DECISION RECORD
FOR
Williams Production RMT Company
Wormwood Unit 2 Federal POD
ENVIRONMENTAL ASSESSMENT –WY-070-EA11-56

DECISION:
BLM's decision is to approve Williams Production RMT Company (Williams) Wormwood Unit 2 Federal POD (WU2) Coal Bed Natural Gas (CBNG) POD Alternative B of the attached Environmental Assessment (EA). Alternative B is the Modified Proposed Action, and is the result of collaboration between the Bureau of Land Management and Williams. Alternative B has been analyzed in the attached 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 an EIS is not required.

Details of the approval are summarized below. The project description, including specific changes made at the onsites, and site-specific mitigation measures, is included in the attached EA.

Well Sites:
The following 26 Applications for Permit to Drill (APDs) and associated infrastructure are authorized:

Well Name	Well #	QQ	Sec	TWN	RNG	Lease #
WORMWOOD UNIT 2 WU	23-13*	NESW	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	43-13	NESE	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	34-21	SWSE	21	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-21	NENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	42-21	SENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-21	NESE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-23	NESE	23	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	14-24	SWSW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-24	NESW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	12-25	SWNW	25	46N	76W	WYW153364
WORMWOOD UNIT 2 WU	14-25	SWSW	25	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-25	NESW	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	34-25	SWSE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-25	NESE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-26	SWNW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	14-26	SWSW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	23-26	NESW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	32-26	SWNE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	41-26	NENE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-26	NESE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-27	SWNW	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	21-27	NENW	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	32-27	SWNE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	34-27	SWSE	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-27	NENE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-27	NENE	27	46N	76W	WYW145596

Water Management:
Williams intends to utilize BLM water management infrastructure approved within adjacent Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) project areas to manage effluent produced from the WU2 project. Water management strategy includes: discharging effluent through 32 permitted outfall locations (WYPDES WY0054593), managed irrigation through multiple pivot systems and an off-project permitted injection well facility. In addition to the 26 proposed Federal wells, Williams will incorporate effluent produced from 3 Fee wells into the water management infrastructure outlined in this plan.

Operator Committed Measures:
The operator has incorporated several measures to alleviate resource impacts into their Master Surface Use Plan (MSUP), submitted on December 21, 2009 revised October 13, 2010. Refer to the MSUP pages 1-9 for complete details of operator committed measures.

Site-specific Mitigation Measures:
Site-specific Conditions of Approval have been applied to this project, in addition to the programmatic and standard COAs identified in the PRB FEIS, to mitigate the site-specific impacts described in the Environmental Consequences section of the attached EA. For a complete description of all site-specific COA's associated with this approval, see Appendix A in the attached EA.

COMPLIANCE WITH LAWS, REGULATIONS, LAND USE PLANS, AND POLICIES:
This approval is in compliance with all Federal laws, regulations, and policies. This includes, but is not limited to, the Federal Land Policy and Management Act, the National Historic Preservation Act, the Threatened and Endangered Species Act, the Migratory Bird Treaty Act, the Clean Water Act, the Clean Air Act, and the National Environmental Policy Act.

Approval of this alternative is in conformance with the *Powder River Basin Oil and Gas Project Environmental Impact Statement and Proposed Plan Amendment* (PRB FEIS), *Record of Decision and Resource Management Plan Amendments for the Powder River Basin Oil and Gas Project* (PRB FEIS/ RMP ROD), and the Approved Resource Management Plan (RMP) for the Public Lands Administered by the Bureau of Land Management, Buffalo Field Office (BFO), (1985/2001/2003).

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

RATIONALE:
The decision to authorize the selected alternative, as summarized above, is based on the following:

1. Mitigation measures were included to reduce environmental impacts below the level of significance (FONSI) while still meeting the project's purpose and need. Mitigation is discussed in the environmental consequences section of the attached EA. For a complete description of all site-specific COA's associated with this approval, see Appendix A in the attached EA.

2. The selected alternative will not result in any undue or unnecessary environmental degradation.

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

4. The Operator, in their POD, has committed to:
   - Comply with all applicable Federal, State, and Local laws and regulations (WMP pg. 1).
   - 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 (WMP, Attachment F).
   - Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD (MSUP, Certifications and Authorizations tab).
   - Provide water analysis from a designated reference well in each coal zone (WMP, Attachment E and p. 11).

5. The Operator has certified that a Surface Use Agreement has been reached with the Landowners (MSUP, Certifications and Authorizations tab).

The selected alternative incorporates components of the Wyoming Governor's Sage Grouse Implementation Team's "core population area" strategy, the Governor's executive order, Wyoming BLM Instruction Memorandum 2010-012, Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate, and local research to provide mitigation for sage-grouse, while meeting the purpose and need for the Wormwood Unit 2 Federal POD Project.

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

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

ACTING Field Manager: Paul Beels Date: 12/21/10

FINDING OF NO SIGNIFICANT IMPACT
FOR
Williams Production RMT Company
Wormwood Unit 2 Federal POD
ENVIRONMENTAL ASSESSMENT –WY-070- EA11-56

FINDING OF NO SIGNIFICANT IMPACT:
On the basis of the information contained in the 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 PRB FEIS to which the EA is tiered; (2) Alternative B is in conformance with the Buffalo Field Office Resource Management Plan (1985, 2001, 2003); and (3) Alternative B does not constitute a major federal action having a significant effect on the human environment. Therefore, an environmental impact statement or a supplement to the existing environmental impact statement is not necessary and will not be prepared.

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 (coal, oil and gas, bentonite, and uranium) is a long-standing and common land use within the Powder River Basin. More than one fourth of the nation's coal production comes from the Powder River Basin. The PRB FEIS reasonably foreseeable development predicted and analyzed the development of 51,000 CBNG wells and 3,200 oil wells (PRB FEIS ROD pg. 2). The additional CBNG development described in Alternative B is insignificant within the national, regional, and local context.

INTENSITY:
The implementation of Alternative B will result in beneficial effects in the forms of energy and revenue production however; there will also be adverse effects to the environment (EA sec. 4). Design features and mitigation measures have been included within Alternative B to prevent significant adverse environmental effects (EA sec. 2.2).

The preferred alternative does not pose a significant risk to public health and safety. The geographic area of the POD does not contain unique characteristics identified within the 1985 RMP, 2003 PRB FEIS, or other legislative or regulatory processes.

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 (EA sec. 4.1.5.1). No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected (EA sec. 4.1.2.1). 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

ACTING

Field Office Manager: Paul Beels Date: 12/21/10

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Williams Production RMT Company
Wormwood Unit 2 Federal
COALBED NATURAL GAS PLAN OF DEVELOPMENT
WY-070- EA11-56

1. INTRODUCTION

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

1.1. Background

Williams Production RMT Company (Williams) submitted the Wormwood Unit 2 (WU2) Federal POD on December 21, 2009 and revised October 13, 2010 to the BFO with 26 Federal APD's to develop and produce natural gas resources within coal bearing formations of the Powder River Basin (PRB). In addition to the 26 proposed Federal wells, Williams will incorporate effluent produced from 3 Fee wells into the water management infrastructure outlined in this plan.

Onsite visits were conducted in 2010 on August 24th and 25th to evaluate the proposal and modify as necessary to alleviate environmental impacts. BLM sent a post-onsite deficiency letter on September 15th, 2010. The project proposal and APDs were considered complete when BLM received the operator's response, and corrections, to the post onsite deficiencies on November 23rd, 2010.

1.2. Purpose and Need for the Proposed Action

The purpose of the proposed action is to explore, develop and produce oil and gas reserves conducted under the rights granted by a Federal oil and gas lease, as required in 43 CFR 3160 et. seq.), all Onshore Orders, and the Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et. seq.), in a manner ensuring the proper handling, measurement, disposition, and site security of leasehold production which protects other natural resources and environmental quality, life and property, which results in maximum economic recovery of gas with minimum waste.

The need for the action is the requirement to obtain approval for the development of an Oil and Gas Lease through an Application for Permit to Drill (APD) on public lands managed by the Bureau of Land Management under Onshore Order No. 1, complying with the National Environmental Policy Act (NEPA), National Historic Preservation Act, Endangered Species Act, Federal Land Policy and Management Act, and other applicable laws, and pursuant to the authority of the Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et. seq.) and prescribed in 43 CFR Part 3160.

1.3. Decision to be Made

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

1.4. Conformance with Land Use Plan and Other Applicable Laws, Regulations, and Policies

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS & RMP Amendment. The proposed action is in compliance with all Federal laws, regulations, and policies. This includes, but is not limited to, the Federal Land Policy and Management Act (1976), 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), and the National Environmental Policy Act (1969).

1.5. Scoping and Issues

External scoping was not conducted for this EA. Extensive external scoping was conducted for the PRB FEIS and is discussed beginning on pg. 15 of the ROD and beginning on pg. 2-1 of the FEIS. This action is similar in scope to the numerous other CBNG PODs that BFO has analyzed; external scoping would be unlikely to identify new issues as was verified by the few POD EAs that were externally scoped 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 B 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 significant issues for the affected resources to further focus the analysis. This EA addresses those site-specific impacts that were not disclosed 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: site stability, reclamation potential, riparian and wetland communities, invasive species
- Wildlife: raptor productivity, greater sage-grouse lek occupancy and persistency
- Cultural: National Register eligible sites,
- Water: ground water depletion, quality and quantity of produced water
- Social and Economic: revenue potential, local economics.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Two alternatives, A and B, were evaluated. A brief description of each alternative is included in the following sections. Programmatic Mitigation Measures, as determined in PRB FEIS Record of Decision apply to all alternatives, including the No Action Alternative (Alternative A), and are included in Appendix A. Standard Mitigation Measures, Operator-committed Mitigation Measures, and site-specific Conditions of Approval (COAs) would apply only to action alternatives (Alternative B) and also are included in Appendix A.

2.1. Alternative A - No Action

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

2.2. Alternative B - 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 Williams Production RMT Company on October 13th, 2010.

Proposed Action Title/Type: Williams Production RMT Company/Wormwood Unit 2 Federal CBNG POD.

Proposed Well Information: There are 26 Federal wells proposed within this POD; the wells are vertical bores proposed on an 80 acre spacing pattern with 1 well per location. Each well will produce from the Big George coal seam. Proposed well house dimensions are 6 ft wide x 6 ft length x 8 ft height. Well house color is Carlsbad Canyon, selected to blend with the surrounding vegetation. A list of proposed wells is included in Table 2.1.

Table 2.1 Proposed Wells – Alternative B

Well Name	Well #	QQ	Sec	TWN	RNG	Lease #
WORMWOOD UNIT 2 WU	23-13*	NESW	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	43-13	NESE	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	34-21	SWSE	21	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-21	NENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	42-21	SENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-21	NESE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-23	NESE	23	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	14-24	SWSW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-24	NESW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	12-25	SWNW	25	46N	76W	WYW153364
WORMWOOD UNIT 2 WU	14-25	SWSW	25	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-25	NESW	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	34-25	SWSE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-25	NESE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-26	SWNW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	14-26	SWSW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	23-26	NESW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	32-26	SWNE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	41-26	NENE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-26	NESE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-27	SWNW	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	21-27	NENW	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	32-27	SWNE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	34-27	SWSE	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-27	NENE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-27	NENE	27	46N	76W	WYW145596

Water Management Proposal:
Williams intends to utilize BLM water management infrastructure approved within adjacent Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) project areas to manage effluent produced from the WU2 project. Water management strategy includes: discharging effluent through 32 permitted outfall locations (WYPDES WY0054593), managed irrigation through multiple pivot systems and an off-project permitted injection well facility. In addition to the 26 proposed Federal wells, Williams will incorporate effluent produced from 3 Fee wells into the water management infrastructure outlined in this plan.

County: Campbell

Applicant: Williams Production RMT Company

Surface Owners: Robert and Janet Christensen, John Iberlin, BLM

Drilling and Construction:

- Wells will be drilled to the Big George coal zone to depths of approximately 1,257 feet

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

- Well metering shall be accomplished by telemetry/central metering facility/well visitation. Metering would entail multiple visits per month to each well/central metering facility.

- A Water Management Plan (WMP) that involves the following infrastructure and strategy: «Number_of_Discharge_Points_P»0 Utilize BLM water management infrastructure approved within adjacent Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) project areas. The project is located entirely within the Pumpkin Creek watershed, which is an intermittent/ephemeral tributary to the Powder River.

- A new road network consisting of 2.29 miles of improved road and 3.53 miles of primitive road.

- An above ground power line network already exists and no additional overhead power will be required. Williams will run high voltage underground power from the existing and proposed power drops to the proposed power distribution panels that are located throughout the project. Power lines from the proposed power distribution panels to the individual wells will also be buried. There are 5 proposed distribution panel/power drops within the POD. Any changes to those locations will be permitted via sundry application and analyzed in a separate NEPA action. If the power line network is not completed before the wells are in production, then temporary diesel generators shall be placed at all indicated power distribution panels/drops.

- A storage tank of 1,000 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 12 months. Fuel deliveries are anticipated to be 2 times per week. Generator noise level varies depending on the equipment used and terrain, and is expected to be 61.7 – 82.3 decibels at 50 feet distance and 54.4 – 76.2 decibels at 100 feet distance.

- A buried gas, water and power line network, and 2 central gathering/metering facilities. See Table 2.3 for a summary of the disturbance values.

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, pages 2-9 through 2-40 (January 2003).

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

2.3. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A)and the infrastructure proposed by the operator (Alternative B), are presented in Table 2.2.

Table 2.2 Summary of Alternatives

Acres or mileage within the action alternatives represent additional facilities and do not include the existing facilities.

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Total CBNG Wells	8	26
Well Locations Nonconstructed Constructed Slotted	8 6/0 2/0.04	 0.73 0
Conventional Wells	0	0
Gather/Metering Facilities Number of Facilities Acreage of Facilities	 2 4.0	 2 4.0
Compressors Number of Compressors	0 0.0	0 0.0
Number of Ancillary Facilities (Staging/Storage Areas)	 2 4.0	 2 4.0
Acres (Miles) of Template/ Spot Upgrade Roads No Corridor With Corridor	 (1.9) (0.39)	 (1.62) (1.71)
Acres (Miles) of Engineered Roads No Corridor With Corridor	 (0.09)	 0
Acres (Miles) of Primitive Roads No Corridor With Corridor	 0	 (0.09) (0.62)
Miles of Buried Power No Corridor With Corridor	 0	 (8.72)
Miles of Pipeline No Corridor With Corridor	 (1.78) (0.10)	 (3.47)
Miles of Overhead Powerlines	(0.15)	0.0
Number of Communication Sites	0	0
Number of Monitor Wells	0	0
Acres of Land Application Disposal	10	0

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
Number of Impoundments On-channel Off-channel Lined Unlined	2/7.86	0 0 0
Water Discharge Points	.0.02	0
TOTAL ACRES DISTURBANCE	**41.92**	**26.64**

3. DESCRIPTION OF AFFECTED ENVIRONMENT

This section describes the environment that would be affected by implementation of the alternatives described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. A screening of all resources and land uses potentially affected is included in Appendix B. Resources that would be unaffected, or not affected beyond the level analyzed within the PRB FEIS, are not discussed within the EA.

Applications to drill were received on December 21st, 2009 with final revisions on November 23rd, 2010. Field inspections of the proposed Wormwood Unit 2 Federal POD CBNG project were conducted on 8/24/2010 and 8/25/2010. Personnel attending the field inspections are identified in section 5 Consultation and Coordination.

3.1. Project Area Description

William's WU2 POD is located in west-central Campbell County, approximately 53 miles southeast of Buffalo, Wyoming. The project area lies immediately south southeast of the approved Wormwood 1 POD within all or parts of Sections 13, 21 and 23-27 of Township 46 North, Range 76 West. The project is located entirely within the Pumpkin Creek watershed, which is intermittent/ephemeral tributary to the Powder River. The topography consists of moderately rough terrain with many ridges and deep draws. The elevation within the project area ranges from approximately 4,480 to 4,725 feet above sea level.

3.2. Soils, Vegetation, and Ecological Sites

3.2.1. Soils

The Powder River Basin is composed of 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 within the WU2 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.

Table 3.1 Dominant Soils Affected by the Proposed Action

Map Unit	Map Unit Name	Acres	Percent
215	Theedle-Kishona Loams, 6 to 20 % Slopes	753	29
233	Ustic Torriorthents, Gullied	263	10
216	Theedle-Kishona-Shingle Loams, 3 to 30 % Slopes	263	10
214	Theedle-Kishona Loams, 0 to 6 % Slopes	222	8

Soils within the project area were identified from the *South Campbell (WY605) and South Johnson (WY619) County Survey Areas, Wyoming.* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was obtained from the published soil survey and the National Soils Information System (NASIS) database for the area.

3.2.1.1. Soils Susceptible to Erosion

Loss in productivity is likely to occur on most soils if erosion continues unchecked. Because soil formation is a very slow process, most soils cannot renew their eroded surface while erosion continues. The development of a favorable rooting zone by the weathering of parent rock is much slower than development of the surface horizon. One estimate of this renewal rate is 0.5 ton per acre per year for unconsolidated parent materials and much less for consolidated materials. These very slow renewal rates support the philosophy that any soil erosion is too much. Loss of organic matter, resulting from erosion and tillage, is one of the primary causes for reduction in production yields. As organic matter decreases, soil aggregate stability, the soil's ability to hold moisture, and the cation exchange capacity decline. (Soil Quality-Agronomy Technical Note #7, USDA, Aug 1998.)

