DECISION RECORD
FOR
Anadarko
Dry Willow Phase V
ENVIRONMENTAL ASSESSMENT –WY-070-10-186

DECISION:
BLM's decision is to approve Anadarko's Dry Willow Phase V Coal Bed Natural Gas (CBNG) POD Alternative B of the attached Environmental Assessment (EA) as modified below. Alternative B is the Modified Proposed Action, and is the result of collaboration between the Bureau of Land Management and Anadarko. 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, pp. 10-13.

Well Sites:
The following 27 Applications for Permit to Drill (APDs) and associated infrastructure are authorized:

No.	Well Name	Well No.	Qtr/Qtr	Sec.	Twn	Rng	Lease No.
1	T-Chair Fed	4376 3-33	NW/SE	03	43N	76W	WYW-144531
2	T-Chair Fed	4376 25-12	SW/NW	25	43N	76W	WYW-153076
3	T-Chair Fed	4376 25-14	SW/SW	25	43N	76W	WYW-153076
4	T-Chair Fed	4376 25-21	NE/NW	25	43N	76W	WYW-153076
5	T-Chair Fed	4376 25-23	NE/SW	25	43N	76W	WYW-153076
6	T-Chair Fed	4376 25-32	SW/NE	25	43N	76W	WYW-153076
7	T-Chair Fed	4376 26-12	SW/NW	26	43N	76W	WYW-147320
8	T-Chair Fed	4376 26-14	SW/SW	26	43N	76W	WYW-147320
9	T-Chair Fed	4376 26-23	NE/SW	26	43N	76W	WYW-147320
10	T-Chair Fed	4376 26-34	SW/SE	26	43N	76W	WYW-147320
11	Dry Fork Fed	4376 29-31	NW/NE	29	43N	76W	WYW-147320
12	Dry Fork Fed	4376 29-32	SW/NE	29	43N	76W	WYW-147320
13	Dry Fork Fed	4376 29-34	SW/SE	29	43N	76W	WYW-147320
14	Dry Fork Fed	4376 29-43	NE/SE	29	43N	76W	WYW-147320
15	Iberlin Ranch Fed	4376 32-34	SW/SE	32	43N	76W	WYW-147320
16	Iberlin Ranch Fed	4376 32-43	NE/SE	32	43N	76W	WYW-147320
17	Iberlin Ranch Fed	4376 33-21	NE/NW	33	43N	76W	WYW-147320
18	Iberlin Ranch Fed	4376 33-41	NE/NE	33	43N	76W	WYW-147320
19	Iberlin Ranch Fed	4376 34-12	SW/NW	34	43N	76W	WYW-144532
20	Iberlin Ranch Fed	4376 34-21	NE/NW	34	43N	76W	WYW-144532
21	Iberlin Ranch Fed	4376 34-41	NE/NE	34	43N	76W	WYW-144532
22	Iberlin Ranch Fed	4376 35-12	SW/NW	35	43N	76W	WYW-147320
23	T-Chair Fed	4376 35-21	NE/NW	35	43N	76W	WYW-147320
24	T-Chair Fed	4376 35-41	NE/NE	35	43N	76W	WYW-147320
25	Christensen Fed	4476 27-12	SW/NW	27	44N	76W	WYW-130098
26	Christensen Fed	4476 27-21	NE/NW	27	44N	76W	WYW-130098
27	Christensen Fed	4476 27-32	SW/NE	27	44N	76W	WYW-130098

Water Management:
Water Management SDI Proposal: The T-Chair SDI water management surge pond and pump facility were proposed for use in association with this POD and are authorized to receive federally produced water:

No.	FACILITY	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	T-Chair SDI	NWNWNW	35	43N	43W	13.50	1 acre	WYW-147320

Water Management SDI Fields Proposal (WYDEQ Permit Number UIC 09-102): The following eight SDI fields were proposed for use in association with this POD and are deferred pending cultural testing.

	Field Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	1	SWNESE	25	43N	76W	NA	62.2	NA
2	2	NESENW	25	43N	76W	NA	74.6	NA
3	3	NWSENE	26	43N	76W	NA	27.6	NA
4	4	NESENW	27	43N	76W	NA	33.2	NA
5	5	NENESE	27	43N	76W	NA	52.2	NA
6	6	SWNENW	35	43N	76W	NA	67.1	NA
7	7	NWSWNE	35	43N	76W	NA	42.2	NA
8	8	NWSESE	35	43N	76W	NA	57.8	NA

Water Management Midwest Injection Facility (WYDEQ Permit Number UIC 05-231). The following existing pump facility and existing injection wells were proposed for use in association with this POD and are authorized to receive federally produced water.

	Injection Well	Qtr/Qtr	Sec	TWP	RNG	Capacity bbl/day	Surface Disturbance (Acres)	Lease #
1	10MADSW13	NESW	13	40N	79W	60,000	NA	NA
2	15MADNW13	NENE	13	40N	79W	60,000	NA	NA
3	20MADSW12	SWSW	12	40N	79W	60,000	NA	NA
4	29MADNW12	SWNW	12	40N	79W	60,000	NA	NA
5	6MADNW12	NWNW	12	40N	79W	60,000	NA	NA

Denials:
The following 11 APDs and associated infrastructure are denied:

No.	Well Name	Well No.	Issue/Justification
1	T-Chair Fed	4376 25-34	Golden Eagle Nest within ½ mile and road in line of sight. Well. Well and engineered road and utility corridor have poor site suitability and poor reclamation potential. To alleviate impacts to soils and eliminate the risk of pad failure caused by peak flow events or loss of circulation during drill this well and associated infrastructure is denied.
2	Iberlin Ranch Fed	4376 32-14	Golden Eagle nest in line of site. Well location has poor sight suitability and high probability of irrecoverable soil loss down steep side slopes and into a sandy blow-out adjacent to the well fill slopes. To alleviate impacts to the soils this well and associated infrastructure is denied.
3	Iberlin Ranch Fed	4376 32-23	Golden Eagle nest in line of sight.
4	Iberlin Ranch Fed	4776 33-12	Direct Sage-Grouse Habitat Loss within a ¼ mile of Cottonwood Creek lek.
5	Iberlin Ranch Fed	4376 34-32	Raptor Nest within a ¼ mile. Well location has poor site suitability with the access road removing rock outcrops. To alleviate impacts to the soils this well and associated infrastructure is denied.
6	Iberlin Ranch Fed	4376 35-14	Road access in center of Cottonwood Creek 3 lek
7	T-Chair Fed	4376 35-32	Well view of raptor nest.
8	Iberlin Ranch Fed	4376 33-32	Perimeter of lek not mapped.
9	T-Chair Fed	4376 35-23	Road access under raptor nest.
10	T-Chair Fed	4376 35-34	Road access under raptor nest.
11	T-Chair Fed	4376 35-43	Road access under raptor nest.

Operator Committed Measures:
The operator has incorporated several measures to alleviate resource impacts into the Master Surface Use Plan (MSUP), submitted on May 25, 2010. Refer to the MSUP and the Wildlife Mitigation tab 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 the attached COA document.

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

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).

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

   - Offer water well agreements to the owners of record for permitted water wells within ½ mile of a federal CBNG producing well in the POD.

   - Provide water analysis from a designated reference well in each coal zone.

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

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

4. It is in the public interest to approve these wells, as this development will help meet the nation's energy needs, and will help to stimulate local economies by maintaining workforce stability.

5. The selected alternative incorporates appropriate local greater sage-grouse research and the best available science from across the species' range in development of the attached conditions of approval.

6. Mitigation measures were selected to alleviate environmental impacts and meet 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 section Site Specific section of the COA document attached to this EA.

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

Field Manager: _____ Date: 8/12/2010

FINDING OF NO SIGNIFICANT IMPACT
FOR
Anadarko
Dry Willow Phase V
ENVIRONMENTAL ASSESSMENT –WY-070-10-186

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 EIS to which the EA is tiered; (2) Alternative B is in conformance with the Buffalo Field Office Resource Management Plan (1985, 2001); 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. 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. Design features and mitigation measures have been included within Alternative B to prevent significant adverse environmental effects.

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. No species listed under the Endangered Species Act or their designated critical habitat will be adversely affected. The selected alternative will not have any anticipated effects that would threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Field Manager: _____ Date: 8/12/10

BUREAU OF LAND MANAGEMENT
BUFFALO FIELD OFFICE
ENVIRONMENTAL ASSESSMENT (EA)
FOR
Anadarko
Dry Willow Phase V
PLAN OF DEVELOPMENT
WY-070-10-186

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

Anadarko submitted the Dry Willow Phase V December 29, 2008 with a total of 38 APD's. Due to the complexity of the issues presented by this project, there were several stages of onsites and negotiation between the BLM and Anadarko and landowners:

- February 17, March 4, and 5, 2010: Initial project onsites on Iberlin Ranch.
- March 17, and 18: Initial onsites on T-Chair Ranch and Christiansen Ranch.
- March 30, 2010: Additional onsite of template and engineered roads on T-Chair Ranch to review re-route of road to well 4376 35-43, well 4376 25-34 and main access route in township 43 Range 76W section 24.
- April 9, and 21, 2010: Planning meetings at BLM with Bene Terra, Anadarko and T-Chair Ranch.
- May 5, 2010: Anadarko submitted the following to BLM for review:
    - Pad Designs
    - Road Designs
    - Line Diagrams
    - Maps A, B, C, D
    - Well List & Lease reference
    - Master Geological Prognosis
    - Surface Use Plan
    - Master Drilling Plan
    - SUDS Form
    - Sample Rig Layout - Slot
    - Sample Rig Layout - Pad
    - Willcox Well Skid Beam Balanced Pump Jack Assembly Structural Dimensions
    - OIM Deficiency Response
    - Water Management Plan
    - Wildlife Mitigation Tab (new)
    - APD's, Plats
- June 8, 2010: Buffalo and District Office meet with Anadarko to discuss the items needed for NEPA analysis. At this meeting Anadarko informed BLM two water management strategies will be used for this project. Injection and SDI.

- June 23, and 24, 2010: Anadarko submit the following non-Onshore Order items to complete the project.
  - Wildlife COA Map
  - Self Certification statement (providing a copy of the MSUP to affected landowners)
- June 30, 2010: Anadarko submitted the following to BLM for review:
  - Revised sheet 4 for the road design set - updated culvert details (Knight Technologies)
  - KTI response letter to BLM (Knight Technologies)
  - Change index directing the file updates (Knight Technologies)
  - Interim Reclamation Agreement and description of water pipeline route to Dry Willow Pump Station.
- July 1, 2010: Anadarko submitted the following to BLM for review:
  - SDI Pond title sheet
  - SDI Pond Site Plan
  - SDI Pond Profiles (Option A)
- July 9, 2010: Anadarko submitted the following to BLM for review:
  - Proof of bonding for the T-Chair SDI surge pond.
  - Site specific reclamation plan for well # 33-21
- July 14, 2010: Anadarko submitted a site specific reclamation plan for well 25-34:
  - Pad Reclamation Plan
  - Proposed Reclamation Construction
  - Proposed Interim Reclamation Topography
  - Proposed Final Reclamation Topography
  - A custom Soil Resource Report for Campbell County Wyoming, Southern Part (USDA NRCS Publication).
- July 22, 2010: Anadarko submitted the following road revisions to BLM for review:
  - Road Line Diagrams
  - Road Line Diagram Plan Maps (North and South)
  - Road Text Report
  - Change Index (addition)
- August 6, 2010: Anadarko submitted the following revisions to the MSUP:
  - Pages 6 and 17 of the MSUP
  - Suds Form
  - Maps A, C, D
- August 11, 2010: Anadarko submitted a revised list of surface owners who will be affected by the project.
- August 12, 2010: Anadarko submitted certification that John Christianson was provided a copy of the MSUP.

There is a direct relationship between the Dry Willow Phase V Federal POD (DW5) and Dry Willow Phase I, II and IIIFederal PODs. The majority of the infrastructure for the wells in Dry Willow Phase V is routed along roads already approved in the Dry Willow Phase I, II and III Federal PODs.

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, all Onshore Orders, and The Mineral Leasing Act, as amended and supplemented, (30 U.S.C. 181 et seq.).

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, 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.

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.

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

The proposed action conforms to the terms and the conditions of the 1985 Buffalo RMP and the 2003 PRB FEIS.

1.4. Issues:

This EA addresses resources and resource uses with site-specific impacts that were not disclosed within the PRB FEIS. Appendix A identifies resources and land uses potentially 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. Issues for this project include sage-grouse , Golden Eagles, and other raptors, , cultural resources, soils, vegetation, water management, invasive species, minerals, and local economics.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Two alternatives, A and B were evaluated. A brief description of each alternative follows.

2.1. Alternative A

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

Alternative B contains complete APDs and 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 Anadarko on May 25, 2010.

Proposed Action Title/Type: Anadarko's Dry Willow Phase V Plan of Development (POD) for 38 coal bed natural gas well APD`s and associated infrastructure.

Proposed Well Information: There were 38 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 Big George coal seam. Proposed well house dimensions are 8.0 ft wide x 8.0 ft length x 8.0 ft height. Depending on the water production (typically when water production is less than 100 barrels per day) the use of pumping units may be more effective artificial lift method for continued dewatering the well as it matures. These pumping units have a maximum height of the 10.5 feet. The base is 9.5 ft length x 3.0 ft wide. Well house, pumping units, and all permanent above ground structures are painted Covert Green, selected to blend with the surrounding vegetation. The original proposed wells are located as follows:

No.	Well Name	Well No.	Qtr/Qtr	Sec.	Twn	Rng	Lease No.
1	T-Chair Fed	4376 3-34	SW/SE	03	43N	76W	WYW-144531
2	T-Chair Fed	4376 25-12	SW/NW	25	43N	76W	WYW-153076
3	T-Chair Fed	4376 25-14	SW/SW	25	43N	76W	WYW-153076
4	T-Chair Fed	4376 25-21	NE/NW	25	43N	76W	WYW-153076
5	T-Chair Fed	4376 25-23	NE/SW	25	43N	76W	WYW-153076
6	T-Chair Fed	4376 25-32	SW/NE	25	43N	76W	WYW-153076

No.	Well Name	Well No.	Qtr/Qtr	Sec.	Twn	Rng	Lease No.
7	T-Chair Fed	4376 25-34	SW/SE	25	43N	76W	WYW-153076
8	T-Chair Fed	4376 26-12	SW/NW	26	43N	76W	WYW-147320
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25	Iberlin Ranch Fed	4376 34-21	NE/NW	34	43N	76W	WYW-144532
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37	Christensen Fed	4476 27-21	NE/NW	27	44N	76W	WYW-130098
38	Christensen Fed	4476 27-32	SW/NE	27	44N	76W	WYW-130098

The following water management surge pond and pump facility were proposed for use in association with this POD.

	FACILITY	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	T-Chair SDI	NWNWNW	35	43N	43W	13.50	10 acres	WYW-147320

Water Management SDI Fields Proposal (WYDEQ Permit Number UIC 09-102): The following eight SDI fields were proposed for use in association with this POD.

