FINDING OF NO SIGNIFICANT IMPACT & DECISION RECORD
FOR
KENNEDY OIL
HANGING WOMAN I
ENVIRONMENTAL ASSESSMENT –WY-070-EA09-1

DECISION: Is to approve Alternative C as described in the attached Environmental Assessment (EA) and authorize KENNEDY OIL's HANGING WOMAN I Coal Bed Natural Gas (CBNG) POD comprised of the following 23 Applications for Permit to Drill (APDs):

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	HWU I HANGING WOMAN	4429	SESE	29	57N	79W	WYW142101
2	HWU I HANGING WOMAN	1230	SWNW	30	57N	79W	WYW142100
3	HWU I HANGING WOMAN	1430	SWSW	30	57N	79W	WYW142100
4	HWU I HANGING WOMAN	2130	NENW	30	57N	79W	WYW142100
5	HWU I HANGING WOMAN	2330	NESW	30	57N	79W	WYW142100
6	HWU I HANGING WOMAN	3230	SWNE	30	57N	79W	WYW142100
7	HWU I HANGING WOMAN	3430	SWSE	30	57N	79W	WYW142100
8	HWU I HANGING WOMAN	4130	NENE	30	57N	79W	WYW142100
9	HWU I HANGING WOMAN	4330	NESE	30	57N	79W	WYW142100
10	HWU I HANGING WOMAN	1231	SWNW	31	57N	79W	WYW142101
11	HWU I HANGING WOMAN	1431	SWSW	31	57N	79W	WYW142101
12	HWU I HANGING WOMAN	2331	NESW	31	57N	79W	WYW142101
13	HWU I HANGING WOMAN	3231	SWNE	31	57N	79W	WYW142101
14	HWU I HANGING WOMAN	3431	SWSE	31	57N	79W	WYW142101
15	HWU I HANGING WOMAN	4131	NENE	31	57N	79W	WYW142101
16	HWU I HANGING WOMAN	4331	NESE	31	57N	79W	WYW142101
17	HWU I HANGING WOMAN	1232	SWNW	32	57N	79W	WYW142101
18	HWU I HANGING WOMAN	1432	SWSW	32	57N	79W	WYW142101
19	HWU I HANGING WOMAN	2132	NENW	32	57N	79W	WYW142101
20	HWU I HANGING WOMAN	2332	NESW	32	57N	79W	WYW142101
21	HWU I HANGING WOMAN	3232	SWNE	32	57N	79W	WYW142101
22	HWU I HANGING WOMAN	3432	SWSE	32	57N	79W	WYW142101
23	HWU I HANGING WOMAN	4332	NESE	32	57N	79W	WYW142101

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

	IMPOUNDMENT Name / Number	Qtr/Qtr	SEC	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	HW PIT	SWNW	36	57	80	1.05	1	STATE
2	HW PIT 1	NWNW	36	57	80	29.03	4.53	STATE
3	HW PIT 2	NWNE	31	57	79	28.13	4.26	WYW 142101

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
KENNEDY OIL
HANGING WOMAN I
PLAN OF DEVELOPMENT
WY-070-EA09-1

INTRODUCTION

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

1. PURPOSE AND NEED

The purpose for the proposal is to produce coal bed natural gas (CBNG) on 2 federal oil and gas mineral leases issued to the applicant by the BLM.

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

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

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternative A - No Action

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

2.2. Alternative B Proposed Action

Proposed Action Title/Type: KENNEDY OIL's HANGING WOMAN I Plan of Development (POD) for 23 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There are 23 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 target 2 coal formations. All wellhead facilities will be operated by pump jacks (12 feet tall and 16 feet in length),and painted Carlsbad Canyon. Proposed wells are located as follows:

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
1	HWU I HANGING WOMAN	4429	SESE	29	57N	79W	WYW142101
2	HWU I HANGING WOMAN	1230	SWNW	30	57N	79W	WYW142100

	Well Name	Well #	QTR	Sec	TWP	RNG	Lease
3	HWU I HANGING WOMAN	1430	SWSW	30	57N	79W	WYW142100
4	HWU I HANGING WOMAN	2130	NENW	30	57N	79W	WYW142100
5	HWU I HANGING WOMAN	2330	NESW	30	57N	79W	WYW142100
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7	HWU I HANGING WOMAN	3430	SWSE	30	57N	79W	WYW142100
8	HWU I HANGING WOMAN	4130	NENE	30	57N	79W	WYW142100
9	HWU I HANGING WOMAN	4330	NESE	30	57N	79W	WYW142100
10	HWU I HANGING WOMAN	1231	SWNW	31	57N	79W	WYW142101
11	HWU I HANGING WOMAN	1431	SWSW	31	57N	79W	WYW142101
12	HWU I HANGING WOMAN	2331	NESW	31	57N	79W	WYW142101
13	HWU I HANGING WOMAN	3231	SWNE	31	57N	79W	WYW142101
14	HWU I HANGING WOMAN	3431	SWSE	31	57N	79W	WYW142101
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17	HWU I HANGING WOMAN	1232	SWNW	32	57N	79W	WYW142101
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19	HWU I HANGING WOMAN	2132	NENW	32	57N	79W	WYW142101
20	HWU I HANGING WOMAN	2332	NESW	32	57N	79W	WYW142101
21	HWU I HANGING WOMAN	3232	SWNE	32	57N	79W	WYW142101
22	HWU I HANGING WOMAN	3432	SWSE	32	57N	79W	WYW142101
23	HWU I HANGING WOMAN	4332	NESE	32	57N	79W	WYW142101

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

	IMPOUNDMENT Name / Number	Qtr/Qtr	SEC	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	HW PIT	SWNW	36	57	80	1.05	1	STATE
2	HW PIT 1	NWNW	36	57	80	29.03	4.53	STATE
3	HW PIT 2	NWNE	31	57	79	28.13	4.26	WYW 142101

County: Sheridan

Applicant: KENNEDY OIL

Surface Owners: Padlock Ranch Company, INC, Bureau of Land Management

Project Description:
The proposed action involves the following:

- Drilling of 23 total federal CBM wells, co-mingled, targeting the Roberts and Odekoven coal seams with an average total depth of 2641 feet. The project lifespan is estimated to be 7-10 years.

- Drilling and construction activities are anticipated to be completed within two years, the term of

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

- Well metering shall be accomplished by telemetry and well visitation. Metering would entail approximately 6-8 visits per month to each well location.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: full containment of the produced water at 2 discharge points, one existing and one proposed, in 3 off-channel impoundments, two existing and one proposed, within the Upper Tongue River watershed.

- Development of one deep groundwater monitoring well located in the NWNE Sec 31, T57N, R79W, completed to the Roberts coal zone.

- An unimproved and improved road network.

- Buried gas and water pipeline infrastructure. There is no proposed powerline network for this POD.

- Pump jacks will be powered by propane until such time when they will be powered by produced methane. Propane tanks will be placed on location and require a minimum of 1 visit per week.

