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. 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).

Discharge of water from the EMITS treatment facility may have effects in Bitter Creek similar to those described in the EIS. Additional flow discharge from this POD may increase the width and extent of wetland and riparian areas and some bottom land species may be replaced by more water tolerant species. When water production is complete wetland areas will gradually shrink as water availability wanes.

4.1.2. Invasive Species

Based on the investigations performed during the POD planning process, and in consultation with Allen Mooney of Campbell County Weed & Pest, Storm Cat has committed to the control of noxious weeds and species of concern using the following measures in an Integrated Pest Management Plan (IPMP), included in the proposal:

- Prompt reseeding and revegetation of areas of disturbed soils with certified weed-free seed
- Cleaning of equipment and vehicles prior to entering and leaving each worksite
- Herbicide application
- Mowing newly revegetated areas during the first season of establishment, prior to seed formation on the weeds of concern to avoid the transport and spread of noxious weeds into the area.

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

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

4.1.3. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the **Middle Powder River** drainage, which is approximately 40.8% of the total predicted in the PRB FEIS.
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of treated water flowing into East Bitter Creek.

No additional mitigation measures are required.

4.2. Wildlife

4.2.1. Big Game Direct and Indirect Effects

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

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

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

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

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 is to be contained in reservoirs or treated and discharged into drainages. If a reservoir were to discharge, it is unlikely produced water will reach a fish-bearing stream. It is unlikely downstream species would be affected.

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

4.2.2.1. Cumulative effects

WDEQ is aware of the concerns about the effects of water quality and flows relative to discharge of treated water directly into the Powder River. They are taking a conservative approach to permitting until more information can be obtained and their watershed based permitting approach is implemented. Long term water quality and flow monitoring, that would be required in the NPDES permit, would ensure that effluent limitations are met. Under permitted conditions, it is not anticipated that existing downstream water uses would be affected.

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

4.2.3. Migratory Birds Direct and Indirect Effects

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

Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses (displacement) were much greater than the direct physical habitat losses.

Overhead power lines affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Cumulative effects

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

4.2.4. Raptors Direct and Indirect Effects

Human activities in close proximity to active raptor nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to over heating or chilling of eggs or chicks. The prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality. In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation. Additional direct and indirect impacts to raptors, from oil and gas development, are analyzed in the PRB FEIS (4-216-221).

Table 5. Infrastructure within close proximity to documented raptor nests within the **East Bitter Creek** project area (Timing limitations will apply to this infrastructure).

Blm ID#	SPECIES	Location	STATUS	WELL / PIT NUMBER	DISTANCE
4387	Great-horned owl	440409 4971668	Active	5-27, 6-27, 11-27, 13-27. Road corridor construction between 5-27 and 13-27	0.2 miles from the 5-27 well.
5148	Unknown	440900 4972000	Inactive	2-27, 5-27, 6-27, 11-27, 14-27, staging area, overhead power in SW section 22	1.15 miles from 6-27 well.

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

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

4.2.5.1. Threatened and Endangered and Sensitive Species

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (<i>Mustela nigripes</i>)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	NE	Suitable habitat of insufficient size.
Threatened				
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Riparian areas with permanent water	NS	NLAA	Suitable habitat present and will be surveyed prior to impacts.

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.

Effect 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

Because the black-tailed prairie dog colonies within and adjacent to the project area are of insufficient size for supporting ferrets and are isolated from any prairie dog complexes, implementation of the proposed development should have no effect on the black-footed ferret.

4.2.5.1.2. Ute's Ladies Tresses Orchid

Reservoirs are located within ephemeral drainages of Bitter Creek or are located in upland habitats. Suitable habitat is present within the project area. Those areas that will be physically disturbed were surveyed in 2007 with negative survey results. Discharged water may impact suitable habitat that was not surveyed in 2007. A Condition of Approval will be applied to the POD to ensure all potentially affected habitats are surveyed prior to any discharge to that habitat.

Reservoir seepage may create suitable habitat if historically ephemeral drainages become perennial, however no historic seed source is present within or upstream of the project area. Implementation of the proposed coal bed natural gas project may affect the Ute ladies'- tresses orchid as suitable habitat is present.