Approximately 355 acres of the area within the WU2 POD boundary contain soil mapping units with a named soil component identified as being highly erosive due to wind or water erosion. Approximately 0.88 acres of the project area has slopes of 25% or more. Areas of slighter slopes and area near drainages usually have deeper soils. Deeper soils tend to have a higher probability of supporting shrubbrush grassland communities. On surfaces with steep topography, vegetation is sparse or even barren. Barren steep slopes experience higher velocity of water movement during heavy storm events. As this storm water moves down slope the velocity is mitigated by thicker vegetation of the sagebrush grasslands. Road and pipeline construction removes vegetation that controls water velocity. This loss of vegetative buffer increases water velocity and head cutting.

Soils with slopes of less than 25% may also be prone to high erosion because of the soil type, particle size, texture, or amount of organic matter. Other contributing factors to slope stability include slope length, slope aspect, and colluvium. Slope length has considerable control over runoff and potential accelerated water erosion. Slope aspect is the direction which the surface of the soil faces. Slope aspect may affect soil temperature, evapotranspiration, wind contact and soil moisture. Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash. It consists largely of material that has rolled, slid or fallen down the slope under the influence of gravity. The rock fragments in colluvium are usually angular, in contrast to the rounded, water-worn cobbles and stones in alluvium and glacial outwash. These factors in combination with slope determine soil stability and the potential for mass soil movement.

Approximately 262 acres (10%) of the project area has soils classified as Ustic Torriorthents, gullied. This soil map unit is classified at the subgroup level of soil taxonomy, indicating a wide range in soil properties making soil suitability's, limitations and interpretations difficult to predict. The gullied phase is used for areas having gullies so deep that intensive measures, including reshaping, are required to reclaim

the soil. No ecological site is assigned to the map unit (Soil Survey Manual Soil Survey Division Staff 1993).

3.2.1.2. Reclamation Potential

Soils with poor reclamation and re-vegetation potential occur throughout the project area as shown in Table 3.2. Currently, soil conditions in the project area are being impacted by CBNG development as well as traditional activities, including livestock grazing and wildlife use. Much of the area is covered with soils that are easily damaged by use or disturbance or are difficult to revegetate or otherwise reclaim. Soil impacts (e.g., roads, linear pipeline scars, and artificial wet areas) can be readily observed in the area. This high erosion potential could result in higher suspended sediment and turbidity levels in the Powder River.

In the absence of recoverable topsoil as is common throughout the project area, the surface organic matter in the form of vegetation, litter and biological crust are critical to maintaining the integrity and viability of the soil.

Table 3.2 Reclamation Potential within the Wormwood Unit 2 Project Area

Reclamation Potential			
	Well	**Moderate**	**Poor**
Total Acres	371	1798	465
% of Project Area	14%	68%	18%

Reclamation potential of soils varies throughout the project area. The main soil limitations in the project area include: depth to bedrock, low organic matter content, and high erosion potential especially in areas of steep slopes. Many of the soils and landforms of this area present distinct challenges for development. Approximately 13.5% of the area within the boundary of the proposed action contains soil mapping units with a named component identified as being a highly susceptible to wind and water erosion and 0.03% of the area has slopes greater than 25% making stabilization of disturbance and reclamation challenging and possibly unachievable in those areas.

The changes to the proposed action resulted in development of Alternatives B. These changes have reduced impacts to the environment which will result from this action; therefore only the environmental consequences of Alternative B are described below.

3.2.2. Vegetation

3.2.2.1. General Description

Species typical of mixed sagebrush/grass plant community comprise the project area flora. Specific species observed throughout the project area include big-sagebrush (Artemisia tridentate), needle and thread (Stipa comate), blue grama (Bouteloua gracilis), western wheatgrass (Agropyron sithii). Cheatgrass or downy brome (*Bromus tectorum*) was noted in the project area. Differences in dominant species within the project area vary with soil type, aspect and topography.

Please refer to the Wormwood Unit 1 POD EA#-WY-070-06-104 approved 07/28/2006, and the Kingwood 1 POD EA#-WY-070-06-210 approved 09/29/06 for details. The environmental consequences on vegetation and soils will be similar to those identified in the Wormwood Unit 1 and Kingwood 1 POD EAs.

3.2.2.2. Wetlands/Riparian

Wetland vegetation is sparse within the WU2 POD development. There are a total of 110 acres (4.2%) of wetlands identified within the WU2 POD boundary. Wetland types identified within the draws are:

PABFh (0.5 acres), PEMB (1.5 acres) and PEMC (108 acres). A brief description of these wetland types are (P) Palustrine Systems which includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: 1. are less than 8 hectares (20 acres); 2. do not have an active wave-formed or bedrock shoreline feature; 3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin; 4. have a salinity due to ocean-derived salts of less than 0.5 ppt. Class (AB) Aquatic Beds includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Class (EM) Emergent characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. Modifiers include (F) Semipermanently Flooded: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface (h) Diked/Impounded: These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors 'diked' and 'impounded' have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits. (B) Saturated: The substrate is saturated to surface for extended periods during the growing season, but surface water is seldom present. (C) Seasonally Flooded: Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface. The WU2 area is interspersed with incised ephemeral drainages which contain isolated small areas with riparian type vegetation, in particular isolated cottonwoods.

3.2.2.3. 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 weeds and/or weed species of concern infestations were discovered by a search of the WERIC database (www.weric.info):

- Black henbane *(Hyoscyamus niger*) is shown to be extensive in T46N R76W.
- Scotch thistle *(Onopordum acanthium)* infestations are present in adjacent township T46N R77W.

Cheatgrass or downy brome (*Bromus tectorum*) was noted in the project area.

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).

The effects of state-listed noxious weeds and/or weed species of concern infestations will be similar to those identified in the Wormwood Unit 1 and Kingwood 1 POD EAs.

3.2.3. Ecological Sites

Ecological Site Descriptions (Table 3.3) are used to provide site and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information.

Table 3.3 Map Units and Ecological Sites

Map Unit	Ecological Site
233	Gullied
153	Lowland (10-14" Northern Plains)
102,116,117,121,122,145,146,147,148,149,214,215,216,217,218	Loamy (10-14" Northern Plains)
171, 221, 236	Sandy (10-14" Northern Plains)

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure are Loamy (10-14" Northern Plains) and Sandy (10-14" Northern Plains) sites.

Loamy (10-14" Northern Plains): Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone. These soils are moderately deep to very deep (greater than 20" to bedrock), well drained soils that formed in alluvium and residuum derived from sandstone and shale. These soils have moderate permeability. The present plant community is a Mixed Sagebrush/Grass. Wyoming big sagebrush is a major component of this Mixed Sagebrush/Grass plant community. Cool-season mid-grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs.

Sandy (10-14" Northern Plains): Sandy sites occur on nearly level to steep slopes on landforms which include hillsides and ridges in the 10-14" precipitation zone. The soils of this site are moderately deep to very deep (greater than 20"to bedrock), well drained soils that formed in eolian deposits, alluvium or residuum derived from unspecified sandstone. These soils have rapid permeability. The main soil limitations include low available water holding capacity, and high wind erosion potential. The soil will develop into active sand dunes, with the deterioration of cover. The present plant community is a *Threadleaf sedge/Needleandthread/Yucca* plant community. Dominant vegetation includes needleandthread, threadleaf sedge, sand dropseed and yucca. Other vegetative species identified at the onsite include prairie sandreed, Indian ricegrass, cheatgrass and prickly pear.

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

Table 3.4 Summary of Ecological Sites

Ecological Site	Acres	Percent
Gullied	262	10%
Lowland (10-14" Northern Plains)	108	4%
Loamy (10-14" Northern Plains)	2002	76%
Sandy (10-14" Northern Plains)	262	10%

3.3. Wildlife

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

A habitat assessment and wildlife inventory surveys were performed by Western Land Services. Western Land Services performed surveys for mountain plover, sharp-tailed grouse, greater sage-grouse, bald eagles, raptor nests, mountain plovers, Ute ladies'-tresses orchid and blowout penstemon habitat and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted

protocol in (2009, 2010). PRBIWG accepted protocol is available on the Wyoming Energy Resource Information Clearinghouse website (www.weric.info). There is no established protocol for survey for blowout penstemon.

A BLM biologist conducted field visits on August 24 and 25, 2010. During those visits, the biologist verified the wildlife survey information, evaluated impacts to wildlife resources, and compiled a list of recommended mitigation measures to reduce impacts to wildlife.

WGFD is the agency responsible for management of wildlife populations in the state of Wyoming. WGFD has developed several guidance documents that BLM 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 its *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (WGFD 2009a), 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 have been developed, those thresholds will be disclosed and discussed both in relation to the current conditions (Affected Environment) and in relation to reasonable foreseeable development, including development associated with the proposed project (Impacts Analysis). 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.

3.3.1. Threatened, Endangered, Proposed, and Candidate Species

3.3.1.1. Threatened and Endangered Species

Threatened, Endangered, Candidate and Proposed species that will be impacted beyond the level analyzed within the PRB FEIS are described below.

3.3.1.1.1. Black-footed ferret

The black-footed ferret is listed as Endangered under the ESA. The affected environment for black-footed ferrets is discussed in the PRB FEIS on pg. 3-175. Prairie dog towns of sufficient size are required to support a population of black-footed ferrets. No prairie dog towns have been identified in the project area. There is no suitable habitat for black-footed ferrets in the Wormwood 2 POD.

3.3.1.1.2. Blowout Penstemon

Blowout penstemon is listed as Endangered under the ESA. A survey was conducted by Western Lands Services identifying blowouts in the Wormwood 2 project area that are potential habitats for blowout penstemon. Soils and vegetation at the sites identified were analyzed and determined not to be suitable habitat for blowout penstemon.

3.3.1.1.3. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is listed as Threatened under the ESA. The affected environment for ULT is discussed in the PRB FEIS on pg. 3-175. A survey for ULTs and their potential habitat in the Wormwood 2 POD indicated that surface hydrology, hydrophytic vegetation, terrain, and soil conditions were not favorable for ULT. There is no suitable habitat for Ute ladies'-tresses orchid in the Wormwood 2 POD.

3.3.1.2. Proposed Species

The affected environment for mountain plover is discussed in the PRB FEIS on pg. 3-177 to 3-178. At the time the PRB FEIS was written, the mountain plover was proposed for listing as a threatened species

under the ESA. USFWS withdrew the proposal in 2003 but reinstated it again in 2010. USFWS will submit a final listing determination in 2011. Mountain plover is a WGFD Species of Greatest Conservation Need (SGCN), because population status and trends are unknown but are suspected to be stable, habitat is vulnerable without ongoing significant loss, and the species is sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a species with highest conservation priority, indicating they are clearly in need of conservation action. They are also listed by USFWS as a Bird of Conservation Concern (BCC) for Region 17, which includes 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.

Mountain plovers require nest sites that are relatively flat, with little or no vegetation ,and as such would not find the rolling terrain and sparse to moderate sagebrush stands present within the Wormwood 2 POD to be suitable as mountain plover nesting habitat.

3.3.1.3. Candidate Species

3.3.1.3.1. Greater Sage-grouse

In 2010, USFWS determined that the sage-grouse is warranted for federal listing across its range, but listing is 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 Wormwood 2 POD contains sagebrush stands with sparse to moderate crown closure. Models indicate that high quality nesting and winter sage-grouse habitat is present. Much of the POD is within two miles of documented leks and sage-grouse likely nest in the POD.

The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008) recommends that impacts be considered for leks within four miles of oil and gas developments. WGFD records indicate that four sage-grouse leks occur within four miles of the project area. These four lek sites are identified in Table 3.5.

Table 3.5 Sage-grouse leks within 4 miles of the Wormwood Unit 2 Federal POD project area

Lek Name	WGFD Category of Impact	Distance from Project Area (mi)	Occupied?
County Line	Extreme	0.4	Yes
County Line North	Extreme	2.6	Yes
Gilkie Ranch	Extreme	1.6	Yes
Innes	High	0.4	Yes

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 two miles of a lek and within identified nesting/brood-rearing habitats greater than two miles from a lek. Moderate impacts occur when well density is between one and two well pad locations per square mile or where there is less than 20 acres of disturbance per square mile. High impacts occur when well density is between two and three well pad locations per square mile or when there are between 20 and 60 acres of disturbance per square mile. Extreme impacts occur when well density exceeds three well pad locations per square mile or when there are greater than 60 acres of disturbance per square mile. Of the

leks in the Wormwood 2 project assessment area, three have been classified by WGFD as extremely impacted and one is highly impacted.

3.3.2. BLM 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 Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A. BLM Wyoming sensitive species that will be impacted beyond the level analyzed within the PRB FEIS are described below.

3.3.2.1. Bald Eagle

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

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. Observations in the BLM database indicate that bald eagles use cottonwood trees along Pumpkin Creek to the north of the Wormwood POD in T46N, R76W Section 23 as roosting sites in the winter.

3.3.2.2. Ferruginous Hawk

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

Nine ferruginous hawk nests have been identified within half mile of the project area (see raptor nest table). The nests are distributed in three clusters, in the northeast, the northwest and the southern portions of the POD. Each cluster probably represents a territory for a pair using alternate nests in different years. Of the nine nests, one, the 5071 in T46N, R76N Section 36 was occupied in 2010.

3.3.3. Big Game

Both pronghorns and mule deer were commonly observed during field surveys. WGFD have mapped the

area as winter/yearlong range for pronghorns and both yearlong and winter/yearlong for mule deer.

Yearlong use is when a population of animals makes general use of habitat within the range on a year-round basis. 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. Populations of pronghorn and mule deer within their respective hunt areas are above WGFD objectives. The most current big game range maps are available from WGFD. The affected environment for pronghorn and mule deer is discussed in the PRB FEIS on pp. 3-117 to 3-122 and pp. 3-127 to 3-132, respectively.

3.3.4. Migratory Birds

A wide variety of migratory birds may be found in the proposed project area at some point throughout the year. Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the calendar year. Many species that are of high management concern use shrub-steppe and shortgrass prairie areas for their primary breeding habitats (Saab and Rich 1997). The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153).

3.3.5. Raptors

The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Four species of raptor have been documented to have used nests within 0.5 miles of the project area: American kestrel, ferruginous hawk, golden eagle, and red-tailed hawk. Only one nest, BLM nest # 5071, a ferruginous hawk nest, in T46N, R76W Section 36 was active in 2010. Ferruginous hawks are classified by BLM as a sensitive species and are discussed in the BLM Sensitive Species section above. The thirty-seven documented raptor nests in the Wormwood 2 POD are listed in the table below.

Raptor nests within 0.5 miles of the Wormwood 2 POD

BLM ID	UTMs	Legal	Substrate	Year	Condition	Status	Species
651	425864E 4866740N	S19 T46N R75W	GHS	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
				2008	Good	INAC	n/a
3998	424932E 4863457N	S36 T46N R76W	ERR	2010	Good	INAC	n/a
				2009	Remnants	INAC	n/a
				2008	Poor	INAC	n/a
				2007	Fair	INAC	n/a
4001	419974E 4866937N	S21 T46N R76W	GHS	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Good	INAC	n/a
				2007	Excellent	INAC	n/a
				2006	Excellent	INAC	n/a

4002	420012E 4866705N	S21 T46N R76W	GHS	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Poor	INAC	n/a
				2007	Excellent	INAC	n/a
				2006	Excellent	INAC	n/a
4005	422709E 4865376N	S26 T46N R76W	CTL	2010	Good	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Excellent	ACTI	GOEA
				2007	Excellent	ACTI	GOEA
				2006	Excellent	ACTI	GOEA
4012	419985E 4867199N	S16 T46N R76W	GHS	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Good	INAC	n/a
				2007	Good	INAC	n/a
				2006	Good	INAC	n/a
4317	417834E 4866153N	S20 T46N R76W	CTL	2010	Good	ACTI	BBMA
				2009	Good	INAC	n/a
				2008	Good	ACTI	RETA
				2006	Good	ACTI	RETA
4764	425133E 4868437N	S13 T46N R76W	CTD	2010	Nest Gone	DNLO	n/a
				2009	Nest Gone	INAC	n/a
				2008	Poor	INAC	n/a
5057	426075E 4867099N	S19 T46N R75W	GHS	2010	Nest Gone	DNLO	n/a
				2009	Nest Gone	DNLO	n/a
				2008	Nest Gone	INAC	n/a
5058	425954E 4866766N	S19 T46N R75W	CKB	2010	Poor	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Poor	INAC	n/a
5059	425600E 4866759N	S19 T46N R75W	CKB	2010	Poor	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Good	INAC	n/a
5060	425884E 4866642N	S19 T46N R75W	CKB	2010	Nest Gone	DNLO	n/a
				2009	Good	INAC	n/a
				2008	Nest Gone	INAC	n/a

5061	425496E 4866527N	S19 T46N R75W	GHS	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
				2008	Good	INAC	n/a
5070	424602E 4863966N	S25 T46N R76W	CKB	2010	Good	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Fair	INAC	n/a
5071	424685E 4863647N	S36 T46N R76W	GHS	2010	Good	ACTI	FEHA
				2007	Good	INAC	n/a
5082	425582E 4866762N	S19 T46N R75W	ROK	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a
				2008	Unknown	UNK	n/a
				2007	Fair	INAC	n/a
5795	425201E 4868643N	S13 T46N R76W	CTD	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
				2008	Poor	INAC	n/a
5796	422975E 4866685N	S23 T46N R76W	CTL	2010	Good	INAC	n/a
				2009	Unknown	INAC	n/a
				2008	Good	ACTI	AMKE
5797	422865E 4865855N	S23 T46N R76W	CTL	2010	Good	INAC	n/a
				2009	Poor	INAC	n/a
				2008	Fair	INAC	n/a
6436	426142E 4864327N	S30 T46N R75W	GHS	2010	Remnants	INAC	n/a
				2009	Remnants	INAC	n/a
6437	426083E 4864055N	S30 T46N R75W	GHS	2010	Remnants	INAC	n/a
				2009	Remnants	INAC	n/a
6438	423550E 4863772N	S35 T46N R76W	CTL	2010	Good	INAC	n/a
				2009	Good	ACTI	FEHA
				2009	Good	ACTF	RETA
6439	425124E 4863309N	S36 T46N R76W	GHS	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
8398	419852E 4867058N	S21 T46N R76W	GHS	2010	Good	INAC	n/a
8399	419752E 4866547N	S21 T46N R76W	GHS	2010	Good	INAC	n/a

10500	423555E 4863773N	S35 T46N R76W	CTL	2010	Good	INAC	n/a
10501	424668E 4863828N	S36 T46N R76W	GHS	2010	Good	INAC	n/a
10502	422764E 4866236N	S23 T46N R76W	CTL	2010	Good	INAC	n/a
10504	423404E 4864732N	S26 T46N R76W	CTL	2010	Fair	INAC	n/a
10505	425422E 4867465N	S18 T46N R75W	ANS	2010	Good	INAC	n/a
10506	425199E 4866975N	S24 T46N R76W	CTL	2010	Good	INAC	n/a
10507	423884E 4863448N	S36 T46N R76W	CTL	2010	Unknown	UNK	n/a
10601	425199E 4866974N	S24 T46N R76W	CTL	2010	Good	INAC	n/a
				2009	Good	INAC	n/a
10602	423990E 4863623N	S36 T46N R76W	CTL	2010	Fair	INAC	n/a
				2009	Good	ACTI	n/a
10703	425935E 4866885N	S19 T46N R75W	CKB	2009	Remnants	INAC	n/a
10710	426045E 4867035N	S19 T46N R75W	ROC	2009	Poor	INAC	n/a
10711	425199E 4866975N	S24 T46N R76W	CTL	2010	Fair	INAC	n/a
				2009	Fair	INAC	n/a

Notes:
ANS = Artificial nesting structure; CTL = Cottonwood (live); CTD = Cottonwood (dead); CKB = Creek bank; ERR= Erosion Remnant; GHS = Ground/Hillside; ROK = Rock outcrop.
ACTI = Active; DNLO = Did not locate; INAC = Inactive; OCCU = Occupied; UNK = Unknown.
AMKE = American kestrel; BBMA = Black-billed magpie; FEHA = Ferruginous hawk; GOEA = Golden eagle; GRHO = Great-horned owl; RETA = Red-tailed hawk; UNRA = Unknown raptor.