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 HANGING WOMAN I POD are listed below under 2.3.1:

2.3.1. Changes as a result of the on-sites

Well #	QTR	Sec	TWP	RNG	onsite notes
21-30	NENW	30	57N	79W	utilities to the SW rerouted to follow contour of hill side and decrease cut for pipeline infrastructure in highly erosive soils.
32-30	SWNE	30	57N	79W	proposed engineered pad not required, location will be incorporated into a rd/utility corridor and be a drive through location
34-30	SWSE	30	57N	79W	well moved: proximity to raptor nest, moved to get out of line of sight
14-30	SWSW	30	57N	79W	well moved/access rerouted: proximity to raptor nest, moved/rerouted to get out of line sight
23-31	NESW	31	57N	79W	access rerouted to keep LWC(low water crossing) perpendicular to drainage
34-31	SWSE	31	57N	79W	designed for an engineered pad, Kennedy Oil drilling representative decided location will not require a constructed pad
43-31	NESE	31	57N	79W	well moved: highly erosive soils, sandy/rocky knob would require an engineered pad, new location will not require a pad, location will be incorporated into rd/access corridor
12-31	SWNW	31	57N	79W	well moved: to get off narrow ridge, sandy/rocky soils with poor reclamation potential, engineered pad requires excessive cut and fill, new location will need an engineered pad, but cut and fill requirements will be approximately ½ of proposed location, and soils are loamy/grass with improved reclamation potential
12-32	SWNW	32	57N	79W	access rerouted to stay off highly erosive soils and follow contour, cut and fill will decrease due to decrease in side slope
14-32	SWSW	32	57N	79W	well moved to get out of highly erosive soils and negate engineered pad requirement, new location; less erosive soils with better reclamation potential, no pad required, Access: rerouted to stay off highly erosive soils
32-32	SWNE	32	57N	79W	well moved: SGH(sagegrouse habitat), proposed location required engineered pad, new location no pad required, Access: short section of proposed access/utilities is not in road corridor, new location: the access/utilities will be in road corridor NOTE: non corridor utilities connecting the E1/2 of Sec 32 to the W1/2 of Sec 32 will be rerouted to follow contour of slope instead of perpendicular to slope, the new route will be in shallow loamy/grass in lieu of highly erosive soils (sand/rocky)
41-32	NENE	32	57N	79W	well moved: SGH, location and access required excessive dirt work for one well, access rerouted to stay out of channel bottom, and use existing primitive road (to be upgraded to improved road)

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. The operator will supply two copies of the complete approved SW-4, SW-3, or SW-CBNG permits to BLM as they are issued by WSEO for impoundments.

2. The operator will supply two copies of the complete approved WYPDES permits to BLM as they are issued by WDEQ for surface discharge of the produced water.

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. Wildlife

1. For any surface-disturbing activities proposed in sagebrush shrublands, the Companies will conduct clearance surveys for sage grouse breeding activity during the sage grouse's breeding season before initiating the activities. The surveys must encompass all sagebrush shrublands within 0.5 mile of the proposed activities.
2. Containment impoundments will be fenced to exclude wildlife and livestock. If they are not fenced, they will be designed and constructed to prevent entrapment and drowning.

2.3.2.5. Air Quality

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

2.3.3. Site specific mitigation measures

General

Please contact Eric Holborn – Natural Resource Specialist, @ (307) 684-1044, Bureau of Land Management, Buffalo, if there are any questions concerning surface use COAs.

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

1. All Kennedy Oil representatives and contractors will have a copy of the approved POD map and conditions of approval with them at all times while conducting activities within the Hanging Woman POD project area.

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

   Reclamation Standards:

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

3. Provide 4" of aggregate where grades exceed 8%. Surfacing material must meet requirements set forth in Wyoming Supplement to BLM Road Manual 9113.

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

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

5. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. This requirement will be waved for trenches installed with wheel trenchers.

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 Hanging Woman I POD is Covert Green (18-0617TPX).

7. If produced water is to be applied to road surfaces as dust abatement, the operator needs an approved Wyoming Oil & Gas Commission Facility Information for Road Application of Waste and Waste Water (Form 20) along with the proposed action describing locations, application rates, etc. Form 20 is available at http://wogcc.state.wy.us.

8. "Roughed-in" or "Pioneer" roads shall be constructed according to the line and grade shown in the approved engineering design. Non-engineered roads shall be constructed to a line and grade established to meet the BLM Gold Book and 9113 guidelines as approved in the MSUP, and shaped according to an approved design template for that road.
   a. Improved roads with utility corridor will not exceed a disturbance working width of 45 feet and blading not to exceed 25 feet unless a specific design is included in the plan and profile section of the master surface use plan.
   b. Primitive roads (2-tracks) with utility corridor will not exceed a disturbance width of 30 feet. Construction of primitive roads access/utility corridor within the POD will minimize impact to sagebrush by minimizing road width, mowing and wheel trenching

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

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

10. All roads, well pads, rig slot, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for the pre-construction meeting.

11. Disturbance for pipelines and utility corridors adjacent to access roads will be contained within the disturbance allowed for road construction.

12. Pipeline installation and/or corridors without road access will not exceed a disturbance width of 30 feet with clearing and blading not to exceed 20 feet.

13. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a 35 foot radius of the well stake.

14. The operator will maintain well drilling, completion and associated construction operations within a 200 foot by 200 foot work area for those locations where a constructed pad is not approved as designed.

15. An impoundment will be non-compliant if the proposed mitigation, or approved action, is not successful, i.e. leaking if permitted under full-containment. Disposal of federally produced water will cease into the non-compliant impoundment until successful mitigation is achieved. If produced water resurfaces below the mitigation site, or in adjacent drainages, the mitigation will be deemed unsuccessful and the impoundment will be lined or reclaimed.

16. Segregated top soil will be redistributed once the instillation of gas, water and electrical utilities is complete at the well head.

17. Reserve pits containing frozen fluids will not be closed. See "Operations/Maintenance", COA #10 of the Conditions of Approval document for further clarification.

18. Top soil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig slots, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches. Segregation will not be required for trenches installed with wheel trenchers.

19. 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:

Seed Mix

Shallow Loamy Ecological Site Seed Mix, 15-19" Precipitation Zone		
Species	**% in Mix**	**Lbs PLS***
Western Wheatgrass - *Rosana*	20	2.4
Idaho fescue – *Joseph*	30	3.6
Bluebunch wheatgrass – *Secar or P-7*	30	3.6
Rocky Mountain beeplant (Cleome serrulata)	10	1.2
Lewis - *Appar*, Blue, or Scarlet flax	5	0.6
White – *Antelope* or Purple Prairie Clover - *Bismarck*	5	0.6
Total	**100%**	**12 lbs/acre**

*PLS = pure live seed
*Northern Plains adapted species
*Double this rate if broadcast seeding

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

Wildlife

All conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (ES-6-WY-07-F012) shall be complied with.

Raptors

1. The following conditions will alleviate impacts to raptors:
   a. No surface disturbing activity shall occur within 0.5 mile of all identified raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season. This timing limitation will affect the following

Township/Range	Section	Wells and Infrastructure
T57 R79	19,29,30,31,32	44-29, 12-30, 14-30, 23-30, 34-30 wells and associated road and corridor construction. 12-32, 14-32, 23-32, 32-32 wells and associated road and corridor construction
T57 R80	25,36	Road and corridor construction

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 0.5 mile timing buffer will be implemented. The timing buffer restricts surface disturbing activities within 0.5 mile of occupied raptor nests from February 1 to July 31.
c. Nest productivity checks shall be completed annually and continue 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.
d. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.
e. Well metering, maintenance and other site visits within 0.5 miles of raptor nests should be minimized as much as possible during the breeding season (February 1 – July 31).
f. The road passing by nest 5611 (SW section 30) shall not be used for POD related activities from February 1 to July 31 annually. If the occupancy check required above indicates the nest is inactive in a given year, travel will not be restricted for the remainder of that year.
g. Maintenance (e.g. work-over, enhancements) on the relocated 44-29 will require an exception from February 1st to July 31st in order to minimize impacts to the nests in section 29 and 32. Routine pumper traffic will be allowed.

Sage Grouse

1. The following conditions will alleviate impacts to sage-grouse:
   a. No surface disturbing activities are permitted within 2 miles of the Hanging Woman South Prong and Hanging Woman Early Prong sage grouse leks between March 1 and June 15, prior to completion of a greater sage grouse lek survey**. This condition will be implemented on an annual basis for the duration of surface disturbing activities.** This timing limitation will affect the following:

Township/Range	Section	Wells and Infrastructure
T57 R79	29,30	Well, road and corridor construction to 44-29, 12-30, 21-30, 23-30, 32-30, 41-30, 43-30

   b. If an active lek is identified during the survey, the 2 mile timing restriction (March 1-June 15) will be applied and surface disturbing activities will not be permitted until after the nesting season. If surveys indicate that the identified lek is inactive during the current breeding season, surface disturbing activities may be permitted within the 2 mile buffer until the following breeding season (March 1). The required sage grouse survey will be conducted by a biologist following the most current WGFD protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
   c. Well metering, maintenance and other site visits within 2.0 miles of documented sage grouse lek sites should be minimized as much as possible during the breeding season (March 1– June 15).

