DECISION RECORD
Yates Petroleum Corporation, Chasm Plan of Development
ENVIRONMENTAL ASSESSMENT –WYW-070-EA11-050
Bureau of Land Management, Buffalo Field Office

DECISION:
BLM approves Yates Petroleum Corporation (Yates) Chasm coalbed natural gas (CBNG) plan of development (POD) Alternative B described in the referenced environmental assessment (EA), WYW-070-EA11-050. Alternative B is the modified proposed action, and is the result of collaboration between the Bureau of Land Management (BLM) and Yates. The BLM analyzed Alternative B in the EA and found to have no significant impacts on the human environment, beyond those described in the Powder River Basin Final Environmental Impact Statement (PRB FEIS) thus there is no requirement for an environmental impact statement. This decision considered the finding of no significant impact for this EA. A summary of the POD's details follows.

Compliance
This decision complies with:
- Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701).
- Mineral Leasing Act of 1920 (30 U.S.C. 181) and 43 CFR Part 3160 to include On Shore Order No. 1.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- National Historic Preservation Act (NHPA)
- Migratory Bird Treaty Act (MBTA) (16 USC 703).
- Buffalo Final Environmental Impact Statement (FEIS) (1985), and FEIS for the Powder River Basin (PRB) Oil and Gas Project, and Record of Decision (ROD) 2003.
- Buffalo Resource Management Plan (RMP), 1985, Amendments 2001, 2003.
- Update of the Bureau of Land Management (BLM), Wyoming, Sensitive Species List, (WY-IM-2010-027), Apr 2010.
- U.S. Department of Interior Order (USDI) 3310, (2010); BLM Manuals 6301; 6302; and 6303 (2011).

Wells:
BLM approves 11 applications for permit to drill (APDs) and their associated infrastructure:

Well Name	Well #	QTR	Sec	TWP	RNG	Lease #	County
CHASM CS	1	NENW	2	42N	76W	WYW130095	CAMPBELL
CHASM CS	2	SWNW	2	42N	76W	WYW130095	CAMPBELL
CHASM CS	3	NESW	2	42N	76W	WYW130095	CAMPBELL
CHASM CS	4	SWNW	10	42N	76W	WYW130095	CAMPBELL
CHASM CS	5	NENW	11	42N	76W	WYW130095	CAMPBELL
CHASM CS	6	SWNW	11	42N	76W	WYW130095	CAMPBELL
CHASM CS	7	NENE	15	42N	76W	WYW130095	CAMPBELL
CHASM CS	8	NENW	15	42N	76W	WYW130095	CAMPBELL
CHASM CS	9	SWNW	15	42N	76W	WYW130095	CAMPBELL
CHASM CS	10	NESW	15	42N	76W	WYW130095	CAMPBELL
CHASM CS	11	SWSW	15	42N	76W	WYW130095	CAMPBELL

Water Management:
The water management plan (WMP) includes 6 reservoirs proposed for use with this POD. Yates bonded 2 reservoirs and BLM approves those 2 for the use of federal water inconjunction with this POD.

Facility Name	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
Big C	SENE	2	42N	76W	14.9	2.5	WYW45729
Big D	SWNE	2	42N	76W	6.0	1.3	WYW45729

Limitations: There are no denials. The following approved reservoirs will not be used for federal water until after Yates applies for a sundry and provides proof of bonding to the BLM.

Facility Name	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
Bent Grass	NWNW	15	42N	76W	26.5	4.0	WYW130095
Butte View	SWNW	2	42N	76W	8.2	1.2	WYW130095
Down Wind	NWNW	15	42N	76W	12.8	2.0	WYW130095
West World	SWNW	2	42N	76W	12.1	1.8	WYW130095

Operator Committed Measures:
Yates incorporated several measures to alleviate resource impacts into their master surface use plan (MSUP), submitted on September 17, 2010. Refer to the Yates' Chasm POD, MSUP, Chapter 4 for details of operator committed measures.

Site-specific Mitigation Measures:
BLM applied site-specific conditions of approval (COAs) to this project, in addition to the programmatic and standard COAs identified in the PRB RMP Amendment Record of Decision (ROD), to mitigate the site-specific impacts described in the Environmental Effects section of the EA. See the project's COAs for a complete description.

RATIONALE:
The BLM based its authorization the selected alternative, as summarized above, on the following:

1. Yates and the BLM included design features and mitigation measures to reduce environmental impacts while meeting the project's need. The finding held the project has no significant impacts.

2. The selected alternative will not result in any undue or unnecessary environmental degradation. The project area is clearly lacking in wilderness characteristics as it is less than 5,000 acres. The COAs will be strictly enforced to ensure there is "no adverse effect" to the Deadwood Road and Crook's 1876 Belle Fourche River Scout – which will not be physically impacted by this project in order to not diminish any other aspects of integrity of the historic properties.

3. The selected alternative will help meet the nation's energy needs and help stimulate local economies by maintaining workforce stability.

4. Yates may use the secondary reservoirs for federally produced water AFTER the BLM approves a sundry and receives proof of bonding for each reservoir.

5. Yates 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 0.5 mile of a federal CBNG producing well in the POD
    - Provide water analysis from a designated reference well in each coal zone

6. Yates certified that it has a surface use agreement with the landowners or it posted bond.

7. The selected alternative incorporates components of the Wyoming Governor's Sage Grouse Implementation Team's "core population area" strategy, the Governor's executive order, and local research to provide mitigation for sage-grouse, while meeting the need for the Chasm Project.

ADMINISTRATIVE REVIEW AND APPEAL: 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: 6/29/11

FINDING OF NO SIGNIFICANT IMPACT
Yates Petroleum Corporation, Chasm Plan of Development
ENVIRONMENTAL ASSESSMENT –WYW-070-EA11-050
Bureau of Land Management, Buffalo Field Office

FINDING OF NO SIGNIFICANT IMPACT:

On the basis of the information contained in the environmental assessment (EA), and all other information available to me, it is my determination that: (1) the implementation of Alternative B will not have significant environmental impacts beyond those already addressed in the Powder River Basin Final Environmental Impact Statement (PRB FEIS) to which the EA tiers; (2) Alternative B conforms to the Buffalo Resource Management Plan (RMP)(1985, 2001, 2003); and (3) Alternative B does not constitute a major federal action having a significant effect on the human environment. Therefore it is unnecessary to prepare an environmental impact statement. This finding is based on my consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), both with regard to the context and to the intensity of the impacts described in the EA.

CONTEXT:

Mineral development (leasable, locatable, and saleable) is a long-standing, common land use in the PRB. About 40% of the nation's coal comes from the PRB. The PRB FEIS reasonably foreseeable development predicted and analyzed the development of 51,000 CBNG wells and 3,200 oil wells (PRB FEIS record of decision (ROD), p. 2). The additional CBNG development described in Alternative B is insignificant in the national, regional, and local context.

INTENSITY:

The implementation of Alternative B will result in beneficial effects - energy and revenue production however; there will also be adverse effects to the environment. Yates and BLM included design features and mitigation measures in Alternative B to minimize adverse environmental effects. Alternative B does not pose a significant risk to public health and safety. The POD's geographic area contains unique characteristics identified in the RMP (1985, 2001, 2003) or other legislative or regulatory processes – sections of the Deadwood Road and Crook's 1876 Belle Fourche River Scout – yet neither retain their integrity of setting. The POD area is clearly lacking wilderness characteristics as it is less than 5,000 acres.

Relevant scientific literature and professional expertise were used in preparing the EA. The scientific community is reasonably consistent with their conclusions on environmental effects relative to oil and gas development. Research findings on the nature of the environmental effects are not highly controversial, highly uncertain, or involve unique or unknown risks.

CBNG development of the nature proposed with this POD and similar PODs was predicted and analyzed in the PRB FEIS; the selected alternative does not establish a precedent for future actions with significant effects.

There are no cultural or historical resources present that will be adversely affected by the selected alternative. No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment

Field Office Manager: _____ Date: 6/29/11

BUREAU OF LAND MANAGEMENT, BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA), WYW-070-EA11-050
Yates Petroleum Corporation, Chasm Coalbed Natural Gas Plan of Development

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 (PRB FEIS) and Resource Management Plan (RMP) Amendment, #WY-070-02-065 (2003), pursuant to 40 CFR 1508.28 and 1502.21. This document is available for review at the BLM Buffalo Field Office (BFO) and on our website. This environmental assessment (EA) addresses site-specific resources and impacts that were unable to be covered in the PRB FEIS.

1.1. Background

Yates Petroleum Corporation (Yates) submitted the Chasm coalbed natural gas (CBNG) plan of development (POD) on February 25, 2009 to the BFO with 11 federal applications for permit to drill (APDs) to develop and produce natural gas from coal bearing formations in the PRB.

Yates and BLM conducted onsite visits on July 14, 2010 to evaluate the proposal and modify it as necessary to alleviate environmental impacts. BLM sent Yates a post-onsite deficiency letter on August 8, 2010. The BLM received Yates' response to the post onsite deficiencies on September 17, 2010. Yates did not address 4 out of the 5 recommended well moves so this created the need for a second onsite. The parties postponed the second onsite until the landowners were able to attend on November 9, 2010. BLM received the operator's response to all post onsite deficiencies on November 11, 2010. The project proposal and APDs were complete when the BLM received the impoundment bonding on June 21, 2011. BLM shared the proposed COAs with Yates on June 23, 2011.

1.2. Need for the Proposed Action

The need of the proposed action is to explore, develop, and produce CBNG in a manner supporting natural resource conservation while operating under the conditional rights granted by a federal oil and gas lease, as required in 43 CFR 3160, all onshore orders, the Mineral Leasing Act (MLA), the Federal Land Policy and Management Act (FLPMA), and other acts and regulations. The lessee must obtain approval for the development of an oil and gas lease through an APD on public lands managed by the BLM under Onshore Order No. 1, pursuant to the MLA, and other laws.

1.3. Decision to be Made

The BLM will decide whether or not to approve the proposed development of oil and gas on the federal leasehold, and if so, under what terms and conditions.

1.4. Scoping and Issues

BLM did not conduct external scoping for this EA. BLM conducted extensive external scoping for the PRB FEI, as discussed on p. 15 of the PRB FEIS record of decision (ROD) and on p. 2-1 of the FEIS. This action is generally similar in scope to the numerous other CBNG PODs that BFO analyzed. External scoping would be unlikely to identify new issues as was verified by the few POD EAs that BFO did externally scope such as the Clabaugh POD (WY-070-EA08-134) and Hollcroft/Stotts Draw POD (WY-070-EA07-021).

The BLM interdisciplinary team (ID team) conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resource and land uses. Appendix A identifies those resources and land uses present and affected by the proposed action; those resources and

land uses that are either not present, not affected, or were adequately covered by the PRB FEIS will not be discussed in this EA. The ID team identified issues for the affected resources to further focus the analysis. This EA addresses site-specific impacts, not disclosed in detail within the PRB FEIS that would help in making a reasoned decision or may be related to a potentially significant effect. Issues for this project include:

- **Soils and vegetation**: invasive species
- **Wildlife**: raptor productivity, greater sage-grouse lek occupancy and persistency
- **Cultural**: National Register of eligible sites, alluvial and/or Aeolian deposits with potential for buried cultural resources
- **Water**: ground water depletion, quality and quantity of produced water

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

BLM evaluated 2 alternatives, A and B. This section includes a brief description of each alternative. Programmatic mitigation measures, as determined in PRB FEIS ROD apply to all alternatives, including the No Action Alternative (Alternative A), and are included in the project's, Standard Mitigation Measures, Operator-committed Mitigation Measures, and site-specific Conditions of Approval (COAs) – which would apply only to Alternative B.

2.1. Alternative A - No Action

BLM analyzed a no action alternative in the PRB FEIS, Volume 1, pp. 2-54 to 2-62. This alternative must also consider and combine the PRB FEIS analysis with the subsequent analysis and development from the adjacent and intermingled PODs: Devon Energy Production Company's Brook Trout, WYW-070-EA08-129 and Anadarko Petroleum Corporation's Dry Willow Five, WYW-070-EA-10-186. (See Table 2.3 for an approximation of the disturbance in the current situation.) This alternative would deny these APDs and /or POD - requiring the operator to resubmit APDs or a POD that complies with statutes and the reasonable measures in the PRB RMP ROD in order to lawfully exercise conditional lease rights. This alternative could, through secretarial discretion suspend the leasehold, or could administratively cancel or withdraw the lease if improperly awarded, or seek to cancel the lease. It is not possible in the abstract to identify every interest and that is beyond the scope here.

2.2. Alternative B - Operator Proposed Action

Alternative B contains complete APDs and is based on the operator and BLM working to reduce environmental impacts. This alternative summarizes the POD as it was finally, after site visits, submitted to the BLM by Yates on November 11, 2010 and finalized on June 21, 2011.

Proposed Action Title/Type: Yates Petroleum Corporation's Chasm CBNG POD.

Proposed Well Information: There are 11 wells proposed in this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from the Big George coal seam. Proposed well house dimensions are 10 ft wide x 10 ft length x 10 ft height. Well house color is Covert Green, selected to blend with the surrounding vegetation. A list of proposed wells is found in Table 2.1.

Table 2.1. Proposed Wells – Alternative B

WELL NAME	WELL #	QTR	SEC	TWP	RNG	LEASE #	COUNTY
CHASM CS	1	NENW	2	42N	76W	WYW130095	Campbell
CHASM CS	2	SWNW	2	42N	76W	WYW130095	Campbell
CHASM CS	3	NESW	2	42N	76W	WYW130095	Campbell

WELL NAME	WELL #	QTR	SEC	TWP	RNG	LEASE #	COUNTY
CHASM CS	4	SWNW	10	42N	76W	WYW130095	Campbell
CHASM CS	5	NENW	11	42N	76W	WYW130095	Campbell
CHASM CS	6	SWNW	11	42N	76W	WYW130095	Campbell
CHASM CS	7	NENE	15	42N	76W	WYW130095	Campbell
CHASM CS	8	NENW	15	42N	76W	WYW130095	Campbell
CHASM CS	9	SWNW	15	42N	76W	WYW130095	Campbell
CHASM CS	10	NESW	15	42N	76W	WYW130095	Campbell
CHASM CS	11	SWSW	15	42N	76W	WYW130095	Campbell

Water Management Proposal: Table 2.2 summarizes the water management infrastructures proposed for use with this POD.