	Field Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
1	1	SWNESE	25	43N	76W	NA	62.2	NA

	Field Number	Qtr/Qtr	Sec	TWP	RNG	Capacity (Acre Feet)	Surface Disturbance (Acres)	Lease #
2	2	NESENW	25	43N	76W	NA	74.6	NA
3	3	NWSENE	26	43N	76W	NA	27.6	NA
4	4	NESENW	27	43N	76W	NA	33.2	NA
5	5	NENESE	27	43N	76W	NA	52.2	NA
6	6	SWNENW	35	43N	76W	NA	67.1	NA
7	7	NWSWNE	35	43N	76W	NA	42.2	NA
8	8	NWSESE	35	43N	76W	NA	57.8	NA

Water Management Midwest Injection Facility (WYDEQ Permit Number UIC 05-231). The following existing pump facility and existing injection wells were proposed for use in association with this POD.

	Injection Well	Qtr/Qtr	Sec	TWP	RNG	Capacity bbl/day	Surface Disturbance (Acres)	Lease #
1	10MADSW13	NESW	13	40N	79W	60,000	NA	NA
2	15MADNW13	NENE	13	40N	79W	60,000	NA	NA
3	20MADSW12	SWSW	12	40N	79W	60,000	NA	NA
4	29MADNW12	SWNW	12	40N	79W	60,000	NA	NA
5	6MADNW12	NWNW	12	40N	79W	60,000	NA	NA

County: Johnson, Campbell

Applicant: Anadarko

Surface Owners: Mark Iberlin, Gene Mankin, Patricia Clark, and John Christiansen

Project Description:
The proposed action involves the following:

- Drilling of 38 federal CBM wells in Big George coal zones to depths of approximately 1600 feet. Eleven well pads are engineered; Eight slots; Nineteen well locations drilled on native ground.

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

- Well metering shall be accomplished by a combination of telemetry and well visitation. Metering would entail 2-3 visits per week during the summer and up to 4 visits per week during the winter to each well location.

- A Water Management Plan (WMP) that involves two water management strategies. Produced water may be used for sub-surface drip irrigation (SDI) and/or re-injected into the Madison aquifer in

Midwest, WY. SDI will involve the T-Chair SDI system facility near the confluence of Collins Draw and Cotton Wood Creek and sub surface irrigated fields on T-Chair Ranch. Eight new stock tanks on private surface will receive CBNG produced water.

- Seventeen culverts with drainage areas over 5 acres (See Table 2 WMP).
- Seven low water crossings on access roads (See Table 3 WMP).
- An existing and proposed improved road network.
- One 10.0 acre staging area which will also be used for the pump station for the Beneterra SDI water management system.
- A storage tank of 500 gallon capacity shall be located with each diesel generator. Generators are projected to be in operation for 24 months. Fuel deliveries are anticipated to be 2-3 times per week during the summer months and 4 times per week during the winter. Duration of a delivery is expected to range between 30 and 60 minutes. Noise level is expected to be 100.5 decibels at 1 meter distance.
- A buried gas, water and power line network, and one existing compression facility which may be fitted with additional compressors. If the power line network is not completed before the wells are in production, then temporary diesel generators shall be placed at the 15 power drops.

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 is also available in the PRB FEIS, Volume 1, pages 2-9 through 2-40 (January 2003).

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

2.2.1. Operator Committed Measures

The operator has incorporated several measures to alleviate resource impacts into the Master Surface Use Plan (MSUP), submitted on May 25, 2010. Refer to the MSUP and the Wildlife Mitigation tab for complete details of operator committed measures.

1. Establish early rapport with landowner and State and Federal agencies
2. Use existing disturbed areas for facilities
3. Plan pipeline route with consideration of other ROW and permitted uses
4. Consolidate utilities
5. Utilize buried power distribution lines in lieu of overhead electrical distribution
6. Obtain the necessary permits for the drilling, completion and production of these wells including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
7. Offer water well agreements to the owners of record for permitted water wells within 0.5 mile of a federal CBNG producing well in the POD
8. Provide water analysis from a designated reference well in each coal zone.
9. The Operator has certified that a Surface Use Agreement has been reached with the landowners.

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

1. Wells that were unable to be moved away from drainages and erosional features will receive stabilization and seeding within 45 days of receipt of spud notice (See Anadarko letter dated July 6, 2010 in MSUP). The following wells and roads will have interim reclamation or stabilization within 45 days of spud notice: T-Chair Fed 4376 25-34, T-Chair Fed 4376 26-12, Dry Fork Fed 4376 29-32, Iberlin Ranch Fed 4376 33-41, Iberlin Ranch Fed 4376 35-14 and Iberlin Ranch 4376 34-12.
2. The operator staked the well 4376 3-34 with a pad design in a sand blow-out with head cuts within the pad disturbance. At the onsite the 4376 3-34 was moved out of the sand blow-out where it became the 4376 3-33.
3. At the onsite the well 4376 33-21 was moved out of line of site of the raptor nest and 200 feet away from the sage-grouse lek center. Anadarko put together a site specific reclamation plan to increase the likely hood that reclamation can be obtained at this location. (See Anadarko letter dated July 9, 2010 Re: justification for the 33-21 well move).
4. The operator staked the well 4376 34-41 with an access road that was proposed through land forms with low reclamation potential. The access road would remove a 10-12 foot knoll that had slopes > 25% and little if any topsoil. Immediately below the pad location there were two head cuts. To reduce impacts to soils the well location and access road was moved to avoid the scoria knoll and head-cuts.
5. The operator staked the well 4376 34-12 on a tight location between to drainages. The pad was reshaped to provide 20 feet of vegetation buffer between toe of fill and top edge of drainage. Silt fence was added along all fill slopes and around top-soil pile.
6. For all wells spudded after November 1, the reserve pit fluids must be removed immediately following completion activities to avoid potential conflicts with raptor timing limitations and the standard COA that reserve pits be closed within 90 days, unless an exception is granted by the BLM Authorized Officer.
7. To minimize surface disturbance and vegetation removal:
    a. Primitive roads will be utilized throughout the project area. This has proven successful on Dry Willow Phase I-III.
    b. Improved roads with utility corridor working width will not exceed 50 feet with a clearing and blading not to exceed 40 feet in width unless a specific design is included in the plan and profile section of the master surface use plan.
    c. Pipeline installation and/or corridors without road access working width will not exceed 35 feet with clearing and blading not to exceed 20 feet.
    d. Mowing at the well site where a constructed pad is not approved as designed will be minimized to a diameter of 75 feet or less from the well stake.

2.2.2. BLM recommended the following design features that the operator did not accept:

1. 4376 32-43 BLM requested the operator propose shorter access route which would stay out of the ephemeral drainage: road is in critical seasonal habitat for sage-grouse brood rearing. This re-route would potentially remove the need for 3 low-water crossings, 5 culverts and 1 power drop in the drainage.
2. 4376 33-32 BLM requested the operator to map the perimeter of Cottonwood Creek 1 lek to determine the wells proximity to the ¼ mile CSU.
3. 4376 26-14 BLM petroleum engineers require a move of an additional 100 feet (total move 130 feet N) is necessary due to the safety concern of loss of circulation during drilling; Operator moved 51 feet north to allow for 75 feet of working room and minimize infringement on the SDI area. The BLM would agree that the 51 foot move would be adequate to address the safety concern.
4. 4376 35-23; 4376 35-34, and 4376 35-43 BLM asked operator to propose a route which utilizes an existing improved road from the south through section 2 of Township 42N Range 76W This request was made because the proposed resource does not adequately protect the natural resources and environmental quality (43CFR 3162.5-1). Specifically, the proposed road follows the ephemeral drainage and crosses the drainage six times in less than a ¾ mile; the road is in critical seasonal

habitat for sage-grouse brood rearing; the road is proposed under raptor nesting trees; the road does not follow existing road and creates unnecessary habitat fragmentation and surface disturbance; there is a better more direct road which crosses the drainage 1 time. Better route is already being proposed for use in other Federal PODs. This re-route would potentially remove the need for 3 low-water crossings, 6 culverts and 1 power drop in the drainage.

2.3. Summary of Alternatives

A summary of the infrastructure currently existing within the POD area (Alternative A), the infrastructure proposed by the operator (Alternative B), and the infrastructure recommended by the BLM (Alternative C) are presented below.

Table 2.1 Summary of the Alternatives

Figures 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	32	38
Well Locations Nonconstructed Constructed Slotted	32	38 19 (11.12 ac) 11 (8.95 ac) 8 (4.68 ac)
Conventional Wells	20	0
Gather/Metering Facilities Number of Facilities Acreage of Facilities		0
Compressors Number of Compressors	2	0
Number of Ancillary Facilities (Staging/Storage Areas)	1 13.8	1 10.0 ac
Acres (Miles) of Template/ Spot Upgrade Roads No Corridor With Corridor	119.87 ac	84.21 ac (3.84 miles) (10.43 miles)
Acres (Miles) of Engineered Roads with utilities corridor		5.48 ac (0.90 miles)
Acres (Miles) of Primitive Roads with utility corridor		27.70 ac (6.53 miles)
Miles of Buried Power No Corridor With Corridor		17.86 miles 0.0 miles 17.76 miles
Miles of Pipeline No Corridor With Corridor		21.34 miles 3.63 miles

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles
		17.76 miles
Miles of Overhead Powerlines		0.0
Number of Communication Sites	0	0
Number of Monitor Wells	0	5 0.5 ac
Number of SDI Pump Facilities	0	1 10 ac
Number of Lined Impoundments	0	1 1 ac
Number of SDI Fields	0	8 353 ac
TOTAL ACRES DISTURBANCE		**516.6**

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.

The following are not present in the project area and will not be further analyzed:

Areas of Critical Environmental Concern (ACECs)
Environmental Justice
Prime or Unique Farmlands
Flood Plains
Hazardous or Solid Wastes
Paleontology
Prime or Sole Source of Drinking Water
Wild and Scenic Rivers
Wilderness Values

Personnel attending the field inspections are also identified in section 5 Consultation and Coordination.

Applications to drill were received on December 29, 2008. Onsite visits were conducted in 2010 on February 17, March 4, 5, 17, 18, and 30 to evaluate the proposal and modify as necessary to reduce environmental impacts. BLM hand delivered a post-onsite deficiency on April 9, 2010. The project proposal and APDs were considered complete when BLM received the operator's response to the post onsite deficiencies on May 25, 2010. New proposed COA's were shared with the operator on April 9, 2010 through July 16, 2010. The entire list of COA's was shared with the operator on August 4, 2010.

The pre-approval onsite was conducted by the following BLM personnel:

- Seth Lambert, Archeologist
- Bill Ostheimer, Wildlife Biologist
- Donald Brewer, Wildlife Biologist
- Stacy Gunderson, Civil Engineer
- Travis Kern, Natural Resource Specialist, Hydrology

Representing the United States Fish and Wildlife Service

- Brad Rogers

Representing the operator:

- Ethan Jahnke
- Joy Kennedy
- Colt Rodeman
- Craig Knight
- Gretchen Romans
- Lanie Murray
- Patrick Smalley
- Clint Beaver

Landowners in attendance:

- Mark Iberlin
- Gene Mankin
- Patricia Clark
- John Christenson

3.1. Topographic Characteristics of Project Area

The Dry Willow Phase V project area is located approximately 40 miles south and west of Gillette, WY, in Campbell County and Johnson County.

Township 42 North, Range 76 West Sections 1, 2, 3, 5, and 6
Township 43 North, Range 76 West Sections 1,2,3,10,12,13,23,24,25,26,27,-28,29,31,32,33,34,35, and 36
Township 43 North, Range 75 West Sections 7, 18, and 30
Township 44 North, Range 76 West Sections 22, 26, and 27

The project area ranges in elevation from 4,600 to 5,000 above sea level. The topography varies from semi flat ridges and deeply incised draws and occasional rock outcropping. Willow Creek is an intermittent drainage that drains from east to west. Collins Draw, Seventeen Mile Creek and Cottonwood Creek are also ephemeral drainage and drain from southwest to northwest in the project area. Several more ephemeral draws, without names are found throughout the area.

The area falls within a 14-16 inch precipitation zone, with most of the precipitation falling during late winter and spring. Existing land practices in the area include livestock grazing, CBNG gas development, and conventional oil production.

3.2. Soils & Vegetation

Based on onsite inspections of Dry Willow Phase V and compliance inspections conducted by the BLM Authorized Officer on previously approved PODs (Dry Willow I, Dry Willow II, Dry Willow III) the project area is considered to have “good” reclamation potential and low erosion potential. Soil models indicate 2,700 acres (26 percent) of the project area has badlands, rock out crops and gullies.

3.2.1. Slope Hazard

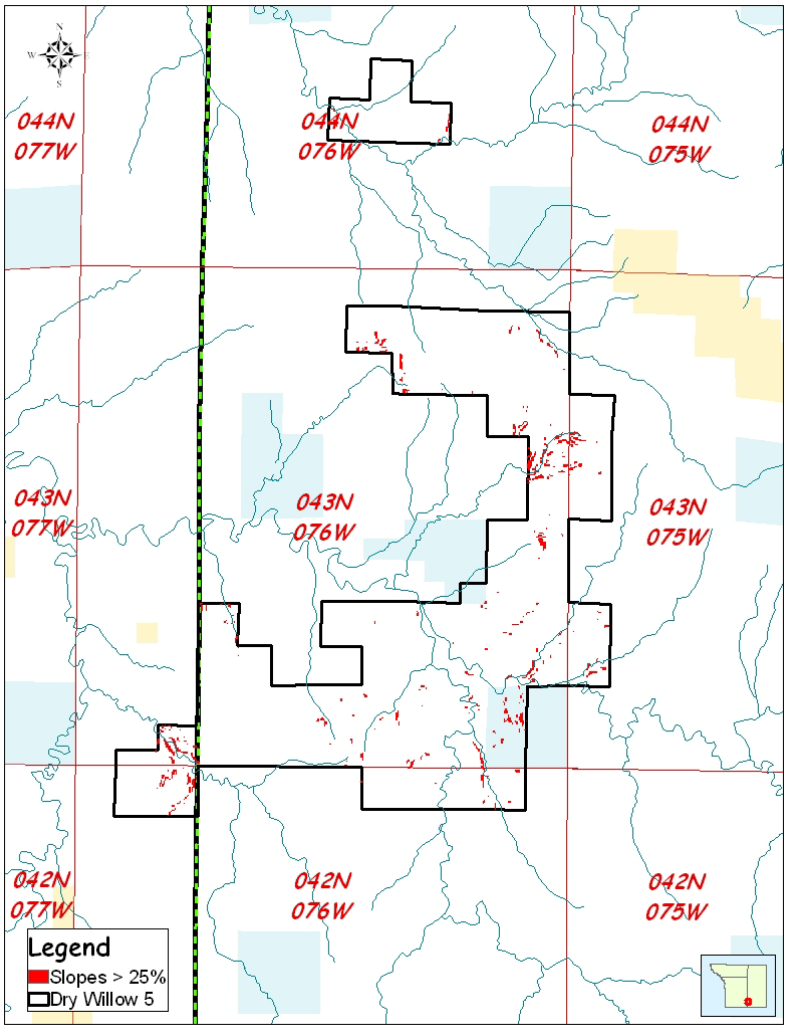
A soil's stability is greatly affected by the slope on which it occurs. In general, the greater the slope, the greater the potential for slumping, landslides and water erosion. Approximately 200 acres (2%) in the project area have slopes of 25% or more. Slopes greater than 25% are shown on Figure 3.4 below.