Water Management

1. The outfall chute into the HW-1 Pit from the HW Pit is eroding and the liner is no longer operating as designed. This outfall will be repaired before these two pits can be used as part of this federal action.
2. As part of the approval of this POD, the operator will be responsible for drilling, completing, and equipping a set of monitoring wells prior to production of the wells associated with this POD, as described below. The specific location will be in the NWNE Section 31 T57N R79W as determined

in consultation with the BLM.

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

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

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

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

2. Sand Zone Monitor Wells
   There could be one or more of these wells at each monitor site, depending on parameters of interest, local concerns, etc. Typically there is a well completed in an overburden sand to monitor leakage of the shallower, generally more accessible sands. Wells are completed in under-burden sands when the under-burden sands are of more local interest or are of more significant thickness and quality, and some sites are established with wells in each of the sands from the surface down to the production zone to study recharge/discharge relationships, inter-aquifer communication, and changes in water quality. In addition, some sites will require shallow alluvial wells along ephemeral drainages receiving CBM discharge water - again to look at recharge. These wells are completed as follows:

   The depth of the sand well(s) will be determined in the field utilizing the geophysical logs from the adjacent coal well(s). On wells where coal is penetrated (as determined from the logs from the adjacent coal well(s)) and on wells greater than 500 feet in depth, drilling and casing will be

done as described above for the coal zone well(s). One of two completion methods may be used. The decision on which method to use will be determined by the authorized officer depending on the objectives and use of the well.

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

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

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

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

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

Standard equipment includes:

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

3. Data collection platform and miscellaneous support equipment.
   All wells are linked to a central data logger (Campbell CR10 or CR510) located in a central shelter and powered via 12 volt batteries and solar modules.

   All wells are enclosed in secure, weather proof shelters and fenced in to protect from livestock and wildlife damage. Please contact the BFO BLM for additional information.

Other Requirements:

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

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

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

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

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

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

Cultural

1. An archaeological "Slow Monitor" of construction shall be performed for this project within designated areas. Only one (1) piece of equipment shall be used for initial soil stripping. Soils will be scrapped at shallow depths (generally less than 5 cm) during initial soil removal; soils will not be "ripped" during this phase. A qualified archaeologist, with a valid BLM Cultural Resource Use Permit, shall follow equipment during initial phase of construction, including vegetation removal and initial soil stripping. Slow monitoring strategy shall continue to a minimum depth of 10 cm and until the archaeologist is satisfied that it is unlikely any cultural materials will be encountered. Any monitoring effort should not only examine excavated areas, but should also examine any spoil piles for cultural material. If any cultural resources are found during monitoring, construction shall halt until a determination of "no historic properties affected" can be made or other mitigation is agreed upon (and completed as required), as per Standard COA (General)(A)(1). A report on monitoring activities will be submitted to BLM within 30 days of fieldwork. Project areas that are subject to this stipulation include: southern portion of access road and utilities to well 12-30, access/utilities and pad for well 23-30, and proposed pits within T57N R79W Section 31 NE.

   In the event that ground cover conditions improve to the point where adequate Class III Inventory can be carried out prior to ground disturbing activities, BLM review and acceptance of a Class III inventory may replace monitoring requirements within Class II inventory areas.

2.4. Alternatives considered but not analyzed in detail

The operator considered storing water in on-channel impoundments, using land application disposal, and also subsurface drip irrigation (SDI). See page 14 of the water management plan for a complete discussion of these options.

2.5. Summary of Alternatives

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

Table 2.5 Summary of the Alternatives

Facility	Alternative A (No Action) Existing Number or Miles	Alternative B (Original Proposal) Proposed Number or Miles	Alternative C (Environmental Alt.) Revised Number or Miles
Total CBNG Wells	0	23	23
Well Locations			
Nonconstructed		19	21
Constructed		4	2
Conventional Wells	0	0	0
Gather/Metering Facilities	0	0	0
Compressors	0	0	0
Ancillary (Staging/Storage Areas)	0	0	0
Template/Spot Upgrade Roads	1.2	4.26	11.0
No Corridor	1.2	.86	2.0
With corridor	0	3.4	9.0
Engineered Roads	0	0	1.9
No Corridor	0	0	.6
With Corridor	0	0	1.3
Primitive Roads	4.2	5.01	0
No Corridor	4.2	.41	0
With corridor	0	4.6	0
Buried Utilities	0	9.1	11.4
No Corridor	0	1.1	1.1
With Corridor	0	8.0	10.3
Overhead Powerlines	0	0	0
Communication Sites	0	0	0
Monitor Wells	0	1	1
LAD	N/A	N/A	N/A
SDI	N/A	N/A	N/A
Treatment Facilities	0	0	0
Impoundments			
On-channel	0	0	0
Off-channel	2 (6 ac)	3 (10 ac)	3 (10 ac)
Lined	1 (1 ac)	1 (1 ac)	1 (1 ac)
Unlined	1 (4.5 ac)	2 (9 ac)	2 (9 ac)
Water Discharge Points	2 (0.1 ac)	2 (0.1 ac)	2 (0.1 ac)
Channel Disturbance			
Headcut Mitigation	0	0	0
Channel Modification	0	0	0
TOTAL ACRES DISTURBANCE	**28.7**	**64.3**	**144**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

Applications to drill were received on December 12, 2007. Field inspections of the proposed HANGING WOMAN I CBNG project were conducted on August 19-20, 2008 by.

NAME	TITLE	AGENCY
Todd Kohler	Cultural/Surface Specialist	SWCA
Brent Sabotka	Hydrologist	SWCA
Joey Sheeley	Planning Specialist	SWCA
Carol Chadwick	Civil Engineer	Chadwick Engineering
Wendy Sutton	Archeologist	BLM
Ted Hamersma	Civil Engineer Technician	BLM
Eric Holborn	Natural Resource Specialist	BLM
Ben Adams	Hydrologist	BLM
Jim Barrows	Company Representative	Kennedy Oil
Roger Rathbun	Company Representative	Kennedy Oil
Terry Eich	Owner	Cole Construction
Don Louse	Padlock Ranch Representative	

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	Ben Adams
Wilderness Values			x	Eric Holborn
ACECs			x	Eric Holborn
Water Resources	x			Ben Adams
Air Quality	x			Eric Holborn
Cultural or Historical Values	x			Wendy Sutton
Prime or Unique Farmlands			x	Eric Holborn
Wild & Scenic Rivers			x	Eric Holborn
Wetland/Riparian			x	Ben Adams
Native American Religious Concerns			x	Wendy Sutton
Hazardous Wastes or Solids		x		Eric Holborn
Invasive, Nonnative Species	x			Eric Holborn
Environmental Justice		x		Eric Holborn

3.1. Characteristics of Project Area

The Hanging Woman 1 POD is located in the northern Powder River Basin and more precisely within the Hanging Woman Watershed, approximately 30 miles northeast of Sheridan, Wyoming. The project area encompasses Township 57 N, Range 79 West Sections 30, 31, 32. The project area comprises 1920 acres with the majority of the total area located on private land and approximately a section and 1/3 being

located on BLM administered land. The surrounding landscape is characterized by ridgelines dissected by several unnamed drainages. The West Prong Hanging Woman Creek and its tributaries are the primary drainages within the project area. Elevations range from 4300 feet on the ridge tips to 3960 feet along the West Prong Hanging Woman Creek. Current land uses with the project area include livestock grazing and CBNG development.

3.2. Vegetation & Soils

Soils within the project area were identified from the *Sheridan County Survey Area, Wyoming (WY633).* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.
Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges to 8+ inches in bottomland. Erosion potential varies from moderate to severe depending on the soil type, vegetative cover and slope. Reclamation potential of soils also varies throughout the project area.