Table 2.2. Proposed Water Management Reservoirs – Alternative B

	Facility Name	Qtr/Qtr	Sec	TWP	RNG	Capacity (acre feet)	Surface Disturbance (acres)	Lease #
1	Bent Grass	NWNW	15	42N	76W	26.5	4.0	WYW130095
2	Big C	SENE	2	42N	76W	14.9	2.5	WYW45729
3	Butte View	SWNW	2	42N	76W	8.2	1.2	WYW130095
4	Big D	SWNE	2	42N	76W	6.0	1.3	WYW45729
5	Down Wind	NWNW	15	42N	76W	12.8	2.0	WYW130095
6	West World	SWNW	2	42N	76W	12.1	1.8	WYW130095

County: Campbell

Applicant: Yates Petroleum Corporation

Surface Owners: T-Chair, Mark Iberin

Drilling and Construction:

- Wells will be drilled to the Big George coal zone to depths of approximately 1,500 feet.
- Drilling and construction activities are anticipated to be completed within 2 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 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, this will reduce well visitation. Metering would entail approximately 12 visits per month to each well.
- A water management plan (WMP) that involves the following infrastructure, strategy, and approved WYPDES permit from the Wyoming Department of Environmental Quality: 6 discharge points and 6 stock water reservoirs (2 primary, 4 secondary) in the Upper Powder River watershed that would provide full containment of discharge water from this POD.
- A road network consisting of 1.8 miles of improved road and 3.9 miles of primitive road.
- An existing above ground power line network will be used. Three power drops will be added.
- A buried gas, water and power line network will be constructed.

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 for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production and standard practices also is available in the PRB FEIS, Volume 1, pp. 2-9 to 2-40 (2003).

Implementation of committed mitigation measures contained in the MSUP, drilling program and WMP, in addition to the standard conditions of approval (COAs) in the PRB RMP 2003 Amendment, Record of Decision (ROD), Appendix A, are incorporated and analyzed in this alternative.

2.3. Alternatives Considered but Not Analyzed in Detail

Yates submitted the original version of the Chasm POD on February 25, 2009 with 11 federal APDs. A series of discussions and onsite visits occurred between BLM and Yates based on the initial proposal. Revisions from the initial project proposal are documented in a revised project description provided by Yates. The revisions are in response to BLM's deficiency letter which is discussed in this document as Alternative B. The initial POD, the post-onsite deficiency letter, and the company's response to the deficiency letter are included in the project administrative record, are available for review at the BFO.

2.4. Summary of Alternatives

The infrastructure currently existing in the POD area (Alternative A) and the infrastructure proposed by the operator (Alternative B) are approximately summarized below.

Table 2.3. Approximate Summary of Alternatives

Acres or mileage within the action alternative represents additional facilities and it does not include acreage of the existing facilities.

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Total CBNG Wells	11	11
Well Locations Nonconstructed Constructed Slotted	11 qty = 1.1 ac	6 qty = 0.6 ac 0 5qty = 0.4ac
Conventional Wells	0	0
Gather/Metering Facilities Number of Facilities Acreage of Facilities	0 0	0 0.0
Compressors Number of Compressors	0 0	0.0 0
Ancillary Facilities Staging/Storage Areas	0	4 qty = 3.7 ac
Acres (Miles) of Template/ Spot Upgrade Roads No Corridor With Corridor	0 28.5 ac/4.4 miles	5.8 ac/1mile 7 ac/0.8 miles
Acres (Miles) of Primitive Roads No Corridor With Corridor	0.3 ac/.1 miles 0	1.0 ac/1.4 miles 19.3 ac/3.5 miles

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Miles of Buried Power No Corridor With Corridor	 0 0	 0 (NA) in Pipeline Corridor
Miles of Pipeline No Corridor With Corridor	 0 0	6.1 ac 1 ac/0.4 miles 6 ac/1.1 miles
Miles of Overhead Powerlines	4.4 ac/1.2 miles	0.0
Number of Impoundments On-channel Off-channel Lined Unlined	0	6 qty 12.8 ac 12.8 0 0 12.8
Water Discharge Points	0	(6 qty x.1 ac) = 0.6 ac
TOTAL ACRES DISTURBANCE	**33.2**	**63.3**

2.5. Conformance.

The proposed action conforms to the 1985 Buffalo RMP, the 2001, and the 2003 PRB FEIS and RMP Amendment. The proposed project complies with all federal laws, regulations, and policies. This includes, but is not limited to: FLPMA (particularly Sections 201 and 202), the National Historic Preservation Act, the Endangered Species Act (1973), the Migratory Bird Treaty Act (1918), the Clean Water Act (1972), the Clean Air Act (1970), the National Environmental Policy Act (1969), and DOI Order 3310.

3. AFFECTED ENVIRONMENT

This section describes and analyzes the physical and regulatory environment existing in and over the project area, absent consideration of the alternatives. This description and analysis focuses on relevant major issues. Appendix A includes a screening of all resources and uses potentially affected. Resources unaffected or not affected beyond the level analyzed in the PRB FEIS, are not discussed in the EA.

The proposed project is southwest of the Pumpkin Buttes, approximately 80 miles southeast of Buffalo, or 60 miles southwest of Gillette, WY. It is accessed from WY Highway 387. The area ranges from 4,700 to 5,000 feet above sea level. The majority of the area is gently rolling hills. All of the land is on split estate. The BLM manages the minerals and the surface is privately owned. The historical land use is cattle ranching. Yet the area experienced an influx of oil and gas development over the last 10 years.

The Chasm POD is on relatively flat areas among the rolling hills. Problems with erosion would be limited to construction areas within drainages. Slighter slopes of these flat areas have deeper soils. Deeper soils in this project are moderately to well-suited to reclamation.

3.1. Soils, Ecological Sites, and Vegetation

3.1.1. Soils

The PRB has relatively young soils which have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams. Soils have surface and subsurface textures of silt loam and fine sandy loam. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally

productive, though varies with texture, slope and other characteristics. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges to 8+ inches in bottomland.

The map unit symbols for the soils identified above for the identified soil map unit symbols found in the POD boundary are listed in Table 3.1, below. Ecological site descriptions are soil and vegetation community descriptions compiled by the Natural Resources Conservation Service (NRCS) for the purpose of resource identification, and providing management and reclamation recommendations.

3.1.2. Ecological Sites

Ecological site descriptions (Table 3.1) provide site and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate ecological sites for the area in this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service (NRCS) published soil survey soils information.

Table 3.1. Existing Soils and Ecological Sites in the Project Area

Dominant Soils Map Unit	Ecological Site Unit Name	Acres	Percentage
116, 122, 127, 144, 145, 146, 147, 214, 215, 216,	Loamy 10-14" Northern Plains	1231	59%
130, 157, 159, 160, 171, 221, 235	Sandy 10-14 NP	577	27%
120, 153	Lowland 10-14 NP	70	3%
233	Unknown	226	11%
	Total Acres	**2,103**	**100%**

Soils in the project area were identified from the South Campbell County Survey Area, Wyoming (WY605), NRCS.

3.1.3. Vegetation

The proposed well locations were visited in July, 2010. The area appeared to be well managed for range use with thick diverse vegetation on all of the locations. The following plants were identified during site visits: Wyoming big sage, western wheatgrass, prairie junegrass, green needlegrass, threadleaf sage, fringed sage, needle and thread, and blue gramma. Scottish moss, lichen, rabbit brush and small patches of cheat grass were also identified.

3.1.3.1. Wetlands/Riparian

The National Wetland Inventory (NWI) identifies approximately 1.5 acres of sporadic, isolated wetlands in the POD boundary. These wetlands have for the most part formed in low lying areas where surface water accumulates for extended periods of time. Some of the wetlands are adjacent to streams and others may be the result of leaking livestock water facilities.

3.1.3.2. Invasive Species

A database containing invasive species locations and other data is maintained by the Wyoming Energy Resource Information Clearinghouse (WERIC). The WERIC database was created cooperatively by the University of Wyoming, BLM and county weed and pest offices. The following state-listed noxious weed and/or weed species of concern infestations were discovered by a search of the WERIC database (www.weric.info):

- Black henbane

Additionally, the operator or BLM confirmed the following infestations and/or documented additional weed species during field investigations:

- Cheat grass or downy brome
- Canada thistle
- Russian knapweed
- Scotch thistle

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

3.2. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by Wildlife Resources, LLC for mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, bald eagle winter roost, and prairie dog colonies according to PRB Interagency Working Group (PRBIWG) protocol in 2008, 2009, and 2010. Wildlife Resources, LLC also conducted surveys for Ute ladies'-tresses orchid, burrowing owl, and swift fox. No formal surveys were conducted for any additional BLM sensitive species.

The BLM biologists conducted field visits on July 14, 2010. The biologist verified the wildlife survey information, evaluated impacts to wildlife resources, and recommended project modifications where wildlife issues arose. Wildlife species common to the habitat types present are identified in the PRB FEIS (p. 3-114). Species identified in the project area or noted as being of special concern are described below. WGFD is the agency responsible for management of wildlife populations in the state of Wyoming. WGFD developed several guidance documents that BFO wildlife staff relies upon in evaluating impacts to wildlife and wildlife habitats. WGFD documents used to analyze the proposed project under the current analysis are referenced in this section.

In, Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (WGFD 2009), WGFD developed impact thresholds to evaluate impacts to wildlife from oil and gas development. For species or habitats discussed in this EA where impact thresholds exist, those thresholds will be discussed regarding the current conditions (Affected Environment) and in relation to reasonable foreseeable development, including development associated with the proposed project (Environmental Effects). Moderate impacts occur when impairment of habitat function becomes discernable. High impacts occur when impairment of habitat function increases. Extreme impacts occur where habitat function is substantially impaired. Mitigation for each level of impact is discussed in the guidelines. Thresholds for impacts are generally determined by well densities, habitat fragmentation, or both.

3.2.1. Threatened, Endangered, Proposed, and Candidate Species

3.2.1.1. Threatened and Endangered Species

3.2.1.1.1. Black-footed ferret

The black-footed ferret is listed as Endangered under the ESA. The U.S. Fish and Wildlife Service (USFWS) block-cleared the PRB in 2011 for having no populations of the black-footed ferret. The affected environment for black-footed ferrets is discussed in the PRB FEIS on p. 3-175. A black-footed ferret requires at least 1,000 acres of prairie dog colonies, separated by no more than 0.9 miles (1.5 km), for survival (USFWS 2008). One black-tailed colony totaling approximately 35 acres was identified within the Chasm POD boundary by Wildlife Resources, LLC. The nearest additional known black-tailed colony is approximately 0.19 miles outside of the project boundary and totals 19.19 acres in size. Black-footed ferret habitat is not present in the project area.

3.2.1.1.2. Blowout Penstemon

Blowout penstemon is endangered under the ESA. It is a regionally endemic species with documented populations in the Sand Hills of west-central Nebraska and the northeastern Great Divide Basin of Carbon County, WY. Suitable habitat consists of sparsely vegetated and early successional, shifting sand dunes and blowout depressions created by wind. Its habitat in Wyoming is typically found on sandy aprons or the lower half of steep sandy slopes deposited at the base of granitic or sedimentary mountains or ridges. The Chasm project area does not contain areas with these characteristics and blowout penstemon is not expected to occur.

3.2.1.1.3. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS on p. 3-175. The PRB FEIS reported that only 4 orchid populations were documented in Wyoming, but since then, 5 additional sites were found in 2005 and 1 in 2006 (Heidel pers. comm.). The new locations were in the same drainages as the original populations, with 2 on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. A Wyoming Natural Diversity Database (WYNDD) model predicts undocumented populations may be present particularly in southern Campbell and northern Converse Counties. Wildlife Resources, LLC surveyed for potential Ute ladies'-tresses habitat in the project area and concluded that the area has limited potential to support the species. No perennial streams were found and the ephemeral drainages were dominated by upland vegetation. Ute ladies'-tresses orchid is not expected to occur.

3.2.1.2. Proposed Species

3.2.1.2.1. Mountain Plover

The affected environment for mountain plover is discussed in the PRB FEIS on p. 3-177 to 3-178. At the time the PRB FEIS was written, the mountain plover was proposed for listing as a threatened species under the ESA. In 2003, USFWS withdrew the proposal, finding that the population was larger than thought and was no longer declining. In addition to being listed as a Wyoming BLM sensitive species, mountain plovers are a WGFD Species of Greatest Conservation Need (SGCN), with a rating of Native Species Status 4 (NSS4). This rating means the species is apparently secure, although it may be quite rare in parts of its range, especially at the periphery. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17. No mountain plover breeding or nesting habitat was found in the project area. The vegetative shrub and grass height in the majority of the area consistently exceeded 4 inches and ground cover was greater than 30%. Prairie dog colonies of less than 40 acres of size are considered to be of insufficient size to expect occurrence of mountain plover (USFWS 2007). There was one black-tailed colony within the project area totaling approximately 35 acres which was overgrown with vegetation providing marginal mountain plover habitat.

3.2.1.3. Candidate Species

3.2.1.3.1. Greater Sage-grouse

In 2010, USFWS determined that the sage-grouse was warranted for federal listing across its range, but listing was precluded by other higher priority listing actions. In addition to being listed as a Wyoming BLM sensitive species, sage-grouse are listed as a WGFD species of greatest conservation need, because populations are declining and they are experiencing ongoing habitat loss. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects

to Nesting Habitat (2008) recommends that impacts be considered for leks within 4 miles of oil and gas developments. WGFD records indicate that 11 sage-grouse leks occur within 4 miles of the project area. These 11 lek sites are identified in the following table.

Table 3.2. Sage-grouse Leks within 4 miles of the Chasm POD

Lek Name	Legal Location	Distance from Project Area (mi)	Occupied?	Existing WGFD Category of Impact
South Butte	T43N, R75W S21 SWNW	3.93	YES	High
Pumpkin	T43N, R75W S29 NWNE	3.00	YES	High
Brown Ranch	T72N, R75W S4 SWSW	3.24	YES	Extreme
T-Chair	T42N, R75W S17 NWNE	2.95	YES	Extreme
Collins North	T42N, R76W S12 SESE	1.22	YES	Extreme
Collins	T42N, R76W S13 NWSE	1.65	NO	Extreme
Collins SW	T42N, R76W S23 NWSE	1.98	YES	Extreme
Cedar Canyon	T42N, R76W S16 SENE	0.11	YES	Extreme
Cottonwood Creek 3	T42N, R76W S3 SENW	Within the POD	YES	Extreme
Cottonwood Creek 1	T43N, R76 S33 SWNW	1.39	YES	Extreme
Cottonwood Creek 2	T43N, R76 S15 SESE	3.06	YES	Extreme

In, Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (2009), WGFD categorized impacts to sage-grouse by number of well pad locations per square mile within 2 miles of a lek and within identified nesting/brood-rearing habitats greater than 2 miles from a lek. Moderate impacts occur when well density is between 1 and 2 well pad locations per square mile or where there is less than 20 acres of disturbance per square mile. High impacts occur when well density is between 2 and 3 well pad locations per square mile or when there are between 20 and 60 acres of disturbance per square mile. Extreme impacts occur when well density exceeds 3 well pad locations per square mile or when there are greater than 60 acres of disturbance per square mile.