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. Soil types in the POD area with severe erosion potential, as defined by the Natural Resources Conservation Service (NRCS; USDA NRCS 2007), are listed in Tables 3.3 along with the number of acres and percentage of the project area.

Table 3.1 Percent Slope within the Dry Willow Phase V Project Area

% Slope	Acres	% of Project Area
0-24%	10,485	98%
Greater than or Equal to 25%	200	2%

Figure 3.4 Areas of Slopes Exceeding 25% within the Project Area



"Miscellaneous Areas"*, Badlands*:

This site occurs on steep slopes and ridge tops, but may occur on all slopes which include landforms such

as hillsides, ridges, and escarpments. Badlands have essentially no soil and support little or no vegetation. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badlands is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Table 3.2 Miscellaneous Areas within the POD Project Area

Miscellaneous Area	Acres	% of Project Area
Rock Outcrop, Badlands, Gullies	2,700	26

Loamy Sites:
This site occurs 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.

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

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

The present plant community is a *Mixed Sagebrush/Grass*. Compared to the HCPC, cheatgrass has invaded with western wheatgrass and thickspike wheatgrass maintaining at a similar or slightly higher level. Virtually all other cool-season mid-grasses are severely decreased. Blue grama is the same or slightly less than found in the HCPC. Plant diversity is low.

Dominant grasses identified include: prairie june grass, bluebunch wheatgrass, and downy brome grass. Other vegetative species identified at the onsite: Wyoming big sagebrush and prickly pear cactus.

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

Sandy Site:
This site occurs on nearly level to 50 percent slopes on landforms which include alluvial fans, hillsides, plateaus, ridges and stream terraces 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 or residuum derived from unspecified sandstone. These soils have moderate, moderately rapid or rapid permeability. The main soil limitations include low available water holding capacity, and high wind erosion potential.

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

The present plant community is a *Needleandthread/threadleaf sedge/Fringed sagewort* plant community.

Compared to the HCPC, prairie sandreed and Indian ricegrass have decreased. Threadleaf sedge, needleandthread and fringed sagewort have increased.

Dominant grasses identified include: needleandthread grass, prairie sandreed, bluebunch wheatgrass, and downy brome grass. Other vegetative species identified at onsite: prickly pear cactus, yucca, and Wyoming big sagebrush.

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

Table 3.3 Summary of Ecological sites

Ecological Site	Acres	Percent %
BADLANDS, ROCK OUTCROP, GULLIES	2,707	26
Clayey 10-14" Northern Plains	37	3
Loamy 10-14" Northern Plains	4,276	42
LOWLAND (10-14 NP)	316	3
SANDY (10-14 NP)	2,464	24
SHALLOW SANDY (10-14 NP)	249	2

3.2.2. Wetlands/Riparian

The northern section of the project area is drained by unnamed tributaries of Willow Creek and Cottonwood Creek. The southern portion is drained by Cottonwood Creek, Collins Draw and their unnamed tributaries. The southwest portion is drained by Seventeen Mile Creek and unnamed tributaries of Cottonwood Creek. The riparian areas (drainage bottoms) are dominated by tree and shrub which consist mainly of cottonwood trees with scattered salt cedar shrubs. The creek bottoms are relatively flat and lack continuous well-defined channels. No standing water, running water, or wetlands were observed in any of the inspected channel sections.

3.2.3. 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):

- Hoary Cress
- Russian knapweed
- Canada thistle
- Leafy Spurge
- Scotch Thistle
- Buffalo Bur
- Salt Cedar
- Common Cocklebur

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

- Cheat grass

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

3.3. Wildlife

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

Habitat assessments and wildlife inventories were performed by Wildlife Resources LLC (2009 and 2010) for mountain plover, sharp-tailed grouse, greater sage-grouse, raptor nests, and prairie dog colonies according to Powder River Basin Interagency Working Group (PRBIWG) accepted protocol. Surveys

were conducted for Ute ladies'-tresses orchid habitat. PRBIWG accepted protocol is available on the CBM Clearinghouse website (www.cbmclearinghouse.info).

WGFD is the agency responsible for management of wildlife populations in the state of Wyoming and 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 and Endangered and Sensitive Species

3.3.1.1. Threatened, Endangered, Proposed, and Candidate Species Worksheet

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct, Indirect or Cumulative Impacts Anticipated?	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	None	4-251 & BA
Blowout penstemon	Sparsely vegetated, shifting sand dunes	No	No	None	Not in FEIS
Threatened					
Ute ladies'-tresses orchid	Riparian areas with permanent water	No	No	None	4-253 & BA
Proposed					

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct, Indirect or Cumulative Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Candidate					
Greater sage-grouse	Basin-prairie shrub, mountain-foothill shrub	Yes	Yes	Yes	4-257 to 4-273

3.3.1.2. 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.

3.3.1.2.1. Black-footed ferret

The USFWS listed the black-footed ferret as Endangered on March 11, 1967. Active reintroduction efforts have reestablished populations in Mexico, Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. In 2004, the WGFD identified six prairie dog complexes (Arvada, Sheridan, Pleasantdale, Four Corners, Linch, Kaycee, and, Thunder Basin National Grasslands) partially or wholly within the BLM Buffalo Field Office administrative area as potential black-footed ferret reintroduction sites (Grenier et al. 2004). The Linch area intersects with the southwestern corner of the POD. USFWS has determined that black-footed ferrets do not occur in Wyoming outside of the Shirley Basin, and the species has been block cleared for the rest of the state.

This nocturnal predator is closely associated with prairie dogs, depending almost entirely upon them for its food. The ferret also uses old prairie dog burrows for dens. Current science indicates that a black-footed ferret population requires at least 1,000 acres of black-tailed prairie dog colonies for survival (USFWS 1989). The project area supports approximately 970 acres of prairie dog town in or adjacent to the project area.

3.3.1.2.2. Blowout Penstemon

Blowout penstemon is a regional endemic species of the Sand Hills of west central Nebraska and the northeastern Great Divide Basin in Carbon County, Wyoming. Suitable blowout penstemon habitat consists of sparsely vegetated, early successional, shifting sand dunes and blowout depressions created by wind (BLM 2005). In Wyoming, the habitat is typically found on sandy aprons or the lower half of steep sandy slopes deposited at the base of granitic or sedimentary mountains or ridges. Based on the onsite assessment conducted by the BLM wildlife biologist, the project area does not contain areas with these characteristics, and blowout penstemon is not expected to occur.

3.3.1.2.3. 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.

The PRB FEIS reported that only four orchid populations had been documented within Wyoming, but since the writing of that document, five additional sites were located in 2005 and one in 2006 (Heidel pers. comm.). The new locations were in the same drainages as the original populations, with two on the same tributary and within a few miles of an original location. Drainages with documented orchid populations include Wind Creek and Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in

Niobrara County. A WYNDD model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties.

According to BHEC (2009, 2010), no suitable habitat is present in the areas where infrastructure is proposed and Ute ladies'-tresses orchid is not expected to occur.

3.3.1.3. Candidate Species

3.3.1.3.1. Greater Sage-grouse

The affected environment for greater sage-grouse (herein referred to as sage-grouse) is discussed in the PRB FEIS (pg. 3-194 to 3-199). On March 23, 2010, the United States Fish & Wildlife Service (hereafter, USFWS) issued a proposed rule, finding that listing the greater sage-grouse as Threatened was warranted, but precluded by other listing priorities (USFWS 2010), and is considered a Candidate species.

In addition, the sage-grouse is listed as a BLM sensitive species, and a Wyoming Game and Fish Department Species of Greatest Conservation Need, with a rating of Native Sensitive Species 2. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action.

The best available science describing both the range-wide and Powder River Basin current status, habitat needs, threats, and projections for the species can be found in the USFWS Proposed Rule (USFWS 2010).

Of particular interest for the current status of greater sage-grouse as related to the project area are those

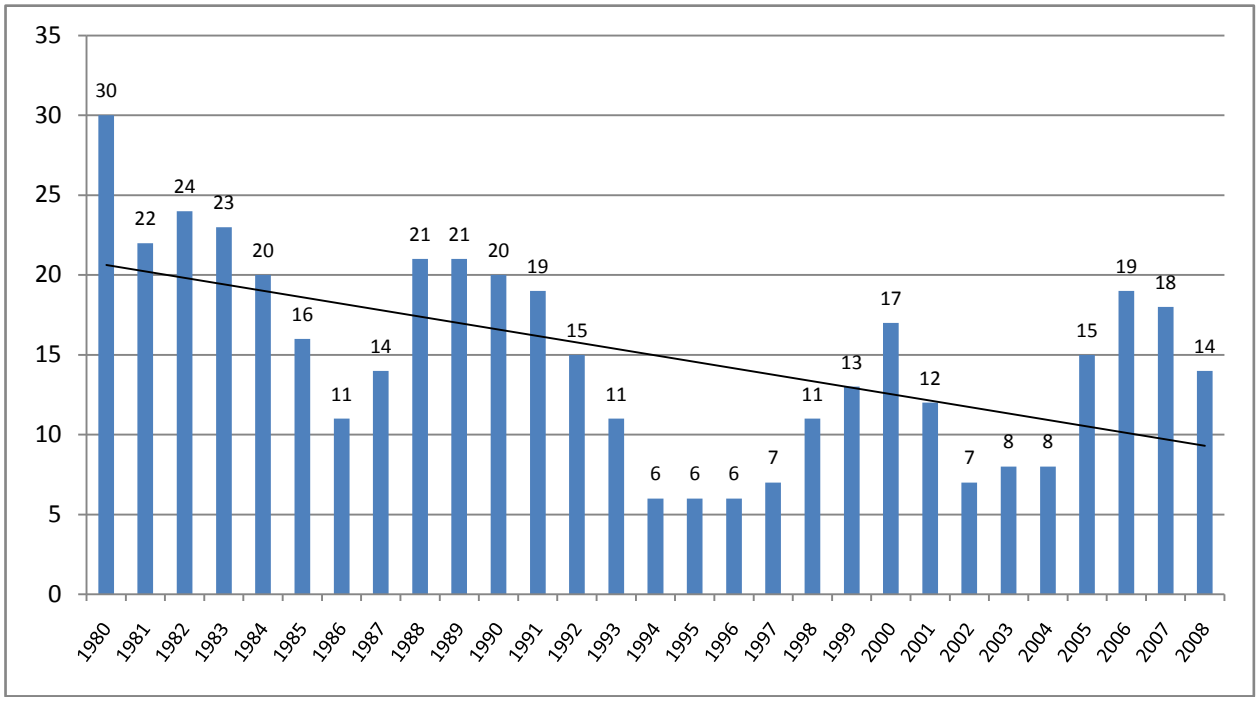
sections of the Proposed Rule that address habitat characteristics (p.13917), connectivity (p.13923-41392), energy development (p. 13942-13949), and projections of future populations (p. 13958-13961).

Powder River Basin

The Powder River Basin serves as a link between the Wyoming Basin and central Montana grouse populations. The Powder River Basin is in sage-grouse Management Zone 1, this management zone is predominantly grasslands and represents the periphery of sage-grouse distribution. In the Powder River Basin sagebrush is more heterogeneously distributed, and where found is at lower densities (less canopy cover), than it is in other management zones. In the context of habitat structural quality within the Powder River Basin, the project area contains quality habitat. The extent of oil and gas development in the project area has compromised habitat effectiveness.

The sage-grouse population within northeast Wyoming has been exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2008b). The following figure illustrates a ten-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that these declines may be a result, in part, of CBNG development in this region of Wyoming and that the leks within the project area are experiencing similar declines (USFWS 2010).

Figure 3.5 Average number of male sage-grouse per active lek within the WGFD Sheridan region, 1980-2007



Research has shown that declines in lek attendance are correlated with oil and gas development. In a typical landscape in the Powder River Basin, energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% percent (Walker et al. 2007). Several studies have shown that well density can be used as a metric for evaluating impacts to sage-grouse, as measured by declines in lek attendance (Braun et al. 2002, Holloran et al. 2005, and Walker et al. 2007).

These studies indicated that oil or gas development exceeding approximately one well pad per square mile, resulted in calculable impacts on breeding populations, as measured by the number of male sage-grouse attending leks (State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development 2008).

Declines in lek attendance associated with oil and gas development may be a result of a suite of factors; however, fragmentation of habitat is the predominant issue (USFWS 2010). The State of Wyoming has adopted a Core Area concept that protects the largest populations of sage-grouse. The BLM has adopted this concept and added Focus areas in the Buffalo Field Office Area to supplement the Core concept. Sage-grouse Core/Focus Areas assume those sufficient amounts of good quality sage-grouse habitat remains un-fragmented by energy or other man-made infrastructure. These basic concepts for management are based on the assumptions that sufficient "islands" of undisturbed (by human infrastructure) sage-grouse habitat would remain to sustain a large enough sage-grouse population for the long-term.

State-wide, Core Population areas are probably sufficient since they encompass approximately 70 percent of sage-grouse; however, in the Buffalo Field Office the Core Population/ Focus Areas capture approximately 25 percent of sage-grouse. To address this inadequacy of Core/Focus areas in the Powder River Basin, the BLM, in coordination with the State of Wyoming have identified areas (between Core areas in Wyoming and Montana) as Connectivity habitat. We believe the combination of Core/Focus areas and Connectivity habitat can maintain a viable greater sage-grouse population in the Powder River.

Project Area

There are 10,688 acres within the POD boundary. Modeled winter habitat covers approximately 40 % of the project area, split between the northern ¼ and southern ¼ of the POD. Sage-grouse nesting models were not available for the project area. Field surveys of the project area indicate that sagebrush cover ranged from sparse to moderately dense in rough to moderately rough terrain with ridges and draws or in rolling hills and flats cut by moderately steep draws. During the onsite visits, the BLM biologist noted that sagebrush stands near much of the proposed project elements were sparse. The majority of the project area (60-80%) can be described as suitable for sage-grouse. Nesting and brood-rearing habitats associated with the Windmill and Windmill NW leks and the Cottonwood Creek I and Cottonwood Creek III leks exhibited good to excellent vegetative structure.