3.4. Water Resources

The project area is within the Upper Powder River drainage system, entirely within the Pumpkin Creek watershed. Topography consists of rough to moderately rough terrain with numerous ridges and deep draws. The elevation within the project area ranges from approximately 4,480 to 4,725 feet above sea level. The average basin slope within the project area is 0.7 percent, while the ephemeral channel slopes range from 0.7 to 2 percent.

The Wyoming Department of Environmental Quality (WDEQ) has assumed primacy from United States Environmental Protection Agency for maintaining the water quality in the waters of the state. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of surface waters of the state. The Wyoming Oil and Gas Conservation Commission (WYOGCC) has authority for permitting and bonding off channel pits that are located over State and fee minerals.

3.4.1. Groundwater

The groundwater in this project area has historically been used for stock water or domestic purposes. A search of the Wyoming State Engineer Office (WSEO) Ground Water Rights Database for this area showed 12 registered stock and domestic water wells within ½ mile of a federal CBNG producing well in the POD with depths ranging from 55 to 500 feet. For additional information on water, please refer to the PRB FEIS (January 2003), Chapter 3, Affected Environment pages 3-1 through 3-36 (groundwater).

WDEQ water quality parameters for groundwater classifications (Chapter 8 – Quality Standards for Wyoming Groundwater) 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 web site.

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

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

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

The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. The Buffalo Field Office has been monitoring coal zone pressures as expressed in depth to water from surface since the early 1990s in the PRB (Figure 3.3).

The areas to the north, east and within the WU2 POD have been intensely developed with CBNG production. As a result, the target coal zone pressure may have been reduced through off set water production. There is 1 BLM groundwater monitoring well located approximately 1 mile from the northeast edge of the WU2 POD boundary, as listed in the table below.

Monitor Well Name	QtrQtr	Sec	T N	R W	Distance from POD mi	Total Depth ft	Initial WL, ft depth from surface	Most Recent WL, ft depth from surface	Drilled by	Date Installed
Pumpkin Creek (Wormwood Unit)	NWNE	14	46	76	0.8 NE	1180	262	967	Williams	12-13-06

The initial water level of the Big George Coal was recorded on 12/13/2006, measured at 262 feet. The most recent measurement recorded on 8/25/2010 was 967 feet below ground level.

This level of depressurization is within the potential predicted in the PRB FEIS which was determined through the Regional Groundwater Model for that document. 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 on their website at http://www.wsgs.uwyo.edu.

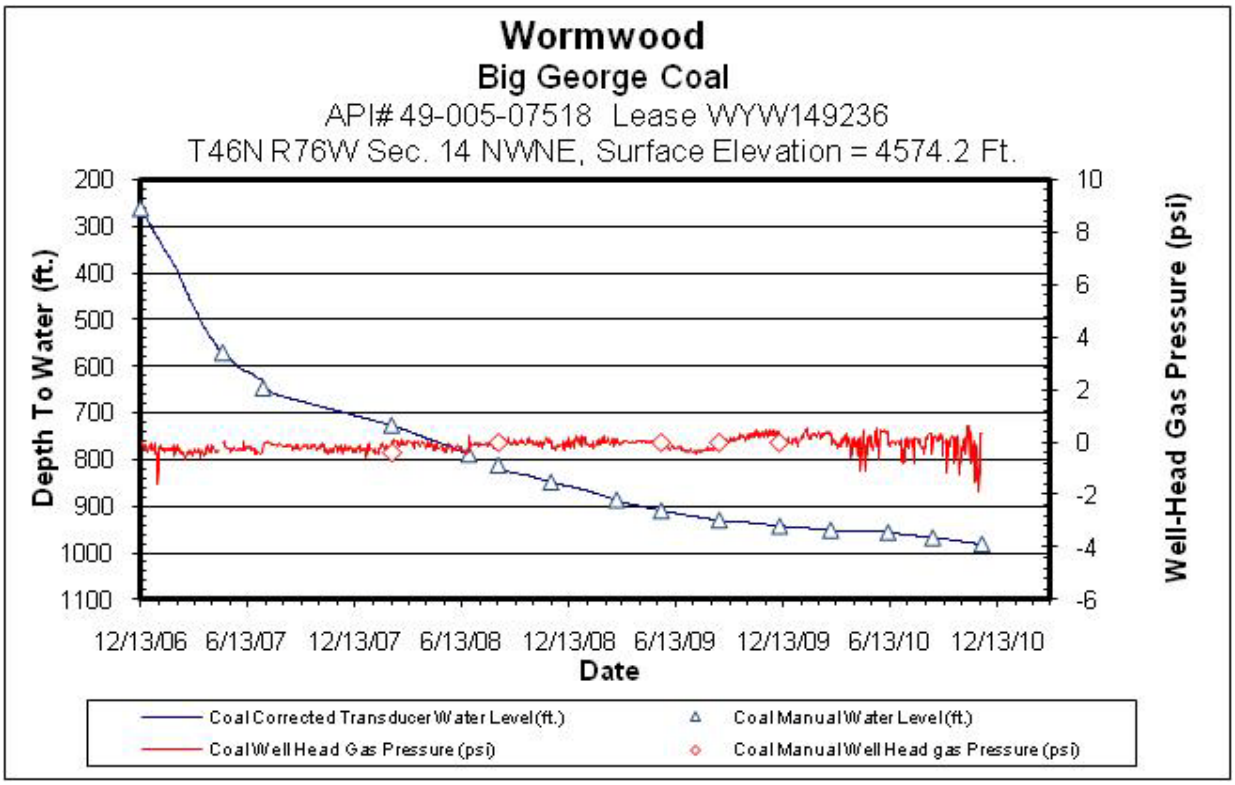


Figure 3.3 Depth to Water from Surface

3.4.2. Surface Water

The project area is within the Pumpkin Creek 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 grassy swales, without defined bed and bank.

The PRB FEIS presents the historic mean Electrical Conductivity (EC, in µmhos/cm) and Sodium Adsorption Ratio (SAR) by watershed at selected United States Geological Survey (USGS) Gauging Stations in Table 3-11 (PRB FEIS page 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams within the Project Area. The representative stream water quality is used in the impact analysis presented in Chapter 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM produced water of varying chemical composition to surface drainages within the Project Area" (PRB FEIS page 3-48). For the Upper Powder River, 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 located at Arvada, WY (PRB FEIS page 3-49).

The operator has identified a single non-permitted spring within the adjacent Wormwood 1 project boundary, which is within ½ mile radius of the WU2 project. The spring is located in the SENW of Section 23, T46N, R76W. Evaluation of the spring and water quality analysis can be found in the approved Wormwood 1 project (WY-070-EA06-104), Attachment E. As reported in the Wormwood 1 project, no flow was observed at the spring, however a water sample analysis returned a water quality of 3910 µmhos/ cm conductivity, 3840 mg/l TDS and 4 SAR.

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

3.5. Economics and Recovery of CBNG Resources

Development of this project would have effects on the local, state, and national economies. Based on the estimates in the BLM's 2009 Reasonably Foreseeable Development Scenario, the drilling of the 29 proposed wells (26 federal and 3 fee) in the WU2 POD will generate approximately 0.23 billion cubic feet of gas (BCFG) per well, over the life of the well. Actual revenue from this amount of gas is difficult to calculate, as there are several variables contributing to the price of gas at any given time. Regardless of the actual dollar amount, the royalties from the gas produced in the WU2 POD would have several benefits. The federal government collects 12.5% of the royalties from all federal wells, which helps offset the costs of maintaining the federal agencies that oversee permitting. In addition to generating federal income, approximately 49% of the royalties from the WU2 POD wells would return to the State of Wyoming. This revenue from mineral development contributes to Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. The development of the WU2 POD project would also provide local revenue by employing workers in the area to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area. This pool of individuals employed to work on the WU2 POD project would also result in an increase in demand for goods and services from nearby communities, primarily those of NE, Wyoming.

3.6. Cultural Resources

Class III cultural resource inventory was performed for the WU2 POD prior to on-the-ground project work (BFO project no. 70100025). Arcadis conducted a block class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports*. Seth Lambert, BLM Archaeologist, reviewed the report for technical adequacy and compliance with Bureau of Land Management (BLM) standards, and determined it to be adequate. The following resources are located in or near the project area.

Site Number	Site Type	Eligibility
48CA2281	Historic Site	Not Eligible
48CA5998	Historic Site	Not Eligible
48CA6008	Prehistoric Site	Not Eligible
48CA6016	Prehistoric Site	Not Eligible
48CA6027	Prehistoric Site	Not Eligible
48CA6028	Historic and Prehistoric Site	Not Eligible

Site Number	Site Type	Eligibility
48CA6055	Historic and Prehistoric Site	Not Eligible
48CA6074	Historic and Prehistoric Site	Eligible
48CA6964	Prehistoric Site	Not Eligible

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

3.7. Air Quality

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

Existing air pollutant emission sources within the region include following:

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

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

4. ENVIRONMENTAL EFFECTS

This section describes the environmental consequences of the proposed action, alternative B. 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. Information specific to resources for this alternative is included within the PRB Final EIS on pages listed in Table 4.1.

4.2. Alternative A

The No Action Alternative was analyzed as Alternative 3 in the PRB FEIS, and is incorporated by reference into this EA. Information specific to resources for this alternative is included within the PRB Final EIS on pages listed in Table 4.1.

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
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
Visual Resources		Direct and Indirect Effects	4-313
		Cumulative Effects	4-314

4.2.1. Soils, Vegetation, and Ecological Sites

4.2.1.1. Soils

4.2.1.1.1. Direct and Indirect Effects

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 runoff 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.

4.2.1.1.2. Cumulative Effects

The designation of the duration of disturbance is defined in the PRB FEIS (pg 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. 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.

4.2.1.1.3. Mitigation Measures

- Impacts to soils and vegetation from surface disturbance will be reduced by following the BLM applied mitigation. Mitigation measures applied to WU2 POD include site stabilization within 30 days of the initiation of construction activities for proposed improved roads with "poor" reclamation

suitability; minimizing disturbance widths for roads and pipeline corridors; and maintaining 20 feet vegetative buffers near drainages.

- The WU2 project area is dominated by soils that have been identified to have limited reclamation potential that will require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, etc.) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy. Stabilization efforts shall be finished within 30 days of the initiation of construction activities..

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

- Compaction would be remediated by plowing or ripping.

4.2.1.1.4. Residual Effects

Residual Effects were also identified in the PRB FEIS at page 4-408 such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

4.2.1.1.5. Susceptible to Erosion

Approximately 355 acres (13.5%) of the area within the WU2 POD boundary contain soil mapping units with a named soil component identified as being highly erosive due to wind or water erosion. Approximately 0.88 acres of the project area has slopes of 25% or more. Areas of slighter slopes and area near drainages usually have deeper soils. Deeper soils tend to have a higher probability of supporting shrubbrush grassland communities. On surfaces with steep topography, vegetation is sparse or even barren. Barren steep slopes experience higher velocity of water movement during heavy storm events. As this storm water moves down slope the velocity is mitigated by thicker vegetation of the sagebrush grasslands. Road and pipeline construction removes vegetation that controls water velocity. This loss of vegetative buffer increases water velocity and head cutting.

Soils with slopes of less than 25% may also be prone to high erosion because of the soil type, particle size, texture, or amount of organic matter. Other contributing factors to slope stability include slope length, slope aspect, and colluvium. Slope length has considerable control over runoff and potential accelerated water erosion. Slope aspect is the direction which the surface of the soil faces. Slope aspect may affect soil temperature, evapotranspiration, wind contact and soil moisture. Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash. It consists largely of material that has rolled, slid or fallen down the slope under the influence of gravity. The rock fragments in colluvium are usually angular, in contrast to the rounded, water-worn cobbles and stones in alluvium and glacial outwash. These factors in combination with slope determine soil stability and the potential for mass soil movement.

Approximately 262 acres (10%) of the project area has soils classified as Ustic Torriorthents, gullied.

This soil map unit is classified at the subgroup level of soil taxonomy, indicating a wide range in soil properties making soil suitability's, limitations and interpretations difficult to predict.

4.2.1.1.6. Reclamation Potential

Direct effects to vegetation would occur from ground disturbance caused by construction of roads, associated pipelines, and well locations. Effects are both short term and long term. Short term effects would occur where vegetated areas are disturbed but reclaimed within 1 to 3 years of the initial disturbance. Long-term effects would occur where road, well sites, water handling facilities, or other semi-permanent facilities would result in loss of vegetation and prevent reclamation for the life of the project. Within the project area, 18% of the soils have poor reclamation suitability. These areas typically occur on the majority of ridge tops found throughout the POD. For further detail please refer to Table 3.2 Reclamation Potential within the Wormwood Unit 2 Project Area. For a detailed summary of the disturbance for the operators proposed action please refer to SUDS form within the WU2 POD.

4.2.1.2. Vegetation

4.2.1.2.1. General Vegetation

4.2.1.2.1.1. Direct and Indirect Effects

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.

Indirect effects, as described in the PRB FEIS, would include the spread and/or establishment of noxious weeds, the alteration in surface water flows affecting vegetation communities, alteration in ecosystem biodiversity, and changes in wildlife habitat. Changes in surface flow would be mitigated by the transporting of the discharged produced CBNG water to Midwest, Wyoming, where it would be reinjected into the Madison aquifer.

Complete restoration of sagebrush shrubland after disturbance can often take decades. Studies of Wyoming big sagebrush post fire recovery intervals, indicated that post fire regeneration of this species can take 50 to 120 years to regenerate naturally (Cooper et al. 2007; Baker 2006). Wyoming big sagebrush took approximately 17 years to re-establish after chemical removal in Wyoming (Johnson 1969) and sagebrush species can take only 3 to 7 years to begin to spread in locations where seed drilling or transplant of seedlings occurred (Tirmenstein 1999).

4.2.1.2.1.2. Cumulative Effects

Cumulative effects to vegetation from oil and gas development are discussed in the PRB FEIS (pages 4-164 and 4-172). Most surface disturbances would be short-term impacts related to construction activities that would be reclaimed through interim reclamation and site stabilization, as committed to by the operator and as required by the BLM in COAs. The proposed project is planned in an area already heavily impacted by mineral development and oil and gas activities.

4.2.1.2.1.3. Mitigation Measures

Impacts to vegetation from surface disturbance would be reduced through the implementation of the mitigation measures in Appendix A; the WU2 Federal POD and its associated plans including the Integrated Weed and Pest Management Plan, the POD-specific reclamation plan, the WMP, the sage-grouse best management practices (BMPs), and the MSUP.

For further detail on reclamation please refer to page 22, of the WU2 POD Reclamation Plan (Attachment H).

In addition, the operator would follow the guidance provided in the Wyoming Policy on Reclamation (Instruction Memorandum WY-90-231). The Wyoming Reclamation Policy applies to all surface-disturbing activities. Authorizations for surface-disturbing actions are based upon the assumptions that an area can and ultimately would 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.