Based on the BLM sage-grouse habitat model and field visits, the sagebrush steppe habitat within the project area was considered suitable nesting and brood rearing habitat. The big sagebrush canopy cover within the project area was qualitatively estimated to be greater than 10% and shrub height within ephemeral draws was considered sufficient to allow for nest concealment. Also, uplands and drainages within the project area contained a diverse mix of forbs, which could potentially be used by sage-grouse and their broods during spring and summer months.

3.2.2. Sagebrush Obligates

Sagebrush ecosystems support a variety of species. Sagebrush obligates are animals that cannot survive without sagebrush and its associated perennial grasses and forbs; in other words, species requiring sagebrush for some part of their life cycle. Sagebrush obligates within the PRB, listed as sensitive species by BLM Wyoming include greater sage-grouse, Brewer's sparrow, sage thrasher, and sage sparrow. Sage sparrows, 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. Sage sparrows prefer large continuous stands of sagebrush, and Brewer’s sparrows are associated closely with sagebrush habitats having abundant scattered shrubs and short grass (Paige and Ritter 1999). Species observed by the BLM biologist include sage thrashers, and Brewer’s sparrows.

The majority of the Chasm project area is dominated by sagebrush/grassland habitat type. The sagebrush cover varies from sparse sage/grassland to a dense sage/grassland. The Chasm project area provides suitable habitat for sagebrush obligates.

3.2.3. Migratory Birds

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153). Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year. BLM must include migratory birds in every NEPA analysis of actions that have the potential to affect migratory bird species of concern in order to fulfill its obligations under the Migratory Bird Treaty Act, Instruction Memorandum No. 2008-050.

The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified 3 groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest. The primary vegetation throughout the project area is sagebrush/grassland with scattered cottonwood trees within draws. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997).

Nationally, grassland and shrubland birds declined more consistently in the last 30 years than any other ecological association of birds (WGFD 2009). Species that may occur in these vegetation types in northeast Wyoming, according to the Wyoming Bird Conservation Plan, are listed in Table 3.3 and are grouped by Level as identified in the Plan.

Table 3.3. High Priority Bird Species Found in Major Vegetation Types in the Chasm POD Area

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

The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153).

3.2.4. Sensitive Species

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

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

The authority for the sensitive species policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the FLPMA and the Department Manual 235.1.1A. BLM Wyoming sensitive species that may impacted beyond the level analyzed in the PRB FEIS are described below.

3.2.4.1. Bald Eagle

The affected environment for bald eagles is described in the PRB FEIS on p. 3-175. At the time the PRB FEIS was written, the bald eagle was a threatened species under the ESA. Due to successful recovery efforts, it was removed from the ESA in 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. In addition to being listed as a Wyoming BLM sensitive species, bald eagles are a WGFD SGCN with a NSS2 rating, due to populations being restricted in numbers and distribution, ongoing loss of habitat, and sensitivity to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region17.

Cottonwood draws are present in the project area providing suitable nesting or roosting habitat although the area lacks the water sources that the species are known to frequent for foraging and nesting. The closest eagle winter roost occurs approximately 3.2 miles west of the project area. Bald eagle use in the project area is limited to a minimal amount of diurnal foraging and roosting behavior.

3.2.4.2. Ferruginous Hawk

The affected environment for ferruginous hawk is discussed in the PRB FEIS on p. 3-183. In addition to being listed as a Wyoming BLM sensitive species, ferruginous hawks are a WGFD SGCN, with a rating of NSS3 because the species is widely distributed, population status and trends are unknown but are suspected to be stable, they are experiencing ongoing loss of habitat, and they are sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action. They are also listed by USFWS as a BCC for Region 17.

According to the BLM data base, ferruginous hawk populations in the PRB declined in recent years. Ferruginous hawks are comparatively sensitive to human disturbance; pairs may abandon nests even when mildly disturbed during nest construction and incubation (Smith and Murphy 1978, White and Thurow 1985, Olendorff 1993). Furthermore disturbed nests fledge fewer young, and they often are not reoccupied the year following disturbances (White and Thurow 1985). Rather than becoming acclimated to repeated disturbance, ferruginous hawks become sensitized and flush greater distances (White and Thurow 1985), which may result in increased clutch or brood mortality due to exposure, predation, starvation, or nest desertion.

Suitable habitat and nesting substrate required by ferruginous hawks is ubiquitous in the area. The BLM raptor database indicates that 8 documented ferruginous hawk nests occur within 0.5 miles of the POD (See Table 3.4), and there are also 17 nests within 2.0 miles of the Chasm POD. Ferruginous hawk habitat is present and it is likely that the species may use habitat and initiate nests in the POD in the future.

3.2.4.3. Loggerhead Shrike

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

3.2.4.4. Western Burrowing Owl

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

The burrowing owl is a small, long-legged owl found throughout open landscapes of North and South America. Burrowing owls can be found in grasslands, rangelands, agricultural areas, deserts, or any dry open area with low vegetation where abandoned burrows dug by mammals such as ground squirrels (*Spermophilus spp*.), prairie dogs (*Cynomys spp.),* and badgers (*Taxidea taxus*) are available. Black-tailed prairie dog colonies provide the primary habitat for burrowing owls (Klute et al. 2003).

Current population estimates for the United States are not well known but trend data suggest declines throughout the burrowing owl range (McDonald et al. 2004). Primary threats are habitat loss and fragmentation, mostly due to intensive agricultural and urban development, and habitat degradation, due to declines in populations of colonial burrowing mammals (Klute et al. 2003).

The BFO database indicates that no burrowing owl nests are reported within 0.5 mile of the Chasm project area. However, 1 prairie dog colony was documented within the project boundary. Burrowing owl nesting is possible within the Chasm POD boundary.

3.2.4.5. Swift Fox

The affected environment for swift fox is discussed in the PRB FEIS on p. 3-189. In addition to being listed as a BLM WY sensitive species, swift fox is also listed as a WGFD SGCN, with a rating of NSS4, because population status and trends are unknown but are suspected to be stable, and habitat is vulnerable but is not undergoing substantial loss. Swift foxes prefer flat, short-grass habitats which do predominate in the project boundary. Although no swift fox were documented during survey efforts the species may occur in the project area.

3.2.4.6. Black-tailed Prairie Dog

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

The black-tailed prairie dog is considered common in Wyoming, although its abundance fluctuates with activity levels of Sylvatic plague and the extent of control efforts by landowners. Comparisons with 1994 aerial imagery indicated that black-tailed prairie dog acreage remained stable from 1994 through 2001, but aerial surveys conducted in 2003 indicated that approximately 47% of the prairie dog acreage was impacted by Sylvatic plague and/or control efforts (Grenier et al. 2004). Due to human-caused factors,

black-tailed prairie dog populations are now highly fragmented and isolated (Miller et al. 1994). Most colonies are small and subject to potential extirpation due to inbreeding, population fluctuations, and other problems that affect long term population viability, such as landowner poisoning and disease (Primack 1993, Meffe and Carroll 1994, Noss and Cooperrider 1994).

One black-tailed prairie dog colony was identified by Wildlife Resources, LLC in the Chasm project area but was reported to be inactive and overgrown with vegetation. The colony was identified to be approximately 35 acres in size. The nearest known active black-tailed colony is approximately 0.19 miles outside of the project boundary and totals 19.19 acres in size.

3.2.5. Big Game

Both pronghorn and mule deer were observed during field visits to the project area. WGFD data indicate that the project area contains yearlong habitat for mule deer and winter yearlong habitat for both antelope and mule deer. Winter yearlong use occurs when animals make general use of habitat on a year-round basis. However, there is a significant influx of additional animals into the area from other seasonal ranges during the winter months. Yearlong use is when a population of animals makes general use of habitat within the range on a year-round basis. Animals may leave under severe conditions. No crucial big game range is known to occur within the project area. The affected environment for pronghorn and mule deer is discussed in the PRB FEIS on pp. 3-117 to 3-122 and pp. 3-127 to 3-132, respectively.

3.2.6. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Four raptor species are known to have used nests within 0.5 miles of the project area: golden eagle, red-tailed hawk, great horned owl, and ferruginous hawk. The affected environment for golden eagles is discussed in the PRB FEIS on pp. 3-145 to 3-146. Golden eagles are listed as a Bird of Conservation Concern (BCC) by USFWS for Bird Conservation Region (BCR) Region 17, which encompasses the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. Golden eagles were also identified as a Level III species in the Wyoming Bird Conservation Plan. Golden eagles are sensitive to extensive human activity around nest sites and are threatened by loss of nesting habitat to industrial development, powerline executions, and other factors (Nicholoff 2003). The WGFD Wyoming Bird Conservation Plan habitat objectives for golden eagles include maintaining open country to provide habitat for small mammals as a food source. Recommendations for management include restricting human activities near nests during peak breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories. Forty-nine raptor nest sites are documented to occur within 0.5 mile of the project boundary. These are listed in the Table 3.4. One of the nests listed was active in 2010.

Table 3.4. Documented Raptor Nests within 0.5 mi. of the Chasm Project Area.

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
4485	420454E 4833533N	S34 T43N R76W	GHS	2010	Poor	INAC	UNRA
				2009	Poor	INAC	n/a
				2008	Poor	INAC	n/a
				2008	Poor	INAC	n/a
				2007	Poor	INAC	n/a
				2006	Poor	INAC	n/a

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
4487	421101E 4832562N	S3 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Poor	INAC	n/a
				2007	Poor	INAC	n/a
				2006	Poor	INAC	n/a
4490	421212E 4828972N	S15 T42N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Good	ACTI	GRHO
				2006	Good	INAC	n/a
4653	423360E 4830550N	S11 T42N R76W	CTL	2010	Unknown	UNK	n/a
				2009	Fair	INAC	n/a
				2008	Good	ACTI	RETA
				2007	Good	ACTI	RETA
				2006	Good	INAC	n/a
4654	424185E 4831663N	S12 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Poor	INAC	n/a
				2007	Fair	INAC	n/a
				2006	Fair	INAC	n/a
5327	420690E 4833442N	S34 T43N R76W	CTL	2010	Poor	INAC	n/a
				2009	Good	INAC	n/a
				2008	Good	INAC	n/a
				2007	Good	ACTI	RETA
5330	421774E 4831563N	S10 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Good	INAC	n/a
				2007	Good	ACTI	RETA
5331	421779E 4830935N	S10 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Good	INAC	n/a

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
5332	422566E 4829329N	S14 T42N R76W	CTL	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
				2008	Good	ACTI	GOEA
				2007	Good	ACTI	GOEA
5333	421482E 4828750N	S15 T42N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Good	INAC	n/a
5334	419892E 4828477N	S16 T42N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
				2007	Good	INAC	n/a
5337	422764E 4832363N	S2 T42N R76W	CTL	2010	Good	ACTI	RETA
				2008	Good	INAC	n/a
				2007	Good	ACTI	GRHO
6098	421087E 4831593N	S10 T42N R76W	CTL	2010	Poor	INAC	UNRA
				2009	Good	INAC	n/a
				2008	Good	INAC	n/a
12178	423549E 4832613N	S1 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
				2007	Poor	ACTI	RETA
12179	422614E 4832573N	S2 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	OCCU	RETA
				2008	Poor	OCCU	RETA
				2007	Poor	ACTI	RETA
12180	423500E 4833730N	S35 T43N R76W	CTL	2010	Nest Gone	INAC	n/a
				2009	Nest Gone	INAC	UNRA
				2008	Nest Gone	INAC	UNRA
				2007	Nest Gone	INAC	UNRA
				2006	Fair	ACTI	GOEA

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
12181	424100E 4832177N	S1 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	FEHA
				2008	Unknown	INAC	FEHA
				2007	Unknown	INAC	FEHA
12182	423716E 4832248N	S1 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	FEHA
				2008	Unknown	INAC	FEHA
				2007	Unknown	INAC	FEHA
12183	424078E 4832629N	S1 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	FEHA
				2008	Poor	INAC	FEHA
				2007	Poor	INAC	FEHA
12184	423486E 4833774N	S35 T43N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	UNRA
12185	422560E 4829318N	S14 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
12186	424132E 4831963N	S1 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	FEHA
				2008	Unknown	INAC	FEHA
				2007	Unknown	INAC	FEHA
12187	420654E 4833027N	S3 T42N R76W	CTL	2010	Poor	INAC	n/a
12188	424164E 4831796N	S1 T42N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	FEHA
				2008	Unknown	INAC	FEHA
				2007	Unknown	INAC	FEHA
12189	421182E 4831399N	S10 T42N R76W	CTL	2010	Fair	INAC	n/a
12190	419632E 4831612N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
12191	419632E 4831612N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
12192	419893E 4828456N	S21 T42N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	UNRA
				2008	Fair	INAC	UNRA

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
12193	419661E 4831540N	S9 T42N R76W	JUN	2010	Poor	INAC	n/a
12194	419785E 4831526N	S9 T42N R76W	CTL	2010	Fair	INAC	n/a
12195	422558E 4829196N	S14 T42N R76W	CTL	2010	Poor	INAC	n/a
12196	420037E 4831186N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12197	420021E 4831258N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12198	419686E 4831546N	S9 T42N R76W	CTL	2010	Nest Gone	INAC	n/a
				2009	Nest Gone	INAC	UNRA
				2008	Nest Gone	INAC	UNRA
12199	419844E 4831487N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12200	419928E 4831518N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12201	421561E 4833060N	S3 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12202	422091E 4831496N	S11 T42N R76W	JUN	2010	Fair	INAC	n/a
				2009	Fair	INAC	UNRA
				2008	Fair	INAC	UNRA
12203	422077E 4829664N	S14 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12204	421999E 4829628N	S14 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
12205	421903E 4829670N	S15 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12206	421763E 4829558N	S15 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12207	421871E 4829400N	S15 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12208	421724E 4829315N	S15 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12209	421406E 4829108N	S15 T42N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	UNRA
				2008	Fair	INAC	UNRA
12210	421429E 4828964N	S15 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12211	419997E 4831325N	S9 T42N R76W	CTL	2010	Poor	INAC	n/a
				2009	Poor	INAC	UNRA
				2008	Poor	INAC	UNRA
12212	422038E 4833491N	S35 T43N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	UNRA
				2008	Fair	OCCU	RETA
				2007	Fair	ACTI	RETA
				2006	Fair	INAC	UNRA

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
12213	423198E 4834176N	S35 T43N R76W	CTL	2010	Good	INAC	n/a
				2009	Good	OCCU	RETA
				2008	Good	ACTI	RETA
				2007	Good	INAC	UNRA
				2006	Good	INAC	UNRA

Nest Substrate Codes:
GHS- Ground/Hillside
CTL- Cottonwood Tree Live
CTD- Cottonwood Tree Dead
BOX- Box Elder Tree
POL- Ponderosa Tree Live
JUN- Juniper

Activity Codes:
INAC- Inactive
ACTI- Active
OCCU- Occupied
DNLO- Did Not Locate

3.2.7. 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.