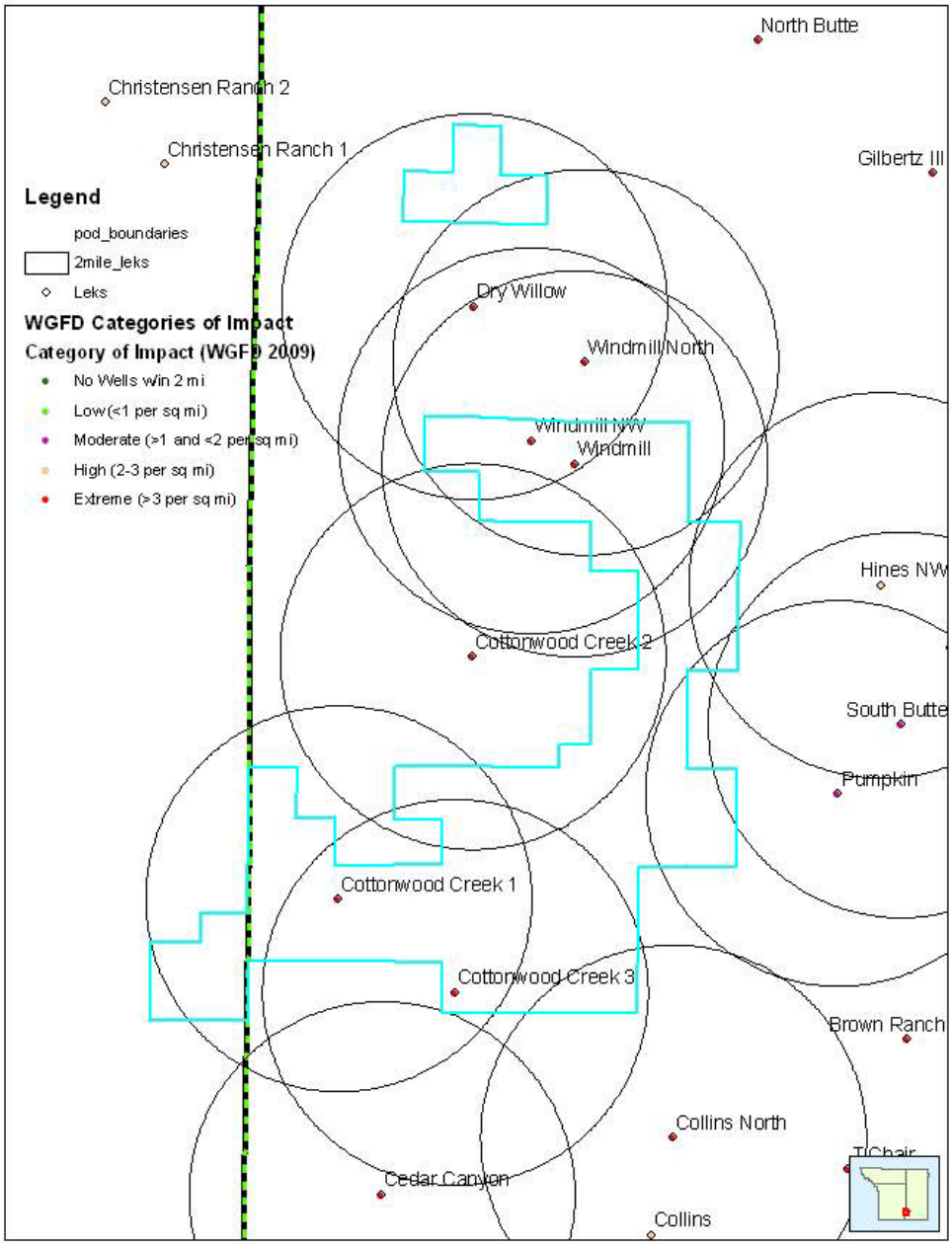
The project area is entirely within the highest WGFD population density classification; an area when combined with like areas around the State account for 65 percent of all breeding sage-grouse. This 65% population density classification was used to delineate Wyoming sage-grouse Core Areas. The project area was not included as Core or Connectivity because of the existing and planned oil and gas development. The closest Core area is 14 miles west of the project area. The USFWS considered 11.2 miles the metric for determining if leks were connected. Using that metric, the project area is not connected to Core/Focus/Connectivity areas. The BLM biologist informally coordinated with Wyoming Game and Fish and determined that formal comments were not warranted for this project because the project area is not important to connectivity. On June 28, 2010 the Wyoming Sage-grouse Implementation Team consolidated the recommendations from the eight local working groups to adjust Core area boundaries, connectivity, recommend procedures and guidelines for development, and identify research, inventory and habitat needs. Outside Core and connectivity habitats, the Implementation Team recommended less restrictions and greater flexibility; a 0.25 mile No Surface Occupancy and 2-mile timing limitation for leks, with the intention that those restrictions would not prevent population declines, but would allow some level of sage-grouse persistence. The Implementation Team also recommended stipulation waivers and enhanced permitting to encourage development outside Core and connectivity areas.

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.

There are eleven leks within two miles of the project. Of those eleven, Hines NW is considered highly impacted and Pumpkin is moderately impacted. The other nine leks are considered extremely impacted. Based on lek counts from 2009 and 2010 the sage-grouse population in the area has declined severely.

In addition to the extreme level of well development in the area, Cottonwood 1 lek has a compressor station located approximately 0.4 miles to the west. The noise from this compressor station has most likely rendered the nesting habitat around the station, and in particular between the lek and station, functionally unsuitable. Leks within two miles of the project are displayed on the following figure:

Figure below shows leks within two miles of the project:



3.3.1.4. Sensitive Species

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

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

The authority for the sensitive species policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the 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.

3.3.1.4.1. 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 identified in the Powder River Basin Oil and Gas Project Biological Opinion (PRB Oil & Gas Project BO), #WY07F0075) (USFWS 2007).

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 in need of conservation.

Habitat for bald eagles to nest or roost in winter is present within the project area along Collins Draw, Willow, Seventeen Mile, and Cottonwood Creeks. Bald eagle roost surveys found nine eagles on February 2, 2010 and five on December 4, 2009 in Dry Willow Creek along the section line between Sections 7 and 8, (T43N, R75W) approximately one mile from the project. There are currently seven non-federal wells within ½ mile of this roosting area. No bald eagle nests were found.

3.3.1.5. Big Game

The affected environment for pronghorn is discussed in the PRB FEIS on pp. 3-117 to 3-122 and for mule deer on pp. 3-127 to 3-132. Both pronghorn and mule deer were observed during field visits to the project area. WGFD data indicate that the project area is winter yearlong range for mule deer and pronghorn. 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. No crucial big game habitat is known to occur in the area. 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.

3.3.1.6. Migratory Birds

Migratory birds are those that migrate for the purpose of breeding and foraging at some point in the year. The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified three groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest. The primary vegetation throughout the project area is sagebrush grassland with cottonwood trees in draws. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds have declined more consistently in the last 30 years than any other ecological association of birds (WGFD 2009). Species that may occur in these vegetation types in northeast Wyoming, according to the Wyoming Bird Conservation Plan, are listed in Table 3.4 and are grouped by Level as identified in the Plan.

Table 3.4 High priority bird species that occur in the major vegetation type within the POD project area

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
	Ferruginous hawk	Yes
	Greater sage-grouse	Yes
	Long-billed curlew	Yes
	McCown's longspur	No
	Mountain plover	Yes
	Sage sparrow	Yes
	Short-eared owl	No
	Upland sandpiper	No
	Western burrowing owl	Yes
Level II	Black-chinned hummingbird	No
	Bobolink	No
	Chestnut-collared longspur	No
	Dickcissel	No
	Grasshopper sparrow	No
	Lark bunting	No
	Lark sparrow	No
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	No
Level III	Common poorwill	No
	Say's phoebe	No

Those known or suspected to occur in the project area are Brewer's sparrow, ferruginous hawk, mountain plover, burrowing owl, chestnut collared longspur, grasshopper sparrow, lark bunting, lark sparrow, loggerhead shrike, sage thrasher, vespers sparrow, and Say's phoebe. On 6/29/2010 the U.S. Fish and Wildlife Service reentered the mountain plover as proposed for threatened species listing under the Endangered Species Act. At the time the PRB FEIS was written, the mountain plover was proposed for listing. In 2003, the Service withdrew the proposal, finding that the population was larger than had been thought and was no longer declining. The affected environment for migratory birds is discussed in the PRB FEIS (pp. 3-150 to 3-153). This discussion includes a list of habitat requirements and foraging patterns for the species listed above, with the exception of upland sandpipers, common poorwills, and Say's phoebes, which are discussed here.

Upland sandpipers prefer Great Plains grasslands, dryland grass pastures, hayfields, and alfalfa fields.

They nest in grass-lined depressions in the ground and feed on insects and seeds on the ground where grasses are low and open. Common whippoorwill inhabit sparse, rocky sagebrush; open prairies; mountain-foothills shrublands; juniper woodlands; brushy, rocky canyons; and ponderosa pine woodlands. They prefer clearings, such as grassy meadows, riparian zones, and forest edges for foraging.

They lay eggs directly on gravelly ground, flat rock, or litter of woodland floor. Nests are often placed near logs, rocks, shrubs, or grass for some shade. They feed exclusively on insects, catching them by leaping from the ground or a perch, or picking them up from the ground. Say's phoebes inhabit arid, open country with sparse vegetation, including shrub-steppe, grasslands, shrublands, and juniper woodlands.

They nest on a variety of substrates such as cliff ledges, banks, bridges, eaves, and road culverts and often reuse nests in successive years. They eat mostly insects and berries.

3.3.1.7. Raptors

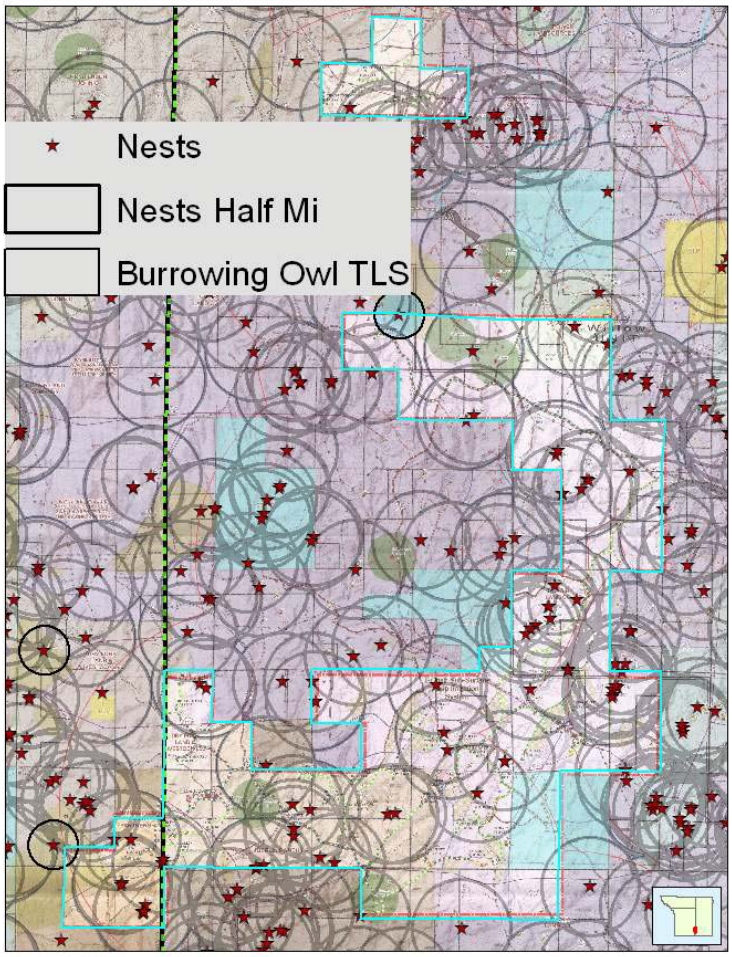
The affected environment for raptors is discussed in the PRB FEIS on pp. 3-141 to 3-148. Five raptor species are known to have used nests within one mile of the project area: Ferruginous hawk, golden eagle, red-tailed hawk, great-horned owl, and burrowing owl.

The affected environment for golden eagles is discussed in the PRB FEIS on pp. 3-145 to 3-146. Golden eagles are listed as a BCC by USFWS for Bird Conservation Region BCR Region 17, which encompasses the project area. BCCs are those species that represent USFWS's highest conservation priorities, outside of those that are already listed under ESA. The goal of identifying BCCs is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. Golden eagles were also identified as a Level III species in the Wyoming Bird Conservation Plan. Golden eagles are sensitive to extensive human activity around nest sites and are threatened by loss of nesting habitat to industrial development, powerline executions, and other factors (Nicholoff 2003). The WGFD Wyoming Bird Conservation Plan habitat objectives for golden eagles include maintaining open country to provide habitat for small mammals as a food source.

Recommendations for management include restricting human activities near nests during peak breeding season; protecting, enhancing, and restoring prey populations; and protecting known nesting territories.

One hundred and forty nine (149) raptor nest sites have been documented to occur within one mile of the project boundary. These nests are listed in the 2010 POD wildlife report (Wildlife Resources 2010). Of these nests listed, three red-tailed hawk nests were active in 2010. In 2009, ten red-tailed hawk nests, two great-horned owl nests, two golden eagle nests, and one long-eared owl nests were active (Wildlife Resources 2009).

Figure below - Raptor nests in the Dry Willow 5 POD area. The POD boundary is depicted in blue. The circles are ½ mile buffers around raptor nests and ¼ mile circles around burrowing owl nests.



3.4. West Nile Virus

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

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

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

Table 3.5 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Veterinary Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007*	155	22	Unk	1
2008*	10	0	0	0
2009*	10	1	0	Unk

*Wyoming Department of Health Records.

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

Although most of the attention has been focused on human health issues, WNv has had an impact on vertebrate wildlife populations. At a recent conference at the Smithsonian Environmental Research Center, scientists disclosed WNv had been detected in 157 bird species, horses, 16 other mammals, and alligators (Marra et al 2003). In the eastern US, avian populations have incurred very high mortality, particularly crows, jays and related species. Raptor species also appear to be highly susceptible to WNv. During 2003, 36 raptors were documented to have died from WNv in Wyoming including golden eagle, red-tailed hawk, ferruginous hawk, American kestrel, Cooper's hawk, northern goshawk, great-horned owl, prairie falcon, and Swainson's hawk (Cornish et al. 2003). Actual mortality is likely to be greater.

Population impacts of WNv on raptors are unknown at present. The Wyoming State Vet Lab determined 22 sage-grouse in one study project (90% of the study birds), succumbed to WNv in the PRB in 2003.

While birds infected with WNv have many of the same symptoms as infected humans, they appear to be more sensitive to the virus (Rinkes 2003).

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

The most common pesticide treatment is to place larvicidal briquettes in small standing water pools along drainages or every 100 feet along the shoreline of reservoirs and ponds. It is generally accepted that it is not necessary to place the briquettes in the main water body because wave action prevents this environment from being optimum mosquito breeding habitat. Follow-up treatment of adult mosquitoes with malathion may be needed every 3 to 4 days to control adults following application of larvicide

(Mooney, personal conversation). These treatment methods seem to be effective when focused on specific target areas, especially near communities, however they have not been applied over large areas nor have they been used to treat a wide range of potential mosquito breeding habitat such as that associated with CBNG development.

The WDEQ and the Wyoming Department of Health sent a letter to CBNG operators on June 30, 2004. The letter encouraged people employed in occupations that require extended periods of outdoor labor, be provided educational material by their employers about WNv to reduce the risk of WNv transmission.