4.2.1.2.1.4. Residual Effects

Residual Effects were also identified in the PRB FEIS at page 4-408 such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

4.2.1.2.2. Wetlands/Riparian

4.2.1.2.2.1. Direct and Indirect Effects

The change in vegetation to wetland/riparian species has occurred in Pumpkin Creek downstream from the project area where discharges have been in place from prior development. Sedges and rushes have completely taken over the original upland species. There are only isolated cottonwood trees within the project area which are not likely to be affected by this water management strategy.

The PRB FEIS identified effects to gallery forests of mature cottonwood trees stating that "(they) may be lost by bank undercutting caused by the increased surface water flows in channels." Included in the ROD is programmatic mitigation "which may be appropriate to apply at the time of APD approval if site specific conditions warrant." (ROD page A-30). One of the conditions included in that section addresses the impact to trees in A.5.8-2: "To reduce adverse effects on existing wetlands and riparian areas, water discharge should not be allowed if increased discharge volumes or subsequent recharge of shallow aquifers will inundate and kill woody species, such as willows or cottonwoods."(ROD Page A-32).

4.2.1.2.2.2. 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 Project Area. SAR in water in the sub-watersheds could be altered by saline soils because disturbed soils with a conductivity of 16 mmhos/cm could release as much as 0.8 tons/acre/year of sodium (BLM 1999c). Soils in floodplains and streambeds may also be affected by produced water high in SAR and TDS. (PRB FEIS page 4-151).

As referenced above, the PRB FEIS did disclose that cumulative impacts may occur to soils and vegetation as a result of discharged produced CBNG water. The cumulative effects on vegetation and soils relative to this project are anticipated to be minimal for the following reasons:

- They are proportional to the total amount of water predicted to be produced in the Upper Powder River watershed and that amount of cumulatively produced water is only approximately 14.6% of the total predicted for this watershed in the PRB FEIS (see section 4.1.3.1.3).
- The WDEQ enforcement of the terms and conditions of the WYPDES permit that are designed to protect irrigation downstream.
- The commitment by the operator to monitor the volume of water flowing into Pumpkin Creek and to construct additional downstream reservoirs, if necessary, to prevent significant volumes of water to

flow into Pumpkin Creek.

- The WMP for the WU2 POD proposes that produced water will not contribute to significant flows downstream.

4.2.1.2.2.3. 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.

4.2.1.2.3. Invasive Species

4.2.1.2.3.1. 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.

4.2.1.2.3.2. 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 salt cedar, Canada thistle and perennial pepperweed.

4.2.1.2.3.3. Mitigation Measures

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

1. 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.

4.2.1.2.3.4. 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.

4.2.1.3. Ecological Sites

4.2.1.3.1. Direct and Indirect Effects

Direct and indirect effects to ecological sites are discussed in the PRB FEIS (pages 4-153-4 to 4-164). As proposed, the project would potentially alter the disturbance regimes in the project area, especially the frequency of fire due to increased activity in the project area. Additional effects include the increase in noxious weeds and alterations in vegetation community diversity and cover.

4.2.1.3.2. Cumulative Effects

Cumulative effects to ecological sites are discussed in the PRB FEIS (pages 4-153 to 4-172). Cumulative effects to ecological sites include the further alteration of disturbance regimes from the increased activity, increase in noxious weeds, and alterations in vegetation community's diversity and cover.

4.2.1.3.3. Mitigation Measures

Impacts to vegetation from surface disturbance would be reduced through the implementation of the mitigation measures in **Appendix A**; the WU2 POD and its associated plans including the Integrated Weed and Pest Management Plan, the POD-specific reclamation plan, the WMP, the sage-grouse BMPs, and the MSUP.

4.2.1.3.4. Residual Effects

The alteration of biodiversity of ecological sites could result from changes in disturbance regimes, alterations in vegetation in reclaimed areas, and the spread and establishment of weed species.

4.2.2. Wildlife

4.2.2.1. Threatened, Endangered, Proposed, and Candidate Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.2.

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

Common Name (scientific name)	Habitat	Project Effects	Rationale
Endangered			
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NE	No prairie dog colonies of sufficient size to support a ferret population.
Blowout penstemon (*Penstemon haydenii*)	Sparsely vegetated, shifting sand dunes	NE	No suitable habitat present.
Threatened			
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water	NE	No suitable habitat present.
Proposed			
Mountain plover	Short-grass prairie with slopes < 5%	NLJ	No suitable habitat present.

Common Name (scientific name)	Habitat	Project Effects	Rationale
Candidate			
Greater Sage-grouse	Basin-prairie shrub, mountain-foothill shrub	MIIH	Sagebrush cover will be affected.

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 of the species
MIIH – May impact individuals and health

4.2.2.1.1. Threatened and Endangered Species

4.2.2.1.1.1. Black-Footed Ferret

4.2.2.1.1.1.1. Direct and Indirect Effects

Suitable habitat is not present within the project area. Implementation of the proposed coal bed natural gas project will have "no effect" on black-footed ferret.

4.2.2.1.1.1.2. Cumulative Effects

The cumulative effects to black-footed ferrets are discussed in the PRB FEIS (pg. 4-251).

4.2.2.1.1.1.3. Mitigation Measures

No mitigation is proposed.

4.2.2.1.1.1.4. Residual Effects

There are no residual impacts to black-footed ferrets.

4.2.2.1.1.2. Blowout Penstemon

4.2.2.1.1.2.1. Direct and Indirect Effects

Suitable habitat is not present within the project area. Implementation of the proposed coal bed natural gas project will have "no effect" on blowout penstemon.

4.2.2.1.1.2.2. Cumulative Effects

The proposed project will have no effect on blowout penstemon.

4.2.2.1.1.2.3. Mitigation Measures

No mitigation is proposed.

4.2.2.1.1.2.4. Residual Effects

There are no residual impacts to blowout penstemon.

4.2.2.1.1.3. Ute Ladies'-Tresses Orchid

4.2.2.1.1.3.1. Direct and Indirect Effects

Suitable habitat is not present within the project area. Implementation of the proposed coal bed natural gas project will have "no effect" on Ute ladies'-tresses orchid.

4.2.2.1.1.3.2. Cumulative Effects

Cumulative effects are discussed in the PRB FEIS on pg. 4-253.

4.2.2.1.1.3.3. Mitigation Measures

No mitigation is proposed.

4.2.2.1.1.3.4. Residual Effects

There are no residual impacts to Ute ladies'-tresses orchid.

4.2.2.1.2. Proposed Species

4.2.2.1.2.1. Mountain Plover

4.2.2.2.2.1.1 Direct and Indirect Effects

There will be no direct impacts to mountain plovers within Wormwood 2 POD. There is a potential to indirectly impact individual birds outside of the POD as vehicle traffic associated with POD activity will increase, posing an increase risk of collisions with birds near roads.

4.2.2.1.2.2. Cumulative Effects

The cumulative impacts to mountain plovers are discussed in the PRB FEIS.

4.2.2.1.2.3. Mitigation Measures

Speed limits have been placed on some roads that will decrease the likelihood of plover/vehicle collisions, however not all roads are covered. No mitigation specific to the project area is proposed.

4.2.2.1.2.4. Residual Effects

The potential for individual mountain plovers outside the project area to collide with project associated vehicles remains.

4.2.2.1.3. Candidate Species

4.2.2.1.3.1. Greater Sage-grouse

4.2.2.1.3.1.1. 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. In the Wormwood 2 POD, approximately 25 acres will be disturbed throughout the POD to construct 26 CBM wells, approximately 3 miles of road, and approximately 6.3 miles of buried utilities to service the 26 wells. Much of the surface disturbance area is in sparse sage stands or grassland and will not reduce sage cover. Impacts from development are known to disturb sage-grouse up to 0.6 mile from the disturbance (Holloran et al. 2007, Aldridge and Boyce 2007). This will result in loss of effective sage-grouse habitat throughout the POD.

Design features specifically included in the proposed action under Alternative B to minimize impacts to sage-grouse include:

- Well locations were moved to reduce impacts to habitat and to protect large blocks of quality habitat.
- Two pod buildings are proposed to monitor wells remotely, which will reduce the amount of vehicle traffic and human presence to visit wells.
- Electric power to wells will be delivered by buried power.

- No new reservoirs will be constructed. All water will be piped to existing outfalls in the Wormwood 1 and Kingwood 1 PODs.

4.2.2.1.3.1.2. 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 four mile radius around the four sage-grouse leks that occur within four miles of the project boundary. Analysis of impacts up to four miles was recommended by the State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas Development Effects to Nesting Habitat (2008).

Excluding the 26 project wells, there are approximately 309 proposed wells (Automated Fluid Minerals Support System [AFMSS] 11/9/2010) within the cumulative effects analysis area. With the addition of these wells, well density would increase to 9.8 wells per square mile. With approval of Alternative B (26 proposed well locations) well density would increases to 10 wells per square mile, well above the one well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development. With the approval of Alternative B, four leks would exceed the WGFD threshold category for extreme impacts.

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 (Powder River Basin) or the entire range of the species is not likely to be compromised (pg. 4-270)." Based on the impacts described in the Powder River Basin Oil and Gas Project FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the four leks that occur within four miles of the project area, and, potentially, extirpation of the local grouse population.

4.2.2.1.3.1.3. Mitigation Measures

To reduce disturbance from construction during the breeding season Seasonal timing restrictions will be placed as a condition of approval on the construction 20 wells and their infrastructure to eliminate disturbance to three leks.

4.2.2.1.3.1.4. Residual Effects

The application of timing restrictions (March 1- June 15) does not address the effects of disturbance from operation and maintenance once wells and infrastructure have been constructed. It also does not address impacts from infrastructure that increases the potential for mortality from predation, accidents, or disease. The USFWS 2010 findings indicate that sage-grouse conservation is best achieved by maintaining extensive stands of sagebrush habitat over large areas (> 10,000 acres).

4.2.2.2. BLM-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.

4.2.2.2.1. Bald Eagle

4.2.2.2.1.1. Direct and Indirect Effects

Impacts to bald eagles are discussed in the PRB FEIS on pg. 4-251 to 4-253. Human activities, traffic, and construction may displace winter roosting, or foraging eagles that use habitats along the riparian corridor of Pumpkin Creek which is approximately 0.5 miles to the north.

4.2.2.2.1.2. Cumulative Effects

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

4.2.2.2.1.3. Mitigation Measures

To reduce the risk of disruption to the winter roosting activities of bald eagles, BFO will require a 0.5

mile disturbance-free buffer and a 1.0 mile radius timing limitation on all winter roost habitat between 1 Nov and 1 Apr, annually.

4.2.2.2.1.4. Residual Effects

Once construction of POD components has been completed, regular attendance to wells and their infrastructure, including six wells that are within a mile of the identified bald eagle winter use area to the north, will cause disturbance to eagles using the area.

4.2.2.2.2. Ferruginous Hawk

4.2.2.2.2.1. Direct and Indirect Effects

Impacts to ferruginous hawks are discussed in the PRB FEIS on pg. 4-262. Ferruginous hawks are known sensitive to disturbance during the breeding season (Olendorff 1973, Gilmer and Stewart 1983, Schmutz 1984, White and Thurow 1985, Bechard et al. 1990). Ferruginous hawks have been shown to select nest sites that avoid human habitation or disturbance (Lokemoen and Duebbert 1976, Schmutz 1984). Once a nest site has been selected, ferruginous hawks have been shown to abandon nest sites that are subject to disturbance (Snow 1974, White and Thurow 1985). When abandonment does occur, it tends to happen prior to hatching, so incubation represents a critically important time for reduced disturbance (Snow 1974, White and Thurow 1985). Sensitivity to disturbance may be inversely related to prey availability (White and Thurow 1985). Nests in proximity to disturbance have been shown to produce fewer young (Olendorff 1973, Blair 1978, White and Thurow 1985). Ferruginous hawks tend not to return to breed in territories where breeding attempts in previous year failed as a result of disturbance (White and Thurow 1985).

4.2.2.2.2.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS on pages 4-257 to 4-273.

4.2.2.2.2.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure, BFO will require a 0.5 mile radius timing limitation on surface disturbance during the breeding season around active ferruginous hawk nests. The USFWS Ecoregional Services Field Office recommends a one mile protection buffer for ferruginous hawks, which are particularly sensitive to disturbance. Williams was unwilling to agree at this time to extending the timing limitation to the one mile distance recommended for ferruginous hawks.

4.2.2.2.2.4. Residual Effects

Even with a timing limitation, ferruginous hawks may abandon nests due to alteration in foraging habitats associated with development or because of sensitivity to well or infrastructure placement. Even with

timing limitations on surface-disturbing activities, ferruginous hawks may be displaced by other activities associated with development. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some ferruginous hawks. Timing limitations do nothing to mitigate habitat loss, therefore drilling and construction that takes place outside of nesting season will still result in habitat loss for this species. The timing limitation will result in some decrease in direct mortalities that would occur with increased drilling traffic during the breeding season. Mortalities associated with maintenance and non-surface-disturbing activities will still occur. Harassment or displacement of nesting individuals will still occur during the production and abandonment phases of the project.

4.2.2.3. Big Game

4.2.2.3.1. Direct and Indirect Effects

Approximately 25 acres of sagebrush steppe and grassland habitat will be disturbed throughout the Wormwood 2 POD. This represents a loss of approximately 1 percent of the forage available to mule deer and pronghorn in the project area. Once construction is completed, some of the disturbed area will be reclaimed which will replace some of the lost forage. The 3 miles of road within the project will increase disturbance to big game species from vehicle traffic and a potential for direct mortality from vehicle collisions.

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

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

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

Increased access to hunting and poaching may occur however, the private land status in the project area is highly effective in restricting public access. Further impacts to big game are described in the PRB FEIS on pp. 4-181 to 4-215.

4.2.2.3.2. 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.

4.2.2.3.3. Mitigation Measures

No mitigation measures are proposed to reduce impacts to big game.

4.2.2.3.4. Residual Impacts

No further impacts are identified from those described in the direct/indirect paragraph above.

4.2.2.4. Migratory Birds

4.2.2.4.1. Direct and Indirect Effects

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

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

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

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

4.2.2.4.2. 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. 4-235. No additional mitigation measures are required.

4.2.2.4.3. Mitigation Measures

No direct mitigation measures are proposed to protect migratory birds however, they will be protected where raptor and sage-grouse timing limitations are in effect.

4.2.2.4.4. Residual Effects

No further impacts are identified.

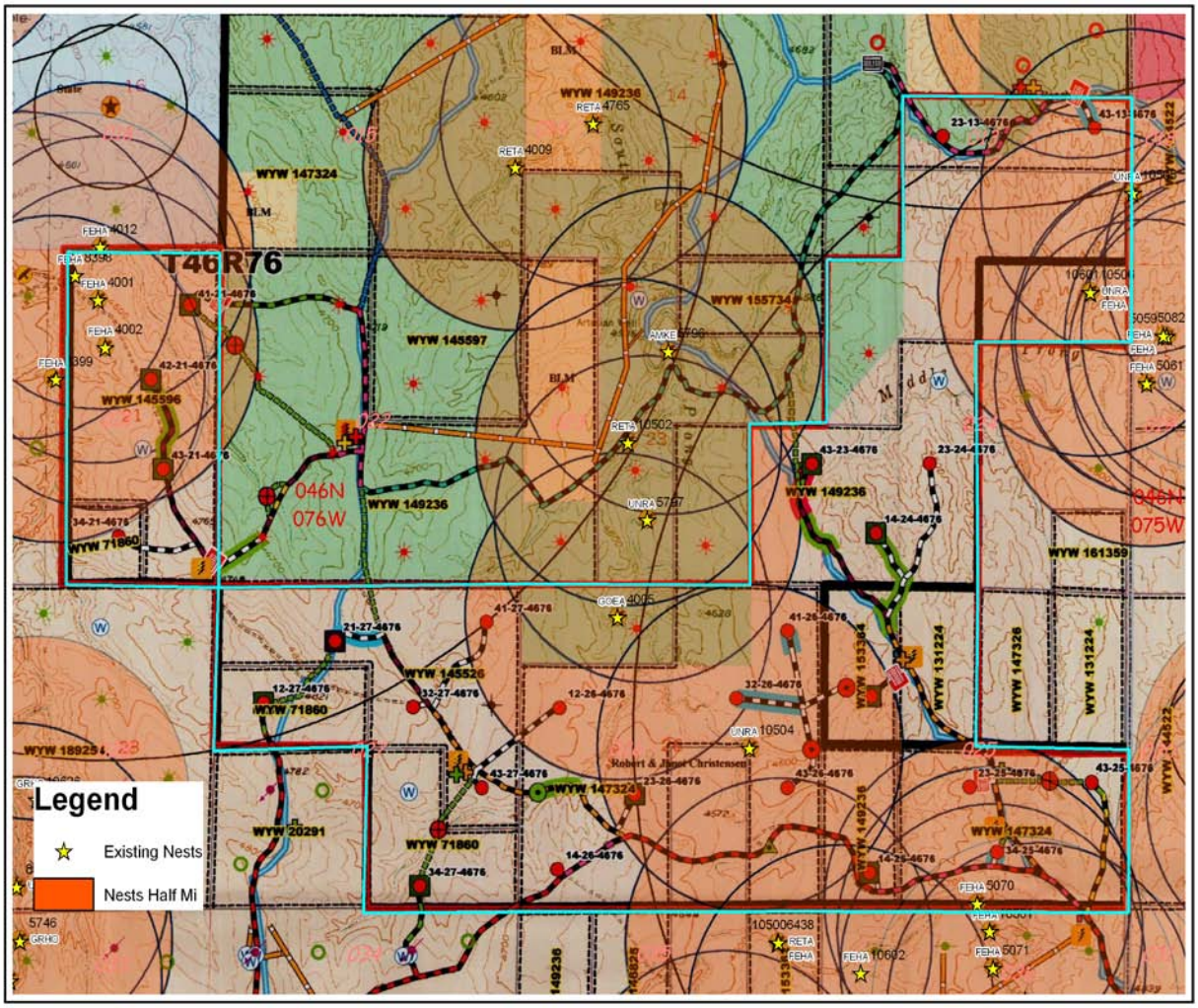
4.2.2.5. Raptors

4.2.2.5.1. 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 infrastructures 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. A list of documented raptor nests within 0.5 mile of project components is shown in the map below.