Table 3.2 - Reclamation Potential

Reclamation Potential	Acres	% of Project Area
Poor	1471.9	77%
Moderate	452.6	24%
Total acres		100%

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

Table 3.3 – Soil Map Unit Types

Map Unit Symbol	Map Unit Name	Acres	%
170	JONPOL-PLATMAK ASSOCIATION, 9 TO 25 PERCENT SLOPES	54.9	3%
240	RENOHILL, MOIST-WYARNO ASSOCIATION, 6 TO 9 PERCENT SLOPES	11.2	1%
261	SHINGLE, MOIST-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SLOPES	478.2	25%
267	SHINGLE-THEEDLE LOAMS, MOIST, 45 TO 75 PERCENT SLOPES	207.9	11%
269	SHINGLE-THEEDLE-KISHONA ASSOCIATION, MOIST, 3 TO 30 PERCENT SLOPES	784.2	41%
282	THEEDLE-KISHONA ASSOCIATION, MOIST, 6 TO 9 PERCENT SLOPES	16.4	1%
319	ZIGWEID-KISHONA-CAMBRIA COMPLEX, MOIST, 3 TO 6 PERCENT SLOPES	119.5	6%
320	ZIGWEID-KISHONA-CAMBRIA LOAMS, MOIST, 6 TO 9 PERCENT SLOPES	250.6	13%
321	WATER	1.5	0%

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

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource

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

Table 3.4 – Map Units and Ecological Sites

Ecological Site Description	Map Unit Symbol(s)	Acres	%
LOAMY (15-19 NP)	170	54.9	3%
CLAYEY (15-19 NP)	240	11.2	1%
SHALLOW LOAMY (15-19 NP)	261	478.2	25%
SHALLOW LOAMY (15-19 NP)	267	207.9	11%
LOAMY (15-19 NP)	269	784.2	41%
LOAMY (15-19 NP)	282	16.4	1%
LOAMY (15-19 NP)	319	119.5	6%
LOAMY (15-19 NP)	320	250.6	13%
Total			**100%**

3.2.1. Dominant Ecological Sites and Plant Communities identified in this POD

3.2.1.1. Loamy

This site occurs on gently undulating rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 inch precipitation zone.

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

The Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Rhizomatous Wheatgrasses, Needleandthread, Blue Grama Plant Community. The potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. The site is dominated by cool season midgrasses.

3.2.1.2. Shallow Loamy

This site occurs on steep slopes and ridge tops, but may occur on all slopes and landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 15-19 inch precipitation zone.

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

The HCPC for this site would be a Rhizomatous Wheatgrass, Bluebunch Wheatgrass, Idaho Fescue Plant Community. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% woody plants. The site is dominated by cool season mid-grasses.

3.2.1.3. Mixed Sagebrush/Grass

The plant community present on both the loamy and shallow loamy ecological sites is *Mixed Sagebrush/Grass*. Compared to the HCPC, sagebrush and blue grama have increased. Production of the cool season grasses and bluebunch wheatgrass have decreased. Cheatgrass has invaded the site.

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

A summary of the ecological sites within the project area are listed in the table 3.4 along with the individual acreage and the percentage of the total area identified within the POD boundary.

3.2.2. Wetlands/Riparian

No natural wetland or riparian areas are present within the project area.

3.2.3. Invasive Species

A search of inventory databases on the Wyoming Energy Resource Information Clearinghouse (WERIC) web site (www.weric.info) showed no state-listed noxious weeds and/or weed species of concern. The WERIC database was created cooperatively by the University of Wyoming, BLM, and county Weed and Pest offices.

The operator has documented (see Weed Management Plan in the Hanging Woman 1 POD) the following noxious (State of Wyoming) weeds to be of concern in the project area: Canada thistle and leafy spurge. Padlock Ranch (landowner w/in the project area) has documented the presence of black henbane on one proposed well site and access road.

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).

Habitat assessments and wildlife inventories were performed by SWCA Environmental Consultants (SWCA 2007a,b; 2008 a,b). SWCA performed surveys for bald eagles, mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol. Habitat surveys were conducted for Ute ladies'-tresses orchid. PRB IWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

A BLM biologist conducted field visits on August 19, 2008. During this time, the biologist reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided project modification recommendations where wildlife issues arose.

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

3.3.1. Big Game

Big game species expected to be within the project area include pronghorn antelope, and mule deer. The WGFD has determined that the project area contains yearlong range for pronghorn antelope and winter-

yearlong and yearlong range for mule deer.

Winter-Yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. **Yearlong** use is when a population of animals makes general use of suitable documented habitat sites within the range on a year round basis. Animals may leave the area under severe conditions.

Pronghorn antelope within the project area belong to the Clearmont herd unit. The 2007 proposed estimate herd population was 8,900 with a population objective of 3,000. Mule deer within the project area belong to the Powder River herd unit. The 2007 proposed estimate herd population was 56,200 with a population objective of 52,000. Big game range maps are available in the PRB FEIS (3-119-143), the project file, and from the WGFD.

3.3.2. Aquatics

The project area is drained by Hanging Woman Creek, a historically ephemeral tributary of the Tongue River. Fish that have been identified in the Tongue River watershed are listed in the PRB FEIS (3-156-159).

Amphibian and reptile species occur throughout the Basin, but there is little recorded baseline information available about them. Montana Natural Heritage Program is currently identifying herptile species present downstream from the project area in Montana. BLM sensitive herptiles are listed later in this document.

3.3.3. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Many species that are of high management concern use shrub-steppe and shortgrass prairie areas for their primary breeding habitats (Saab and Rich 1997). Migratory bird species of management concern that may occur in the project area are listed in the PRB FEIS (3-151).

3.3.4. Raptors

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

Four raptor nest sites were identified by SWCA and BLM within 0.5 mile of the project area, of these, two were active in 2008.

Table 4. Documented raptor nests within the project area in 2008.

BLM ID#	SPECIES	UTM (NAD 83)	SUBSTRATE	CONDITION	2008 STATUS
5610	Great-horned owl	4970532N 389394E	Juniper	Excellent	Active
5611	Red-tailed hawk	4970518N 386804E	Box elder	Excellent	Active
5612	Unknown	4970249N 389644E	Juniper	Fair	Inactive

BLM ID#	SPECIES	UTM (NAD 83)	SUBSTRATE	CONDITION	2008 STATUS
5613	Unknown	4969039N 388553E	Juniper	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 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004). This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1000 acres of black-tailed prairie dog colonies for survival (USFWS 1989). The WGFD believes the combined effects of poisoning and Sylvatic plague on black-tailed prairie dogs have greatly reduced the likelihood of a black-footed ferret population persisting east of the Big Horn Mountains (Grenier 2003). The U.S. Fish and Wildlife Service has also concluded that black-tailed prairie dog colonies within Wyoming are unlikely to be inhabited by black-footed ferrets (Kelly 2004).

No black-tailed prairie dog colonies were identified within the project area during consultant or BLM site visits. Black-footed ferret habitat is not present within the project area.

3.3.5.1.2. Ute Ladies'-Tresses Orchid

This orchid is listed as Threatened under the Endangered Species Act. It is extremely rare and occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. Wyoming Natural Diversity Database model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties. In Wyoming, *Spiranthes diluvialis* blooms from early August to early September, with fruits produced in mid August to September (Fertig 2000).

Suitable orchid habitat is not present within the project area. Hanging Woman creek and its tributaries are ephemeral. SWCA surveyed the project area in August of 2007 for suitable orchid habitat with negative results (SWCA 2007 a,b).

3.3.5.2. Sensitive Species

The USDI Bureau of Land Management (BLM) Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. Two habitat types, prairie dog colonies and sagebrush ecosystems, specifically, are the most common among habitat types within the Powder River Basin that contain habitat components required in the life cycle of several sensitive species. These are described below in general terms. Those species within the Powder River Basin that were once listed or candidates for listing under the Endangered Species Act of 1973 and remain BLM Wyoming sensitive species are described in more detail. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as

amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A.