WNv firmly established and spread across the United States since its discovery in 1999 in New York. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. Though less than 1% of mosquitoes carry WNv, they still are 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 appear to have leveled off. Historic data collected by the CDC, published by the USGS at: www.westnilemaps.usgs.gov, and are summarized in Table 3.5. Reported data from the PRB includes Campbell, Sheridan and Johnson counties.

Table 3.5. Historical West Nile Virus Information

Year	Total WY Human Cases	PRB		
		Human Cases	Equine Cases	Bird Cases
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007	155	22	Unk	1
2008	10	0	0	0
2009	10	1	1	No record
2010	6	0	0	0

Source: Wyoming Department of Health, www.badskeeter.org/detections.html.

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 may exhibit a gradual decline in the number of reported cases.

Although most of the attention focused on human health issues, WNv had an impact on vertebrate wildlife populations. At a recent conference at the Smithsonian Environmental Research Center, scientists disclosed WNv was detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al 2003). In the eastern US, avian populations incurred very high mortality, particularly crows, jays and related species. Raptor species also appear to be highly susceptible to WNv.

Researchers documented that 36 raptors died from WNv in Wyoming in 2003. These included 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, Holloran 2005, Clark 2006, Walker 2011, 2007).

Mosquitoes can potentially breed in any standing water that lasts more than 4 days. In the PRB 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 (Zou 2006). Preliminary research conducted in the PRB indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than 2 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.

3.3. Water Resources

The project area is in the Upper Powder River drainage system. The Wyoming Department of Environmental Quality (WDEQ) assumed primacy from United States Environmental Protection Agency (EPA) for maintaining the water quality in the waters of the state of Wyoming. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights, and permitting reservoirs for impounding surface water within state. The Wyoming Oil and Gas Conservation Commission (WYOGCC) have authority for permitting and bonding off-channel impoundments that are located over state and fee minerals.

3.3.1. Groundwater

The groundwater in the project area is historically used for stock water or domestic purposes. A search of the WSEO groundwater rights database for this area showed 10 registered stock and domestic water wells within 1 mile of the POD boundary with depths ranging from 8 to 600 feet. For additional information on groundwater, please refer to the PRB FEIS (2003), Chapter 3, Affected Environment pp. 3-1 to 3-36.

WDEQ Water Quality Rules and Regulations: Chapter 8. Quality Standards for Wyoming Groundwaters define the following general limits for Total Dissolved Solids (TDS): 500 mg/l TDS for Drinking Water (Class I), 2000 mg/l for Agricultural Use (Class II) and 5000 mg/l for Livestock Use (Class III). For additional water quality limits for groundwater, please refer to the WDEQ internet site.

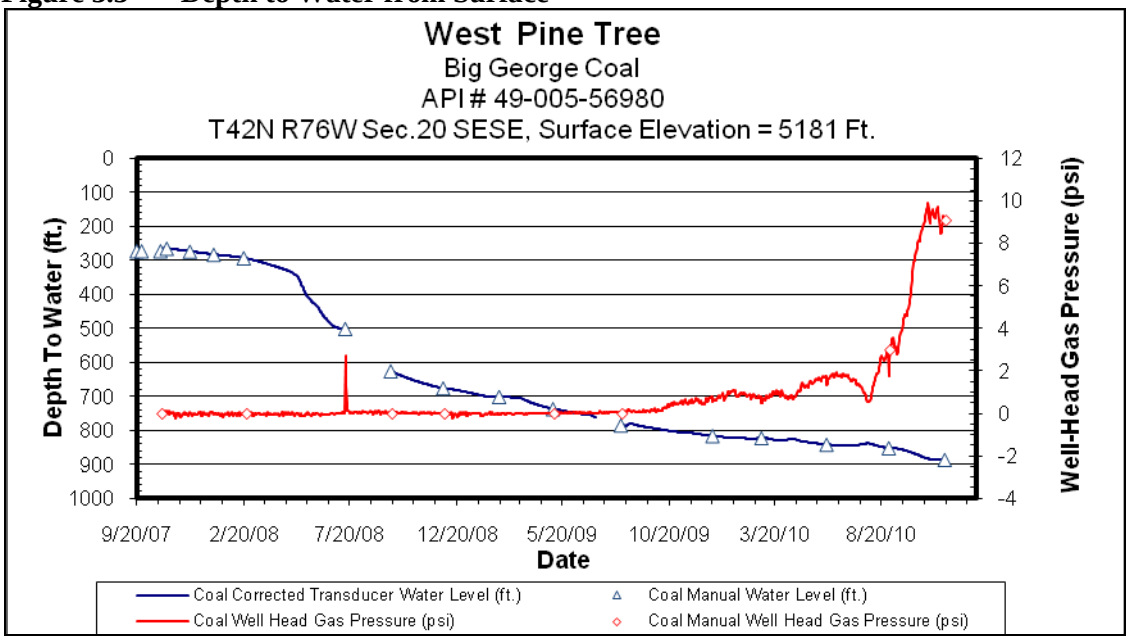
The ROD includes a monitoring, mitigation and reporting plan (MMRP). The objective of the MMRP is to monitor those elements of the analysis addressed in the ROD where there was limited information available during the preparation of the PRB FEIS. The MMRP called for the use of adaptive management to make management changes based on the results of monitoring data.

Specifically relative to groundwater, the MMRP identified the following (PRB FEIS ROD, p. E-4):

- The effects of infiltrated waters on the water quality of existing shallow groundwater aquifers are not well documented at this time (2003);
- 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, and
- Shallow groundwater wells would be installed and monitored where necessary.

The production of CBNG requires the temporary reduction of the hydraulic head in the saturated coal zones targeted for CBNG production. The BFO has monitored coal zone water levels and gas pressures in the PRB since the early 1990s. The Chasm POD is surrounded by approved federal, fee, and state CBNG projects. As a result, the target coal zone pressure may have been reduced through off set water production associated with those projects. The West Pine Tree Unit Groundwater monitoring well was installed by Devon Energy Production Company as a part of the BFO's groundwater monitoring program. The well is located in the SESE of Section 20, Township 42 N, Range 76 W, and is less than 1.5 miles from the Chasm Pod boundary. The initial water level of the Big George coal at this site was recorded at 272 feet below ground level on September 20, 2007. On November 18, 2010, the water level was 887 feet below the ground surface, representing a decline of 615 feet since the well was completed (Figure 3.3). This level of drawdown is within the range predicted through the regional groundwater modeling conducted for the PRB FEIS. For additional information, please refer to the PRB FEIS. Chapter 4, Groundwater; and the Wyoming State Geological Survey's Open File Report 2009-10 titled "1993-2006 Coalbed Natural Gas (CBNG) Regional Groundwater Monitoring Report: Powder River Basin, Wyoming" which is available at: http://www.wsgs.uwyo.edu.

Figure 3.3 Depth to Water from Surface



3.3.2. Surface Water

The project area is within the Dry Fork Powder River drainage which is tributary to the Upper Powder River watershed. Most of the drainages in the area are ephemeral (flowing only in response to a precipitation event or snow melt) to intermittent (flowing only at certain times of the year when it receives water from alluvial groundwater, springs, or other surface source – PRB FEIS Chapter 9 Glossary). The channels are primarily well vegetated and stable with mild incision and meandering.

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, p. 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 CB[NG] produced water of varying chemical composition to surface drainages within the Project Area," (PRB FEIS, p. 3-48). For the Upper Powder River Watershed, the EC ranges from 1,797 at maximum monthly flow to 3,400 at low monthly flow; and the SAR ranges from 4.76 at maximum monthly flow to 7.83 at low monthly flow. These values were determined at the USGS station (Station ID 06317000) located on the Upper Powder River at Arvada, WY (PRB FEIS, p. 3-49).

Yates observed no natural springs in the project area.

,Refer to the PRB FEIS, Chapter 3, Affected Environment, pp. 3-36 to 3-56 for more information regarding surface water.

3.4. Cultural Resources

Class III cultural resource inventory was performed for the Chasm POD prior to on-the-ground project work (BFO project no. 70090052). A class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports* was provided to BFO by Yates. Ardeth Hahn, BLM Archaeologist, 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 in or near the project area.

Site Number	Site Type	Eligibility
48CA1568	Deadwood Road	Eligible
48CA4975	Crook's 1876 Belle Fourche River Scout	Eligible
48CA6962	Historic Site	Not Eligible

Some of the project area analyzed in this EA occurs on deep alluvial and/or Aeolian deposits. Alluvial and Aeolian deposits typically have a high potential for buried cultural resources, which are nearly impossible to locate during a Class III inventory (Ebert & Kohler 1988:123; Eckerle 2005:43).

Sites 48CA1568 (Deadwood Road) and 48CA4975 (Crook's 1876 Belle Fourche River Scout) are eligible for the National Register. Contributing portions (typically expressed as wagon ruts) of site 48CA1568 (Deadwood Road) are present in the project area. None of the contributing portions of the sites retain their integrity of setting due to modern additions to the landscape including CBNG wells, upgraded roads, pipelines, reservoirs, POD buildings, compressor stations, etc.

4. ENVIRONMENTAL EFFECTS

This section describes the environmental effects of the proposed action, Alternative B from Section 2, on the physical and regulatory environment (Section 3). The effects analysis addresses the direct and indirect effects of implementing the proposed action, the cumulative effects of the proposed action combined with reasonably foreseeable federal and non-federal actions, identifies and analyzes mitigation measures (COAs), and discloses any residual effects remaining following mitigation.

4.1. Alternative A

The No Action Alternative was analyzed as Alternative 3 in the PRB FEIS, and is incorporated by reference into this EA, as are the pertinent analyses for the PODs discussed in Section 2.1, above. Information specific to resources for this alternative is included in the PRB Final EIS on pages listed in Table 4.1. Also see Table 2.3.

Table 4.1. Location of Discussion of the No Action Alternative in the PRB FEIS

Resource		Type of Effect	Page(s) of PRB FEIS
Project Area Description	Geologic Features and Mineral Resources	Direct and Indirect Effects	4-164 and 4-134
		Cumulative Effects	4-164 and 4-134
Soils, Vegetation, and Ecological Sites	Soils	Direct and Indirect Effects	4-150
		Cumulative Effects	4-152
	Vegetation	Direct and Indirect Effects	4-163
		Cumulative Effects	4-164
	Wetlands/Riparian	Direct and Indirect Effects	4-178
		Cumulative Effects	4-178

Resource		Type of Effect	Page(s) of PRB FEIS
Wildlife	Sensitive Species - Greater Sage-Grouse	Direct and Indirect Effects	4-271
		Cumulative Effects	4-271
	Aquatic Species	Direct and Indirect Effects	4-246
		Cumulative Effects	4-249
	Migratory Birds	Direct and Indirect Effects	4-234
		Cumulative Effects	4-235
	Waterfowl	Direct and Indirect Effects	4-230
		Cumulative Effects	4-230
	Big Game	Direct and Indirect Effects	4-186
		Cumulative Effects	4-211
	Raptors	Direct and Indirect Effects	4-224
		Cumulative Effects	4-225
Water	Ground Water	Direct and Indirect Effects	4-63
		Cumulative Effects	4-69
	Surface Water	Direct and Indirect Effects	4-77
		Cumulative Effects	4-69
Economics and Recovery of CBNG Resources		Direct and Indirect Effects	4-362
		Cumulative Effects	4-370
Cultural Resources		Direct and Indirect Effects	4-286
Air Quality		Direct and Indirect Effects	4-386
		Cumulative Effects	4-386

4.2. Alternative B

4.2.1. Project Description

Alternative B is the project as it was proposed by the operator. Alternative B includes mitigation requested by the BLM and desires of the private surface owners.

4.2.2. Soils, Ecological Sites, and Vegetation

4.2.2.1. Soils

Erosion, poor reclamation, and road instability are not major issues for this project. The project overlays relatively flat topography with 59% of the project in loamy soil and 27% in sandy soil.

Table 4.2. Chasm POD's Dominant Soils & Ecological Sites by Acreage and Percent

Dominant Soils Map Unit	Ecological Site Unit Name	Acres	Percentage
116, 122, 127, 144, 145, 146, 147, 214, 215, 216,	Loamy 10-14" Northern Plains	1231	59%
130, 157, 159, 160, 171, 221, 235	Sandy 10-14 NP	577	27%
120, 153	Lowland 10-14 NP	70	3%
233	Unknown	226	11%
	Total Acres	**2,103**	**100%**

4.2.2.1.1. Direct and Indirect Effects

The sandy soil may be challenging to reclaim while the loamy soil may be exposed to soil loss and potential erosion. The impacts listed below, singly or in combination, would increase the potential for valuable soil loss due to increased water and wind erosion, invasive plant establishment, and increased sedimentation and salt loads to the watershed system.

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

- Mixing of horizons – occurs where construction on roads, pipelines or other activities take place. Mixing may result in removal or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Soils which are more susceptible to wind and water erosion may be moved to the surface. Soil structure may be destroyed, which may impact infiltration rates. Less desirable inorganic compounds such as carbonates, salts or weathered materials may be relocated and have a negative impact on revegetation. This drastically disturbed site may change the ecological integrity of the site and the recommended seed mix.
- Loss of soil vegetation cover, biologic crusts, organic matter and productivity.
- Soil erosion would also affect soil health and productivity. Erosion rates are site specific and are dependent on soil, climate, topography and cover.
- Soil compaction – the collapse of soil pores results in decreased infiltration and increased erosion potential. Factors affecting compaction include soil texture, moisture, organic matter, clay content and type, pressure exerted, and the number of passes by vehicle traffic or machinery.
- Alteration of surface run-off characteristics.
- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

4.2.2.1.2. Cumulative Effects

The designation of the duration of disturbance is defined in the PRB FEIS, (p. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization, as committed to by the operator in their POD surface use plan and as required by the BLM in COAs.

Geomorphic effects of roads and other surface disturbance range from chronic and long-term contributions of sediment into waters of the state to catastrophic effects associated with mass failures of road fill material during large storms without adequate drainage. Roads can affect geomorphic processes primarily by: accelerating erosion from the road surface and prism itself through mass failures and surface erosion processes; directly affecting stream channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and debris at road-stream crossings.

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

4.2.2.1.3. Mitigation Measures

Impacts to soils and vegetation from surface disturbance will be reduced by following the guidance in the Reclamation Requirements, Appendix B of this EA; see also Wyoming Policy on Reclamation (IM WY-90-231). The Reclamation requirements apply to all surface disturbing activities. Authorizations for surface disturbing actions are based upon the assumptions that an area can and ultimately will be successfully reclaimed. BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to an approved "Reference Site" or NRCS Ecological Site Transition State. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both

disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal.
To help mitigate soil erosion from development and to ensure proper access road construction the following conditions will be applied to the project.