The letter encouraged companies to contact either local Weed and Pest Districts or the Wyoming Department of Health for surface water treatment options.

3.5. Water Resources

The 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.

3.5.1. 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 109 registered stock and domestic water wells within 1mile of a federal CBNG producing well in the POD with depths ranging from 0 to 1,132 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.

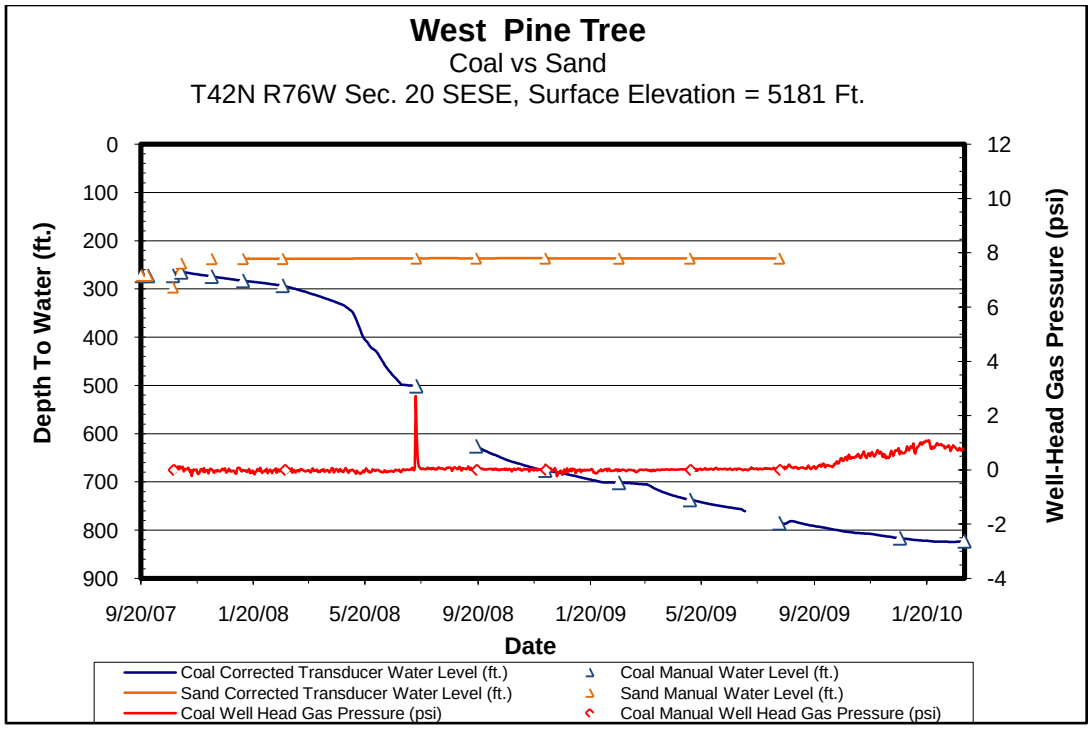
The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. The Buffalo Field Office has been monitoring coal zone pressures as expressed in depth to water from surface since the early 1990's in the PRB.

Table 3.6 Monitor Well in Big George Coal Zones near Dry Willow Phase 5

Monitor Well Name	QtrQtr	Sec	T N	R W	Distance from DW5 POD, (mi)	Total Depth, (ft)	Initial WL, ft depth from surface	Most Recent WL, ft depth from surface	Drilled by	Date Installed
West Pine Tree	SESE	20	42	76	3.4	1434	272	822	Devon Energy	9/20/2007

Dry Willow I-III approved federal wells and nearly 500 other federal, state and fee wells have been drilled in the vicinity of the project area. As a result, the target coal zone pressure may have been reduced through off set water production. The West Pine Tree groundwater monitoring well was installed Devon Energy as a part of the BLM deep groundwater monitoring program. The initial water level of the Big George coal, which is indicative of the pressure in the coal zone, was recorded at 272 feet below ground level. The most recent measurement, dated 3/1/2010 recorded the water level at 822 feet below ground level, for a decline of 550 feet since the well was completed. West Pine Tree monitor well is a developed and producing CBNG field. The West Pine Tree monitor well was installed at or near the time field began to produce water. About three months of base line water level for the water in the Big George was obtained at the initial reading of 272 ft. The water level in the sand zone has remained relatively constant at 236 ft.

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.



3.5.2. Surface Water/Wetlands/Riparian

The project area is within the Willow Creek and Cottonwood Creek drainages which are tributaries 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 near Arvada, WY, ID # 06317000 (PRB FEIS page 3-49).

The operator has not identified any natural springs within this POD boundary. However, according to the surface owners, there is a spring located in the NESE Sec. 14, T43N R76W. For more information regarding surface water, please refer to the PRB FEIS Chapter 3 Affected Environment pages 3-36 through 3-56.

3.6. 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 38 proposed wells in the Dry Willow Phase V 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 Dry Willow Phase V 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 Dry Willow Phase V 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 Dry Willow Phase V 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 Dry Willow Phase V project would also result in an increase in demand for goods and services from nearby communities.

3.7. Cultural Resources

Class III cultural resource inventory was performed for the Dry Willow 5 POD prior to on-the-ground project work (BFO project no. 70090046). 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.

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.

Sites 48JO134 (Bozeman Trail), 48CA1568 (Deadwood Road) and 48CA5494 (Ft. Fetterman to Ft. McKinney Telegraph Line) are eligible for the National Register. Contributing portions (typically expressed as wagon ruts) of each site are present in the project area. None of the contributing portions of the sites retain their integrity of setting due to modern additions to the landscape including CBM wells, upgraded roads, pipelines, reservoirs, POD buildings, compressor stations, etc.

Portions of the Dry Willow 5 project lie within 2 miles of the Pumpkin Buttes TCP (48CA268). Three wells (4476-27-12, 4476-27-21 and 4476-27-32) and their associated infrastructure are believed to have No Adverse effects on the setting of the Pumpkin Buttes TCP.

Table 3.7 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48CA268	Prehistoric	E
48CA1568	Historic	E
48CA1570	Historic	E
48CA4975	Historic	E
48CA6916	Prehistoric	E
48JO134	Historic	E
48JO2292	Historic	E

Site Number	Site Type	National Register Eligibility
48JO2293	Historic	E
48JO3059	Historic	E

3.8. Air Quality

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

Existing air pollutant emission sources within the region include following:

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

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

4. ENVIRONMENTAL CONSEQUENCES

For a discussion of Alternatives A and B environmental consequences see Powder River Basin Oil and Gas Project Final Environmental Impact Statement (WY–070–02–065). 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 B

4.1.1. Vegetation & Soils

4.1.1.1. 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 run-off characteristics.

- An important component of soils in Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type, are biological soil crusts, or cryptogamic soils that occupy ground area not covered with vascular plants. Biological soil crusts are important in maintaining soil stability, controlling erosion, fixing nitrogen, providing nutrients to vascular plants, increasing precipitation infiltration rates, and providing suitable seed beds (BLM 2003). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily disturbed or destroyed by surface disturbances associated with construction activities.

These impacts, 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.

Anadarko's project designers laid out Dry Willow Phase V with a focus on reclamation, avoidance of steep side slopes, and minimum foot print. Of the 38 proposed well locations within the project area, the operator has staked 35 wells in areas identified with "good" reclamation potential. Nineteen locations are to be drilled without a pad or a slot, 8 locations will be drilled with a slot design specified to be 30 ft x 120 ft, (0.10 acres) and 11 will be drilled on engineered pads with an average size of 150ft x 175ft (0.7 acres). There are 21.7 miles of new proposed access roads proposed within the project area. The operator has indicated that the average width of disturbance related to road construction is 50 feet. This would equate to approximately 117 acres of surface disturbance. Approximately 4 % of those roads propose to cross slopes that exceed 25%, while 96 % would be built in areas with "good" reclamation potential. Of the 21.7 miles of proposed roads, 0.9 miles require engineering, 7.0 miles will be maintained as primitive, and 9.9 miles are template designs. Many miles of the template roads utilize existing ranch roads or other oil and gas roads in the project area. These existing roads are being upgraded to template design to carry additional traffic or to facilitate the installation of larger water and gas lines. Primitive roads will be seeded over the entire surface, where as template and engineered roads would be seeded in the ditches.

The operator staked the well 4376 32-14 with a pad design that had cuts and fills located in a sand blow-out. Some of the fill of the pad was proposed over steep side slopes. The location was determined to have low reclamation potential due to the sand blow-out and yucca plants present across the pad area. The BLM ID team has identified the well 4376 32-14 to have poor site suitability and high probability of irrecoverable soil loss down steep side slopes and into a sandy blow-out adjacent to the well fill slopes. To alleviate impacts to the soils this well and associated infrastructure is recommended to be denied.

The operator staked the well 4376 25-34 within line of site and within a ¼ mile of a Golden Eagle nest. At the onsite the operator moved the well location just outside the ¼ mile biological buffer and over a

steep side slope to get out of line of site and away from the ¼ mile biological buffer. This new location has extreme erosion hazards and serious safety concerns due to a steep cliff immediately below the location. Anadarko submitted a site specific reclamation plan for the access road and the well pad to aid BLM in determining the feasibility of the well location. Because this well location is expected to be in use for about 5-15 years there is a high probability that soils from the fill portions of the pad will not be contained behind the 1.5 foot tall silt fence. These soils (including topsoil) will be irrecoverably lost into the ephemeral drainage. Topsoil is a key component for reclamation success and if lost to the drainage reclamation success is expected to be limited.

The well is proposed to be drilled 1,497 feet total depth (TD), which would result in a minimum of 149 feet of surface casing set (10 % of TD). Directly below the location is an ephemeral drainage and a cliff which is estimated to be 50-80 feet drop to the bottom of the drainage. Loss of circulation while drilling the well to set the surface casing would be an unnecessarily risky proposal with the well bore so close (approximately 100 ft) to where the 60 % side slopes begin to transition to the cliff wall. When the cliff was viewed from the drainage bottom there were signs of recent soil slumping where soil material was piled up in the drainage bottom and cliff walls were left with sheer vertical walls. The un-vegetated cliff face indicates an unstable land formation directly below the well location which is likely give way due to loss of circulation during drilling operations. Constructing an engineered well pad and roads on slopes that exceed 25 % with portions that exceed 60 % directly below an engineered pad presents serious safety concerns for BLM. Therefore, a BLM petroleum engineer reviewed the 4376 25-34 well location, drilling depth and the well bores proximity to the cliff. The engineered pad which is proposed does not offer much space to conduct safe drilling operations. The engineered pad is 103 feet at its widest point and narrows down to approximately 50 feet at the narrow portion.

Cut slopes for this engineered pad are proposed directly below a SDI field. These cut slopes will likely become the preferential flow path for water injected into the shallow soils. This water combined with the in-slope pad design is likely to saturate the land form which the pad is built on and compromise the ability of the pad to withstand heavy traffic. The BLM ID team has identified the well 4376 25-34 and engineered road and utility corridor to have poor site suitability, poor reclamation potential and a safety concern. To alleviate impacts to soils and eliminate the risk of pad failure caused by peak flow events or loss of circulation during drill this well and associated infrastructure is recommended to be denied.

The operator staked the well 4376 34-32 with an access road that was proposed through land forms with low reclamation potential. The access road would affect 2 areas of rock outcrops and impact minor slopes of 25% or greater. Reclamation success is dependent on soil stability and topsoil. These areas of rock outcrops had little if any topsoil present. This location was determined to have low reclamation potential due to the rock outcrops and yucca plants present in the rocky areas. The BLM ID team has identified the well 4376 34-32 to have poor site suitability with the access road removing rock outcrops. To alleviate impacts to the soils this well and associated infrastructure is recommended to be denied.

The operator staked the well 4376 32-43 at the end of a road which facilitated the access to two other proposed CBNG wells. The access came up the drainage bottom of an ephemeral drainage. Two of the wells which were part of the road layout are recommended to be denied due to other issues. A re-route should stay out of the ephemeral drainage, avoid critical seasonal habitat for sage-grouse brood rearing, potentially remove the need for 3 low-water crossings, 5 culverts and 1 power drop in the drainage, be direct and lessen the maintenance and reclamation requirements, decrease the sediment contribution to the drainage. BLM ID team recommends the well be denied.

BLM asked operator to propose a route to these three wells: 4376 35-23; 4376 35-34, and 4376 35-43 which utilizes an existing improved road from the south through section 2 of Township 42N Range 76W. This request was made because the proposed resource does not adequately protect the natural resources

and environmental quality (43CFR 3162.5-1). Specifically the road follows the ephemeral drainage and crosses the drainage six times in less than a ¾ mile; road is in critical seasonal habitat for sage-grouse brood rearing; road is proposed under raptor nesting trees; road does not follow existing road and creates unnecessary habitat fragmentation and surface disturbance; a better more direct road which crosses the drainage 1 time is already being proposed for use in other Federal PODs. A re-route would potentially remove the need for 3 low-water crossings, 6 culverts and 1 power drop in the drainage. BLM ID team recommends these wells be denied.

Direct effects to vegetation would occur from ground disturbance caused by construction of well pads, compressor stations, ancillary facilities, associated pipelines, roads and the conversion of native vegetation to rotational crop land in the SDI fields. 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, SDI fields or other semi-permanent facilities would result in loss of vegetation and prevent reclamation for the life of the project.

Sagebrush does not come back easily after human disturbance such as urban or agricultural development, or even after natural occurrences such as wildfire. It takes years, maybe lifetimes, for sagebrush to fully grow back. Sagebrush still hasn't returned to some areas of the Columbia Basin burned by a large fire 40 years ago (Pacific Northwest National Laboratory Shrub Steppe Ecology Series May 2010). Sage brush is not likely to come back in fields which were sub-irrigated due to the increased sodium concentrations in the root zone.

4.1.1.2. 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.

ISR uranium recovery at the Nichols Ranch ISR Project site lies within in the Dry Willow Phase V project vicinity. The ISR uranium recovery would entail the addition of the disturbance activities: Approximately 300 acres would be disturbed for construction of roads, facilities and well locations. Earth-moving activities associated with are nearly the same for those of CBNG projects. It involves construction of surface facilities, access roads, well fields, and pipelines and would include clearing of top soil and land grading. Drilling of wells and installation of pipelines will occur. Low levels of traffic generated by construction activities and daily operations when the project is operational would not significantly increase traffic or accidents on roads in the vicinity. However the addition of ISR uranium recovery project within the Dry Willow Phase V project vicinity will add to the cumulative effect of soil disturbances and may delay interim and final reclamation on some of the roads proposed for use in Dry Willow Phase V and the previously approved Dry Willow Phase I-III projects as well.

4.1.1.3. Mitigation Measures

The proponent planned their project to maximize the fluid mineral drainage while avoiding areas with soil limitation where possible. BLM made further recommendations during the onsite to avoid areas with low reclamation potential and poor site suitability. Disturbances approved within these areas require the programmatic/standard COA’s be complimented with adherence to the operator committed measures.
Impacts to soils and vegetation from surface disturbance will be reduced by following the BLM applied mitigation.

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.