3.3.5.2.1. Sagebrush obligates

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

3.3.5.2.2. Bald eagle

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

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

Marginal roosting (individual cottonwood and boxelder trees) and no nesting habitat for bald eagle exist within one mile of the project area. The potential for roosting eagles in the project area is discountable due to the paucity of suitable substrate and a lack of a reliable food source.

3.3.5.2.3. Black-tailed prairie dog

No black-tailed prairie dog colonies were identified within the project area during consultant and BLM site visits (SWCA 2007 and 2008).

3.3.5.2.4. Grouse

3.3.5.2.4.1. Greater sage-grouse

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

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

Suitable sage-grouse habitat is distributed through the project area. High quality nesting habitat is mainly found in the north and east halves of the project area. BLM records identified five sage grouse leks within four miles of the POD. These lek sites are identified below (Table #).

Table 3.1 Sage-**grouse leks surrounding the project area.**

LEK NAME	LEGAL LOCATION T57 R79	OCCUPANCY AND ACTIVITY STATUS YEAR (PEAK MALES)	DISTANCE FROM PROJECT AREA
Hanging Woman Early Prong	T57,R79 Section 18	2008 (23) 2007 (Unknown) 2006 (26)	1.25 miles to the 21-30
Hanging Woman Middle Fork	T57,R79 Section 8SE	2008 (Inactive) 2007 (unknown) 2006 (8)	2.4 miles to the 41-30
Hanging Woman South Middle Fork	T57,R79 Section 21	2008 (6) 2007 (6) 2006 (10)	1.8 miles to the 41-30
Hanging Woman Main Fork	T57,R79 Section 15	2006-2008 unknown	3.2 miles to the 41-30
Hanging Woman	T57,R79 Section 8NE	2008 (Inactive) 2007 (Inactive) 2006 (unknown)	3.2 miles to the 41-30

3.3.5.2.4.2. Sharp-tailed grouse

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

The project area has the potential to support sharp-tailed grouse during most of the year. The mosaic of grasslands, sagebrush-grasslands, and brushy draws could sustain grouse through the year. The closest documented sharp-tailed grouse lek is about eight miles to the north.

3.3.5.2.5. Mountain plover

Suitable mountain plover habitat is not present within the project area (SWCA 2007a). The combination of broken topography and over 14 inches of precipitation results in higher grass, making the project area unattractive to plover.

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 lies astride the West Prong of Hanging Woman Creek which is within the Upper Tongue River drainage system.

3.5.1. Groundwater

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

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

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

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

The BLM installed shallow groundwater monitoring wells at five impoundment locations throughout the PRB to assess ground-water quality changes due to infiltration of CBNG produced water. The most intensively monitored site had a battery of nineteen wells which were installed and monitored jointly by

the BLM and USGS starting in August of 2003. Water quality data has been sampled from these wells on a regular basis. That impoundment site, which has since been reclaimed, lies atop approximately 30 feet of unconsolidated deposits (silts and sands) which overlie non-uniform bedrock on a side ephemeral tributary to Beaver Creek and is approximately one and one-half miles from the Powder River. Baseline investigations showed water in two sand zones, the first was at a depth of 55 feet and the second was at a depth of 110 feet. The two water bearing zones were separated by a fifty-foot thick shale layer. The water quality of the two water bearing zones fell in the WDEQ Class III and Class I classifications respectively. Preliminary results from this sampling indicated increasing levels of TDS and other inorganic constituents over a six month period resulting in changes from the initial WDEQ classifications.

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

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

A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 4 registered stock water wells within 1 mile of the POD boundary with depths ranging from 56 to 250 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 West Prong of Hanging Woman Creek, which is a tributary to Hanging Woman Creek and eventually to the Upper Tongue River. All of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated grassy swales, without defined beds and banks, grading rapidly upward to steep, deeply incised and actively eroding gully systems.

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

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

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

3.6. Cultural Resources

Class III cultural resource inventories were conducted for the Kennedy Hanging Woman POD prior to on-the-ground project work (BFO project no. 70080068). SWCA conducted a block class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) for the project. Wendy Sutton and Seth Lambert, BLM Archaeologists, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The following resources are located near the project area.

Table 3.6 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48SH1653	Site	NE
IR-A	Isolate	NE

During onsites it was noted that visibility was inadequate to conduct Class III inventory within drainages, due to heavy vegetation. Some of the project area analyzed in this EA occurs on deep alluvial deposits. Alluvial deposits typically have a high potential for buried cultural resources, which are nearly impossible to locate during a Class III inventory.

3.7. Air Quality

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

Existing air pollutant emission sources within the region include following:

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

For a complete description of the existing air quality conditions in the Powder River Basin, please refer to the PRB Final EIS Volume 1, Chapter 3, pages 3-291 through 3-299.

4. ENVIRONMENTAL CONSEQUENCES

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

4.1. Vegetation & Soils Direct and Indirect Effects

The predominance of shallow soils, steep slopes and climatic limitations throughout the Hanging Woman I POD as identified by the NRCS Soil Survey for Northern Sheridan County and the BLM onsite investigations warrant the need for additional reclamation related conditions of approval (COA's) and the use of best management practices (BMP's) to help assure that the reclamation requirements of the Wyoming Reclamation Policy will be met.

The majority of the proposed disturbance was planned within uplands areas containing loamy and shallow loamy ecological sites. Efforts have been made to avoid soil conditions with limited reclamation potential. However, in those areas where erosion concerns associated with proposed disturbance could not be avoided, mitigation and/or site specific COA's to address soil stabilization in a timely fashion have been applied. In addition the operator has addressed, via the MSUP, site specific mitigation for areas identified having limited reclamation potential.

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

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

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

Impacts to vegetation and soils from surface disturbance will be reduced, by following the operator's plans and BLM applied mitigation. Of the 23 proposed well locations, 1 is on a reclaimed conventional well pads, 20 can be drilled without a well pad being constructed and 2 will require a constructed (cut & fill) well pad. Surface disturbance associated with the drilling of the 21 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 15 x 40 feet), and compaction (from vehicles driving/parking at the drill site). Estimated disturbance associated with these 21 wells would involve approximately 0.9 acre/well for 18.9 total acres. The other 2 wells requiring cut & fill pad construction would disturb approximately .37 acres/well pad for a total of .73 acres. The total estimated disturbance for all 23 wells would be 19.6 acres.

Approximately 12.8 miles of improved roads would be constructed to provide access to various well locations. 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,) in a common trench, usually along access routes. This practice results in less surface disturbance and overall

environmental impacts. Approximately .9 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 Constructed Pad	21 2		18.9 .73	Long Term
Gather/Metering Facilities	0	Site Specific	0	Long Term
Screw Compressors	0	Site Specific	0	Long Term
Monitor Wells	1	Site Specific	1	Long Term
Impoundments On-channel Off-channel Water Discharge Points	 0 3 2	 Site Specific Site Specific Site Specific	 0.0 10.0 0.5	Long Term
Channel Disturbance Headcut Mitigation* Channel Modification	 0 0	 Site Specific Site Specific	 0.0 0.0	
Improved Road No Corridor With Corridor	 2.6 10.2	 45 feet 50 feet	 14.2 50.3	Long Term
2-Track Roads No Corridor With Corridor	0.0	12' Width or Site Specific 20' Width or Site Specific	0	Long Term
Pipelines No Corridor With Corridor	 .9	20' Width or Site Specific	2.2	Short Term
Buried Power Cable		12' Width or Site Specific		Short Term

Facility	Number or Miles	Factor	Acreage of Disturbance	Duration of Disturbance
No Corridor	0		0	
Overhead Powerlines	0.0	15' Width	0	Long Term

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

4.1.1. Wetland/Riparian

No natural wetland or riparian areas were observed within the project area during the site visit. However, 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 could 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).