1. Access to the Chasm Federal #1well location must be constructed prior to drilling the well. This will protect unprepared soils from erosion and compaction, reduce dust and provide safe access to the well site for heavy equipment and water trucks.
2. Staking for the Chasm #9 slot design must be field reviewed prior to construction. BLM prefers to review at pre-construction onsite.

4.2.2.1.4. Residual Effects

Residual effects were also identified in the PRB FEIS, p. 4-408. Despite expedient reclamation, residual effects may include the loss of vegetative cover, for several years until reclamation is successfully established.

4.2.2.2. Ecological Sites and Vegetation

4.2.2.2.1. Direct and Indirect Effects

The majority of the project area is covered by mixed sagebrush/grass plant communities. Historically, this plant community evolved under grazing by bison and a low fire frequency. Currently, it is found under moderate, season-long grazing by livestock in the absence of fire or brush management. Wyoming big sagebrush is a significant component of this 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 grasses, and miscellaneous forbs. Dominant grasses include needle and thread, western wheatgrass, and green needlegrass. Grasses of secondary importance include blue grama, prairie junegrass, and Sandberg bluegrass. Forbs commonly found in this plant community include plains wallflower, hairy goldaster, slimflower scurfpea, and scarlet globemallow. Sagebrush canopy ranges from 20% to 30%. Fringed sagewort is commonly found. Plains pricklypear can also occur.

When compared to the historic climax plant community, sagebrush and blue grama have increased. Production of cool-season grasses, particularly green needlegrass, is reduced. The sagebrush canopy protects the cool-season mid-grasses, but this protection makes them unavailable for grazing.
Cheatgrass (downy brome) has invaded the site. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community to support domestic livestock and wildlife such as mule deer and antelope.

Direct effects to vegetation would occur from ground disturbance caused by construction of well pads, compressor stations, ancillary facilities, associated pipelines and roads. Short term effects would occur where vegetated areas are disturbed but later reclaimed within 1 to 3 years of the initial disturbance. Long-term effects would occur where well pads, compressor stations, roads, water-handling facilities or other semi-permanent facilities would result in loss of vegetation and prevent reclamation for the life of the project.

Sagebrush does not come back easily after human disturbance such as urban or agricultural development, or even after natural occurrences such as wildfire. It takes years, maybe generations, for sagebrush to fully grow back. Sagebrush still hasn't returned to some areas of the Columbia Basin burned by a large fire 40 years ago (Pacific Northwest National Laboratory Shrub Steppe Ecology Series May 2010).

4.2.2.2.2. Cumulative Effects

Vegetation requires 2 or more growing seasons to establish a viable root zone, become capable of producing a self perpetuating seed source, and is capable of competing with opportunistic sources of

weeds. An ecological system requires more than five years to establish a diversity of species that support a functional condition to wildlife and natural systems.

Cumulative effects may be reduced through expedient reclamation of disturbed sites. Disturbed areas exhibit successful vegetation based on many variables including: mitigation of water and wind erosion, salvaging topsoil, seed mix, seeding methods and grazing management.

4.2.2.2.3. Mitigation Measures

As part of the Reclamation Requirements, Appendix B of this EA, the BLM will consider having the project proponent restore topography to a properly functioning condition, reseed the area, and prepare disturbed sites for eventual restoration. Mitigation measures are listed in the Standard COAs.

4.2.2.2.4. Residual Effects

Reclamation success impacts ecological function and net primary production, effecting range and wildlife values through ecosystem degradation. If an area is not reclaimed or if seeding fails, or grazing is allowed before the root zone establishes, the plant community could be reduced to a "Go-back Land Plant Community". Residual effects were identified in the PRB FEIS, p. 4-408. Construction causes loss of vegetative cover. Despite expedient reclamation, vegetation may take several years until it is successfully established.

4.2.2.2.5. Wetlands/Riparian

4.2.2.2.5.1. Direct and Indirect Effects

Re-surfacing water from the impoundments will potentially allow for wetland-riparian species establishment. Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges.

Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species. A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS, p. 4-175).

4.2.2.2.5.2. 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 POD 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, p. 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 Powder River drainage and the total amounts that were predicted in the PRB FEIS (see Section 4.2.3.2.2).
- The WMP for the Chasm POD proposes that produced water will not contribute significantly to flows downstream.

Additional mitigation measures may be required should discharges into the Powder River watershed from the downstream-most reservoirs become necessary.

4.2.2.2.5.3. Mitigation Measures

Mitigation measures are listed in the Standard COAs.

4.2.2.2.5.4. Residual Effects

There will be changes to wetland and riparian areas through alterations in volume, velocity, timing and quality of the stream flow due to direct discharge. Turbidity and solids loading in the streams would probably increase due to erosion of project disturbed areas and sediment transport to the associated drainages. These impacts would be mitigated by expediently stabilizing the disturbance and reducing the amount of sediment reaching the streams.

4.2.2.2.6. Invasive Species

4.2.2.2.6.1. Direct and Indirect Effects

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.

4.2.2.2.6.2. Cumulative Effects

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 Canada thistle, Russian knapweed and Scotch thistle.

4.2.2.2.6.3. Mitigation Measures

The operator committed to the control of noxious weeds and species of concern using the following measures identified in their integrated pest management plan (IPMP):

1. Control methods include physical, biological, and chemical methods:
   Physical methods include mowing during the first season of establishment, prior to seed formation, and hand pulling of weeds (for small or new infestations). Biological methods include the use of domestic animals, or approved biological agents. Chemical methods include the use of herbicides, done in accordance with the existing surface use agreement with the private surface owner.
2. Preventive practices:
   Certified weed-free seed mixtures will be used for re-seeding, and vehicles and equipment will be washed before leaving areas of known noxious weed infestations.
3. Education:
   The company will provide periodic weed education and awareness programs for its employees and contractors through the county weed districts and federal agencies. Field employees and contractors will be notified of known noxious weeds or weeds of concern in the project area.

4.2.2.2.6.4. Residual Effects

Control efforts by the operator are limited to the surface disturbance associated the implementation of the project. Cheat grass and other invasive species that are present within non-physically disturbed areas of the project area are anticipated to continue to spread unless control efforts are expanded. Cheatgrass and to a lesser extent, Japanese brome (*B. japonicus*) are found in such high densities and numerous locations throughout NE Wyoming that a control program is not considered feasible at this time; these annual bromes would continue to be found within the project area.

4.2.3. Wildlife

4.2.3.1. Threatened, Endangered, Proposed, and Candidate Species

4.2.3.1.1. Threatened and Endangered Species

BLM analyzed the project's potential effects on threatened and endangered species. See Table 4.3.

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

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Endangered				
Black-footed ferret (*Mustela nigripes*)	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	NE	No suitable habitat present. USFWS block-cleared PRB.
Blowout penstemon (*Penstemon haydenii*)	Sparsely vegetated, shifting sand dunes	NP	NE	No suitable habitat present.
Threatened				
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NP	NE	No suitable habitat present.
Proposed				
Mountain plover (*Charadrius montanus*)	Short-grass prairie with slopes < 5%	NS	NLJ	May impact individuals only.
Candidate				
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	K	MIIH	Sagebrush cover will be affected. Human presence and traffic will increase. Overhead power will be 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.
NLJ – Not likely to jeopardize the continued existence.

Effects Determination for Candidate, Petitioned and Sensitive Species

NI - No Impact from the project on the species or its habitat

MIIH -The project may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.

WIPV- Will impact population viability.

4.2.3.1.1.1. Black-Footed Ferret

4.2.3.1.1.1.1. Direct and Indirect Effects

There is 1 black-tailed prairie dog colony within or adjacent to the Chasm project area totaling approximately 35 contiguous acres. Due to the limited availability of habitat, the black-footed ferret is not

present within the project area and the implementation of the proposed development will have "*no effect*" on the black-footed ferret.

4.2.3.1.1.1.2. Cumulative Effects

The PRB FEIS discusses impacts to black-footed ferret are on p. 4-251.

4.2.3.1.1.1.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.1.1.1.4. Residual Effects

None identified.

4.2.3.1.1.2. Blowout Penstemon

4.2.3.1.1.2.1. Direct and Indirect Effects

No sand dunes, blowouts, or large sand deposits were identified within the Chasm project area. Also none of the vegetation associated with known blowout penstemon populations was identified within the project area. The project will have "*no effect*" on blowout penstemon**.**

4.2.3.1.1.2.2. Cumulative Effects

None identified.

4.2.3.1.1.2.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.1.1.2.4. Residual Effects

None identified.

4.2.3.1.1.3. Ute Ladies'-Tresses Orchid

4.2.3.1.1.3.1. Direct and Indirect Effects

Suitable wetland and riparian habitat is not present near the Chasm project area. The project will have "*no effect*" on Ute Ladies'-Tresses orchid.

4.2.3.1.1.3.2. Cumulative Effects

The PRB FEIS discusses impacts to Ute Ladies'-Tresses orchid are on p. 4-253.

4.2.3.1.1.3.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.1.1.3.4. Residual Effects

None identified.

4.2.3.1.2. Proposed Species

4.2.3.1.2.1. Mountain Plover

4.2.3.1.2.1.1. Direct and Indirect Effects

Suitable habitat is not present near the Chasm project area, and the potential habitat provided by the black-tailed prairie dog colony is of insufficient size. The project is "*not likely to jeopardize the continued existence of the mountain plover* ".

4.2.3.1.2.1.2. Cumulative Effects

The PRB FEIS discusses impacts to mountain plover are on p. 4-254.

4.2.3.1.2.1.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.1.2.1.4. Residual Effects

There is a potential for plovers to be impacted by project related traffic outside the project boundary.

4.2.3.1.3. Candidate Species

4.2.3.1.3.1. Greater Sage-grouse

4.2.3.1.3.1.1. Direct and Indirect Effects

Impacts to sage-grouse associated with energy development are discussed in detail in the, 12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered (USFWS 2010). Impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Research indicates that sage-grouse hens also avoid nesting in developed areas. Direct and indirect impacts to sage-grouse are discussed in more detail in the PRB FEIS, pp. 4-257 to 4-273.

Implementation of the project will adversely impact nesting habitat, both through direct loss and avoidance of the area by sage-grouse. An initial 65.8 acres of habitat will be removed from the construction of wells and associated infrastructure. Realization of the proposed project will also contribute to habitat fragmentation and effectiveness. Disruptive activities related to maintenance and construction may inhibit sage-grouse from using remaining habitat. The Chasm project does not occur in any BFO identified key sage-grouse habitat or Wyoming core areas.

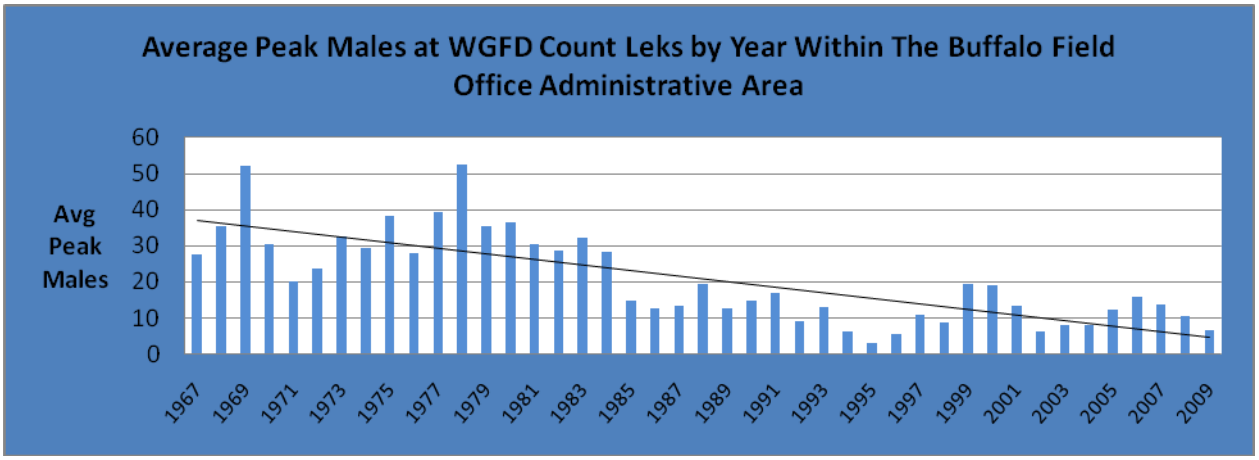
A portion of the proposed access for the CHASM 2 well uses an existing two-track route which passes within 0.07 miles of documented sage-grouse strutting grounds and also through the 0.25 mile controlled surface use area (CSU) of the associated lek (Cottonwood Creek 3). Approximately 1.6 acres of new disturbance will take place within the 0.25 mile CSU due to the installation of buried corridored utilities along the existing two-track. This disturbance will directly affect sage-grouse habitat immediately adjacent to the proposed utility corridor. The sage-grouse habitat affected by this disturbance is marginal in contrast with the surrounding area; in turn the location of the proposed access through the 0.25 mile CSU will minimize the amount of high quality habitat that otherwise would be affected by other feasible alternative access routes and utility corridors. In other words, it is better to use the existing road through the 0.25 mile CSU than pioneer a new route through nesting habitat outside the CSU. The remainder of the proposed access road to the CHASM 2 well falls outside of the CSU discussed above and uses an existing two-track route for a short segment of the route; the reminder of the proposed access (approximately 0.28 miles), as well as the pipelines and reservoirs in the NW quarter of section 2, will cause direct loss of suitable nesting habitat and fragment high quality nesting habitat.

The Chasm 9 well was located within the 0.25 mile CSU for the Cedar Canyon Lek, approximately 75 yards off an existing resource road, in sage-brush, and the well requires a pad. The BLM biologist at the on-site identified an alternate location at the edge of the 0.25 mile CSU, along the road, which would remove no nesting cover. Yates moved the well to the preferred location identified at the onsite.

4.2.3.1.3.1.2. Cumulative Effects

Recent research suggests that the cumulative and synergistic effects of current and foreseeable CBNG development within the vicinity of the project area are likely to impact the local sage-grouse population, cause declines in lek attendance, and may result in local extirpation. The cumulative impact assessment area for this project encompasses the project area and the area that is encompassed by a 4 mile radius around the 4 sage-grouse leks that occur within 4 miles of the project boundary, resulting in an area of 161.23 mi^2. Analysis of impacts up to 4 miles was recommended by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008).

The sage-grouse population in northeast Wyoming is exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2008). Figure 3 illustrates a 10-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that these declines may be a result, in part, of CBNG development, as discussed in detail in USFWS (2010).



In its, Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (2009), WGFD categorized impacts to sage-grouse by number of well pad locations per square mile within 2 miles of a lek and within identified nesting/brood-rearing habitats greater than 2 miles from a lek. Based on the 2 mile analysis for determining category of impact, the proposed wells within the Chasm project area will not change the categories of impact for the 6 leks within 2 miles of the project area, reference Table 3.2 for current impact determinations.