4.2.5.2. Sensitive Species Direct and Indirect Effects

Continued loss of prairie dog habitat and active prairie dog towns will result in the decline of numerous sensitive species in the short grass prairie ecosystem.

Table 4.3 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	K	MIIH	Additional water may increase habitat.
Spotted frog (<i>Ranus pretiosa</i>)	Ponds, sloughs, small streams	NP	NI	Prairie not mountain habitat.
Birds				
Baird's sparrow (<i>Ammodramus bairdii</i>)	Grasslands, weedy fields	S	MIIH	Sagebrush cover will be affected.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Mature forest cover often within one mile of large water body.	S	MIIH	Project includes overhead power.
Brewer's sparrow (<i>Spizella breweri</i>)	Basin-prairie shrub	S	MIIH	Sagebrush cover will be affected.
Burrowing owl (<i>Athene cunicularia</i>)	Grasslands, basin-prairie shrub	S	MIIH	Prairie dog colony present.
Ferruginous hawk (<i>Buteo regalis</i>)	Basin-prairie shrub, grasslands, rock outcrops	K	MIIH	Active nest present.
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	K	MIIH	Sagebrush cover will be affected.
Long-billed curlew (<i>Numenius americanus</i>)	Grasslands, plains, foothills, wet meadows	NP	NI	Habitat not present.
Mountain plover (<i>Charadrius montanus</i>)	Short-grass prairie with slopes < 5%	NP	NI	Habitat not present.
Northern goshawk (<i>Accipiter gentilis</i>)	Conifer and deciduous forests	NP	NI	No forest habitat present.
Peregrine falcon (<i>Falco peregrinus</i>)	cliffs	NP	NI	No nesting habitat present.

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Plants				
Porter's sagebrush (<i>Artemisia porteri</i>)	Sparsely vegetated badlands of ashy or 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. Bald eagle

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

There are **eight** miles of existing overhead three-phase distribution lines within the project area. The wire spacing is likely in compliance with the Avian Power Line Interaction Committee's (1996) suggested practices and with the Service's standards (USFWS 2002); however other features may not be in compliance. **The operator** is proposing an additional **1.3** miles of overhead three-phase distribution lines. There are currently approximately **5.5** miles of improved roads within the project area, with 5.5 miles proposed.

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

Roads present a collision hazard, primarily from bald eagles scavenging on carcasses resulting from other road related wildlife mortalities. Collision risk increases with automobile travel speed. Typically two-tracks and improved project roads pose minimal collision risk. In one year of monitoring road-side carcasses the BLM Buffalo Field Office reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; eagles (bald and golden) were observed feeding on 16 of the reported road-side carcasses (<4%).

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

4.2.5.2.2. Black-tailed prairie dog

No prairie dog towns will be impacted by the proposed development; all development is greater than one quarter mile from the two prairie dog towns.