Proposed and Existing Infrastructure within 0.5 mile of Documented Raptor Nests within the Wormwood Unit 2 Federal POD Project Area



Wells 32-26 and 43-26 are 0.17 and 0.18 miles respectively from next 10504 which is an inactive nest of an unknown raptor in a cottonwood tree. The nest is out of line of sight of both wells which should provide enough protection to the nest site, but it is possible that raptors may be reluctant to use this nest site in the future.

Well 34-25 is 0.18 miles from nest 5970, an inactive ferruginous hawk nest. The nest is located across a haul road and is out of line of sight of the well. There are existing wells on state land near the nest. It is likely that the ferruginous hawk pair that uses this territory has abandoned the area because of existing disturbance and will not likely return.

Well 32-21 was 0.18 miles from nest 4002, an inactive ferruginous hawk nest but was moved 600 feet to a location further from the nest and out of line of sight of the nest.

Well 12-26 was moved to a site approximately 0.43 miles and out of line of sight from golden eagle nest 4005 which was active in 2006, 2007, and 2008. This move will reduce the amount of disturbance in close proximity to the nest.

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

4.2.2.5.2. Cumulative Effects

The cumulative effects associated with Alternatives 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. 4-221.

4.2.2.5.3. Mitigation Measures

Timing limitation restrictions will be placed on 19 wells and their associated infrastructure to eliminate disturbance from construction during raptor nesting season.

4.2.2.5.4. Residual Impacts

Once wells are developed, routine maintenance and operation activities will disturb raptors and possibly cause raptors to avoid using nest locations or to abandon active nests.

4.2.3. Water Resources

The operator has submitted a comprehensive WMP for this project. Williams intends to utilize BLM water management infrastructure approved within adjacent Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) project areas to manage effluent produced from the WU2 project. Water management strategy includes: discharging effluent through 32 permitted outfall locations (WYPDES WY0054593), managed irrigation through multiple pivot systems and an off-project permitted injection well facility. 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. 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 is predicted to be 14.5 gpm per well or 420.5 gpm (0.94 cubic feet per second (cfs) or 678.2 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that was anticipated to be produced from CBNG development per year (Table 2-8 Projected Amount of

Water Produced from CBM Wells Under Alternatives 1, 2A and 2B pg 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 60,319 acre-feet in 2010 (maximum production is estimated in 2006 at 171,423 acre-feet). As such, the volume of water resulting from the production of these wells is 1.1% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.2.3.1. Groundwater

4.2.3.1.1. 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 pg 4-5). For this action, it may be assumed that a maximum of 168.2 gpm will infiltrate at or near the discharge points and impoundments (271.3 acre feet per year). This water will saturate the near surface alluvium and deeper formations prior to mixing with the groundwater used for stock and domestic purposes. According to the PRB FEIS, "the increased volume of water recharging the underlying aquifers of the Wasatch and Fort Union Formations would be chemically similar to alluvial groundwater." (PRB FEIS pg 4-54). Therefore, the chemical nature and the volume of the discharged water may not degrade the groundwater quality.

The PRB FEIS predicts that one of the environmental consequences of coal bed natural gas production is possible impacts to the groundwater. "The effects of development of CBM on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS page 4-1). In the process of dewatering the coal zone to increase natural gas recovery rates, this project may have some effect on the static water level of wells in the area. The permitted water wells produce from depths which range from 50 to 500 feet compared to 1,121 to 1,257 feet to the Big George. The operator has committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (½ mile of a federal CBNG producing well) of the proposed wells.

Recovery of the coal bed aquifer was predicted in the PRB FEIS to "…resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater 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 page 4-38).

4.2.3.1.2. 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 page 4-64).

Development of CBNG through 2018 (and coal mining through 2033) would remove 4 million acre-feet of groundwater from the coal zone aquifer (PRB FEIS page 4-65). This volume of water "…cumulatively represents 0.5 percent of the recoverable groundwater stored in the Wasatch – Tongue River sands and coals (nearly 750 million acre-feet, from Table 3-5). All of the groundwater projected to be removed during reasonably foreseeable CBNG development and coal mining would represent less than 0.3 percent of the total recoverable groundwater in the Wasatch and Fort Union Formations within the PRB (nearly 1.4 billion acre-feet, from Table 3-5)." (PRB FEIS page 4-65).

4.2.3.1.3. 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 July, 2010, over 2013 impoundment sites have been investigated with more than 2297 borings. Of these impoundments, 264 met the criteria to require "compliance monitoring" if constructed and used for CBNG water containment. Only 135 impoundments requiring monitoring are presently being used. As of the second quarter of 2010, only 20 of those monitored impoundments (14.6%) caused a change in the "Class of Use" of any parameter in the underlying aquifer water.

4.2.3.1.4. Residual Effects

The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. The Buffalo Field Office has been monitoring coal zone pressures as expressed in depth to water from surface since the early 1990's in the PRB.

The areas around and within TM2 POD have been intensely developed with CBNG production. As a result, the target coal zone pressure may have been reduced through off set water production.

4.2.3.2. Surface Water

4.2.3.2.1. Direct and Indirect Effects

Produced Water Quality

Table 4.3 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 (WY0054593), and the concentrations found in the POD's representative water sample.

Table 4.3 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Upper Powder River Watershed at Arvada, WY 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		
Livestock Use (Class III)	5,000	8	
WDEQ Water Quality Requirement for WYPDES Permit WY0054593			
At discharge point (varies, see permit)	5,000		7,500
At Irrigation Compliance point (see permit)			
Predicted Produced Water Quality			
Big George Coal Zone	1,410	14.9	2,250
WYPDES Permit WY0054593	1,490	18.1	2,370
Spring	3,840	4	3,910

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the

Powder River Basin is the irrigation of crops (PRB FEIS pg 4-69). The water quality projected for this POD is 1410.0 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS). As previously mentioned land application is part of the water management strategy and may be utilized.

The quality for the water produced from the Big George target coal zone from these wells is predicted to be similar to the sample water quality collected from a location near the POD. A maximum of 14.5 gallons per minute (gpm) is projected is to be produced from these 29 wells (26 federal and 3 fee), for a total of 420.5 gpm for the POD.

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

Permit WY0054593 effluent limits were set at (WYPDES pp 2-10):

pH	6.5 to 9.0
TDS	5,000 mg/l max
Specific Conductance	7,500 mg/l max
Dissolved iron	1,000 µg/l max
Total Barium	1,800 µg/l max
Total Arsenic	7 µg/l max
Chlorides	150 mg/l

The WYPDES permit addresses maximum discharge flow rates by month, and outfalls that have flow restrictions that are applicable based on direct discharges. For a list of these rates, restrictions and discharges, please review the permit for more detail (pp 2-15).

The WYPDES permit also addresses existing downstream concerns, such as irrigation use, in the COA for the permit. The designated water quality monitoring stations are identified as TRIB1, UPR, and DPR. See pages 8-15 for information requiring sampling, monitoring, reporting and their locations.

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

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

Produced Water Control

There are 32 approved discharge points associated with this project. They have been appropriately sited and utilize appropriate water energy dissipation designs. Existing water management facilities were evaluated for compliance with best management practices during the onsites previously conducted for the Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) projects. The only new water management infrastructure associated with WU2 will be water collection and delivery pipelines that will transfer water to the aforementioned projects. In addition to discharging effluent into existing reservoirs, Williams may also discharge directly into the channel as outlined in the WYPDES permit and approved projects associated with the Wormwood/Kingwood PODs. A table listing the locations and detail of the 32 approved outfalls can be found in the WMP. Effluent from Wormwood 2 may also be directed to two distinct managed irrigation systems (each having multiple pivots) as well as an off-project permitted injection well facility.

To manage the produced water, no new impoundments will be constructed within the project area. Based on historic effluent production rates for the area, all effluent produced from WU2 can be adequately managed within the existing water management system without adversely impacting Pumpkin Creek and its associated vegetative communities. Williams has demonstrated on page 14 of the WMP that total annual inflows from the surrounding approved PODs and the proposed Wormwood 2 well sites minus total annual outflows including the off-project injection facility will be more than adequate to control the water balance. Total annual inflow from approved wells in adjacent and relevant PODs, plus 29 wells proposed from Wormwood 2 and reservoir inflow is 7,610 acre-feet. Total annual outflow from reservoir evaporation and infiltration, direct discharge during release periods, effluent diverted to pivot irrigation systems and release from discharging reservoirs is 5,619 acre-feet. The remaining 1,991 acre-feet of excess effluent will be transported via pipeline to the approved off-project injection facility (UIC #08-144) to the Salt Creek Madison/Tensleep formation located near Midwest, WY. For a detailed list of water balance rates and permits see the WMP, page 14, and Attachments.

Produced Water Quantity

The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). Consequently, the volume of water produced from these wells may result in the addition of 0.14 cfs below the lowest reservoir (after infiltration and evapotranspiration losses). The operator has committed to monitor the condition of channels and address any problems resulting from discharge. Discharge from the impoundments will potentially allow for streambed enhancement through wetland-riparian species establishment. Sedimentation will occur in the impoundments, but would be controlled through a concerted monitoring and maintenance program. Phased reclamation plans for the impoundments will be submitted and approved on a site-specific; case-by-case basis as they are no longer needed for disposal of CBNG water, as required by BLM applied COAs.

Alternative (2A), the approved alternative in the Record of Decision for the PRB FEIS, states that the peak production of water discharged to the surface will occur in 2006 at a total contribution to the mainstem of the Upper Powder River of 68 cfs (PRB FEIS pg 4-86). The predicted maximum discharge rate from these 29 wells is anticipated to be a total of 420.5 gpm or 0.94 cfs to impoundments. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment the produced water re-surfacing in Pumpkin Creek from this action (0.14 cfs) may add a maximum 0.752 cfs to the Upper Powder River flows, or 1.1% 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 pg 4-85).

In the WMP portion of the POD, the operator provided an analysis of the potential development in the watershed above the project area (WMP page 14). Based on the area of the Pumpkin Creek watershed above the POD (27,110 acres) and an assumed density of 1 well per location every 80 acres, the potential exists for the development of 339 wells which could produce a maximum flow rate of 4,914 gpm (11 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.
4. Not all wells will be discharging into reservoirs or to the surface.

When completed, the potential maximum flow rate of produced water for all wells associated with the approved and pending overall Wormwood/Kingwood project areas (in addition to the 29 wells outlined in this plan) will be 9.87 cfs, which is much less than the volume of runoff estimated from the 2-year, 24 hour storm event within the Pumpkin Creek watershed, which is 1,605 cfs. See Table 2 of the WMP, page 7.

In-channel downstream impacts are addressed in the WMP for the Wormwood Unit 2 Federal POD prepared by Western Land Services for Williams Production RMT Company. Additional concerns not discussed above or outlined in the WMP can be found in the approved Wormwood 1 (WY-070-EA06-104) and Kingwood 1 (WY-070-EA06-210) project WMP's.

4.2.3.2.2. Cumulative Effects

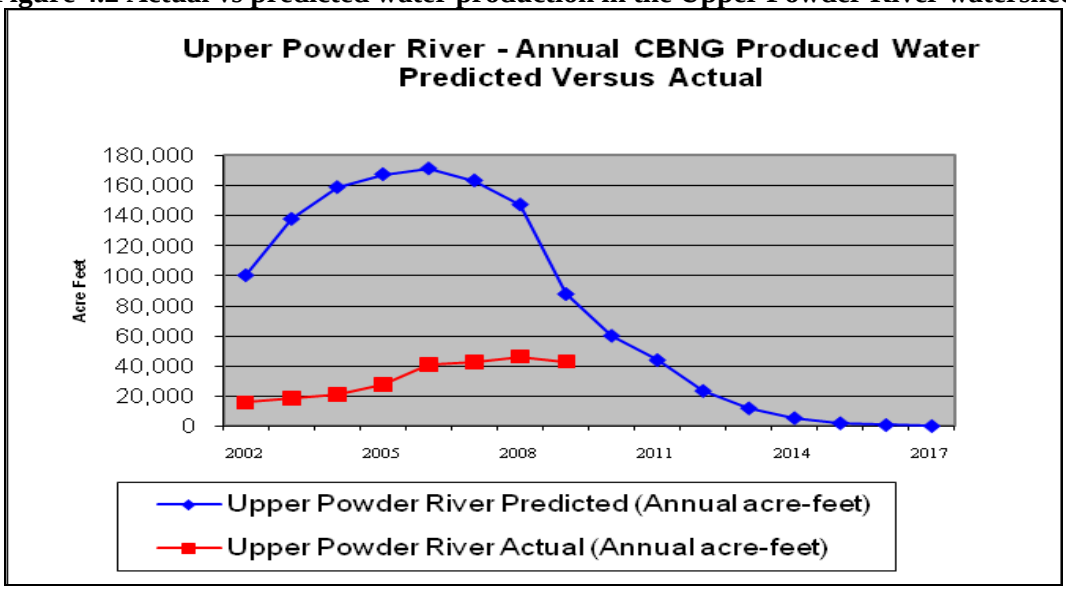
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2009, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 255,531 acre-ft of water compared to the predicted 1,135,567 acre-ft disclosed in the PRB FEIS (Table 2-8 page 2-26). These figures are presented graphically in Figure 4.2 and Table 4.4 following. This volume is 22.5 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.4 Actual vs predicted water production in the Upper Powder River watershed *2009 Data Update 04-06-10*

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	43,009	48.8	255,531	22.5
2010	60,319	1,195,886				
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**		**255,531**			

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

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

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 22.5% 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.

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

4.2.3.2.3. Mitigation Measures

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

The operator has 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 revegetate disturbance within channel and floodplain associated with this project.

4.2.3.2.4. 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 pg 4-118).

4.2.4. Economics and Recovery of CBNG Resources

4.2.4.1. Direct and Indirect Effects

Direct and indirect effects to the socioeconomic structure of Johnson and Campbell counties as a result of project implementation would be as described in the PRB FEIS. Likewise, cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS starting on page 4-336. No mitigation is warranted and no residual effects are expected.

4.2.4.2. 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, please refer to the referenced PRB FEIS, Volume 2, Chapter 4.

4.2.5. Cultural Resources

4.2.5.1. Direct and Indirect Effects

Non eligible site(s) 48CA2281, 48CA6027, 48CA6028, 48CA6055 and 48CA6964 will be impacted by the proposed project. No historic properties will be impacted by the proposed project. Following the Wyoming State Protocol Section VI(A)(1) the Bureau of Land Management electronically notified the Wyoming State Historic Preservation Officer (SHPO) on 11/12/10 that no historic properties exist within the APE. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the Standard COA (General)(A)(1).

4.2.5.2. 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).

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 deposits and the presence of heavy vegetation that prevented an adequate Class III inventory, the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described in the site specific COA's. 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 COA's.

The proposed water line that connects Wormwood Unit 2 with Wormwood Unit 1 runs within 100 feet of Eligible site 48CA6074. As discussed in the field with personnel from Williams and Western Lands Services on 12/13/10, if the line is installed on the West side of the existing improved road 48CA6074 will not be impacted. Moving the line will not cause any additional disturbance or have any effect on the water management strategy discussed herein. Therefore the line must be installed on the West side of the road and all surface disturbing activities within 200 feetof the boundary of 48CA6074 will be monitored by a Cultural Use Permitee.

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.

4.2.6. Air Quality

4.2.6.1. Direct and Indirect Effects

In the project area, air quality impacts would occur during construction (due to surface disturbance by earth-moving equipment, vehicle traffic fugitive dust, well testing, as well as drilling rig and vehicle engine exhaust) and production (including non-CBM well production equipment, booster and pipeline compression engine exhaust). The amount of air pollutant emissions during construction would be

controlled by watering disturbed soils, and by air pollutant emission limitations imposed by applicable air quality regulatory agencies. Air quality impacts modeled in the PRB FEIS concluded that projected oil & gas development would not violate any local, state, tribal or federal air quality standards.

4.3. Summary of Effects and Reasonably Foreseeable Actions

Table 4.5 provides a comparison of the cumulative effects associated with the alternatives.

Table 4.5 Summary of Environmental Consequences for Wormwood Unit 2 POD by Alternative

Resource/Species	Alternative A	Alternative B
Wetlands/Riparian Areas	No existing wetlands/riparian areas would be disturbed.	2 culvert and 6 utility crossings would disturb wetland/riparian areas.
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		
Bald eagle	No habitat loss	Greatest habitat loss.
Sensitive Species		Greatest predation and collision risk associated with overhead power lines.
Greater Sage Grouse	No habitat loss.	likely to have effect on the overall spread of WNV.
	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	No Impact

4.3.1. Reasonably Foreseeable Actions

It is reasonably foreseeable that this operator may later submit additional APDs at 80 acre spacing in areas of the POD or lease(s) where the operator believes there may be gaps in resource extraction. It is also reasonably foreseeable this operator or adjacent operators will submit additional APDs to a lease(s) adjacent to or continuous with the lease(s) supporting this Wormwood Unit 2 POD. This reasonably

foreseeable development may include but is not limited to townships 46N 76W; 45N 76W; 46N 77W; 47N 76W; or 46N 75W.