Based on the summary of research describing the impacts of energy development on sage-grouse, efforts to reduce habitat loss and fragmentation are likely to be the most effective in ensuring long-term lek persistence. Design features specifically included in the proposed action under Alternative B to minimize impacts to sage-grouse include:

- Well locations and access were located in a manner to minimize habitat loss and fragmentation.
- Existing overhead power was used to minimize raptor perches and reduce habitat fragmentation, and any additional power lines are to be buried.

The PRB FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area [PRB] or the entire range of the species is not likely to be compromised (p. 4-270)." Based on the impacts described in the PRB FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the 11 leks that occur within 4 miles of the project area, and, potentially, extirpation of the local grouse population.

The Cottonwood Creek 3 lek currently experiences routine disturbance. The disturbance is related to metering and maintenance activities associated with the Brook Trout POD 3S-1 well which was approved as part of the overlapping that POD which overlaps the Chasm POD. This well has an average visitation rate of 3 to 4 times per week. Under Alternative B the access to the Brook Trout POD 3S-1 well will be shared by the proposed CHASM 2 well which will result in increased routine vehicle traffic through the shared portion of the access road. This may enhance avoidance of the area by sage-grouse as well as augment the possibility for vehicle related mortalities.

The effect determination concerning sage-grouse for the Chasm POD is, "*The project may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*"

4.2.3.1.3.1.3. Mitigation Measures

To reduce impacts to breeding sage-grouse (as described in the PRB EIS (pp. 4-223 and 4-224), surface disturbing activities will be restricted during the nesting and early brood rearing season near leks and in high quality nesting habitat, this timing restriction will apply to the entire project area.

Restrictions for cultural resources will satisfactorily limit habitat loss associated with installation of corridored utilities along the existing two-track route within the 0.25 mile conditional surface use area of the Cottonwood Creek 3 Lek.

Restrictions on disruptive activities and surface occupancy within a 0.25 mile of the Cottonwood Creek 3 Lek, as directed in the BFO RMP Maintenance Action of September 17, 2010; and further supported by WY-2010-012 IM Policy Statement 2: Sage-grouse leks outside Core Areas, and consistent with the Yates' All Day POD Modified Decision Record, dated April 8, 2011, to minimize impacts to the lek.

4.2.3.1.3.1.4. Residual Effects

A timing limitation does nothing to mitigate loss and fragmentation of habitat or changes in disease mechanisms. Suitability of the project area for sage-grouse will be negatively affected due to habitat loss and fragmentation and proximity of human activities associated with CBNG development.

4.2.3.1.4. Sagebrush Obligates Direct and Indirect Effects

The species directly affected by the Chasm project include Brewer's sparrow and the sage thrasher. The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected impacts to the sagebrush obligates identified in the project area are discussed in the Migratory Bird section to follow, and impacts to sagebrush communities are described in the sage-grouse section above.

4.2.3.1.4.1. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.1.4.2. Mitigation Measures

No further mitigation measure applied.

4.2.3.1.4.3. Residual Effects

None identified.

4.2.3.2. Migratory Birds Direct and Indirect Effects

Direct and indirect effects to migratory birds are discussed in the PRB FEIS (pp. 4-231 to 4-235). Disturbance of habitat within the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of wells, roads, and pipelines. Reclamation and other activities that occur in the spring may be detrimental to migratory bird survival. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Activities will likely displace migratory birds farther than the immediate area of physical disturbance. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Habitat fragmentation will result in more than just a quantitative loss in the total area of habitat available; the remaining habitat area will also be qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows

declined by 57% within 100 m (328 feet) of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses through displacement were much greater than the direct physical habitat losses.

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

Migratory bird species in the PRB nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptor nesting timing limitations are applied, nesting migratory birds are also protected. Where these timing limitations are not applied and migratory bird species are nesting, migratory birds remain vulnerable.

4.2.3.2.1. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, p. 4-235. No additional mitigation measures are required.

4.2.3.2.2. Mitigation Measures

Migratory bird species within the PRB nest in the spring and early summer and are vulnerable to the same effects as sage-grouse and raptor species. Though no timing restrictions are typically applied specifically to protect migratory bird breeding or nesting, where sage-grouse or raptors nesting timing limitations are applied, in this case the entire POD for sage-grouse, nesting migratory birds will also receive protection.

4.2.3.2.3. Residual Effects

Those species and individuals that are still nesting when the sage-grouse timing limitations are over (June 30) may have nests destroyed, or be disturbed, by construction activities. Sage-grouse timing limitations will apply to the entire project. Protections around active raptor nests (February 1- July 31) extend past most migratory bird nesting seasons. Only a percentage of known nest are active any given year, so the protections for migratory birds from June 30-July 31 will depend on how many raptor nests are active.

4.2.3.3. Sensitive Species

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

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-265.

4.2.3.3.1. Bald EagleDirect and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS on pp. 4-251 to 4-253. A more recent study completed in 2004 suggests that two-tracks and improved project roads pose minimal collision risk to bald eagles. In one year of monitoring road-side carcasses the BLM BFO reported 439 carcasses, 226 along interstate highways (51%), 193 along paved highways (44%), 19 along gravel county roads (4%), and 1 along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported; bald and golden eagles were observed feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads do not affect bald eagles.

Activities associated with the Chasm project may impact bald eagles by disturbing foraging activity in the area. The project will not impact any identified nests or winter roost concentration areas.

4.2.3.3.1.2. Cumulative Effects

The cumulative effects for bald eagles associated with Alternative B are described in the PRB FEIS (pp. 4-251 to 4-253).

4.2.3.3.1.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.3.1.4. Residual Effects

There will be increased traffic in the general area resulting from this project which may increase disturbance to known bald eagle populations in the Pumpkin Butte area.

4.2.3.3.2. Ferruginous HawkDirect and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Impacts expected from project actions are described in the raptor section.

4.2.3.3.2.1. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.3.2.2. Mitigation Measures

No further mitigation measure applied.

4.2.3.3.2.3. Residual Effects

None identified.

4.2.3.3.3. Loggerhead ShrikeDirect and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Expected project impacts to loggerhead shrikes are discussed in the Migratory Bird Section, above.

4.2.3.3.3.1. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.3.3.2. Mitigation Measures

No further mitigation measure applied.

4.2.3.3.3.3. Residual Effects

None identified.

4.2.3.3.4. Western Burrowing Owl

4.2.3.3.4.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Use of roads and pipeline corridors may increase owl vulnerability to vehicle collision.

4.2.3.3.4.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.3.4.3. Mitigation Measures

The Thunder Basin National Grasslands in Campbell County, WY, who cooperated with the BLM in the creation of the 2003 PRB EIS, recommends a 0.25 mile timing restriction buffer zone for burrowing nest locations during their nesting season (April 15 to August 31) if any are found during the annual nesting survey, PRB RMP ROD, A.5.11.1. Instruction Memorandum No. 2006-197, directs field offices to "use the least restrictive stipulations that effectively accomplish the resource objectives or uses." Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months (See Chapter 3 of the PRB FEIS for breeding, nesting, and migration chronology) from six and one half months and from 0.5 mile to 0.25 mile.

No further mitigation measure applied.

4.2.3.3.4.4. Residual Effects

None identified.

4.2.3.3.5. Swift FoxDirect and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Increased traffic will increase the risk of swift fox mortality from vehicle collision. Increase surface water and structures (well houses, culverts) may favor swift fox predators and competitors.

4.2.3.3.5.1. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.3.5.2. Mitigation Measures

No further mitigation measure applied.

4.2.3.3.5.3. Residual Effects

None identified.

4.2.3.3.6. Black-tailed Prairie Dog

4.2.3.3.6.1. Direct and Indirect Effects

Impacts to black-tailed prairie dogs are discussed in the PRB FEIS on pp. 4-255 to 4-256. Individual prairie dogs may be disrupted or killed by vehicles and construction operations. The overall population number and habitat acreage will not be changed from impacts associated with this project.

4.2.3.3.6.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273.

4.2.3.3.6.3. Mitigation Measures

No further mitigation measure applied.

4.2.3.3.6.4. Residual Effects

No further effects identified.

4.2.3.4. Big GameDirect and Indirect Effects

Under Alternative B winter yearlong range for pronghorn would be directly impacted by the construction of 11 wells. Yearlong range for mule deer would be impacted by the construction of 5 wells. The construction of 6 wells will impact mule deer winter range; - all through approximately 5.7 miles of new roads, approximately 1.6 miles of new pipelines outside of roads, 4 staging areas, and increased vehicle traffic on established roads.

In addition to the direct habitat loss and potential vehicle collisions big game would likely be displaced from the project area during drilling and construction (Hiatt and Baker 1981). Further information regarding direct and indirect effects to big game is provided in the PRB FEIS on pp. 4-181 to 4-215.

The amount of anticipated big game habitat disturbance warrants effective reclamation efforts designed to facilitate re-establishment of diverse plant community assemblages including sagebrush, grass, and food-forbs.

4.2.3.4.1. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-181 to 4-215.

4.2.3.4.2. Mitigation Measures

No further mitigation measures applied.

4.2.3.4.3. Residual Impacts

While big game animals are expected to return to the project area following construction, continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to new disturbances (Lustig 2003). Habitat effectiveness for big game is anticipated to be reduced in the project area.

4.2.3.5. Raptors Direct and Indirect Effects

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

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

Table 4.4. Proposed and Existing Infrastructure within 0.5 mile of Documented Raptor nests within the Chasm project area

BLM ID	Infrastructure
4487	• Overhead power and access/utility corridor
4490	• 10CHAS well, 11CHAS well and access/utility corridor
4654	• Access/utility corridor
5330	• 5CHAS well, 6CHAS well and access/utility corridor
5331	• 6CHAS well and access/utility corridor
5333	• 10CHAS well and access/utility corridor
5334	• 11CHAS well, overhead power and access/utility corridor
5337	• CHAS3 well, reservoir and access/utility corridor
6098	• 4CHAS well, overhead power and access/utility corridor
12137	• 7CHAS well, overhead power and access/utility corridor
12138	• 7CHAS well, overhead power and access/utility corridor
12178	• Reservoir and access/utility corridor
12179	• 1CHAS well, 2CHAS well, 3CHAS well, overhead power drop, reservoir and access/utility corridor
12180	• Access/utility corridor
12181	• Access/utility corridor
12182	• Reservoir and access/utility corridor
12183	• Access/utility corridor
12184	• Access/utility corridor
12186	• Access/utility corridor
12187	• Access/utility corridor
12188	• Access/utility corridor
12189	• 4CHAS well, overhead power and access/utility corridor
12192	• 11CHAS well, overhead power and access/utility corridor
12196	• 4CHAS well, overhead power and access/utility corridor
12197	• 4CHAS well, overhead power and access/utility corridor
12199	• 4CHAS well, overhead power and access/utility corridor
12200	• 4CHAS well, overhead power and access/utility corridor
12201	• 2CHAS well, overhead power drop, reservoir and access/utility corridor
12202	• 5CHAS well, 6CHAS well and access/utility corridor
12203	• 7CHAS well, overhead power and access/utility corridor
12204	• 7CHAS well, overhead power and access/utility corridor
12205	• 7CHAS well, overhead power and access/utility corridor
12206	• 7CHAS well, overhead power and access/utility corridor
12207	• 7CHAS well, overhead power and access/utility corridor
12208	• 7CHAS well, overhead power and access/utility corridor
12209	• 10CHAS well and access/utility corridor
12210	• 10CHAS well and access/utility corridor
12211	• 4CHAS well, overhead power and access/utility corridor
12212	• 1CHAS well, 2CHAS well, overhead power drop, reservoir and access/utility corridor

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

4.2.3.5.1. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, p. 4-221.

4.2.3.5.2. Mitigation Measures

To reduce the risk of decreased productivity or nest failure (PRB FEIS, p. 4-218), the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests. In addition, well metering, maintenance, and other site visits within 0.5 mile of raptor nests should also be minimized during the breeding season around active nests. In order to further understand the degree of potential population effects to raptor species (PRB FEIS, pp. 4-219 to 4-220), annual surveys for new raptor nests and nest occupancy checks shall be completed.

4.2.3.5.3. Residual Impacts

In spite of design by Yates and BLM during project planning and mitigation measures applied as COAs by BLM, there will be an increase in traffic, construction activity and human presence in the area throughout the life of the project which will the affect the area for nesting raptors.

4.2.3.6. West Nile Virus

4.2.3.6.1. Direct and Indirect Effects

This project is likely to result in standing surface water which may potentially increase mosquito breeding habitat. BLM consulted with applicable state agencies, County Weed and Pest and the State Health Department, per above mitigation in the PRB ROD, A.5.4.10., regarding the disease and the need to treat mosquitoes for any CBNG discharge waters that become stagnant. BLM has also consulted with the researchers that are studying the dynamics of WNv species and its effects in Wyoming (Holloran 2011).

4.2.3.6.2. Cumulative Effects

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.

4.2.3.6.3. Mitigation Measures

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. 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.

4.2.4. Water Resources

The operator 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 Powder River watershed and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists, in consultation with the BLM, developed the water management plan that proposes to contain all of the produced water in on-channel reservoirs. 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 maximum water production for the Chasm POD is predicted to be 45 gpm per well, or 495 gpm for the POD as approved under this alternative (1.1 cubic feet per second (cfs) or 798 acre-feet per year). 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, p. 2-26). For the Upper Powder River drainage, the volume projected to be produced in the watershed in 2010 was 60,319 acre-feet (maximum production was estimated to be 171,423 acre-feet in 2006). Thus the water volume from these wells is 1.3% of the total volume projected for 2010. This volume of produced water is also within the predicted parameters of the PRB FEIS.

4.2.4.1. Groundwater

4.2.4.1.1. Direct and Indirect Effects

The PRB FEIS predicts an infiltration rate of 40% to groundwater aquifers and coal zones in the Upper Powder River drainage area (PRB FEIS, p. 4-5). For this action, it may be assumed that a maximum of 198 gpm will infiltrate at or near the discharge points and impoundments (319 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, p. 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the possible environmental consequences of CBNG production is impacts to the groundwater. "The effects of development of CB[NG] 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, p. 4-1). In the process of dewatering the coal zones to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 8 to 600 feet compared to 1280 feet to the Big George coal. The operator committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (0.5 mile of a federal CBNG producing well) of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to ". . . resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater stored within the Wasatch - Tongue River sand and coals, and sands units above and below the coals is almost 750 million acre-feet of recoverable groundwater are (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, p. 4-38).

4.2.4.1.2. 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, p. 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, p. 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, p. 4-65).