4.1.1.4. 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.

These six wells which have expedited interim reclamation or stabilization required within 45 days of spud notice namely: T-Chair Fed 4376 25-34, T-Chair Fed 4376 26-12, Dry Fork Fed 4376 29-32, Iberlin Ranch Fed 4376 33-41, Iberlin Ranch Fed 4376 35-14 and Iberlin Ranch 4376 34-12 have very limited space on location for the construction of well pads. Most of these locations have head-cuts or drainages immediately next to cut and fill slopes. This expedited interim reclamation or stabilization and the installation of silt fence was BLMs and Anadarko's best effort to decrease the likelihood that soil will be irrecoverably lost in the drainage. Additionally, efforts were made to ensure an undisturbed vegetative buffer between the pad disturbance and head-cuts or edge of drainages. Despite these collaborative efforts there will inevitably be machine traffic which will crush vegetation near the edges of drainage and head-cuts while the pad is being constructed and/or when silt fence is being installed. Silt fence remains the only mechanical barrier between the fill slope and the drainage. Therefore, it can be assumed greater than normal soil losses may occur at these six locations if the silt fence cannot contain mass movement or sediment transport during storm events. These soil losses are expected to be permanent because more damage would occur to trying to retrieve the soil from the drainages.

See Ground Water Section 4.1.5.1 for the effects that elevated sodium concentrations have on plant growth.

4.1.2. Invasive Species

4.1.2.1. 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.

4.1.2.2. 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.

4.1.2.3. 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.

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.

4.1.2.4. 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.

4.1.3. Wildlife

In addition to the construction operation and maintenance of the CBNG field, the proposed action includes 353 acres of sub-surface drip irrigation fields, and the potential for pump-jacks and well-head compressors at each well.

Installation of the irrigation system would have similar impacts to wildlife as pipeline construction, and would occur outside the breeding season. Operation and maintenance of irrigation these fields will require human presence and activity on a yearlong basis. During the growing season (April – October), typical farming activities can be anticipated, planting of alfalfa, spraying weeds and pests, and cutting crops through the summer. Repair work on the irrigation system can be anticipated to occur, however the frequency and duration is unknown. Repair work would most likely entail a back-hoe or trencher.

Project design features included to minimize the impact to wildlife from the irrigation management were inspecting each field for its proximity to raptor nests and the presence of suitable sage-grouse habitat. The originally proposed fields were located mostly in blue gramma/prickly pear communities, and on the terraces above drainages where most raptor nests were found; however, BLM did recommend approximately 67.1 gross ac/37.5 irrigable ac be removed from the proposed project to protect either proximal raptor nests, or sage-grouse habitat.

Originally the DEQ permitted 419.9 acres (gross field boundaries) to be used in the SDI system. Beneterra estimated of those 419.9 acres 262.6 would be irrigable. BLM modified the gross field acreage from 419.9 acres down to 352.8 acres boundaries to protect nesting raptors and a Golden Eagle. The irrigable acreage after all changes were made to protect raptors and eliminate those fields which are not economically feasible amounts to 225.1 acres.

The excluded areas (67.1 gross ac/37.5 irrigable ac) were eliminated due to proximity of raptor nests and are located in sec. 25 SE, 30 W, and 35 E.

The excluded areas (approximately 40 gross ac/unknown irrigable ac) in the Sections 1 and 2 of Township 42N Range 76W were removed by Beneterra and the T-Chair landowners because they were too isolated from the project and not large enough to make them economical for water disposal.

Pump-jacks could negatively affect all wildlife species addressed in this EA. Typical CBNG well-heads are static (do not move) and are six feet high, the electrical panel can reach to 8-10 feet. A CBNG well-head with a pump-jack is approximately 12 feet high and the pump moves up to about 14 feet. Due to the added height and motion of the well, CBNG well locations with pump-jacks are much more visible than typical CBNG wells.

Well head compressors are either gas or electric powered engines which stand approximately eight feet. They are typically located on the well location. Well head compression could negatively affect all wildlife species addressed in this EA. Noise produced from the compressors could prevent wildlife from using otherwise suitable habitats adjacent to the wells.

Mitigation applied to the compressors to keep noise below 49 dBA at 150 feet. 150 feet represents average distance to the edge of a CBNG location. This restriction will limit the noise level in native habitats to at or below the level used for "sensitive receptors" as defined in the PRBFEIS.

4.1.3.1. Threatened, Endangered, Proposed and Candidate Species

4.1.3.1.1. Threatened and Endangered Species

Potential project effects on Threatened and Endangered Species were analyzed and a summary is provided in Table 4.1.

Table 4.1 Summary of Threatened and Endangered Species Habitat and Project Effects.

Common Name (scientific name)	Habitat	Project Effects for all alternatives	Rationale
Endangered			
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	NE	Species has been block cleared for this portion of the state.
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 will be impacted.
Project Effects **LAA** - Likely to adversely affect **NE** - No Effect **NLAA** - May Affect, not likely to adversely affect individuals or habitat.			

4.1.3.1.2. Candidate Species

4.1.3.1.2.1. Greater Sage-grouse

####### 4.1.3.1.2.1.1. 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). Energy impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with wells and infrastructure and was discussed in the affected environment.

The proposed action will impact approximately 575 acres of variously suitable sage-grouse habitat. This represents approximately 5 percent of the POD area. As a result of operator proposed measures and BLM imposed design features negotiated at the onsite, most of the wells and infrastructure do not remove sagebrush. Those project elements that do directly remove sagebrush include approximately 58 acres of sub-surface drip irrigation system (SDI) in section 25 (T43R76), the 33-32, 33-12, 25-32, 25-23, 35-14, 25-14 well locations and their associated infrastructure, and the 20 acres around the SDI pump station and

field in section 35 (T43R76). Of the 575 total acres in the Surface Use Data Summary Form, the SDI accounts for 353 acres. This acreage identified for SDI was reviewed in the field for sage-grouse habitat suitability and most (approximately 80%) was considered marginal habitat. The entire SDI acreage accounts for 3.3 percent of the POD area. The USFWS determined that sage-grouse become extirpated when agricultural tillage exceeds 25% of available sage-grouse habitat (USFWS 2010), well over the anticipated impacts from tillage in this project.

Farming in these SDI areas could be an adverse or beneficial impact for sage-grouse. The addition of what will essentially be 353 acres of wet, forb-filled meadows will undoubtedly attract grouse in the summer, particularly hens with broods. These fields can provide excellent foods for grouse through both forbs (alfalfa) and insects and therefore could improve the success rate for hens raising broods and increase brood sizes into the fall. The SDI fields could be detrimental to sage-grouse if haying occurs at times when grouse are in the fields and birds are killed by the swather. If the SDI fields produce *Culex tarsalis* mosquitoes, then sage-grouse may be exposed to higher levels of west Nile virus than they would without the irrigation.

Three wells and one new access route were proposed within ¼ mile lek CSU areas. The three wells, 33-12, 33-32, and 33-21 were all staked on the ¼ mile radius from the point used for the Cottonwood 1 lek. These wells would most certainly fall within the ¼ mile buffer of the Cottonwood 1 lek perimeter, if the lek perimeter were mapped as BLM requested in accordance with the January 4, 2010 Instruction Memorandum WY-2010-012. Although the Cottonwood 1 lek did not have any birds on it in 2010, the wildlife biologist that surveys this lek has surveyed it since 2005 and could have mapped the lek from memory.

The 33-12 well, as well as part of the access and pipeline, was staked exactly ¼ mile from the mapped point for the Cottonwood 1 lek. It is highly probably that if the lek perimeter were mapped as BLM requested, this well location, and portions of the pipeline and road, would be within the ¼ mile CSU. In addition, well # 33-12, its access, and its pipeline to the existing compressor station, would split a large (100 acre) patch of intact nesting habitat within ½ mile of the Cottonwood 1 lek. The removal and fragmentation of this habitat could prevent repatriation of this nesting area adjacent to the lek when the POD and compressor are removed. Based on inspections of past surface disturbance, such as pipelines in the area, construction of this well, access, and pipeline corridor would remove the habitat function for this habitat patch for probably 40-60 years. The BLM wildlife biologist recommended denial of this well.

The 33-32 well was staked exactly ¼ mile from the mapped point for the Cottonwood 1 lek. At the onsite the BLM wildlife biologist recommended mapping the lek perimeter. It is highly probable that if the lek perimeter were mapped, then this well location would be within the ¼ mile CSU and in view of the lek. The operator did not map the perimeter of the lek, therefore the wildlife biologist recommends denial of the well.

The 33-21 well was staked just over ¼ mile from the mapped point for the Cottonwood 1 lek. It is probable that if the lek perimeter was mapped, as BLM requested, then this well location would be within the ¼ mile CSU. Despite this proximity to the lek, the well is not in view of the lek, is along the existing crowned and ditched road, and is placed in a non-vegetated bowl. Given these conditions, the well will not unduly impact sage-grouse breeding or nesting.

The access to 35-14 was planned through the ¼ mile CSU for the Cottonwood Creek 3 lek. This well is also located 0.08 miles from a raptor nest. Timing limitations would protect the lek and raptor nest during the construction phase of the project. Routine operation and maintenance of the well once it is constructed will be required and will include the use of the access road and human presence in the area throughout the year. Once a well is constructed, the operation and maintenance activities required are not

subject to timing limitations. If the well and access were permitted, the access would remove the habitat function of nesting habitat adjacent to the lek for probably 40-60 years. The BLM wildlife biologist recommended denial of this access through the CSU.

Pump-jacks would greatly increase the visibility of well locations, add a moving element to the landscape, and approximately double the well height. Greater sage-grouse are adversely impacted by vertical structures in their environment. This has been documented in research of tree invasion and powerline placement into sage-grouse habitats (USFWS 2010 pp. 13928-9 and 13937). It is reasonable to predict that the area of avoidance around a well will increase with pump-jack placement. The USFWS and WGFD recently addressed letters to the Buffalo BLM expressing concern for use of pump-jacks to power CBNG wells. Their main concerns were the increased noise: "The noise from the operation of the pump jacks could exacerbate issues with lekking greater sage-grouse and breeding mountain plover." (USFWS 2009). The WGFD included movement as a concern: "We are also concerned with the noise and movement associated with the use of pump-jacks. Based upon our experience in other fields and published scientific literature, we believe their use could add yet another stressor to those already existing and have the potential to negatively affect sage-grouse." (WGFD 2009)

Well locations that would negatively affect sage-grouse with the addition of a pump-jack are those that are visible from leks: 25-21, 25-23, 25-32, 32-14, 33-21, 33-32; or are exposed to suitable nesting/brooding habitat; 3-33, 25-12, 25-14, 26-14, 33-41, 26-34, 27-12, 27-21, 27-32, 29-32, 29-34, 32-34, 32-43, 33-12, 34-12, 34-21, 34-41, 35-12, 35-41, 35-43.

4.1.3.1.2.1.2. 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 proposed project, there are approximately 516 proposed wells (Automated Fluid Minerals Support System [AFMSS]) within the cumulative effects analysis area. With the addition of these wells, well density would increase to 7.25 wells per square mile. With approval of Alternative B (38 proposed well locations) well density would increases to 7.3 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, 27 leks would exceed the WGFD threshold category for extreme impacts.

Based on the summary of research describing the impacts of energy development on sage-grouse, efforts to reduce habitat loss and fragmentation are likely to be the most effective in ensuring long-term lek persistence. Design features specifically included in the proposed action under Alternative B to minimize impacts to sage-grouse are listed earlier in this EA and can be found in the Plan of Development under Mitigation.

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. Specific analysis of pump-jacks and well-head compression at each well location was not included in the PRBFEIS. Impacts from noise are addressed on page 4-268 and habitat fragmentation on page 4-269.

4.1.3.1.2.1.3. Mitigation Measures

The BLM will require monitoring and adaptive management for West Nile Virus outbreaks that may be enabled by the SDI fields.

4.1.3.1.2.1.4. Residual Effects

The application of timing restrictions (March 1- June 15) has been ineffectual in preventing population declines in the Powder River Basin. 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).

This apparent need of the species for large undisturbed landscapes is currently incompatible with CBNG development. Despite application of design features and mitigation to minimize impacts, the proposed action will likely contribute to the extirpation of sage-grouse in the project area.

4.1.3.2. Sensitive Species

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

4.1.3.2.1. Bald Eagle

4.1.3.2.1.1. Direct and Indirect Effects

The proposed action is not anticipated to kill bald eagles or disrupt nesting. New overhead power constructed for the project by Powder River Energy Corporation will be constructed in accordance with their Avian Protection Plan, minimizing the risk of electrocution to a negligible level. Foraging and roosting eagles could be flushed from the project area as a result of project activities. A known roost is located in the approximately 0.9 miles from the POD boundary. Project construction or operations are not anticipated to impact eagles using the known roosting area in Dry Willow creek (on section line between sections 7 and 8) approximately 0.9 miles from the POD boundary.

4.1.3.2.1.2. Cumulative Effects

The cumulative effects for bald eagles associated with Alternative B are described in the PRB FEIS (pp. 4-251 to 4-253). Specific analysis of pump-jacks and well-head compression at each well location was not included in the PRBFEIS or past consultations.

4.1.3.2.1.3. Mitigation Measures

No mitigation measures are necessary for this project.

4.1.3.2.1.4. Residual Effects

Despite efforts to avoid impacts to bald eagles, coal bed natural gas development in general, and this project specifically, will require overhead power. Although overhead power is currently being

constructed with the best available information and technology to avoid electrocutions, some electrocution risk to bald eagles does exist.

4.1.3.2.2. Big Game

4.1.3.2.2.1. Direct and Indirect Effects

Impacts to big game are discussed in the PRB FEIS on pp. 4-181 to 4-215. As discussed in that document, impacts would occur through alterations in hunting and/or poaching, increased vehicle collisions, harassment and displacement, increased noise, increased dust, alterations in nutritional status and reproductive success, increased fragmentation, loss or degradation of habitats, reduction in habitat effectiveness. Alternative B would result in the loss of approximately 575 acres of big game habitat.

Impacts to pronghorn would also occur through addition of barbed wire fences on the landscape. Declines in all populations of big game species are expected to occur as a result of CBNG development. Big game would likely increase their avoidance behavior throughout the project area due to the fragmentation associated with the road distribution and well density. Pump-jacks and well-head compression will most likely increase the level of impact to big game from noise and fragmentation, making more than 575 acres unsuitable. Noise was address in the PRB FEIS on page 4-185. Habitat fragmentation from pump-jacks would displace deer and antelope further from well locations.

4.1.3.2.2.2. 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. Specific analysis of pump-jacks and well-head compression at each well location was not included in the PRBFEIS.

4.1.3.2.2.3. Mitigation Measures

Reducing the noise from well-head compressors to 49 dBA at 150 feet will avoid increased fragmentation at the well head. Prohibiting pump-jacks at locations for sage-grouse and raptors will eliminate the increase level of fragmentation to big-game at those locations.

4.1.3.2.2.4. Residual Impacts

None identified.