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

DATE	NAME	TITLE	COMPANY	PRESENT at ONSITE
8/24-8/25	Raymond Stott	Natural Resource Specialist	BLM	YES
8/24-8/25	Pat Cole	Wildlife Biologist	BLM	YES
8/24-8/25	Don Brewer	Wildlife Biologist	BLM	NO
8/24	Seth Lambert	Archaeologist	BLM	YES
8/24	J Bunderson	Civil Engineer	BLM	YES
8/24	Duane Joslyn	Construction Manager	Williams Prod. RMT	YES
8/25	Penny Bellah	Regulatory Team Lead	Williams Prod. RMT	YES
8/24-8/25	Doug McAdam	Drilling	Williams Prod. RMT	YES
8/24-8/25	Charlie Bolerjack	Operations	Williams Prod. RMT	YES
8/24-8/25	Randy Materi	Construction	Williams Prod. RMT	YES
8/24-8/25	Randee Jaspersen	Landman	Williams Prod. RMT	YES
8/24-8/25	Pat Barker	Project Manager	Western Land Services	YES
8/24-8/25	Mike Lindsley	Operations	Western Land Services	YES
8/24	Allen Aksamit	Biologist	Western Land Services	YES
8/24-8/25	Bob Christensen	Landowner		NO
8/24-8/25	John Iberlin	Landowner		NO

6. OTHER PERMITS REQUIRED

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

7. REFERENCES AND AUTHORITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Code of Federal Regulations (CFR)

1. 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of July 1, 2004.
2. 43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of October 1, 2006.

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

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

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

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

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

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

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

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

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

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

Ebert, James I., and Timothy A. Kohler. 1988. The Theroretical Basis of Archaeological Predictive Modeling and a Consideration of Appropriate Data-Collection Methods, in *Quantifying the Present and Predicting the Past: Theory, Method, and Applicatin of Archaeolgical Predictive Modeling*, edited by W. James Judge and Lynne Sebastian, pp 97-171. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO.

Eckerle, William. 2005. Experimental: Archaeological Burial Model for Powder River and Tongue River Hydrological Basins, Wyoming. In *Adaptive Management and Planning Models for Cultural Resource in Oil and Gas Fields in New Mexico and Wyoming*, by Eric Ingbar, Lynne Sebastian, Jeffrey Altschul, Mary Hopkins, William Eckerle, Peggy Robinson, Judson Finley, Stephen A. Hall, William E. Hayden, Chris M. Rohe, Tim Seaman, Sasha Taddie, and Scott Thompson, pp. 39-102. Prepared for the Department of Energy, National Energy Technology Laboratory by Gnomon, Inc. Electronic document, http://www.gnomon.com/DOEPumpIII/FinalCombinedReport.pdf, accessed August and September 2010.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Madson Chris. 2005. *Deer on the Anticline* in Wyoming Wildlife. March 2005

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

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

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

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

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

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

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

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

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

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

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

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

NRCS Web Soil Survey. n.d. Electronic document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8. LIST OF INTERDISCIPLINARY TEAM PREPARERS AND REVIEWERS

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Interdisciplinary Team Lead: Ray Stott

APPENDIX A: CONDITIONS OF APPROVAL FOR THE APPLICATION FOR PERMIT TO DRILL

POD Name: Wormwood Unit 2 Federal POD WY-070-EA11-56

Operator Name: Williams Production RMT Company

Field Office: Buffalo Field Office
Address: 1425 Fort Street
Buffalo, Wyoming 82834

Office Telephone Number: 307-684-1100

List of Wells:
The following 26 Applications for Permit to Drill (APDs) and associated infrastructure are authorized:

Well Name	Well #	QQ	Sec	TWN	RNG	Lease #
WORMWOOD UNIT 2 WU	23-13*	NESW	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	43-13	NESE	13	46N	76W	WYW149235
WORMWOOD UNIT 2 WU	34-21	SWSE	21	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-21	NENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	42-21	SENE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-21	NESE	21	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-23	NESE	23	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	14-24	SWSW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-24	NESW	24	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	12-25	SWNW	25	46N	76W	WYW153364
WORMWOOD UNIT 2 WU	14-25	SWSW	25	46N	76W	WYW149236
WORMWOOD UNIT 2 WU	23-25	NESW	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	34-25	SWSE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-25	NESE	25	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-26	SWNW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	14-26	SWSW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	23-26	NESW	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	32-26	SWNE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	41-26	NENE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	43-26	NESE	26	46N	76W	WYW147324
WORMWOOD UNIT 2 WU	12-27	SWNW	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	21-27	NENW	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	32-27	SWNE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	34-27	SWSE	27	46N	76W	WYW71860
WORMWOOD UNIT 2 WU	41-27	NENE	27	46N	76W	WYW145596
WORMWOOD UNIT 2 WU	43-27	NENE	27	46N	76W	WYW145596

SITE SPECIFIC:

1. Well 43-13: Maintain a 20 foot vegetative buffer from the sandy blowout adjacent to the well stake and apply erosion control measures to control erosion of the blowout (silt fence).

2. Well locations and associated access routes in section 21 of T46N R76W will require within 30 days of construction, stabilization measures to ensure stability of the identified highly erosive soils.

3. Well 42-21: Maintain a 20 foot vegetative buffer from the drainage and ensure the pit is lined.

4. Well 43-23: Within 30 days of construction, stabilization measures to ensure stability of the identified highly erosive soils on those areas of the access road needing engineered or spot upgraded. There is a major rill at the well site caused from erosion of a cow trail that was discussed would be mitigated for safety measures and marked off for identification during construction/drilling. To ensure flow off the well slot and rill, place a waterbar or other means to direct the flow into the side drainage.

5. Well 14-24: Within 30 days of construction, stabilization measures to ensure stability of the identified highly erosive soils on those areas of the access road.

6. Well 23-24: Within 30 days of construction, stabilization measures will be required on the access road down the hill into the well location due to erosive soil conditions. Apply road surfacing on the hill, due to the slope of the access exceeding 8%.

7. Well 12-25: The access crossing located west of the well will require road surfacing into and out of the crossing due to the slope exceeding 11%. Within 30 days of construction, stabilization measures will be required at the well access due to erosive soil conditions.

8. Well 23-25: Within 30 days of construction, stabilization measures are required on the utility crossing that tie into the 43-25 well location due to erosive conditions and the slope banks at the channel.

9. Well 14-26: Maintain a 20 foot vegetative buffer from the drainage to the east.

10. Well 23-26: Mitigate the rilling and rutting of the cow trail adjacent to the well location.

11. Well 43-26: Monitor and if need be mitigate the two headcuts found downstream of the road crossing into the location. Apply road surface to the route, adjacent the crossing where the slope exceeds 13%.

12. Well 21-27: Within 30 days of construction, stabilization measures apply at the pad due to erosive soil conditions and sandy blowout areas. Apply road surface into the pad at the access due to the slope exceeding 8% as it approaches the location. Ensure the pit is lined.

13. Well 34-27: Within 30 days of construction, stabilization measures apply on the utility crossing that tie into the 43-27 well location due to erosive conditions and the slope banks at the channel.

14. Well 43-27: Within 30 days of construction, stabilization measures apply at the access east of the well where the engineered portion is shown on the existing culvert that shot-gunned out and is in need of repair. Road surfacing is also required on the portion of access that is west of the culvert, due to erosive soils and excessive slope.

15. The proposed POD building located east of well 12-25 will require, within 30 days of construction, stabilization measures due to the erosive soils (sandy areas, rocky outcrop and yucca plants). The entire road access to the proposed POD will need to be surfaced because of the erosive soils.

16. It was determined that Carlsbad Canyon would be the color scheme for this project.

Cultural

1. All surface disturbing activity in the following areas will be monitored by a BLM cultural resource use permit (CRUP) holder or permitted crew chief. The Bureau has identified these areas as having a high potential for buried cultural deposits (areas containing alluvial deposits along or near Pumpkin Creek and its tributaries). Some portions of the monitoring areas as described may lie outside alluvial deposits and exact monitoring areas are left to the discretion of the archeological monitor. All monitored areas must be plotted on the map provided with the monitoring report. The submission of two copies of a monitoring report to BFO is required within 30 days of the completion of all monitoring work.

    a. All surface disturbing activity associated with the construction of the 43-13-4676 well and the associated infrastructure running North for 500 feet.
    b. All surface disturbing activity associated with the construction of proposed infrastructure in the NE Sec.15 T46N R76W and NW Sec.16 T46N R76W where alluvial deposits are crossed.
    c. All surface disturbing activity associated with the construction of proposed infrastructure in Sec.4 T46N R76W and Sec.9 T46N R76W where alluvial deposits are crossed.

2. The proposed water line that connects Wormwood Unit 2 with Wormwood Unit 1 runs within 100 feet of Eligible site 48CA6074 (Sec.9 T46N R76W). If the line is installed on the West side of the existing improved road 48CA6074 will not be impacted. Therefore the line must be installed on the West side of the road and all surface disturbing activities within 200 feet of the boundary of 48CA6074 will be monitored by a CRUP. Results of the 48CA6074 monitoring will be included with the project monitoring report. The CRUP shall notify the BLM-BFO cultural staff no less than three days in advance of construction activities.

Wildlife

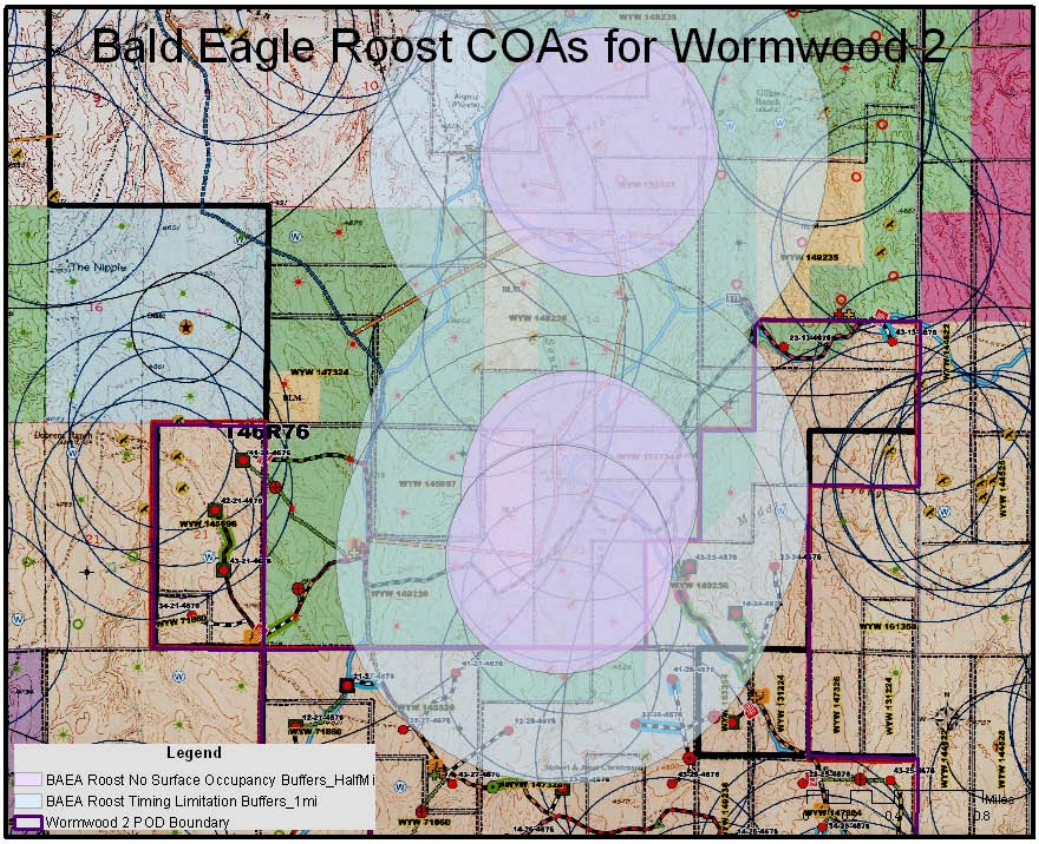
Bald Eagles

The following conditions will alleviate impacts to bald eagles:

1. "A year-round disturbance-free buffer zone of 0.5 mile will be established year-round for all bald eagle winter roost sites. This buffer zone restriction may be adjusted based on site specific information through coordination with and with written concurrence of the Service's Wyoming Field Office." This programmatic mitigation measure will be applied specifically to the portion of Beaver Creek shown on the attached map.

    a. Surveys to document activity shall be conducted by a biologist following BLM protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
    b. If a roost is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile will be established. A seasonal minimum disturbance-free buffer zone of 1 mile will be established for all bald eagle roost sites (1 November – 1 April).
    c. If a nest is identified and construction has not been completed, a year-round disturbance-free buffer zone of 0.5 mile would be established. A seasonal minimum disturbance-free buffer zone of 1 mile will be established for all bald eagle nest sites (1 February – 15 August).

2. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

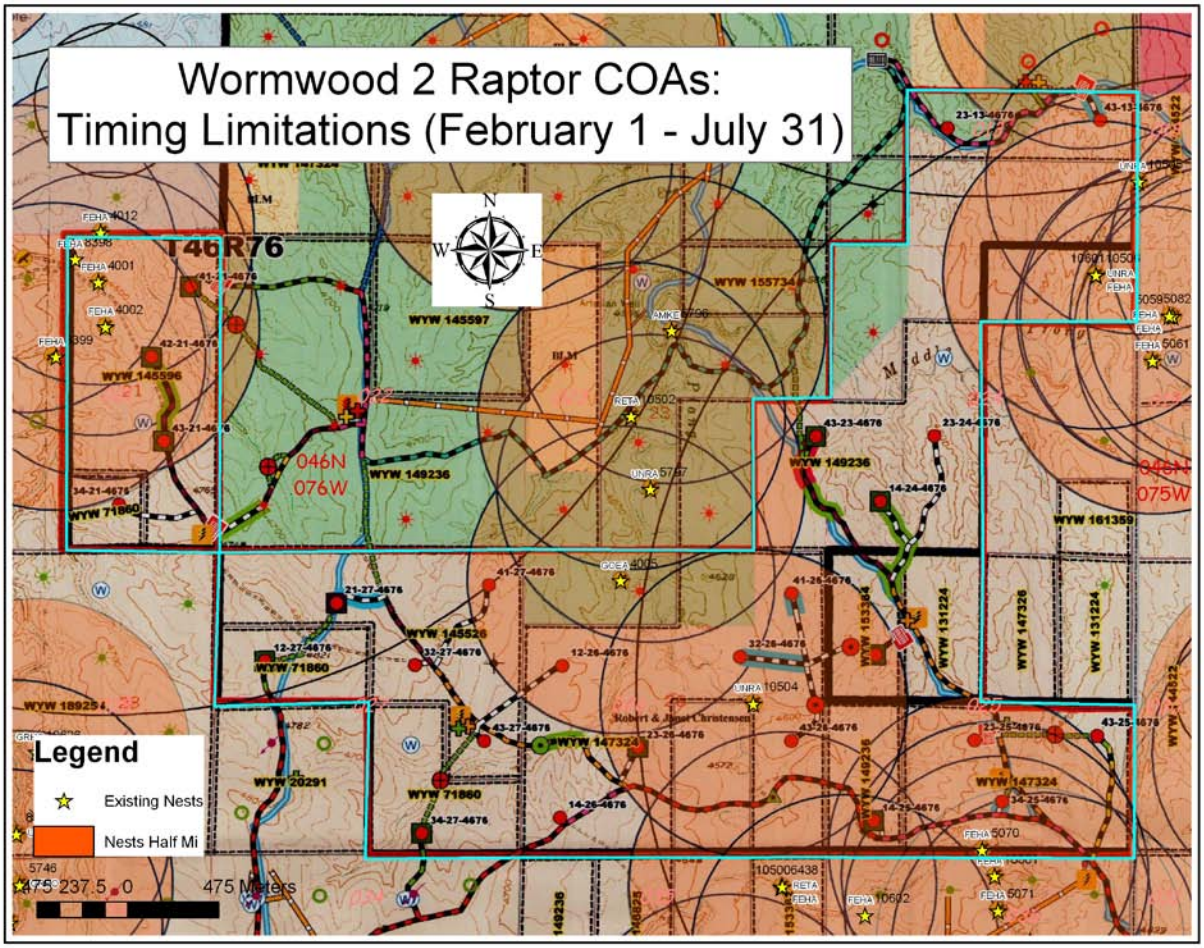


Raptors

The following conditions will alleviate impacts to raptors:

1. No surface-disturbing activities shall occur within 0.5 mile of all identified raptor nests, from 1 February through 31 July, annually, prior to a nesting survey. This timing limitation will be in effect unless surveys determine the nest to be inactive.
1. Surveys shall be conducted by a biologist follow Refer to the attached map for affected wells and infrastructure.