4.2.4.1.3. Mitigation Measures

Adherence to the drilling COAs, the setting of casing at appropriate depths, following safe remedial procedures in the event of casing failure, and utilizing proper cementing procedures should protect any 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 address the potential impacts from infiltration on shallow ground water, the Wyoming DEQ has developed a guidance document, "Compliance Monitoring and Siting Requirements for Unlined Impoundments Receiving Coalbed Methane Produced Water" (November, 2008). For all new WYPDES permits, the WDEQ requires that the proponent investigate the shallow groundwater at the proposed impoundment locations. Drilling at proposed impoundments began in the spring of 2004. Based on information received from the WDEQ, as of December, 2010, over 2016 impoundment sites have been investigated with more than 2305 borings. Of these impoundments, 257 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 132 impoundments requiring monitoring are presently being used. As of the fourth quarter of 2010, only 24 of those monitored impoundments (13.6%) caused a change in the "Class of Use" of any parameter in the underlying aquifer water.

4.2.4.1.4. Residual Effects

As described in Section 3.4.1, the production of CBNG in this project area has already reduced the saturation level in some of the coal zones targeted for CBNG production.

4.2.4.2. Surface Water

4.2.4.2.1. Direct and Indirect Effects

Produced Water Quality

Table 4.5 shows the average values of EC and SAR as measured at selected USGS gauging stations at high and low monthly flows, as well as the Wyoming groundwater quality standards for TDS and SAR for Class I to Class III water (there is no current standard for EC). It also shows constituent limits for TDS, SAR and EC detailed in the project area WYPDES permit, and the concentrations found in the POD's representative water sample.

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

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Primary Watershed at Powder River Gauging station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
WDEQ Water Quality Standards for WYPDES Permit # WY0094111	5000		2800
At discharge point		17	
Predicted Produced Water Quality from the Big George Coal Zone	1530	12.2	2470

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the PRB is the irrigation of crops (PRB FEIS, p. 4-69). The water quality projected for this POD is 1850 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). However direct land

application is not included in this proposal. If at any future time the operator entertains the possibility of irrigation or land application with the water produced from these wells, the proposal must be submitted as a sundry notice for separate environmental analysis and approval by the BLM.

The quality for the water produced from the Big George target coal zone wells is predicted to be similar

to the sample water quality collected from a location near the POD. A maximum of 45.0 gallons per minute (gpm) is projected is to be produced from these 11 wells, for a total of 495 gpm for the POD.

The outfall design proposed for use in this project provides passive water treatment by aerating the produced water. Aeration adds dissolved oxygen to the produced water, allowing susceptible ions to oxidize and precipitate out of the water. This action is of particular importance with dissolved iron, as it is a key water quality parameter that is monitored by the state. When iron precipitates from the produced water, it will frequently leave iron oxide at or near the outfall, which can be identified as an orange stain on materials that have been in contact with the water. The orange stain represents a positive benefit to the downstream waters, as iron left near the outfall means improved water quality downstream.

The operator obtained a Wyoming Pollutant Discharge Elimination System (WYPDES) permit from the WDEQ for the discharge of water produced from this project. Permit number WY0094111 will cover discharges in the Dry Fork Powder River drainage.

Permit effluent limits were set at (WYPDES, p. 2):

pH	6.5 to 9
Specific Conductance	2800 µmhos/cm max
Dissolved iron	1000 µg/l max
Sodium Adsorption Ratio	17 max
Total Barium	1800 µg/l max
Total Arsenic	8.4 µg/l max
Chlorides	150 mg/l

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COAs for the permit. As part of the WYPDES permits, an Irrigation Monitoring Point has been established in the SWSE of Section 35, Township 43N, Range 76W.

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 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 60 days of initial production. A copy of the water analysis will be submitted to the BLM Authorized Officer. For more information, please refer to the WMP included in this POD.

Produced Water Control

There are 6 discharge points proposed under this alternative. They have been appropriately sited and use appropriate water energy dissipation measures. Existing and proposed water management facilities were evaluated for compliance with best management practices during the onsite.

To manage the produced water, 6 on channel impoundments (80.5 acre feet of storage) would potentially be used for the project. These impoundments will disturb approximately 12.8 acres, including the dam structures. All 6 impoundments are proposed to be newly constructed and will be built to meet the requirements of the WSEO, WDEQ, and the needs of the operator and the landowner. Monitoring may be required based upon shallow groundwater investigations required for new impoundments by the WDEQ.

All water management facilities were evaluated for compliance with best management practices during the onsite.

Yates designated 2 of the reservoirs as “primary” and the remaining 4 as “secondary”. This means that Yates will initially only use federally produced water in the “primary” reservoirs. Although the currently proposed “secondary” reservoirs meet environmental standards for BLM authorization, Yates will not use the secondary reservoirs for federally produced waters under this initial approval. The secondary designation allows Yates to forgo bonding the secondary reservoirs until Yates is certain of the need for management of federally produced waters in the secondary reservoirs. Yates cannot use the secondary reservoirs for federally produced water until after Yates applies for and BLM approves sundry notices to that effect in addition to the associated proof of bonding. The purpose for the sundry, in part, is assurance that the proposed use of the secondary reservoir(s) comports to that which received analysis.

Produced Water Quantity

The PRB FEIS estimates that 15% of the impounded water will re-surface as channel flow (PRB FEIS, p. 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.17 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator 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 is likely to 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. Included in the COAs are requirements to collect predisturbance soil analyses at reservoir sites located over federal minerals. These analyses will determine baseline soil chemistry which will serve as an objective for final reclamation of the impoundment sites.

Alternative (2A), the approved alternative in the ROD for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 with a total contribution to the mainstem of the Upper Powder River of 68 cfs (PRB FEIS, p. 4-87). The predicted maximum discharge rate from these 11 wells is anticipated to be a total of 495 gpm (1.1 cfs), which will be discharged to the proposed impoundments. As stated above, 0.17 cfs of flow may be expected to resurface below the lowest reservoir. Using full containment of the produced water and an assumed conveyance loss of 20% (PRB FEIS, p. 4-74) of the resurfaced flow below the reservoirs, this action may add a maximum 0.14 cfs to the Upper Powder River flows, or 0.2% of the predicted total CBNG produced water contribution. For more information regarding the maximum predicted water impacts resulting from the discharge of produced water, see Table 4-6 (PRB-FEIS, p. 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watersheds above the project area (WMP Appendix E). Based on the area of the Collins Draw watershed above the POD (23.96 sq mi) and an assumed density of one well per location, every 80 acres, the potential exists for the development of 192 wells which could produce a maximum flow rate of 8640 gpm (19 cfs) of water. In the area of the Seventeen Mile Creek watershed above the POD (11.51 sq mi) and an assumed density of one well per location, every 80 acres, the potential exists for the development of 92 wells which could produce a maximum flow rate of 4140 gpm (9 cfs) of water. The BLM agrees with the operator that this is not expected to occur because:

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

The potential maximum flow rate of produced water within the watersheds upstream of the project area, 19 cfs in Collins Draw and 9 cfs in seventeen Mile Creek, is much less than the flow rate of runoff estimated from the 2-year storm event (336 cfs and 242 cfs respectively), (WMP Attachment E).

Springs
The development of CBNG, and the production and discharge of water in the area surrounding any natural springs may affect the flow rate or water quality of the spring. However, during the development of the POD, no natural springs were observed. Therefore any impacts to springs will be negligible.

In-channel downstream impacts are addressed in the WMP for the Chasm POD prepared by Bison Environmental Inc. for Yates Petroleum Corporation.

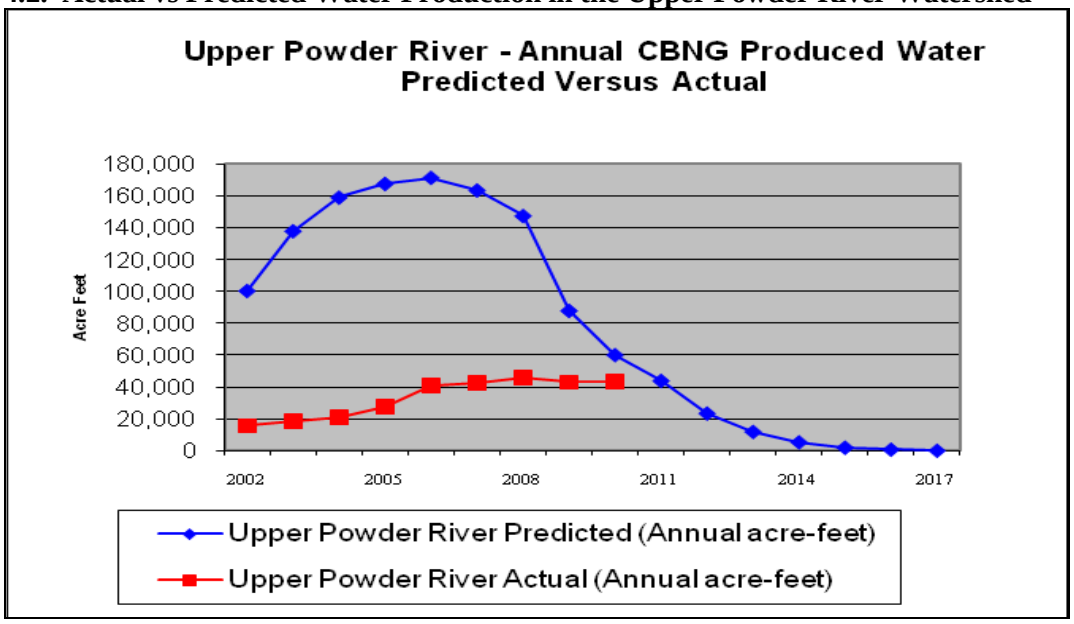
4.2.4.2.2. Cumulative Effects

The analysis in this section includes cumulative data from fee, state and federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC). As of December 2010, all producing CBNG wells in the Upper Powder River watershed discharged a cumulative volume of 298,864 acre-ft of water compared to the predicted 1,135,567 acre-ft disclosed in the PRB FEIS (Table 2-8, p. 2-26). These figures are presented graphically in Figure 4.2 and Table 4.6. following. This volume is 25.0 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.6. Actual vs Predicted Water Production in the Upper Powder River Watershed
2010 Data Update 04-06-11

Year	Upper Powder River Predicted (Annual acre-feet)	Upper Powder River Predicted (Cumulative acre-feet from 2002)	Upper Powder River Actual (Annual acre-feet)		Upper Powder River Actual (Cumulative acre-feet from 2002)	
			A-ft	% of Predicted	A-Ft	% of Predicted
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521	45,936	31.1	212,522	20.3
2009	88,046	1,135,567	43,079	48.9	255,601	22.5
2010	60,319	1,195,886	43,263	71.7	298,864	25.0
2011	44,169	1,240,055				
2012	23,697	1,263,752				
2013	12,169	1,275,921				
2014	5,672	1,281,593				
2015	2,242	1,283,835				
2016	1,032	1,284,867				
2017	366	1,285,233				
Total	**1,285,233**		**298,864**			

Figure 4.2. Actual vs Predicted Water Production in the Upper Powder River Watershed



The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. 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 10 primary watersheds in the PRB. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

As referenced above, the PRB FEIS disclosed 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 Powder River drainage, which is approximately 25% of the total predicted in the PRB FEIS.
2. The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
3. The commitment by the operator to manage the volume of water discharged by fully containing it in on-channel reservoirs.

Refer to the PRB FEIS, Volume 2, pp. 4-115 to 117 and Table 4-13 for cumulative effects relative to the watershed and p. 4- 117 for cumulative effects common to all sub-watersheds.

4.2.4.2.3. Mitigation Measures

Channel crossings by roads and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM. Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.

The operator committed to monitor the water discharge points and the channels downstream for stability. If erosion is noted, the operator will be required to repair and stabilize the area using selected mitigation techniques.

The operator has also committed to expediently stabilize and re-vegetate disturbance within channels and floodplains associated with this project.

4.2.4.2.4. Residual Effects

"Streams enhanced by large volumes of CBM produced water may begin to establish meander patterns on longer wavelengths in response to increased flows. Stream drainages would readjust to their existing natural flows at the end of the project's life. Downcutting (stream erosion) and sediment deposition (aggradation) are natural processes that occur as stream drainages age through time. Downcutting occurs within the upper reaches of a drainage system as the stream channel becomes incised through erosion, until the slope of the stream and its velocity are reduced and further erosion is limited. Sediment is deposited within the lower, slower reaches of a stream.

Surface drainages could be degraded from erosion caused by increased surface flow, unless rates of CBM discharge and outfall locations are carefully controlled. Increased flows could cause downcutting in fluvial environments, resulting in increased channel capacity over time within the upper and middle reaches of surface drainages." (PRB FEIS, p. 4-118).

4.2.5. Cultural Resources

4.2.5.1. Direct and Indirect Effects

No contributing portions of eligible site 48CA1568 (Deadwood Road) and 48CA4975 (Crook's 1876 Belle Fourche River Scout) will be physically impacted (see site specific COAs). None of the historic properties in the project area retain their integrity of setting. The proposed project will not diminish any other aspects of integrity of the historic properties. Following the Wyoming State Protocol Section VI(B)(1) the BLM determined that the project will result in "No Adverse Effect". The Wyoming State Historic Preservation Officer (SHPO) concurred with the Bureau's determination on November 19, 2010 (SHPO File# 1010LKN018).

4.2.5.2. Cumulative Effects

Construction and development of oil and gas resources impacts cultural resources through ground disturbance, unauthorized collection, and visual intrusion of the setting of historic properties. This results in fewer archaeological resources available for study of past human life-ways, changes in human behavior through time, and interpreting the past to the public. Additionally, these impacts may compromise the aspects of integrity that make a historic property eligible for the National Register of Historic Places. Recording and archiving basic information about archaeological sites and the potential for subsurface cultural materials in the proposed project area serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Construction of large plans of coalbed natural gas development on split estate often include associated infrastructure that is not permitted through BLM. Project applicants may connect wells draining fee minerals, or previously constructed pipelines on fee surface with a federal plan of development. BLM has no authority over such development which can impact historic properties. BLM has the authority to modify or deny approval of federal undertakings on private surface, but that authority is limited to the extent of the federal approval. Historic properties on private surface belong to the surface owner and they are not obligated to preserve or protect them. The BLM may go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally impacted by the landowner at any time. The cumulative effect of numerous federal approvals can result in impacts to historic properties. Archeological inventories reveal the location of sites and although the BLM goes to great lengths to protect site location data, information can potentially get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public.

4.2.5.3. Mitigation Measures

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).

The utility corridor crossing of the Deadwood Road in T42N R76W Section 3 follows an existing two-track route with utility lines buried in the road. Site specific cultural COA #1 limits new surface disturbance for the utility corridor construction to 27 feet, in addition to the existing 8 feet of disturbance related to the existing primitive road and corridor, for a total corridor width of 35 feet. BLM, in consultation with the Wyoming Historic Preservation Officer (SHPO), determined that a 20 foot buffer of undisturbed surface between the utility corridor and the physical Deadwood Road (48CA1568) ruts is adequate avoidance of this contributing segment of a NRHP eligible site. In the letter from Bob Irwin of Yates to Jennifer Spegon, BLM NRS, dated November 11, 2010, Yates indicates that buried utilities will require 25 feet, and brushhog a maximum of 35 feet. A temporary fence will be installed and removed by a qualified archaeologist who meets or exceeds the qualification standards recommended by the Secretary of the Interior during construction of the 2 Chasm federal well and associated utility corridor located at the Deadwood Road crossing (T42N R76W Section 3), as described in the site specific COAs.