4.1.2. Invasive Species

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

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

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

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

4.1.3. Cumulative Effects

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

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

- They are proportional to the actual amount of cumulatively produced water in the Upper Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is approximately 51% of that total (see section 4.4.2.1).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The WMP for the HANGING WOMAN I proposes that produced water will not contribute significantly to flows downstream.
- The commitment by the operator to monitor the volume of water flowing into Hanging Woman Creek and prevent significant volumes of water from flowing into the Upper Tongue River.

No additional mitigation measures are required.

4.2. Wildlife (Alternative C – Environmentally Preferred)

4.2.1. Big Game Direct and Indirect Effects

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

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

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

Winter big game diets are sub-maintenance, meaning they lose weight and body condition as the winter progresses. Survival below the maintenance level requires behavior that emphasizes energy conservation.

Canfield et al. (1999) pointed out that forced activity caused by human disturbance exacts an energetic disadvantage, while inactivity provides an energetic advantage for animals. Geist (1978) further defined effects of human disturbance in terms of increased metabolism, which could result in illness, decreased reproduction, and even death.

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

4.2.1.1. Big Game Cumulative effects

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

4.2.2. Aquatics Direct and Indirect Effects

Produced water is to be contained in off-channel impoundments. If an impoundment were to discharge, it is unlikely that the produced water will reach a fish-bearing stream, and that downstream species would be affected.

4.2.2.1. Aquatics Cumulative effects

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

4.2.3. Migratory Birds Direct and Indirect Effects

Disturbance of the habitat types within the project area is likely to impact migratory birds. Native habitats are being lost directly with the construction of wells, roads, and pipelines. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Human activities likely displace migratory birds farther than simply the physical habitat disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003). Based on the onsite field evaluation of a producing State well, masking noise from pump jacks is not anticipated to extend more than 100 meters from the well.

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

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

equipment.

Migratory bird species within the Powder River Basin nest in the spring and early summer and are vulnerable to the same affects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable. Additional direct and indirect effects to migratory birds are discussed in the PRB FEIS (4-231-235).

4.2.3.1. Migratory Birds Cumulative effects

The cumulative effects associated with Alternative C are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, please refer to the referenced PRB FEIS, Volume 2, Chapter 4, Page 4-235. No additional mitigation measures are required.

4.2.4. Raptors Direct and Indirect Effects

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

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

Table 4.2. Infrastructure within close proximity (0.5 mile) to documented raptor nests within the project area (Timing limitations will apply to this infrastructure).

BLM ID#	INFRASTRUCTURE	DISTANCE
5610	44-29	0.1 mile
5611	14-30 Road segment	0.2 mile 250 feet
5612	44-29	0.2 mile
5613	23-32	0.2 mile

At the August 2008 onsite the 14-30 well location and access were changed to keep both the well and travel to and from it out of view of nest 5611. This nest was listed as an unknown raptor nest and is located 0.2 miles from the 14-30 well. There was no alternative location for this well that increased the distance between the nest and well, and placing the well and access out of view was the best alternative possible. There is a possibility that this nest location will not be used in the future by buteos (Swainson's and red-tailed hawks being the most probable), and will either be abandoned, or be used by great-horned owls. The existing road access between sections 30 and 31 runs within 100 meters of nest 5611. Kennedy Oil agreed to restrict access on this road segment during the breeding season (2/1-7/31). All wells can be access using alternate roads. A Condition of Approval restricting travel during the breeding season will be applied.

The 41-32 (changed to 44-29) well location was moved closer to the 5610 nest in order to protect high quality sage-grouse nesting habitat. The moved well was placed on an existing disturbance associated with an abandoned windmill. The 5610 nest remains out of view from the relocated well. Two roosting

great-horned owls were flushed from the nest area at the August onsite. The 5612 owl nest remained in view of the relocated well and is 0.2 miles from the well. Activity such as work-over rigs and enhancements at this well location has a strong potential to disrupt breeding activity. In order to minimize disturbance at both the 5612 and 5610 nest locations, a condition of approval requiring an exception for maintenance activities (e.g. work-over, enhancements) shall be applied.

Nest 5613 is located at the bottom of a deep (100-200 feet) draw and although the 23-32 well is located only 0.2 miles away, the topography of the canyon should provide sufficient protection to this nest.

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

4.2.4.1. Raptors Cumulative effects

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

4.2.5. Threatened and Endangered and Sensitive Species

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

4.2.5.1. Threatened and Endangered Species

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

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

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

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

4.2.5.2. Sensitive Species Direct and Indirect Effects

BLM will take necessary actions to meet the policies set forth in sensitive species policy (BLM Manual 6840). BLM Manual 6840.22A states: "The BLM should obtain and use the best available information deemed necessary to evaluate the status of special status species in areas affected by land use plans or

other proposed actions and to develop sound conservation practices. Implementation-level planning should consider all site-specific methods and procedures which are needed to bring the species and their habitats to the condition under which the provisions of the ESA are not necessary, current listings under special status species categories are no longer necessary, and future listings under special status species categories would not be necessary."

4.2.5.2.1. Sagebrush obligates

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

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

Table 4.3 Summary of Sensitive Species Habitat and Project Effects.

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	NP	MIIH	Sagebrush cover will be affected.
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	K	MIIH	Sagebrush cover will be affected.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	NP	NI	Habitat not present.
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	NP	NI	Permanently wet meadows not present.
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	NP	NI	Streamside habitats not present
Fish				
Yellowstone cutthroat trout (*Oncoryhynchus clarki bouvieri*)	Mountain streams in Tongue River drainage	NP	NI	No perennial streams.
Mammals				
Black-tailed prairie dog (*Cynomys ludovicianus*)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	NP	NI	Habitat not present.
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	NP	NI	Habitat not present.
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	NP	NI	Habitat not present.
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water.	NP	NI	Cliffs & perennial water not present.
Swift fox (*Vulpes velox*)	Grasslands	NP	NI	Habitat not present.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.

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

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

Project Effects
NI No Impact.
MIIH May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the population or species.
WIPV Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI Beneficial Impact

4.2.5.2.2. Bald eagle Direct and Indirect Effects

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

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

Produced water will be stored in one proposed reservoir and one existing off-channel impoundment 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.

4.2.5.2.3. Grouse

4.2.5.2.3.1. Greater sage-grouse Direct and Indirect Effects

Five greater sage-grouse leks occur within four miles of the project area. The proposed action will adversely impact breeding, nesting, brood rearing, late summer, and winter habitats. Proposed project elements that are anticipated to negatively impact grouse are listed in table 4.1. Using 0.6 miles as a distance for impacts (Holloran et al. 2007, Aldridge and Boyce 2007), effective sage-grouse habitat loss will occur within approximately five square miles. In an effort to minimize impacts, at the onsite, the 32-32 and 41-32 wells, along with their respective access, were moved out of suitable sage-grouse nesting habitat. In addition, Kennedy Oil will not construct overhead power. In place of overhead power, Kennedy proposes to employ gas powered pumps at each well. These pumps will produce noise that will add to the severity, and potentially the scope, of effective sage-grouse habitat loss. At the August 2008 onsite, similar gas powered wells in section 36 were visited to qualitatively asses the noise level. With use of mufflers, these engines would have a much smaller sphere of influence than the 0.6 miles attributed to overhead power.

Based on the best available science, which is summarized below, the proposed action will most likely contribute to the extirpation of the local grouse population and subsequent abandonment of the five leks listed in section 3.

In addition to the proposed measures above, as a result of the onsite investigations, the operator dropped nine reservoirs and four wells from the proposed action due to sage-grouse habitat. The seventeen project changes to minimize impacts to sage-grouse habitat are listed in Section 2.3.1 of this EA. The operator did not agree to drop the 23-4 well located on BLM surface within 0.25 of the Laskie Draw lek.