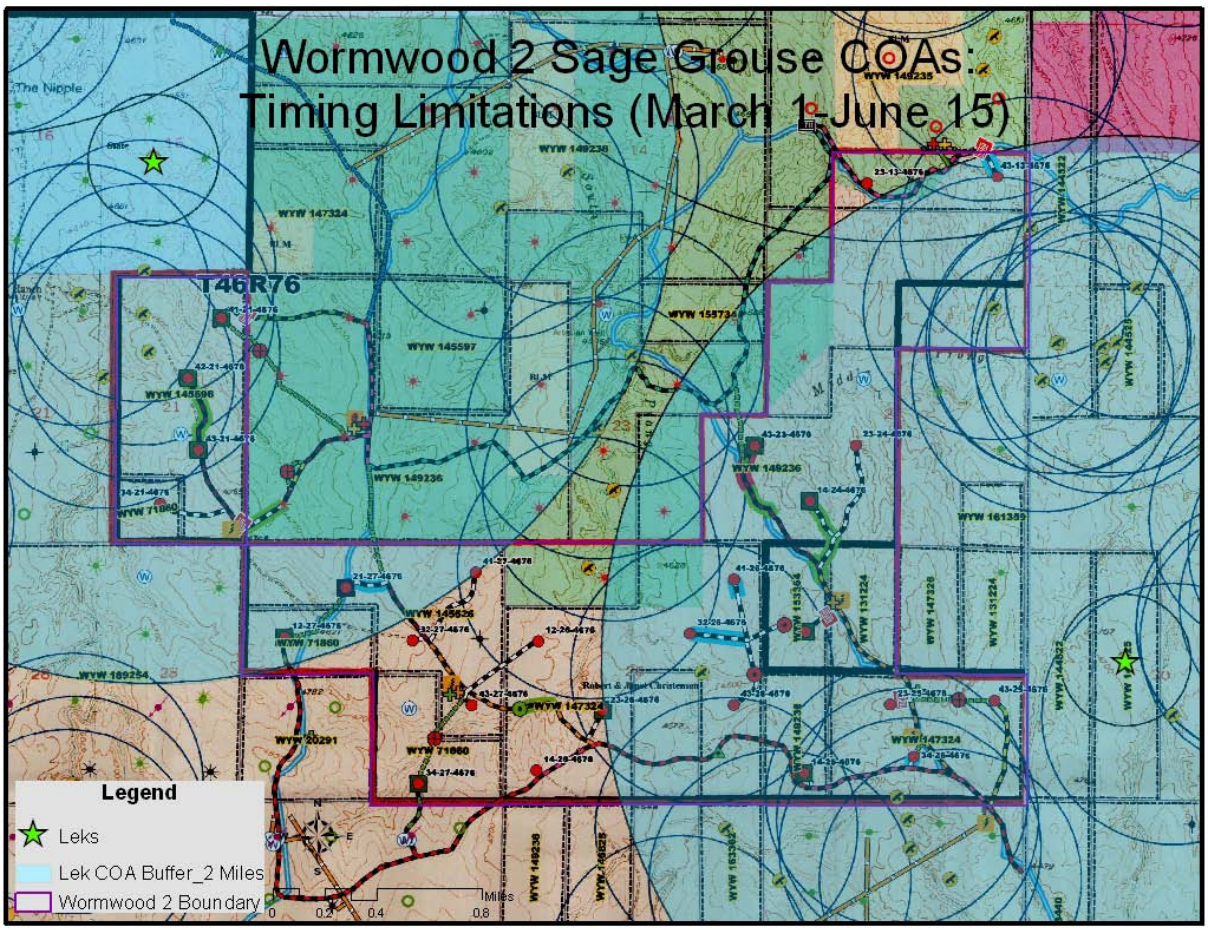
    a. Surveys shall be conducted by a biologist following BLM protocol. All survey results shall be submitted in writing to a Buffalo BLM biologist and approved prior to surface disturbing activities.
    b. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.



Sage-Grouse

The following conditions will alleviate impacts to sage-grouse:

1. No surface-disturbing activities shall occur within sage-grouse habitat, from 15 March through 30 June, annually. Refer to the attached map for affected wells and infrastructure.



PROGRAMMATIC

1. Channel Crossings:
   - Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
   - Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.
2. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

Vegetation

1. Weed educational material will be reviewed with operators during preconstruction on-site meetings with operators, subcontractors, and landowners and will also be attached to approved APDs and PODs.

Wetland/Riparian

1. Crossings of wetland/riparian areas by linear features, such as pipelines, roads, and power lines will be avoided to the extent practicable. Where crossings cannot be avoided, impacts will be minimized

through use of the following measures:

- Site-specific mitigation plans will be developed during the APD, POD, or Sundry Notice approval process for all proposed disturbance to wetland/riparian areas.

- Crossings will be constructed perpendicular to wetland/riparian areas where practical.

- Wetland areas will be disturbed only during dry conditions (that is, during late summer or fall), or when the ground is frozen during the winter.

- No waste material will be deposited below high water lines in riparian areas, flood plains, or in natural drainage ways.

- The lower edge of soil or other material stockpiles will be located outside the active floodplain.

Noise

1. Noise mufflers will be installed on the exhaust of compressor engines to reduce the exhaust noise.

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

   Two measurements commonly used to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the average day/night noise level (L_{dn}). The L_{eq} is an A-weighted sound level containing the same sound energy as the instantaneous sound levels measured over a specific time period. Noise levels are perceived differently, depending on the length of exposure and the time of day. The L_{dn} takes into account the duration and time the noise is encountered. An additional 10 decibels on the A-weighted scale (dBA) are added to late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposure levels to account for people's greater sensitivity to sound during the nighttime hours. After adjustment, the 24 hourly values are averaged to determine the $l_{dn.}$

   Existing literature concludes an l_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise (FERC 2003).

   Noise can be reduced by construction of obstacles in the direct path from the noise source to a receiver or by increasing the distance between a CBM facility and an existing noise-sensitive receptor.

Air Quality

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

STANDARD

General

1. All contractors/operators will have a complete copy of the approved Wormwood Unit 2 Federal APD/POD, including COAs, at the drill site, during the construction of the roads and drill pad, the drilling of the well, completion of the well, and all other related construction activities.

2. A pre-construction field meeting shall be conducted prior to beginning any dirt work approved under this POD. The operator shall contact the BLM Authorized Officer Ray Stott @ 307-684-1179 at least 4-days prior to beginning operations so that the meeting can be scheduled. The operator is responsible for having all contractors present (dirt contractors, drilling contractor, pipeline contractor, project oversight personnel, etc.) including the overall field operations superintendent, and for providing all contractors copies of the approved POD, project map and BLM Conditions of Approval pertinent to the work that each will be doing.

3. Approval of this APD does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease that would entitle the applicant to conduct operations thereon. In addition, approval of this APD does not imply that the operator has legal access to the drilling location. When crossing private surface 43 CFR 3814 regulations must be complied with and when crossing public surface off-lease the operator must have an approved right-of-way.

4. Confine all equipment and vehicles to the access road(s), pad(s), and area(s) specified in the approved APD or POD.

5. The approval of this project does not grant authority to use off lease Federal lands. No surface disturbing activity, or use of off-lease federal lands, is allowed on affected leases until right-of-way grants become effective which is the date signed by the authorized officer.

6. This POD is valid for two years from the date of approval or until the oil and gas lease expires/terminates, whichever occurs first. If this well intends to earn a lease extension, diligent operations (actual drilling) must be in progress over the lease expiration date, advance lease rentals must have been paid, and a letter stating drilling operations were in progress must be submitted to this office no later than five days past the expiration date. If the APD terminates, any surface disturbance created under the application must be reclaimed according to an approved plan.

7. The operator will be in compliance with all applicable local, state and/or federal laws, regulations, and/or statutes.

8. A progress report must be filed a minimum of once a month starting with the month the well was spudded continuing until the well is completed. The report must be filed by the 25th of each month on a Sundry Notice (Form 3160-5). The report will include the spud date, casing information such as size, grade, weight, hole size, and setting depth, amount and type of cement used, top of cement, depth of cementing tools, casing test method, intervals tested, perforated, acidized, fractured and results obtained and the dates all work done.

9. In the event abandonment of the hole is desired, an oral request may be granted by this office but must be timely followed within 5 days with a "Notice of Intention to Abandon" (Form 3160-5). The "Subsequent Report of Abandonment" (Form 3160-5) must be submitted within 30 days after the actual plugging of the well bore, reporting where the plugs were placed, and the current status of the surface restoration.

10. Whether the well is completed as a dry hole or as a producer, two copies of all logs run, core

descriptions, core analysis, well-test data, geologic summaries, sample descriptions, and all other surveys or data obtained and compiled during the drilling, work over, and/or completion operations will be filed with Form 3160-4. A gamma ray log shall be run from T.D. to ground surface.

11. The operator is responsible for informing all persons associated with this project that they shall be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects on site. If archaeological, historical, or vertebrate fossil materials are discovered, the operator is to suspend all operations that further disturb such materials and immediately contact the Authorized Officer. Operations are not to resume until written authorization to proceed is issued by the Authorized Officer.

12. Within five (5) working days, the Authorized Officer will evaluate the discovery and inform the operator of actions that will be necessary to prevent loss of significant cultural or scientific values.

13. The operator is responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized Officer that the required mitigation has been completed, the operator will be allowed to resume operations.
    a. If any cultural values [sites, artifacts, human remains (Appendix L FEIS)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. The authorized officer will conduct an evaluation of the cultural values to establish appropriate mitigation, salvage or treatment. The operator is responsible for informing all persons in the area who are associated with this project that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. If historic or archaeological materials are uncovered during construction, the operator is to immediately stop work that might further disturb such materials, and contact the authorized BLM officer (AO). Within five working days the AO will inform the operator as to:

        - whether the materials appear eligible for the National Register of Historic Places;
        - the mitigation measures the operator will likely have to undertake before the site can be used (assuming in situ preservation is not necessary); and,
        - a time-frame for the AO to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation Officer, that the findings of the AO are correct and that mitigation is appropriate. The AO will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the AO that the required mitigation has been completed, the operator will then be allowed to resume construction measures.

    b. If paleontological resources, either large or conspicuous, and/or a significant scientific value are discovered during construction, the find will be reported to the Authorized Officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological values. Operations within 250 feet of such a discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The applicant will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.

14. The operator shall be responsible for the prevention of fires on public lands caused by its employees,

contractors or subcontractors. During conditions of extreme fire danger, surface use operations may be limited or suspended in specific areas.

15. All survey monuments found within the area of operations shall be protected. Survey monuments include, but are not limited to: General Land Office and Bureau of Land Management Cadastral Survey Corners, reference corners, witness points, U. S. Coast and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any survey monuments, the incident shall be reported in writing to the Authorized Officer.

16. If any time the facilities located on public lands authorized by the terms of the lease are no longer included in the lease (due to a contraction in the unit or other lease or unit boundary change) the BLM will process a change in authorization to the appropriate statute. The authorization will be subject to appropriate rental or other financial obligation determined by the authorized officer.

17. Gas produced from this well may not be vented or flared beyond an initial authorized test period of 30 days or 50 MMCF following its completion, whichever first occurs, without the prior written approval of the authorized officer. If gas is vented or flared without approval beyond the test period authorized above, you may be directed to shut-in the well until the gas can be captured or approval to continue venting or flaring as uneconomic is granted. You shall be required to compensate the lessor for that portion of the gas vented or flared without approval which is determined to have been avoidably lost.

18. The first producing well drilled to each targeted coal zone will be designated as the POD "Reference Well". Reference wells will not be required for PODs within a 6 mile radius of the first reference well designated by the operator, nor for co-mingled coal zones. The designated reference well must be equipped to be sampled at the well head. A reference well sample will be collected from the wellhead and submitted for analysis; using the list of analytes identified in WDEQ WYPDES Application for Permit to Surface Discharge Produced Water from CBM New Discharges, Renewals, or Major Modifications, within 30 to 60 days of initial water production. Results of the analysis will be submitted to the BFO-BLM authorized Officer as they become available and will include the following information: Operator Name, POD Name, Well Name and location and Date Sampled.

19. By November 1 each year, companies will submit the following information, attached to a Sundry Form 3160-5, where construction and development have taken place in the last year.
    - Georeferenced spatial data depicting as-built locations of all facilities, wells, roads, pipelines, power lines, reservoirs, discharge points, and other related facilities to the BLM for all PODs.
    - Two as-built copies of Map D.

20. If any dead or injured threatened, endangered, proposed, or candidate species is located during construction or operation, the U.S. Fish and Wildlife Service's Wyoming Field Office (307-772-2374), their law enforcement office (307-261-6365), and the BLM Buffalo Field Office (307-684-1100) shall be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the BLM Buffalo Field Office (307-684-1100) shall be notified within 24 hours.

21. Operators shall comply with all other conservation measures and terms and conditions identified in the Powder River Basin Oil and Gas Project Biological Opinion (ES-6-WY-07-F012).

22. If an undocumented raptor nest is located during project construction or operation, the Buffalo Field Office (307-684-1100) shall be notified within 24 hours.

DRILLING AND PRODUCTION OPERATIONS

1. The spud date will be reported electronically, (see website location above) to the Authorized Officer 24 HOURS BEFORE SPUDDING, unless otherwise required in site specific conditions of approval.

Spud Notice Site:
http://www.wy.blm.gov/minerals/og/og_notices/spud_notice.php

2. The operator shall complete coal bed natural gas wells (case, cement and under ream) as soon as possible, but no later than 30 days after drilling operations, unless an extension is given by the BLM Authorized Officer.

Well Control Equipment

1. The well control equipment approved in this project lists the minimum requirements.

2. The flow line shall be a minimum of 30 feet from the well bore and securely anchored. The 30-foot length of line is a minimum and operators must make consideration for increasing this length for topography and/or wind direction.

3. The flow line shall be a straight run.

4. The flow line must be constructed from non-flammable material.

5. All cuttings and circulating medium shall be directed to and contained in a reserve pit.

6. The nearest edge of the pits shall be a minimum of 25' from the rig.

7. A minimum of 2' of freeboard shall be maintained in the pits at all times.

8. The authorized officer may modify these requirements at any time if it is determined that increased pressure control is deemed necessary.

9. Verbal notification shall be given to the Authorized Officer at least 24 hours before formation tests, BOP tests, running and cementing casing, and drilling over lease expiration dates.

Casing Program

1. The minimum requirement for casing centralizers is as follows: all casing strings will have centralizers on the bottom three joints (i.e. a minimum of one centralizer per joint starting with the shoe joint).

2. In addition, the production casing string shall be centralized with API approved centralizers using the following specifications:

    2.1. One centralizer per~120' (specifically every third or fourth joint depending on joint length).

    2.2. One centralizer 25' above surface casing shoe.

3. Surface casing length shall follow current requirements set forth by the WOGCC. Increased surface casing may be required so that the surface casing shoe may be set into a competent formation.

Cement Program

1. If there are indications of inadequate primary cementing of the surface, intermediate, or production casing strings; such as but not limited to no returns to surface, cement channeling, fallback or mechanical failure of equipment, the operator will evaluate the adequacy of the cementing operations. This evaluation will consist of running a cement bond log (CBL) or an alternate method approved by the Authorized Officer (AO) no sooner than 12 hours and no later than 24 hours from the time the cement was first pumped.

2. If the evaluation indicates inadequate cementing, the operator shall contact a BLM Buffalo Field Office Petroleum Engineer for approval of remedial cementing work. Remedial cementing will consist of, but may not be limited to:

    2.1. Perforating and squeezing cement to ground surface should the top of cement (TOC) be below the surface casing shoe. This shall be done within 36 hours of the completion of pumping the primary cement job.

    2.2. One-inching cement to ground surface should the top of cement (TOC) be above the surface casing shoe.

    2.3. Fallback that is found to be less than 30' from ground surface may be topped off with cement slurry.

3. The adequacy of the remedial cementing operations shall be verified by a cement bond log (CBL) or an alternate method approved by the Authorized Officer (AO). All remedial work shall be completed and verified prior to drilling out the casing shoe or perforating the casing for purposes other than remedial cementing.

4. The cement mix water used must be the same water used to develop the cement program and be of adequate quality, so as not to degrade the setting properties. Waters containing high carbonates or bicarbonates (greater than 2,000 ppm) should be avoided.

Production Equipment

1. All gas measurement equipment that deviates from Onshore Order #5 (or WY NTL 2004-1 in the case of electronic flow computers) shall be approved via a Notice of Intent sundry (Form No. 3160-5) prior to installation and use. This includes any type of primary device other than a standard orifice plate meter. Requests for a variance from the minimum standards of Onshore Order #5 must list:

    The specific type of equipment.

    How this equipment will meet or exceed the requirements of Onshore Order #5.

    The location, specific well and lease number where the equipment will be used.

2. An appropriate pressure gauge is required to be installed on each casing annulus to monitor this pressure.

3. Other actions such as off-lease measurement, commingling, allocation, etc. shall be approved via a Notice of Intent sundry (Form No. 3160-5). Submission of additional information in the POD shall not be construed as permission for these items. If the operator wishes to utilize off-lease gas measurement for wells approved in this POD, they are required to obtain approval via a Notice of Intent sundry (Form No. 3160-5) prior to any gas production. A map shall be attached to the sundry

that delineates where the individual wells will be measured for federal royalty. Unless this POD is committed to a Federal Oil & Gas Unit or Agreement, the production from all Federal wells shall be measured for Federal royalty prior to being combined with production from any other Federal, Indian, or non-Federal leases.

Well and POD Building Identification

1. From the time a well pad is constructed or a well is spudded (if no well pad needed), until abandonment, all well locations must be properly identified with a legible sign. The sign will include the well name and number, operator name, lease number, and the surveyed location.

2. At each POD building site where federal wells are metered, the operator is required to maintain a legible sign displayed in a conspicuous place. This sign is required to be in place at the time metering goes online. The sign shall include: POD name, Operator, Federal well names and numbers, Federal lease numbers being metered at the POD building, and surveyed location of the building.