4.2.5.2.3. Greater sage-grouse

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

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

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

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

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

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

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

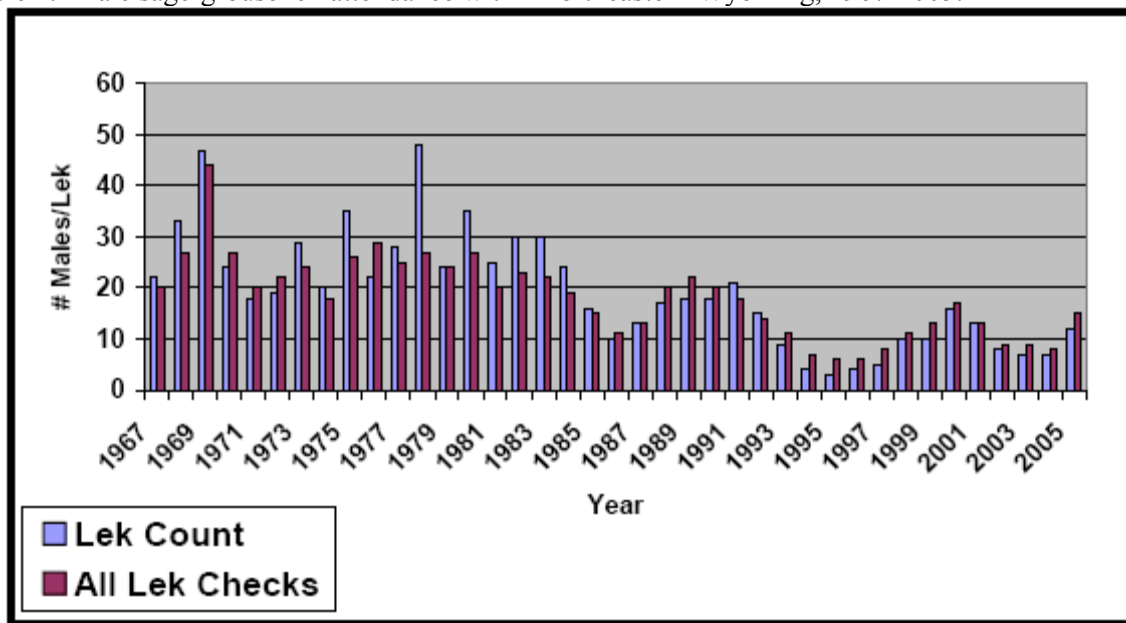
Percentage of sage-grouse nesting within a certain distance from their breeding lek is unavailable for the Powder River Basin. The Buffalo and Miles City field offices through the University of Montana with assistance from other partners including the U.S. Department of Energy and industry are currently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

Vegetation communities within the Powder River Basin are naturally fragmented as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. Without contiguous habitat available to nesting grouse it is likely a smaller percentage of grouse

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

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

Figure 1. Male sage-grouse lek attendance within northeastern Wyoming, 1967-2005.



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

A two-mile timing limitation given the long-term population decline and that less than 50% of grouse are

expected to nest within the limitation area is likely insufficient to reverse the population decline. Moynahan and Lindberg (2004) like WAFWA (Connely 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).

4.2.5.2.4. Mountain plover

Mineral development may have mixed effects on mountain plovers. Disturbed ground such as buried pipe line corridors and roads may be attractive to plovers while human activities within one-quarter mile may be disruptive. Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision. The existing overhead power lines adjacent to the project area provide perch sites for raptors potentially resulting in increased mountain plover predation. CBNG infrastructure such as the well houses, roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes. An analysis of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

Suitable mountain plover habitat **is not** present within one quarter mile of proposed activities. The project **will not** affect mountain plovers.

4.2.5.3. Cumulative effects

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

4.3. West Nile Virus Direct and Indirect Effects

This project is likely to result in standing surface water which may potentially increase mosquito breeding habitat. BLM has consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD page 18, regarding the disease and the need to treat. BLM has also consulted with the researchers that are studying the dynamics of WNV species and its effects in Wyoming.

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

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

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

4.4. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. CBNG-produced water will either be stored in non-discharging on-channel or off-channel impoundments or it will be treated in an EMIT facility and then discharged into Bitter Creek. 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, in consultation with the BLM, developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategies.

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

The maximum water production is predicted to be **15.0** gpm per well or **315.0** gpm (0.7 cfs or 508 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 9,689acre-feet in 2008 (maximum production is estimated in **2005** at 12,328 acre-feet). As such, the volume of water resulting from the production of these wells is 5% of the total volume projected for 2008. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 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 117 gpm will infiltrate at or near the discharge points and impoundments (**188** acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, “the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically

similar to alluvial groundwater.” (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. “The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers.” (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 10 to 460 feet compared to 264 feet to 712 for the various coals seams in the **Cook, Wall, and Pawnee coal zones**. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

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

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

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

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

The BLM has installed shallow groundwater monitoring wells at five impoundment locations in the PRB to assess ground-water quality changes due to infiltration of CBNG produced water. Water quality data has been sampled from these wells on a regular basis. Preliminary data from three sites show increasing TDS level as water infiltrates while two sites are not.