4.2.5.2.3.2. Greater sage-grouse Cumulative Effects

In addition to the direct impacts to sage-grouse habitat that will be created by the federal wells and associated infrastructure the project area does contain existing fee, state, and federal fluid mineral development. The sage-grouse cumulative impact assessment area for this project encompasses a four mile radius from the five leks listed in section 3. There are approximately 208 existing wells and associated infrastructure within four miles of the four leks - an area of 83 square miles. The existing well density is approximately 2.5 wells/section. Due to this level of development (twice the State Wildlife

Agencies' ad hoc Committee for Sage-grouse and Oil and Gas Development 2008 recommended well density) there is a potential that the population(s) breeding at these leks may become extirpated without the federal development.

There are 175 proposed wells (23 from this POD) within four miles of the five leks. With the addition of the 152 proposed wells that are not associated with this proposed action, the well density within four miles of the four leks increases to 4.3 wells/section. With approval of alternative C the well density increases to 4.4 wells/section. With the addition of the proposed wells there is even greater potential that the population(s) breeding at these leks may become extirpated.

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

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

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

Impacts from CBNG development are likely to be significant and additive to the long-term impacts afflicting the sage-grouse population (WGFD 2004). Greater sage-grouse habitat is being directly lost with the addition of well sites, roads, pipelines, powerlines, reservoirs and other infrastructure in the Powder River Basin (WGFD 2005, WGFD 2004). Sage-grouse avoidance of CBNG infrastructure results in even greater indirect habitat loss. In southwestern Wyoming, yearling female greater sage-grouse avoid nesting in areas within 0.6 miles of producing well pads (Holloran et al. 2007), and in southern Alberta, brood-rearing females avoid areas within 0.6 miles of producing wells (Aldridge and Boyce 2007). Doherty et al. (2008) demonstrated that sage-grouse in the Powder River Basin avoided otherwise suitable wintering habitats once they have been developed for energy production, even after timing and lek buffer stipulations had been applied. The WGFD feels a well density of eight wells per section creates a high level of impact for sage-grouse and that sage-grouse avoidance zones around mineral

facilities overlap creating contiguous avoidance areas (WGFD 2004). As interpreted by coordinated effort with state fish and wildlife agencies from Montana, Colorado, Utah, South Dakota, North Dakota and Wyoming, (State wildlife agencies' ad hoc committee for sage-grouse and oil and gas development 2008), research indicates that oil or gas development exceeding approximately 1 well pad per square mile with the associated infrastructure, results in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (Holloran 2005, Walker et al. 2007)

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

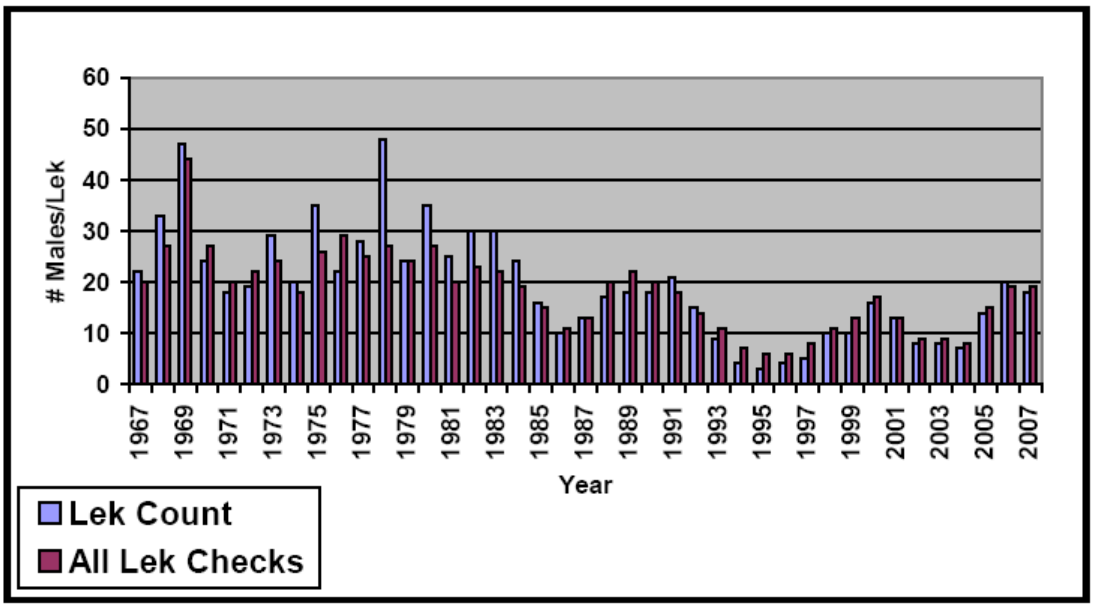
Vegetation communities within the Powder River Basin are naturally fragmented, as they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The Powder River Basin is also near the eastern edge of greater sage-grouse range. A sagebrush cover assessment within Wyoming basins estimated sagebrush coverage within the Powder River Basin to be 35% with an average patch size less than 300 acres (Rowland et al. 2005). The Powder River Basin patch size has decreased by more than 63% in the past forty years, from 820 acre patches and an overall coverage of 41% in 1964 (Rowland et al. 2005).

The existing development within the cumulative impacts assessment area has greatly fragmented the sage-grouse habitat. Disturbance created by this project will contribute to additional fragmentation.

Another concern with CBNG development is that reservoirs created for water disposal provide habitat for mosquitoes associated with West Nile virus (WGFD 2004). West Nile virus represents a significant new stressor, which in 2003 reduced late summer survival of sage-grouse an average of 25% within four populations including the Powder River Basin (Naugle et al. 2004). In northeastern Wyoming and southeastern Montana, West Nile virus-related mortality during the summer resulted in an average decline in annual female survival of 5% from 2003 to 2006 (Walker et al. 2007). Powder River Basin sage-grouse losses during 2004 and 2005 were not as severe. Summer 2003 was warm and dry, more conducive to West Nile virus replication and transmission than the cooler summers of 2004 and 2005 (Cornish pers. comm.).

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

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



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

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

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

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

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

4.2.5.2.3.3. Sharp-tailed grouse Direct and Indirect Effects

Effects similar to sage-grouse.

4.3. West Nile Virus Direct and Indirect Effects

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

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

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

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

4.4. Water Resources

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

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 4.4 gpm per well (the maximum pumping rate) or 101 gpm (0.22 cfs or 163 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Tongue River drainage, the projected volume produced within the watershed area was 20,282 acre-feet in 2008 (maximum production was predicted to occur in 2006 at 22,351 acre-feet). As such, the volume of water resulting from the production of these wells is 0.8% of the total volume projected for 2008. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

The PRB FEIS predicts an infiltration rate of 39% to groundwater aquifers and coal zones in the Upper Tongue River drainage area (PRB FEIS pg 4-5). For this action, it may be assumed that a maximum of 39 gpm will infiltrate at or near the discharge points and impoundments (63 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "…the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). However, there is potential for infiltration of produced water to influence the quality of the antecedent groundwater.

The WDEQ requires that operators determine initial groundwater quality below impoundments to be used for CBNG produced water storage. If high quality water is detected (Class 3 or better) the operator is required to establish a groundwater monitoring program at those impoundments.

In order to address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ developed a guidance document, "Compliance Monitoring for Ground Water Protection Beneath Unlined Coalbed Methane Produced Water Impoundments" (June 14, 2004). This guidance document became effective August 1, 2004, and was revised as the "Compliance Monitoring and Siting Requirements for Unlined Coalbed Methane Produced Water Impoundments" which was approved in June, 2006.

The Wyoming DEQ established an Impoundment Task Force which drafted an "Impoundment Monitoring Plan" to investigate the potential for existing impoundments to have impacted shallow groundwater. Drilling at selected existing impoundments began in the spring of 2006.

As of April of 2008, approximately 1,774 impoundment sites had been investigated through over 1,988 borings. Of these impoundments, 259 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 109 impoundments requiring monitoring are presently being used. As of the first quarter of 2008, only 16 of those monitored impoundments caused a change in the "Class of Use" of the underlying aquifer water.