Protection of Fresh Water Resources

1. All oil and gas operations shall be conducted in a manner to prevent the pollution of all freshwater resources. All fresh waters and waters of present or probable future value for domestic, municipal, commercial, stock or agricultural purposes will be confined to their respective strata and shall be adequately protected. Special precautions will be taken to guard against any loss of artesian water from the strata in which it occurs and the contamination of fresh water by objectionable water, oil, condensate, gas or other deleterious substance to such fresh water.

Miscellaneous Conditions

1. Any changes to the approved drilling plan and/or these conditions of approval shall be approved by the BLM-Buffalo Field Office Petroleum Engineer prior to being implemented.

   After hour's numbers:
   Petroleum Engineer: Matthew Warren Home Telephone: 307-620-0103

2. If any cores are collected, a copy of all analysis performed shall be submitted to the BLM-Buffalo Field Office Petroleum Engineer.

SURFACE USE STANDARD

A. Construction

1. Prior to construction, the operator will remove all staking (engineered road, pads, well stakes, etc.) for those areas which were not approved with the POD/APD.

2. All roads, well pads, rig slots, culverts, spot upgrades and locations where engineered construction will occur will be completely slope staked for review prior to construction.

3. Topsoil will be segregated for all excavation including the entire disturbance area for constructed pads and excavated areas for rig leveling, reserve pits, constructed roads, spot upgrades, reservoir upgrades, outfalls and utility trenches and redistributed for interim reclamation activities. This requirement will not be applied for pipelines installed with wheel trenchers.

4. The operator will not push soil material and overburden over side slopes or into drainages. All soil material disturbed will be placed in an area where it can be retrieved without creating additional undue surface disturbance and where it does not impede watershed and drainage flows.

5. Maintain a minimum 20-foot undisturbed vegetative border between disturbance areas and the edge of adjacent drainages, unless otherwise directed by the BLM Authorized Officer.

6. Reserve pits will be adequately fenced during and after drilling operations until pit is reclaimed so as to effectively keep out wildlife and livestock. Adequate fencing, in lieu of more stringent requirements by the surface owner, is defined as follows:

    - Construction materials will consist of steel or wood posts. Three or four strand wire (smooth or barbed) fence or hog panel (16-foot length by 50-inch height) or plastic snow fence must be used with connectors such as fence staples, quick-connect clips, hog rings, hose clamps, twisted wire, etc. Electric fences will not be allowed.
    - Construction standards: Posts shall be firmly set in ground. If wire is used, it must be taut and evenly spaced, from ground level to top wire, to effectively keep out animals. Hog panels must be tied securely into posts and one another using fence staples, clamps, etc. Plastic snow fencing must be taut and sturdy. Fence must be at least 2-feet from edge of pit. 3 sides fenced before beginning drilling, the fourth side fenced immediately upon completion of drilling and prior to rig release. Fence must be left up and maintained in adequate condition until pit is closed.

7. The reserve pit will be oriented to prevent collection of surface runoff. After the drilling rig is removed, the operator may need to construct a trench on the uphill side of the reserve pit to divert surface drainage around it. If constructed, the trench will be left intact until the pit is closed.

8. The reserve pit will be lined with an impermeable liner if permeable subsurface material is encountered. An impermeable liner is any liner having permeability less than 10-7 cm/sec. The liner will be installed so that it will not leak and will be chemically compatible with all substances that may be put in the pit. Liners made of any man-made synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use. In gravelly or rocky soils, a suitable bedding material such as sand will be used prior to installing the liner.

9. The reserve pit will be constructed so that at least half of its total volume is in solid cut material (below natural ground level).

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

Soil Type	Road Grade 2-4%	Road Grade 5-8%	Road Grade 9-12%	Road Grade 13-16%
Highly erosive Granitic or sandy	240	180	140	100
Intermediate Erosive clay or load	310	260	200	150
Low erosive shale or gravel	400	325	250	175

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

12. The minimum diameter for culverts will be 18 inches. However, all culverts will be appropriately sized in accordance with standards in BLM Manual 9113 or at the discretion of the Authorized Officer.

13. Maximum speed on all operator-constructed and maintained roads will not exceed 25 miles per hour.

14. Pipeline construction shall not block nor change the natural course of any drainage. Pipelines shall cross perpendicular to drainages. Suspended pipelines shall provide adequate clearance for maximum runoff.

15. During construction, emissions of particulate matter from well pad and road construction would be minimized by application of water or other non-saline dust suppressants with at least 50 percent control efficiency. Dust inhibitors (surfacing materials, non-saline dust suppressants, and water) will be used as necessary on unpaved roads that present a fugitive dust problem. The use of chemical dust suppressants on public surface will require prior approval from the BLM Authorized Officer.

16. All overhead power lines on BLM surface will be constructed to Avian Power Line Interaction Committee (APLIC) (2006 edition or most recent edition) by the standards and additional standards identified in the PRB FEIS Biological Opinion (Volume 3, Appendix K, page 43). BLM strongly recommends the burial of powerlines, or alternatively the adoption and implementation of APLIC standards for overhead powerline construction on other surface ownership lands.

B. Operations/Maintenance

1. All waste, other than human waste and drilling fluids, will be contained in a portable trash cage. This waste will be transported to a State approved waste disposal site immediately upon completion of drilling operations. No trash or empty barrels will be placed in the reserve pit or buried on location. Operators and their contractors will comply with all state and local laws and regulations pertaining to disposal of human and solid waste will be complied with.

2. Sewage shall be placed in a self-contained, chemically treated porta-potty on location.

3. The operator and their contractors shall ensure that all use, production, storage, transport and disposal of hazardous and extremely hazardous materials associated with the drilling, completion and

production of these wells will be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines. All project-related activities involving hazardous materials will be conducted in a manner to minimize potential environmental impacts. In accordance with OSHA requirements, a file will be maintained onsite containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds and/or substances which are used in the course of construction, drilling, completion and production operations.

4. Produced fluids shall be put in test tanks on location during completion work. Produced water will be put in the reserve pit during completion work per Onshore Order #7.

5. The only fluids/waste materials which are authorized to go into the reserve pit are RCRA exempt exploration and production wastes. These include:
   - drilling muds & cuttings
   - rigwash
   - excess cement and certain completion & stimulation fluids defined by EPA as exempt

   It does not include drilling rig waste, such as:
   - spent hydraulic fluids
   - used engine oil
   - used oil filter
   - empty cement, drilling mud, or other product sacks
   - empty paint, pipe dope, chemical or other product containers
   - excess chemicals or chemical rinsate

   Any evidence of non-exempt wastes being put into the reserve pit may result in the BLM Authorized Officer requiring specific testing and closure requirements.

6. Reserve pits will be closed as soon as possible, but no later than 90 days from time of drilling/well completion, unless the BLM Authorized Officer gives an extension. Pits must be dry of fluids or they must be removed via vac-truck or other environmentally acceptable method prior to backfilling, re-contouring and replacement of topsoil. Mud and cuttings left in pit must be buried at least 3-feet below re-contoured grade. The operator will be responsible for re-contouring any subsidence areas that develop.

7. The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring of any subsidence areas that develop from closing a pit before it is completely dry. The plastic pit liner (if any) will be cut off below grade and properly disposed of at a state authorized landfill before beginning to re-contour the site.

8. The operator will be responsible for prevention and control of noxious weeds and weeds of concern on all areas of surface disturbance associated with this project (well locations, roads, water management facilities, etc.) Use of pesticides shall comply with the applicable Federal and State laws.

9. Prior to the use of pesticides on public land, the holder shall obtain from the BLM authorized officer a pesticide use permit (PUP). The PUP must include a written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed necessary by the authorized officer to such use.

C. Producing Well

1. Landscape those areas not required for production to the surrounding topography as soon as possible. The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring and reseeding of any subsidence areas that develop.

2. Any spilled or leaked oil, produced water or treatment chemicals must be reported in accordance with NTL-3A and immediately cleaned up in accordance with BLM requirements. This includes clean-up and proper disposition of soils contaminated as a result of such spills/leaks.

3. Distribute stockpiled topsoil evenly over those areas not required for production (ie. cut/fill slopes, road ditches, pipelines, etc.) and reseed with approved seed mix.

4. Upgrade and maintain access roads and drainage control (e.g., culverts, drainage dips, ditching, crowning, surfacing, etc.) as necessary and as directed by the BLM Authorized Officer to prevent soil erosion and accommodate safe, environmentally-sound access.

D. Reclamation/Dry Hole

1. BLM will not release the performance bond until all disturbed areas associated with the APD/POD have been successfully revegetated (evaluation will be made after the second complete growing season) and has met all other reclamation goals of the surface owner and surface management agency.

2. A Notice of Intent to Abandon and a Subsequent Report of Abandonment must be submitted for abandonment approval.

3. For performance bond release approval, a Final Abandonment Notice (with a surface owner release letter on split-estate) must be submitted prior to a final abandonment evaluation by BLM.

4. Phased reclamation plans will be submitted to BLM for approval prior to individual POD facility abandonment via a Notice of Intent (NOI) Sundry Notice. Individual facilities, such as well locations, pipelines, discharge points, impoundments, etc. need to be addressed in these plans as they are no longer needed. Individual items that will need to be addressed in reclamation plans include:

    - Configuration of reshaped topography, drainage systems, and other surface manipulations
    - Waste disposal
    - Revegetation methods, including specific seed mix (pounds pure live seed/acre) and soil treatments (seedbed preparation, fertilization, mulching, etc.). On private surface, the landowner should be consulted for the specific seed mix.
    - Other practices that will be used to reclaim and stabilize all disturbed areas, such as water bars, erosion fabric, hydro-mulching, etc.
    - An estimate of the timetables for beginning and completing various reclamation operations relative to weather and local land uses.
    - Methods and measures that will be used to control noxious weeds, addressing both ingress and egress to the individual well or POD.
    - Decommissioning/removal of all surface facilities
    - Closure and reclamation of areas utilized or impacted by produced CBNG water, including discharge points, reservoirs, off-channel pits, land application areas, livestock/wildlife watering facilities, surface discharge stream channels, etc.
    - Refer to BLM Impoundment Reclamation Guidance for further information on reclaiming impoundments.
    - Refer to the Wyoming Reclamation Policy for further guidance on reclamation.

5. All disturbed lands associated with this project, including the pipelines, access roads, water management facilities, etc will be reclaimed and reseeded within 180 days of well plugging. The reclamation work must be in accordance with the surface use plan and any pertinent site-specific COAs.

6. Disturbed lands will be re-contoured back to conform with existing undisturbed topography. No depressions will be left that trap water or form ponds.

7. The fluids and mud must be dry in the reserve pit before re-contouring pit area. The operator will be responsible for re-contouring of any subsidence areas that develop from closing a pit before it is completely dry. The plastic pit liner (if any) will be cut off below grade and properly disposed of at a state authorized landfill before beginning to re-contour the site.

8. Before the location has been reshaped and prior to redistributing the topsoil, the operator will rip or scarify the drilling area and access road on the contour to 4" below the compacted layer. The rippers are to be no farther than 24 inches apart.

9. Distribute the topsoil evenly over all disturbed areas. Prepare the seedbed and seed with approved seed mix.

10. Soil fertility testing and the addition of soil amendments may be required to stabilize some disturbed lands.

11. Any mulch utilized for reclamation needs to be certified weed free.

12. Waterbars are to be constructed at least one (1) foot deep, on the contour with approximately two (2) feet of drop per 100 feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars are to be constructed with the berm on the downhill side to prevent the soft material from silting in the trench. The initial waterbar should be constructed at the top of the backslope. Subsequent waterbars should follow the following general spacing guidelines:

Slope (percent)	Spacing Interval (feet)
< 2	200
2 - 4	100
4 - 5	75
> 5	50

Appendix B: Resource and Species Worksheets

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality				PRB FEIS: 3-291-298, 4-404-406, 4-377-386
Noise	Yes	Yes	Yes	
Cultural	Yes	Yes	No	PRB FEIS: 3-206-228, 4-273-288, 4-394
Native American religious concerns	No	No	No	PRB FEIS: 3-218-219, 3-228, 4-277-278
Traditional Cultural Properties	No	No	No	PRB FEIS: 3-218-219, 4-277-278
Mineral Potential	Yes	Yes	Yes	PRB FEIS: 3-66-70, 3-230, 4-127-129
Coal	No	No	Yes	PRB FEIS: 3-66
Fluid Minerals	Yes	Yes	Yes	PRB FEIS: 3-68-69
Locatable Minerals	No	No	No	Add in EA
Other leasables	No	No	No	
Salable minerals	No	No	NA	
Paleontology	Yes	No	Yes	PRB FEIS: 3-65-66, 4-125-127
PFYC 3	Yes	Yes	Yes	PRB FEIS: 3-65-66, 4-125-127
PFYC 5	No	No	No	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	No	No	No	PRB FEIS: 3-266, 4-326
Walk-in-Area	No	No	No	
Social & Economic				PRB FEIS: 3-275-289, 4-336-370
Environmental Justice	No	No	No	
Transportation	Yes	No	No	
Soils & Vegetation				PRB FEIS: 3-78-107, 4-134-152, 4-153-164, 4-393-394, 4-406
Erosion Hazard	Yes	Yes	No	PRB FEIS: 3-82, 4-135
Poor Reclamation Potential	Yes	Yes	No	PRB FEIS: 3-86, 4-149-152
Slope hazard	Yes	Yes	No	PRB FEIS: 3-81, 4-135
Forest products	No	No	No	
Prime and Unique Farmland	No	No	No	
Invasive Species	Yes	Yes	No	PRB FEIS: 3-103-108, 4-153-172
Wetlands/Riparian	Yes	No	Yes	PRB FEIS: 4-117-124, 3-108-113, 4-172-178, 4-406
Special Designations				
Proposed ACEC	No	No	No	
Wild & Scenic River	No	No	No	PRB FEIS: 3-273

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Wilderness Characteristics/Citizen Proposed	No	No	No	
WSA	No	No	No	
Visual Resources				PRB FEIS: 3-252-263, 4-302-314, 4-403
Class II	No	No	No	
Class III	No	No	No	
Water				PRB FEIS: 3-1-56, 4-1-122, 4-135, 4-33, 4-405
Floodplains	No	No	No	
Ground water	Yes	Yes	Yes	PRB FEIS: 3-1-30, 4-1-69, 4-392, 4-405
Surface water	Yes	Yes	Yes	PRB FEIS: 4-85-86, 4-117-124, 3-36-56. 4-69-122, 4-393, 4-405
Drinking water	Yes	Yes	Yes	PRB FEIS: 3-52, 4-50-52
Wildland Urban Interface				
Waste Management	Yes	Yes	Yes	
Wildlife				PRB FEIS: 3-113-153, 4-179, 4-247, 4-397
ESA listed, proposed, or candidate species	Yes	Yes	Yes	PRB FEIS:4-251 - 4-273
BLM sensitive species	Yes	Yes	Yes	PRB FEIS: 4-257-265
General wildlife	Yes	Yes	Yes	PRB FEIS: 4-179-249
West Nile virus potential	No	No	No	

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.	No	No	No	4-251, BA & BO
Blowout penstemon	Sparsely vegetated, shifting sand dunes	No	No	No	Not in FEIS
Threatened					
Ute ladies'-tresses orchid	Areas with appropriate hydrology	No	No	No	4-253, BA & BO

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?
Proposed					
Mountain plover	Short-grass prairie with slopes < 5%	No	No	No	4-254, 4-255 & BA
Candidate					
Greater sage-grouse	Basin-prairie shrub, mountain-foothill shrub	*Expected*	*Yes*	*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.	No	No	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.	No	No	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	No	No	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.	No	No	No	No
Bald eagle	Mature forest cover often within one mile of large water body with reliable prey source nearby.	No	No	No	4-251 to 4-253 & BA
Brewer's sparrow	Sagebrush shrubland	Expected	Habitat	No	
Ferruginous hawk	Basin-prairie shrub, grasslands, rock outcrops	Yes	Yes	Yes	Site-specific
Loggerhead shrike	Basin-prairie shrub, mountain-foothill shrub	Expected	Habitat	No	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?
Long-billed curlew	Grasslands, plains, foothills, wet meadows	No	No	No	No
Northern goshawk	Conifer and deciduous forests	No	No	No	No
Peregrine falcon	Cliffs	No	No	No	No
Sage sparrow	Basin-prairie shrub, mountain-foothill shrub	No	No	No	No
Sage thrasher	Basin-prairie shrub, mountain-foothill shrub	Expected	Habitat	No	No
Trumpeter swan	Lakes, ponds, rivers	No	No	No	No
Western Burrowing owl	Grasslands, basin-prairie shrub	No	No	No	No
White-faced ibis	Marshes, wet meadows	No	No	No	No
Yellow-billed cuckoo	Open woodlands, streamside willow and alder groves	No	No	No	No
Mammals					**4-264 &4-265**
Black-tailed prairie dog	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	Yes	Yes	No	4-255, 4-256
Fringed myotis	Conifer forests, woodland chaparral, caves and mines	No	No	No	No
Long-eared myotis	Conifer and deciduous forest, caves and mines	No	No	No	No
Spotted bat	Cliffs over perennial water.	No	No	No	No
Swift fox	Grasslands	Uncertain	Uncertain	No	No
Townsend's big-eared bat	Caves and mines.	No	No	No	No
Plants					**4-258**
Limber pine	Mountains, associated with high elevation conifer species	No	No	No	No
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	No	No	No	No
William's wafer parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	No	No	No	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	Yes	Incremental	No	4-181 to 4-215
Aquatics	No	No	No	4-235 to 4-249
Migratory Birds	Yes	Yes	No	4-231 to 4-235
Raptors	Yes	Yes	Yes	4-216 to 4-221
Plains Sharp-tailed Grouse	No	No	No	4-221 to 4-226