Approximately 1650 new impoundment sites have been investigated with over 1850 borings as of December, 2007. Of those impoundments, 240 met the criteria to provide compliance monitoring data if constructed and used for CBNG water containment. Only 108 monitored impoundments are currently in use. As of the 4th quarter 2007, only 9 monitored impoundments exceed groundwater class of use limits (Fischer, 2008). The BLM requires that operators comply with the DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

4.4.1.1. Groundwater Cumulative Effects:

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

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

4.4.2. Surface Water

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

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

Predicted Values	TDS, mg/l	SAR	EC, µmhos/cm
Most Restrictive Proposed Limit		10	1,000
Least Restrictive Proposed Limit		2	3,200
Primary Watershed at 06324500 Gauging station			
Historic Data Average at Maximum Flow		4.62	1,421
Historic Data Average at Minimum Flow		6.15	2,154
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 WY0055999 & WY0055956			
At discharge point	na	na	7,500
Predicted Produced Water Quality Cook/ Wall/ Pawnee	1,240	25.5	1,950

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 1240.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS).

The quality for the water produced from the Cook/Wall/Pawnee target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 15.0 gallons per minute (gpm) is projected is to be produced from these 21 wells, for a total of 315.0 gpm for the POD. See Table 4.5. Water quality produced from the EMIT plant will be improved over raw CBNG waters. For more information, please refer to the WMP included in this POD.

There are 9 discharge points proposed for this project. They have been appropriately sited and utilize

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

To manage the produced water, 7 impoundments (115.6 ac-ft) would potentially be constructed within the project area. These impoundments will disturb approximately 17.66 acres including the dam structures. Of these water impoundments, 4 would be on-channel reservoirs disturbing 9.42 acres (2 of these are existing), and 3 would be off-channel ponds disturbing 8.24 acres. The off-channel impoundments would result in evaporation and infiltration of CBNG water. Criteria identified in “Off-Channel, Unlined CBNG Produced Water Pit Siting Guidelines for the Powder River Basin, Wyoming” (WDEQ, 2002) was used to locate these impoundments. Monitoring may be required based upon WYDEQ findings relative to “Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments” (June 14, 2004). Existing impoundments will be upgraded and proposed impoundments will be constructed to meet the requirements of the WSEO, WDEQ and the needs of the operator and the landowner. All water management facilities were evaluated for compliance with best management practices during the onsite.

The volume of water produced from these wells may result in a maximum addition of 0.7 cfs in Bitter Creek below at the treatment plant discharge point. The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the treatment plant and seepage from impoundments in the POD area will potentially allow for channel vegetation enhancement through wetland-riparian species establishment. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Middle Powder River of 86 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 21 wells is anticipated to be a total of 315.0 gpm or 0.7 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) a maximum 0.55 cfs to the Middle Powder River flows, or 0.04% of the predicted total CBNG produced water contribution. This incremental volume is statistically below the measurement capabilities for the volume of flow of the Middle Powder River watershed (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP page G-2). Based on the area of the Bitter Creek watershed above the POD (75.68 sq mi) and an assumed density of one well per location every 80 acres, the potential exists for the development of 605 wells which could produce a maximum flow rate of 9,082 gpm (20.2 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watershed upstream of the project area, 20.2 cfs, is much less than the runoff rate estimated from the 2-year storm event of 501 cfs of the drainage.

The proposed method for surface discharge provides passive treatment through the aeration supplied by the energy dissipation configuration at each discharge point outfall. Aeration adds dissolved oxygen to the produced water which can oxidize susceptible ions, which may then precipitate. This is particularly

true for dissolved iron. Because iron is one of the key parameters for monitoring water quality, the precipitation of iron oxide near the discharge point will improve water quality at downstream locations.