When a project is constructed in an 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) on mitigation or avoidance. Due to the presence of alluvial and/or Aeolian deposits identified by the NRCS soil survey (NRCS n.d.), and areas of High to Very High Sensitivity Zones per the PUMP III Model (Eckerle 2005), the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COAs.

4.2.5.4. Residual Effects

During the construction phase, there will be numerous crews working across the project area using heavy construction equipment without the presence of archaeological monitors. Due to the extent of work and the surface disturbance caused by large vehicles, it is possible that unidentified cultural resources can be damaged by construction activities. The increased human presence associated with the construction phase can also lead to unauthorized collection of artifacts or vandalism of historic properties.

4.3. Summary of Wildlife Effects

Table 4.7. provides a comparison of the cumulative effects on wildlife associated with the alternatives.

Table 4.7. Summary of Environmental Effects on Wildlife for the Chasm POD by Alternative

Resource/Species	Alternative A	Alternative B
Wetlands/Riparian Areas	No existing wetlands/riparian areas would be disturbed.	No existing wetlands/ riparian areas would be disturbed.

Resource/Species	Alternative A	Alternative B
Wildlife		
Big Game	No habitat loss or fragmentation. Would likely see increased traffic passing through due to surrounding mineral development	Greatest habitat loss.
		Greatest habitat fragmentation.
Raptors	No habitat loss.	Greatest foraging habitat fragmentation.
	No wells authorized near nests.	
Migratory Birds	No habitat loss.	Greatest habitat loss.
		Greatest habitat fragmentation.
	No habitat fragmentation.	
Threatened and Endangered Species		
Sensitive Species		
Bald Eagle	No habitat loss.	
Greater Sage Grouse	No habitat loss.	Greatest habitat loss.
	No decision on overhead electricity. Overhead power could be routed through project area on private surface without BLM discretion increasing predation and collision risk. Grouse may avoid overhead power lines.	
West Nile Virus	No Impact	likely to have effect on the overall spread of WNV.

5. CONSULTATION & COORDINATION

Agencies summarized in Table 5.1 were consulted on the proposed project to confirm compliance with applicable laws and regulations.

Table 5.1. Consultations

Contact	Title	Organization	Present at Onsite
Jennifer Spegon	Natural Resource Specialist	BLM	Yes
Bill Ostheimer and Chris Sheets	Biologists	BLM	Yes
Brent Sobotka	Hydrologist	BLM	Yes
Stacy Gunderson	Civil Engineer	BLM	Yes
Ardeth Hahn	Archeologist	BLM	Yes
Victor Xuan	Petroleum Engineer	BLM	No
Kerry Aggen	Geologist	BLM	No
Kristine Phillips	Legal Instruments Examiner	BLM	No
Michelle Covert	Legal Assistant	BLM	No
Bud Stewart	Biologist	WY Game and Fish	No

Contact	Title	Organization	Present at Onsite
Pauline Schuette	Biologist	USFWS	No
Bob Irwin	Regulatory Specialist	Yates Petroleum	Yes
Heather Arambel	Landman	Yates Petroleum	Yes
Brad MacKearney	Pipeline Foreman	Rowdy Pipeline	Yes
Trent Knez	Drilling Supervisor	Yates Petroleum	Yes
Mark Iberlin	Land Owner	Iberlin Ranch	Yes
Gene Mankin	Land Owner	T-Chair Land Company	Yes
Mary Hopkins	State Historic Preservation Officer	Wyoming State Historic Preservation Office	No
Laura Nowlin	Historic Preservation Specialist	Wyoming State Historic Preservation Office	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 ROD.

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Appendix A: Affected Resources and Species Worksheets

Affected Resources Worksheets

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality				PRB FEIS: 3-291-298, 4-404-406, 4-377-386
Noise				
Cultural	Yes	Yes	No	
Native American religious concerns	No	No	No	
Traditional Cultural Properties	No	No	No	
Mineral Potential				PRB FEIS: 3-66-70, 3-230, 4-127-129
Coal				PRB FEIS: 3-66
Fluid Minerals				PRB FEIS: 3-68-69
Locatable Minerals				Add in EA
Other leasables				
Salable minerals				
Paleontology				PRB FEIS: 3-65-66, 4-125-127
PFYC 3				PRB FEIS: 3-65-66, 4-125-127
PFYC 5				PRB FEIS: 3-65-66, 4-125-127
Rangeland management				Not in PRB FEIS
Existing range improvements				
Proposed range improvements				
Recreation				PRB FEIS: 3-263-273, 4-319-328
Developed site				PRB FEIS: 3-266, 4-326
Walk-in-Area				
Social & Economic				PRB FEIS: 3-275-289, 4-336-370
Environmental Justice				
Transportation				
Soils & Vegetation				PRB FEIS: 3-78-107, 4-134-152, 4-153-164, 4-393-394, 4-406
Erosion Hazard				PRB FEIS: 3-82, 4-135
Poor Reclamation Potential				PRB FEIS: 3-86, 4-149-152
Slope hazard				PRB FEIS: 3-81, 4-135
Forest products				
Prime and Unique Farmland				
Invasive Species				PRB FEIS: 3-103-108, 4-153-172
Wetlands/Riparian				PRB FEIS: 4-117-124, 3-108-113, 4-172-178, 4-406
Special Designations				
Proposed ACEC				
Wild & Scenic River				PRB FEIS: 3-273

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Wilderness Characteristics/Citizen Proposed	No	No	No	DOI Order 3310
WSA				
Visual Resources				PRB FEIS: 3-252-263, 4-302-314, 4-403
Class II				
Class III				
Water				PRB FEIS: 3-1-56, 4-1-122, 4-135, 4-33, 4-405
Floodplains				
Ground water				PRB FEIS: 3-1-30, 4-1-69, 4-392, 4-405
Surface water				PRB FEIS: 4-85-86, 4-117-124, 3-36-56. 4-69-122, 4-393, 4-405
Drinking water				PRB FEIS: 3-52, 4-50-52
Wildland Urban Interface				
Waste Management				
Wildlife				PRB FEIS: 3-113-153, 4-179, 4-247, 4-397
ESA listed, proposed, or candidate species				
BLM sensitive species				
General wildlife				
West Nile virus potential				

Threatened, Endangered, Proposed, and Candidate Species Worksheet

Common Name	Habitat	Presence? (NP, NS, S, K)	Direct Impacts Anticipated?	Intend to apply COA?	Direct, indirect, and/or cumulative impacts anticipated beyond the level analyzed within the PRB FEIS?
Endangered					
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NP	None	No	4-251, BA & BO 2011 USFWS block cleared PRB having no black footed ferrets
Blowout penstemon	Sparsely vegetated, shifting sand dunes	NP	None	No	Not in FEIS
Threatened					
Ute ladies'-tresses orchid	Areas with appropriate hydrology	NP	None	No	4-253, BA & BO
Proposed					
Candidate					
Greater sage-grouse	Basin-prairie shrub, mountain-foothill shrub	MIIH	Direct loss of habitat	Yes	4-257 to 4-273

Sensitive Species Worksheet

Common Name	Habitat	Presence? (NP, NS, S, K)	Direct Impacts Anticipated ?	Intend to apply COA?	Direct, indirect, and/or cumulative impacts anticipated beyond the level analyzed within the PRB FEIS?
Amphibians					**4-258**
Northern leopard frog	Beaver ponds and cattail marshes from plains to montane zones.	NP	No	No	
Columbia spotted frog	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	NP	No	No	
Fish					**4-259 & 4-260**
Yellowstone cutthroat trout	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	NP	No	No	
Birds					**4-260 to 4-264**
Baird's sparrow	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	NP	No	No	
Bald eagle	Mature forest cover often within one mile of large water body with reliable prey source nearby.	NS	No	No	4-251 to 4-253 & BA
Brewer's sparrow	Sagebrush shrubland	K	Yes	sage-grouse and Raptor COAs will minimize impacts.	
Ferruginous hawk	Basin-prairie shrub, grasslands, rock outcrops	K	Yes	Active nests will be protected from project related surface disturbance during nesting.	

Common Name	Habitat	Presence? (NP, NS, S, K)	Direct Impacts Anticipated ?	Intend to apply COA?	Direct, indirect, and/or cumulative impacts anticipated beyond the level analyzed within the PRB FEIS?
Loggerhead shrike	Basin-prairie shrub, mountain-foothill shrub	S	yes	sage-grouse and Raptor COAs will minimize impacts.	
Long-billed curlew	Grasslands, plains, foothills, wet meadows	NP	No		
Mountain plover	Short-grass prairie with slopes < 5%	S	No	Not found during surveys.	4-254, 4-255 & BA
Northern goshawk	Conifer and deciduous forests	NP	No		
Peregrine falcon	Cliffs	NP	No		
Sage sparrow	Basin-prairie shrub, mountain-foothill shrub	NS	No		
Sage thrasher	Basin-prairie shrub, mountain-foothill shrub	K		Sage-grouse and Raptor COAs will minimize impacts.	
Trumpeter swan	Lakes, ponds, rivers	NP	No		
Western Burrowing owl	Grasslands, basin-prairie shrub	S	No		
White-faced ibis	Marshes, wet meadows	NP	No		
Yellow-billed cuckoo	Open woodlands, streamside willow and alder groves	NP	No		
Mammals					**4-264 &4-265**
Black-tailed prairie dog	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	Yes	No	4-255, 4-256
Fringed myotis	Conifer forests, woodland chaparral, caves and mines	NP	No		
Long-eared myotis	Conifer and deciduous forest, caves and mines	NP	No		
Spotted bat	Cliffs over perennial water.	NP	No		
Swift fox	Grasslands	S	Yes	sage-grouse and Raptor COAs will minimize impacts.	
Townsend's big-eared bat	Caves and mines.	NP	No		

Common Name	Habitat	Presence? (NP, NS, S, K)	Direct Impacts Anticipated ?	Intend to apply COA?	Direct, indirect, and/or cumulative impacts anticipated beyond the level analyzed within the PRB FEIS?
Plants					**4-258**
Limber pine	Mountains, associated with high elevation conifer species	NP	No		
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	NP	No		
William's wafer parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	NP	No		

Non-designated wildlife worksheet

Common Name / Group	Presence? (NP, NS, S, K)	Direct Impacts Anticipated?	Intend to apply COA?	Direct, indirect, and/or cumulative impacts anticipated beyond the level analyzed within the PRB FEIS?
Big Game	K	YES	NO	4-181 to 4-215
Aquatics	NP	No	No	4-235 to 4-249
Migratory Birds	K	YES	NO	4-231 to 4-235
Raptors	K	YES	YES	4-216 to 4-221
Plains Sharp-tailed Grouse	NS	No	No	4-221 to 4-226

Appendix B. RECLAMATION REQUIREMENTS, WY BLM

The following Reclamation Requirements apply to all surface disturbing activities, including BLM initiated activities, and must be addressed in each reclamation plan. These requirements also must be met prior to release of the bond and/or the reclamation liability. Where these Reclamation Requirements differ from other applicable federal, laws, rules, and regulations, those requirements supersede this policy. State and/or local statutes or regulations may also apply.

1. **Manage all waste materials:**
   a. Segregate, treat, and/or bio-remediate contaminated soil material.
   b. Bury only authorized waste materials on site. Buried material must be covered with a minimum of three feet of suitable material or meet other program standards.
   c. Ensure all waste materials moved off-site are transported to an authorized disposal facility.

2. **Ensure subsurface integrity, and eliminate sources of ground and surface water contamination.**
   a. Properly plug all drill holes and other subsurface openings (mine shafts, adits etc.).
   b. Stabilize, properly back fill, cap, and/or restrict from entry all open shafts, underground workings, and other openings.
   c. Control sources of contamination and implement best management practices to protect surface and ground water quality.

3. **Re-establish slope stability, surface stability, and desired topographic diversity.**
   a. Reconstruct the landscape to the approximate original contour or consistent with the land use plan.
   b. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
   c. Eliminate highwalls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
   d. Minimize sheet and rill erosion on/or adjacent to the reclaimed area. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area.

4. **Reconstruct and stabilize water courses and drainage features.**
   a. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
   b. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.

5. **Maintain the biological, chemical, and physical integrity of the topsoil and subsoil (where appropriate).**
   a. Identify, delineate, and segregate all salvaged topsoil and subsoil based on a site specific soil evaluation, including depth, chemical, and physical characteristics.
   b. Protect all stored soil material from erosion, degradation, and contamination.
   c. Incorporate stored soil material into the disturbed landscape.
   d. Seed soils to be stored beyond one growing season, with desired vegetation.
   e. Identify stockpiles with appropriate signage.

6. **Prepare site for revegetation.**
   a. Redistribute soil materials in a manner similar to the original vertical profile.
   b. Reduce compaction to an appropriate depth (generally below the root zone) prior to redistribution of topsoil, to accommodate desired plant species.
   c. Provide suitable surface and subsurface physical, chemical, and biological properties to support the long term establishment and viability of the desired plant community.

d. Protect seed and seedling establishment (e.g. erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.)

7. Establish a desired self-perpetuating native plant community.

a. Establish species composition, diversity, structure, and total ground cover appropriate for the desired plant community.
b. Enhance critical resource values (e.g. wildlife, range, recreation, etc.), where appropriate, by augmenting plant community composition, diversity, and/or structure.
c. Select genetically appropriate and locally adapted native plant materials based on the site characteristics and ecological setting.
d. Select non-native plants only as an approved short term and non-persistent alternative to native plant materials. Ensure the non-natives will not hybridize, displace, or offer long-term competition to the endemic plants, and are designed to aid in the re-establishment of native plant communities.

8. Reestablish complementary visual composition

a. Ensure the reclaimed landscape features blend into the adjacent area and conform to the land use plan decisions.
b. Ensure the reclaimed landscape does not result in a long term change to the scenic quality of the area.

9. Manage Invasive Plants

a. Assess for invasive plants before initiating surface disturbing activities.
b. Develop an invasive plant management plan.
c. Control invasive plants utilizing an integrated pest management approach.
d. Monitor invasive plant treatments.

10. Develop and implement a reclamation monitoring and reporting strategy.

a. Conduct compliance and effectiveness monitoring in accordance with a BLM (or other surface management agency) approved monitoring protocol.
b. Evaluate monitoring data for compliance with the reclamation plan.
c. Document and report monitoring data and recommend revised reclamation strategies.
d. Implement revised reclamation strategies as needed.
e. Repeat the process of monitoring, evaluating, documenting/reporting, and implementing, until reclamation goals are achieved.