4.1.3.2.3. Migratory Birds

4.1.3.2.3.1. Direct and Indirect Effects

Direct and indirect effects to migratory birds are discussed in the PRB FEIS (pp. 4-231 to 4-235). Migratory birds, other than raptors which are discussed independently, likely to be impacted by the proposed project that are also BLM sensitive species are mountain plover, burrowing owl, Brewer's sparrow, sage thrasher, loggerhead shrike. 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). Well-head compression would negatively impact communications important to breeding and warning of predators.

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.

Pump-jacks and well-head compressors would increase the edge effect from well locations for species sensitive to movements and noise. Noise impacts to migratory birds are addressed in the PRBFEIS page 4-232. Those species with research that indicate negative effects from pump-jacks and well-head compressors include Brewer's sparrow (Ingelfinger 2004), mountain plover (Blickley and Patricelli 2007), and burrowing owl.

4.1.3.2.3.2. Cumulative Effects

Fragmentation of shrub steppe has the further potential to affect the conservation of sagebrush-obligate migratory species because of the permanence of disturbance (Knick and Rotenberry 1995). Several decades are required to reestablish ecologically functioning mature sagebrush communities. Migratory species dependent upon sagebrush may not recover for many years due to the loss and fragmentation of sagebrush in the project and surrounding areas from cumulative actions such as fee and state oil and gas development, uranium claims, permitted wind farms.

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS, with the exception of the potential for pump-jacks and well-head compression at each well location. The FEIS did not include either of these infrastructures in the proposed action. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-235. No additional mitigation measures are required.

4.1.3.2.3.3. Mitigation Measures

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, in this case the entire POD, nesting migratory birds are also protected. Restrictions placed on pump-jacks and compressors for sage-grouse and raptors will also provide protections to migratory birds.

4.1.3.2.3.4. Residual Effects

Those species and individuals that are still nesting when the sage-grouse timing limitations are over (June 15) may have nests destroyed, or be disturbed, by construction activities. Sage-grouse timing limitations will apply to the entire project. Protections around active raptor nests (Feb 1- July 31) extend past most migratory bird nesting seasons. Only a percentage of known nests are active any given year, so the protections for migratory birds from June 15-July 31 will depend on how many raptor nests area active.

4.1.3.2.4. Raptors

4.1.3.2.4.1. 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.

Golden eagle nest BLM ID 5492 is located 0.2 and 0.43 miles in view, from wells 32-14 and 32-23 respectively. Timing limitations would provide protection to the nest during the construction phase but once wells are constructed, operation and maintenance involving vehicle traffic and human presence is required throughout the year. Operations and maintenance of these wells has a strong potential to disrupt breeding and/or prevent future use of this nest. The BLM wildlife biologist recommended denial of these wells.

The raptor nest (probably red-tailed hawk, Wildlife Resources # IA243) in SWSW Section 35, T43R76, is located 0.1 miles from the 35-14 well. The well is out of view of the nest; however the proximity of the well to the nest makes it quite probable that operations and maintenance of the well would disrupt breeding and/or prevent future use of this nest. Maintenance actions such as pulling unit, tanks, or drill rig set up on the well, would not be subject to timing limitations and would be in view of this nest, and would probably disrupt breeding. Noise from operations and maintenance at the well could disrupt breeding. The BLM wildlife biologist recommended denial of this well

The golden eagle nest (Wildlife Resources # A102) in SWSE Section 25, T43R76, is 0.26 miles from the relocated 25-34 well. The original well location was 0.2 miles from this nest (which was found at the onsite). The proponent relocated the well out of view; however a 0.25 mile segment of the access road is in view and between 0.3 and 0.2 miles of the nest. Vehicle traffic during operation and maintenance on this proposed access route has a strong potential to disrupt breeding and/or prevent future use of this nest. The BLM wildlife biologist recommended denial of this well due to the access in view.

Raptor nest Wildlife Resources # IA135 is located in view and 0.16 miles from well 35-32. No alternative locations for the well were identified at the onsite or proposed later. The Collins Draw access for this and the 35-23, 35-34, 35-43 wells travel within 200 feet of the IA135 nest tree. The landowner indicated that haul trucks currently haul gravel on this road outside the raptor nesting season. Project operations and maintenance traffic along this road has a good probability to disrupt breeding and/or prevent future use of this nest. The BLM requested an alternative route be proposed for access to the35-23, 35-34, 35-43 wells. None was proposed; therefore the BLM biologist recommends denial of this access route.

The sub-drip irrigation field to the west of the IA135 nest was adjusted to be 0.2 miles away from this nest, which was assessed as an adequate biological buffer at the onsite. Nest BLM ID 642, a historic red-tailed nest location is directly adjacent to this sub-drip irrigation field. This nest was not found in 2009 or 2010. The tree may not be used (new nests built) for the duration of irrigation. The BLM wildlife

biologist recommended denial of this well, as well as denial of the access in Collins Draw to protect raptors using nest IA135.

At the onsite, a previously unknown nest was found approximately 250 feet from the 34-32 well. There were two additional known nests within ¼ mile. Operations and maintenance activities at the well are not restricted by a timing limitation and could disrupt breeding. The BLM wildlife biologist recommended denial of this well.

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

Well locations as proposed after on-sites could be fitted with pump-jacks and well-head compressors with minimal additional impacts to raptors. Wells were moved sufficiently to account for the added visual disturbance and height.

4.1.3.2.4.2. Cumulative Effects

The cumulative effects associated with Alternatives B are within the analysis parameters and impacts described in the PRB FEIS, with the exception of the potential for pump-jacks and well-head compression at each well location. For details on expected cumulative impacts, refer to the PRB FEIS, pg. 4-221.

4.1.3.2.4.3. Mitigation Measures

Surveys during the nesting season and application of timing restrictions for active nests will protect nesting raptors during drilling and construction.

4.1.3.2.4.4. Residual Impacts

Operations and maintenance are not subject to timing limitations and may impact the nests described above as vehicle traffic, human presence, and noise from .

4.1.4. West Nile Virus

4.1.4.1. Direct and Indirect Effects

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

4.1.4.2. Cumulative Effects

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

4.1.4.3. Mitigation Measures

There is no evidence that treatment, either through the use of larvicides or malithion, on a site specific or basin-wide scale will have any effect on the overall spread of the disease. The State agencies have not instituted state-wide treatment for mosquitoes due to WNv, nor are they requiring any mitigation specific to permitting for CBM operations. BLM will continue to consult with the State agencies and the researchers working in the area in order to stay abreast of the most current developments and any need to apply mitigation.

Local control of mosquitoes may keep a viral outbreak from impacting local sage-grouse populations.

Anadarko will monitor mosquito vectors and treat the SDI fields if the mosquito population warrants treatment.

4.1.5. Water Resources

The operator has submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices, monitoring of downstream impacts within the Cottonwood Creek and Collins Draw watersheds 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.

There are two water management strategies for handling federally produced water:
The Madison Injection Facility: 100 % of the water will be pumped north through a series of buried water line to the Dry Willow Pump station in Section 35 Township 44N Range 76W where it will be pumped through existing water line to an injection well. Midwest Injection wells are permitted to inject a maximum of 80,000 barrels per day per well (3.36 million gallons per day), or 400,000 barrels per day (16.8 million gallons per day) for the combined five well system.

The Beneterra T-Chair subsurface drip irrigation system (SDI): 90% of the CBNG water will be pumped to a pump facility located adjacent to Cotton wood Creek and Collins Draw ephemeral drainages in Campbell County, WY. These facilities will direct CBNG produced water to 8 SDI field where water will be injected into alluvium, colluvium and the Wasatch Formation at depths up to 10 feet. The system is designed to inject up to a capacity of 1.89 million gallons per day or 1,312 gpm. 10 % will still go the Madison injection facility. The Beneterra T-Chair subsurface drip system is deferred pending cultural findings.

Eight stock tanks on private surface will receive CBNG federally produced water.

The maximum water production is predicted to be 20.0 gpm per well or 760 gpm or 1,225.7 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 2% of the total volume projected for 2010. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.1.5.1. Groundwater

4.1.5.1.1. 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, where 90 percent of the produced water be directed to the T-Chair SDI system, and will be injected between 4 and 10 feet below the ground surface, it may be assumed that a maximum of 684 gpm will infiltrate at or near the SDI fields (1103.1 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.

ISR uranium recovery at the Nichols Ranch ISR Project site lies within in the Dry Willow Phase V project vicinity. This process requires large amounts of water to be pumped into formation which contains the uranium deposits. This process may which pumps water into the uranium bearing formation may create a problem for CBNG well development which requires water to be pumped out of the formation.

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 0 to 1,132compared to 1600 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 (1/2 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).

SDI systems are designed to utilize cations present in the soils to mitigate the impact of the quality of CBNG water on soils. The irrigation quality of the CBNG "produced water" and the variability of soils and the range in characteristics (RIC) of their physical and chemical properties within the project area, have the potential to cause long term soil impacts.

Literature review of soils and soil primary soil characterization lab data collected by the NRCS indicates a wide variability of the soils and their properties within the Powder River Basin. The variability of soils identified within the project area included in table # 3.3 Summary of Ecological sites in chapter 3 "affected environment". Variability or RIC of soil features and properties of the identified soils include:

- soil depth
- available water holding capacity
- saturated hydraulic conductivity
- amount, depth to base and the mineralogy of clays present
- highly variable chemical properties found in alluvial and colluvial soils within the Powder River Basin.

CBNG produced water has a moderate to high salinity hazard and often has a very high sodium hazard based on standards used for irrigation suitability. The sodium hazard of CBNG produced water may affect the soil resource. Sodic irrigation water causes dispersion of clays and clogging of soil pores thereby impairing soil hydraulic conductivity, affecting water availability and reducing soil aeration, all of which are important to long term soil health and productivity. Elevated sodium concentrations can harm some plants due to direct toxicity as they are taken up by the root cells. Sodium can also indirectly affect crop growth by causing calcium, potassium, and magnesium deficiencies.

With time, salts from CBNG water could accumulate in the root zone in concentrations that may affect plant growth and water utilization. Semi arid and arid climates create the potential for upward movement of salts into the root zone. Proper plant selection for deep rooted salt tolerance is important. Germination of these plant species may require special management practices to prevent negative impacts to soils.

With yearlong water disposal at volumes above the desirable leaching fraction, there is a potential for impacted water to affect shallow aquifers. The characteristics of the water impacting shallow ground water maybe very difficult to predict and model, from previous experience there is a potential for migration of low quality water to impact the subsurface environment.

Sites should be closely monitored to assure long term soil health and productivity is maintained. Specific soil chemical and physical property action levels should be established to ensure that the soil is not measurably impacted and that remedial actions can be implemented before soil damage occurs. These thresholds should be based on soil type, vegetation, water quality, soil and/or water amendments used, potential land use, beneficial use goals and landowner requests. Monitoring of the SDI fields should include an evaluation of soil chemical and physical properties, runoff and erosion, water quantity and quality, and vegetative performance

The long term impacts and mitigation success are unknown at this time. Impacts are subjective and not well defined and long term effects will depend on the success of applied soil amendments and intense monitoring, management and immediate site mitigation. Reclamation and mitigation practices maybe difficult to achieve and are expensive and are the sole responsibility of the operator, contractor and landowner.

4.1.5.1.2. 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).

4.1.5.1.3. 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 WDEQ has developed a guidance document, "Compliance Monitoring and Siting Requirements for Unlined Impoundments Receiving Coalbed Methane Produced Water" (November, 2008) which can be accessed on their web site. For all new WYPDES permits, the WDEQ requires that the proponent investigate the shallow groundwater at the proposed impoundment locations. Based on information received from the WDEQ, as of December 2009, approximately 2013 impoundment sites have been investigated with more than 2296 borings. Of these impoundments, 273 met the criteria to require “compliance monitoring” if constructed and used for CBNG water containment. Only 146 impoundments requiring monitoring are presently being used. As of the fourth quarter of 2009, only 21 of those monitored impoundments (14.4%) caused a change in the “Class of Use” of any parameter in the underlying aquifer water.

WYDEQ has required a 500 foot buffer around all SDI field to minimize the risk that water injected into the shallow soil layers will not find a preferential flow path and begin to flow into drainages.

4.1.5.1.4. Residual Effects

As described in Chapter 3.4.1, the production of CBNG in this project area has already removed some of the water saturation in the coal zones for the production of gas. With yearlong water disposal at volumes above the desirable leaching fraction, there is a potential for impacted water to affect shallow aquifers.

The characteristics of the water impacting shallow ground water maybe very difficult to predict and model, from our previous experience there is a potential for migration of low quality water to impact the subsurface environment. However, West Pine Tree Monitor well results do not indicate that there is a hydraulic connection between the Wasatch sands and the coal in this area. The extent of the current drawdown in the coal might imply that water production will be less than anticipated.

4.1.5.2. Surface Water/Wetland/Riparian

4.1.5.2.1. Direct and Indirect Effects

Produced Water Quality

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

Table 4.2 Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Sample location or Standard	TDS, mg/l	SAR	EC, μmhos/cm
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		
Upper Powder River Watershed at 06317000 Gauging station, Arvada, WY			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Water Quality Requirement for UIC Permit # 09-102, UIC Facility WYS-005-00564 T-Chair SDI At surge pond compliance point	5,000	No limit	No limit
WDEQ Water Quality Requirement for UIC Permit # 05-231, UIC Facility WYS-025-024 Midwest Injection wells (five).	5,000	No limit	No limit
Predicted Produced Water Quality Big George Coal Zone Reference Well	1,610	14.8	2,440

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 1610 mg/l TDS which is within the WDEQ criteria for agricultural use (2000 mg/l TDS).

Subsurface Drip Water Disposal

The T-Chair SDI and fields are considered a Class V injection well, DEQ permit number UIC 09-102 UIC facility number WYS-005-00564. The injectate will be sampled at the surge pond which is located in the NWNENW of section 35, Township 43 North, Range 76 West. There are eight irrigated fields (353 acres); each field is authorized through the DEQ as an injection well. The fields which will receive produced water via buried water lines are in Section 24, 25, 26, 27 and 35 of township 43 North Range 76 West, and Section 30 of Township 43 North, Range 75 West. (See Map C of the Water Management Plan). T-chair Subsurface Drip Irrigation System will include a lined off-channel surge pond. Five monitor wells were installed in the around the surge pond, all of which were used to characterize the groundwater. Water quality analyses indicate the groundwater beneath the proposed operation is a mixture of Class III and Class IV waters, although the findings were not disclosed. The ground water in the receiving formation shall be sampled semi-annually at the five monitor wells located around the facility. The upper permit limit for TDS is 10,000 milligrams /liter; yet the maximum TDS permitted to inject into each field is 5,000 milligrams /liter. Anadarko is authorized to inject 1.89 million gallons per day or 1,312 gpm. through the T-Chair SDI system. A 500 foot buffer around the field is required to allow visual inspection of ephemeral drainages adjacent to the fields for the purpose of monitoring for resurfacing of injected water.