For WYPDES permits received by DEQ after the August 1st effective date, the BLM will require that operators comply with the requirements outlined in the current approved DEQ compliance monitoring guidance document prior to discharge of federally-produced water into newly constructed or upgraded impoundments.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of water wells in the area. The permitted water wells in the area produce from water bearing zones

ranging in depth from 56 to 250 feet below the ground surface. The targeted coal zones range from 2690 to 3050 feet below ground surface. As mitigation, the operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence of the proposed wells.

The operator will be required to install a deep groundwater monitor well cluster in a location identified at the onsite as per condition of approval #2 in the Water Management section of the Site Specific COAs. This monitor well cluster will be included in the BLM Deep Groundwater Monitoring program which has been ongoing since the late 1990's. There are currently 55 monitor well locations located around the Powder River Basin which are completed to the producing coal zones and the sands above and in some cases below the coal. The purpose of the monitoring program is to quantify the extent of groundwater draw down associated with CBNG production.

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

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

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

4.4.1.1. Groundwater Cumulative Effects:

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

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

4.4.2. Surface Water

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

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

Predicted Values	**TDS, mg/l**	**SAR**	**EC,** µmhos/cm
Most Restrictive Proposed Limit –		0.5	500
Least Restrictive Proposed Limit		10	2500
Tongue River at WY/MT state line nr Decker, WY Historic Data Average at Maximum Flow Historic Data Average at Minimum Flow		 0.36 0.86	 318 731
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8) Drinking Water (Class I) Agricultural Use (Class II) Livestock Use (Class III)	 500 2,000 5,000	 8	
Predicted Produced Water Quality Co-mingled Roberts, Odekoven, & unnamed under Odekoven	3080	74.5	4760

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 expected from this POD is 3080 mg/l TDS which is not within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation, land application or SDI with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the targeted coal zones from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 4.4 gallons per minute (gpm) will be produced from these 23 wells (maximum pumping rate), for a total of 101 gpm for the POD. See Table 4.5.

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

There is one new and one existing discharge points proposed to be used 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, 2 impoundments (30 AF) have been built and 1 (28 AF) would potentially be constructed within the project area. These impoundments will disturb approximately 10.0 acres including the embankments. All 3 of these impoundments are off-channel storage facilities disturbing approximately 10 acres. The off-channel impoundments will result in evaporation and infiltration of CBNG water. All water management facilities were evaluated for compliance with best management practices during the onsite.

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.03 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be

submitted and approved on a site-specific, case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Tongue River of 5 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 23 wells is anticipated to be a total of 101 gpm or 0.2 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in Hanging Woman Creek from this action (0.03 cfs) may add a maximum 0.03 cfs to the Upper Tongue River flows, or 0.5% of the predicted total CBNG produced water contribution. This incremental flow rate is statistically below the measurement capabilities for flows in the Tongue River (refer to Statistical Methods in Water Resources U.S. Geological Survey, Techniques of Water-Resources Investigations Book 4, Chapter A3 2002, D.R. Helsel and R.M. Hirsch authors). For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS pg 4-85).

The operator did not provide an analysis of the potential development in the watershed above the project area. The BLM agrees with the operator that excessive amounts of water are not expected to be produced 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 is less than the volume of runoff estimated from the 2-year storm event for the Hanging Woman 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 applied for a WYPDES permit from the WDEQ and will provide a final approved copy when it is issued.

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.

For additional information, please refer to the WMP for the Hanging Woman Federal POD I prepared by SWCA Environmental Consultants for Kennedy Oil.

4.4.2.1. Surface Water Cumulative Effects

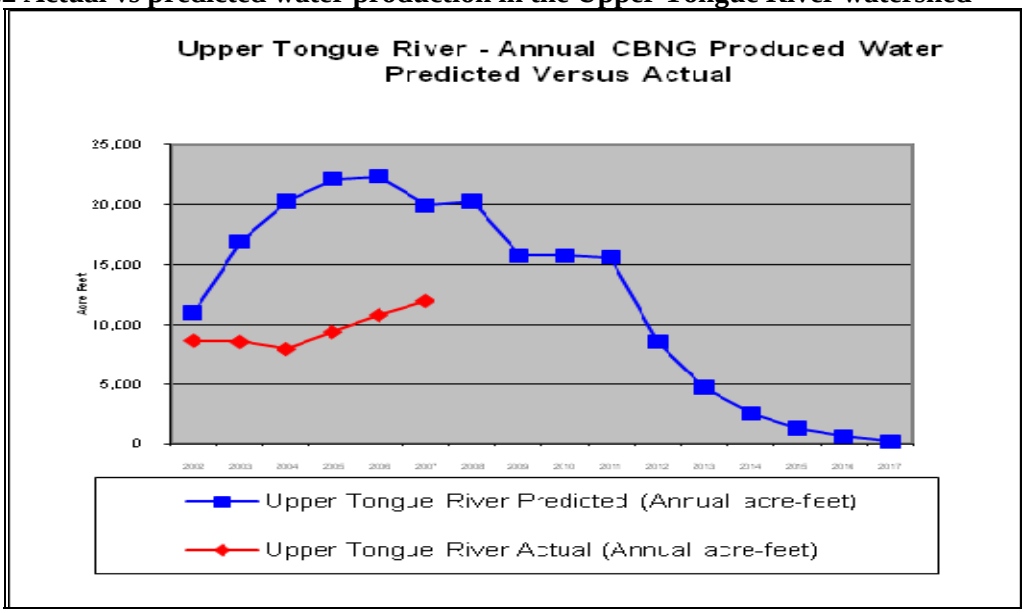
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Tongue River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2008, all producing CBNG wells in the Upper Tongue River watershed have discharged a cumulative volume of 57,396 acre-ft of water compared to the predicted 112,670 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.1 and Table 4.6 following. This volume is 51 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Tongue River watershed.

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

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

Figure 4.2 Actual vs predicted water production in the Upper Tongue River watershed



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

The PRB FEIS states that "Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim MOC (Memorandum of Cooperation) that the two DEQs (Wyoming and Montana Departments of Environmental Quality) have signed. This MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the two states develop a better understanding of the effects of CBM discharges through the enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, through the implementation of instream monitoring and adaptive management, water quality standards and interstate agreements can be met." (PRB FEIS page 4-117). Similar discussions also occurred for water discharged to the Tongue River. However, the MOC expired and was not renewed. The EPA approved the Montana Surface Water Standards for EC and SAR. Therefore the Wyoming DEQ is responsible for ensuring that the Montana standards are met at the state line under the Clean Water Act (CWA). Litigation between Wyoming and Montana (now before the United States Supreme Court) which was entered into after issuing the PRB FEIS ROD will now determine the water quality and quantity parameters which will be applied to CBNG produced water disposal into waters flowing from Wyoming into Montana.

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 Upper Tongue River drainage and the total amount that was predicted in the PRB FEIS, which is only approximately 51% of that total (see section 4.4.2.1).
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.

3. The commitment by the operator to monitor the volume of water discharged.

No additional mitigation measures are required.

Refer to the PRB FEIS, Volume 2, page 4-93 – 99 and table 4-10 for cumulative effects relative to the Upper Tongue River watershed and beginning on page 4-117 for cumulative effects common to all sub-watersheds.

4.5. Cultural Resources

When a project is constructed in area with a high potential for buried cultural material, archaeological monitoring is often included as a condition of approval. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) relating to mitigation or avoidance. Due to the presence of alluvial deposits and the presence of heavy vegetation that prevented an adequate Class III inventory, the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described in the COA's.

Non eligible site 48SH1653 will be impacted by the proposed project. No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 11/6/08 that no historic properties exist within the APE. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the Standard COA (General)(A)(1).

4.6. Air Quality

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Air quality impacts modeled in the PRB FEIS concluded that projected oil & gas development would not violate any local, state, tribal or federal air quality standards.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Richard Currit	Senior Archeologist for Review and Consultation	State Historical Preservation Officer	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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