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

Permit effluent limits were set at (WYPDES WY0055999 and WY0055956 page 4):

Total Petroleum Hydrocarbons	10 mg/l max
pH	6.5 to 9.0
Specific Conductance	7500 mg/l max
Dissolved iron	1000 µg/l max
Total Arsenic	150 µg/l max
Total Selenium	5 µg/l max
Chlorides	2000 mg/l

WYPDES permit WY0055948 applies to discharge from the Drake treatment plant and has the following standards:

pH	6.5 to 9.0	Specific Conductance
	1330 mg/l max	
Chlorides		150 mg/l
Dissolved iron		1000 µg/l max
Total Arsenic		150 µg/l max
Total Barium		1800 µg/l max
Total Selenium		5 µg/l max
Sulfates		3000 mg/l

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

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

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

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

In-channel downstream impacts are addressed in the WMP for the East Bitter Creek POD prepared by Bison Environmental for Stormcat Energy.

4.4.2.1. Surface Water Cumulative Effects

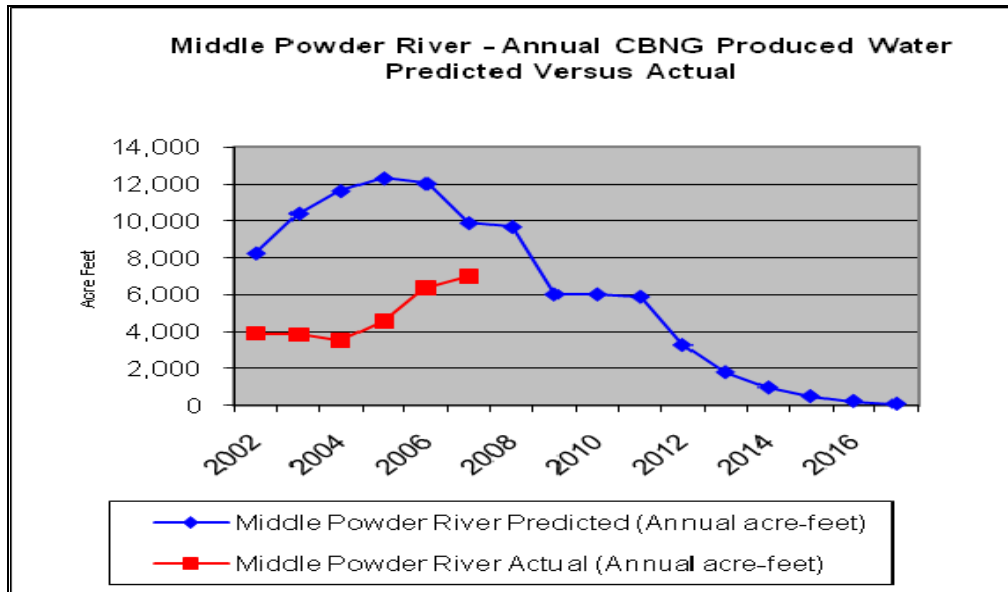
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the **Middle Powder River** watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2007, all producing CBNG wells in the **Middle Powder River** watershed have discharged a cumulative volume of **29,312** acre-ft of water compared to the predicted **64,587** acre-feet 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 **45.4** % 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 *2007 Data Update 3-08-08*

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	7,020	70.9	29,312	45.4
2008	9,689	74,276				
2009	6,030	80,306				
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		29,312			

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

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

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

1. They are proportional to the actual amount of cumulatively produced water in the **Middle Powder River** drainage, which is approximately 45.4% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

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

4.5. Cultural Resources

BLM review, conducted by Wendy Sutton, has determined that one site and two isolated resources will be impacted by the current project. The impacted site (48CA6573) and isolates (IR2 and IR8) have been recommended as not eligible to the National Register of Historic Places. As such, these resources are not considered historic properties; therefore, the impact to this resource result in *no historic properties affected*. Following the Wyoming State Protocol, Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 4/29/2008 that the proposed project would result in *no historic properties affected/no effect* (DBU_WY_2008_1010).

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
Chris Brown	Project Engineer	Bison Environmental	Yes
Seth Lambert	Environmental Consultant	Bison Environmental	Yes
Mike Jaeger	Project Manager	Storm Cat Energy	No
James Hansen	Operations Supervisor	Storm Cat Energy	No

6. OTHER PERMITS REQUIRED

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

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