Subsurface Drip Water Disposal - Design

The facility will have an approximate foot print of 300 feet x 800 feet including the pond and storage tanks, driving area. (See WMP Beneterra Dry Willow SDI Pond Design) The facility will have an electric pump of unknown horse power; there will be two tanks (6,500 gallons each) to store sulfuric acid. The tanks will have secondary containment to capture an accidental spill. The tanks will be refilled approximately every 10 days via tanker truck. To divert water away from the facility, a diversion ditch on the northwest side will be constructed. Reclamation bonding of the surge pond is required as it overlies federal mineral. The bond has been found to be adequate as prepared by Travis M. Evan, PE for Environmental & Civil Solutions. The bond amount is set at $62,470.00 (see WMP rider). Approximately 90 % of the water for Dry Willow Phase V would use the SDI water disposal method for growing a variety of alfalfa. Sage-brush and grasses will currently growing on these fields will be displaced by alfalfa.

Midwest Injection Well Water Disposal

The Midwest injection wells are authorized to inject into the Tensleep and Madison Formations. DEQ permit number UIC Permit # 05-231, UIC Facility WYS-025-024 Midwest Injection wells. The ground water in the Madison formation is classified as Class III because the groundwater in the Madison formation has total dissolved solid of 2,846 mg/L. The ground water in the Madison formation will be further classified by sampling the 20MADSW12 injection well. 20MADSW12 is one of 5 injection wells for which Anadarko has permission to inject into. The injectate cannot exceed 5,000 mg/L total dissolved solids. Midwest Injection wells are permitted to inject a maximum of 80,000 barrels per day per well (3.36 million gallons per day), or 400,000 barrels per day (16.8 million gallons per day) for the combined five well system. (See WMP UIC Permit # 05-231) Not much is known of the facility design as it was permitted through Wyoming State DEQ. Approximately 10 % of the water for Dry Willow Phase V would be piped to the Midwest injection well.

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 20.0 gallons per minute (gpm) is projected is to be produced from these 38 wells, for a total of 760 gpm for the POD. See Table 4.5.

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 included in this POD.

Produced Water Quantity
The PRB FEIS assumes that 15% of the impounded water will re-surface as channel flow (PRB FEIS pg 4-74). The assumption can be made for this project. It is predicted that 114 gpm will resurface in area drainages Assuming a conveyance loss of 20%, 91 gpm or 0.2 cfs will contribute to the mainstem of the Upper Powder River flow.

The predicted maximum discharge rate from these 38 wells is anticipated to be a total of 760 gpm or 1.69 cfs to SDI fields. Using an assumed conveyance loss of 20% (PRB FEIS pg 4-74) and full containment, the produced water re-surfacing in the Upper Powder River from this action may add a maximum 0.33 cfs to the flows, or 0.3 % 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).

The operator has committed to monitor the condition of channels and address any problems resulting from discharge. 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 main-stem of the of 68 cfs (PRB FEIS pg 4-86).

Springs/Wetlands/Riparian Areas
Re-surfacing water from the SDI fields will potentially allow for wetland-riparian species establishment. Continuous high stream flows into wetlands and riparian areas would change the composition of species and dynamics of the food web. The shallow groundwater table would rise closer to the surface with increased and continuous stream flows augmented by produced water discharges. Vegetation in riparian areas, such as cottonwood trees, that cannot tolerate year-round inundated root zones would die and would not be replaced. Other plant species in riparian areas and wetland edges that favor inundated root zones would flourish, thus changing the plant community composition and the associated animal species.

A rise in the shallow ground groundwater table would also influence the hydrology of wetlands by reducing or eliminating the seasonal drying periods that affect recruitment of plant species and species composition of benthic and water column invertebrates. These changes to the aquatic food web base would affect the higher trophic levels of fish and waterfowl abundance and species richness for wetlands and riparian areas." (PRB FEIS Page 4-175).

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).

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

In-channel downstream impacts are not addressed in the WMP for the Dry Willow Phase V POD prepared by WWC Engineering for Anadarko. It is assumed the sub-irrigated fields will be operated in a manor so that water does not enter the channels of any drainage.

4.1.5.2.2. Cumulative Effects

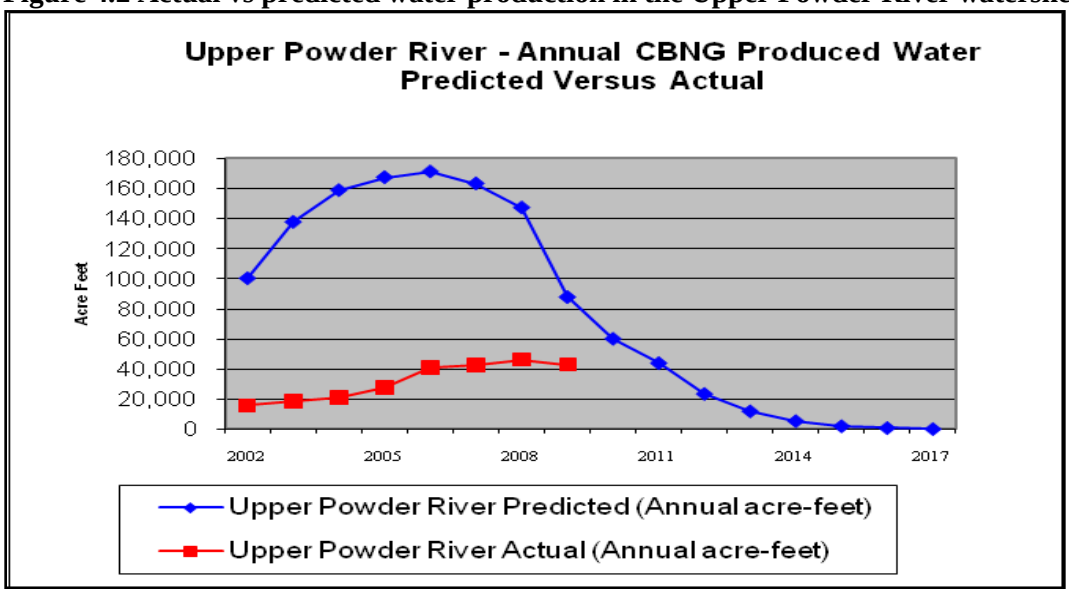
The analysis in this section includes cumulative data from Fee, State and Federal CBNG development in the watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

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 4.1 and Table 4.3 following. This volume is 22.5 % of the total predicted produced water analyzed in the PRB FEIS for the watershed.

Table 4.3 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 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.

4.1.5.2.3. 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 also committed to expediently stabilize and revegetate disturbance within channel and floodplain associated with this project.

4.1.5.2.4. Residual Effects

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).

4.1.6. Economics and Recovery of CBNG Resources

4.1.6.1. Direct and Indirect Effects

BLM petroleum engineers calculated the Original Gas in Place (OGIP) within the Dry Willow Phase V project area based on 80 acres spacing and a coal density of 1,742 ton/acre foot. Original Gas in Place in Million Cubic Feet of Gas is [acres*(ton of coal/acre ft.)*(thickness of coal in ft)*(gas content scf/ton of coal)]/1000000]. The gas content is determined by finding the depth of ground water for a nearby monitor well and calculated based to the depth of the coal to determine the gas content. Gas content is calculated [(Coal depth-ground water depth)* (.433*.71+(.496*well elevation)]. When added together, the OGIP for each coal seam is added together for that well to get the total gas in place.

There is the potential to recover 3,820 Million Cubic Feet of Gas (MMCF) of CBNG from the 38 potential wells within the Dry Willow Phase V POD. A total of 5 wells are being recommended to be denied due to impacts to sage-grouse habitat and raptors. The potential loss of gas is 691.2 MMCF of CBNG.

4.1.6.2. 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.

Assuming the surrounding wells are drilled at or near 80 acres spacing, there is the potential for 691.2 MMCFG of CBNG that will not be recovered as a result of selecting alternative B. Approximately 18% of the recoverable CBNG will remain in the formation.

4.1.6.3. Mitigation Measures

No additional mitigation measures are considered.

4.1.6.4. Residual Effects

Economics dictates the rate of recovery of the CBNG resource. At this time, the market price of CBNG is depressed due primarily to low demand as storage facilities are at capacity and infrastructure to transport the product from Wyoming to other markets does not exist. Many existing CBNG wells within the PRB are currently shut in reducing the rate of CBNG recovery. It is uncertain at this time when the market price of CBNG will increase.

4.1.7. Cultural Resources

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 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.

No contributing portions of eligible sites 48JO134 (Bozeman Trail), 48CA1568 (Deadwood Road) and 48CA5494 (Ft. Fetterman to Ft. McKinney Telegraph Line) will be physically impacted. None of the

historic properties within the project area retain their integrity of setting. The proposed project will not diminish any other aspects of integrity of the historic properties.

A small portion of the proposed project is believed to have a No Adverse effect on the setting of the Pumpkin Buttes TCP (48CA268). This No Adverse effect will be mitigated through application of the PROGRAMMATIC AGREEMENT BETWEEN THE BUREAU OF LAND MANAGEMENT AND THE WYOMING STATE HISTORIC PRESERVATION OFFICER REGARDING MITIGATION OF ADVERSE EFFECTS TO THE PUMPKIN BUTTES TRADITIONAL CULTURAL PROPERTY FROM ANTICIPATED FEDERAL MINERALS DEVELOPMENT CAMPBELL COUNTY, WYOMING; Appendices A-G. These mitigation measures incorporate standard BMPs to reduce visual contrast and will be incorporated during all phases (drilling, construction, operation, reclamation, etc) of wells 4476-27-12, 4476-27-21 and 4476-27-32 and their associated infrastructure (new surface disturbance to junction with existing disturbance).

Following the Wyoming State Protocol Section VI(B)(1) the Bureau of Land Management determined that the project will result in an "No Adverse Effect". The Wyoming State Historic Preservation Officer (SHPO) concurred with the Bureau's determination on 08/09/10.

SDI has been proposed for produced water disposal. The effects of SDI on buried cultural deposits are not known. Through agreement between the BLM, WY SHPO and Anadarko, a Geoarcheological testing plan has been designed to mitigate potential negative effects to buried cultural resources. The proposed SDI system will be deferred pending results of the BLM-SHPO approved testing program.

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).

4.1.8. Air Quality

4.1.8.1. 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.

4.1.8.2. 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. 4-386.

4.1.8.1. Mitigation Measures

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.

4.1.8.2. Residual Effects

Some increase in air pollution emissions would occur as a direct result of the development; however these direct impacts are predicted to be below applicable thresholds.

4.1.9. Travel Management

Conflicts between Uranium development CBNG activities may increase. Additional roads will likely result in increased trespass onto private lands within the project area and non-public roads on BLM managed surface. In the past, the BLM has received complaints from adjacent landowners stating that trespassing has increased with the additional roads constructed for CBNG development. Vandalism of wells and infrastructure may also increase with the additional roads.

The PRB FEIS states, "Impacts related to the construction of access roads used to extract CBNG include an increase in average daily traffic (ADT), increase in risk of traffic accidents from additional project-related vehicles as well as non-project-related vehicles, increased potential access to remote areas, an increased risk of vehicle collisions with livestock and wildlife, and visual intrusion of project-related vehicles and activities".

4.1.9.1. 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. 4-302.

4.1.9.2. Mitigation Measures

In order to maintain the travel management objectives in the RMP and to reduce conflicts between the public relative to new roads in the project area, the company will sign the junctions of private and public roads.

In order to maintain the travel management objectives in the RMP and to reduce conflicts between the public relative to new roads in the project area, the company will sign the junctions of private and public roads.

Travel within the Dry Willow Phase V POD, on all private roads that would access Federal land, is restricted to authorized company personnel serving in their official capacity. Signs reading "Private Road - No Public Access" will be installed at the intersection of private and public roads within the project area. Contact the Outdoor Recreation Planner at BLM BFO for specific direction regarding signage and related materials. Gates may be required to be installed if necessary to prevent unauthorized travel. The signs and gates will be provided and maintained by the operator.

4.1.9.3. Residual Effects

There will be unavoidable long-term indirect adverse effects to the properties adjacent to the major access roads within the project area through increased traffic, noise and dust from project related vehicles.

4.1.10. Visual Resource Management

4.1.10.1. Direct and Indirect Effects

The visual resources will be impacted by construction of a new access road, pipelines, power lines, and the introduction of a new well to the area. Disturbance associated with access roads, pipelines, and power lines will create linear contrasts with the natural lines and the wells will contrast with the natural forms. However, considering the presence of other modifications (fences, stock water ponds), the impact is expected to be minor. Adherence with BLM applied mitigation (in the form of COAs) addressing these

visual contrasts should minimize visual resource impacts to the Dry Willow Phase V project area and keep the plan of development within the visual resource management Class IV.

4.1.10.2. 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. 4-314.

4.1.10.3. Mitigation Measures

Anadarko will mount lights at compressor stations on a pole or building at the minimum necessary height and direct them downward to illuminate key areas within the facility while minimizing the amount of light projected outside the facility.

Access roads must follow natural contours as closely as possible and will avoid approaching public roads at a perpendicular angle to prevent direction of the attention of a casual observer. Powerlines will be buried to prevent additional visual disturbance.

All permanent above-ground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for the Dry Willow Phase V POD is Covert Green, 18-0617 TPX.

4.1.10.4. Residual Effects

Effects to quality of life may occur depending on an individual's point of view. For those who prefer the solitude and natural setting, their quality of life will be affected for the life of the project.

5. CONSULTATION/COORDINATION

Contact	Title	Organization	Present at Onsite
Brad Rogers	Wildlife Biologist	U.S. Fish & Wildlife Service	yes
Bud Stewart	Energy Coordinator	WGFD	no

6. OTHER PERMITS REQUIRED

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

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Appendix A. Affected Resources Worksheet

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality	Yes	Yes	Yes	PRB FEIS: 3-291-298, 4-404-406, 4-377-386
Cultural	Yes	Yes	No	PRB FEIS: 3-206-228, 4-273-288, 4-394
Native American religious concerns	Yes	Yes	No	Add in EA
Traditional Cultural Properties	Yes	Yes	No	Add in EA
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	Yes	Yes	No	Add in EA
Other Leasables	No	No	No	Add in EA
Salable Minerals	No	No	NA	
Paleontology	No	No	Yes	PRB FEIS: 3-65-66, 4-125-127
PFYC 3	Yes	Yes	NA	PRB FEIS: 3-65-66, 4-125-127
PFYC 5	Yes	Yes	NA	PRB FEIS: 3-65-66, 4-125-127
Rangeland management				Not in PRB FEIS
Existing range improvements	Yes	No	NA	
Proposed range improvements	Yes	Yes	Yes	Add to EA
Recreation	Yes	No	Yes	PRB FEIS: 3-263-273, 4-319-328
Developed site	No	No	Yes	PRB FEIS: 3-266, 4-326
Walk-in-Area	No	No	Yes	
Social & Economic	Yes	Yes	Yes	PRB FEIS: 3-275-289, 4-336-370
Soils & Vegetation	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-78-107, 4-134-152, 4-153-164, 4-393-394, 4-406
Erosion Hazard	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-82, 4-135
Poor Reclamation Potential	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-86, 4-149-152
Slope hazard	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-81, 4-135
Forest products	No	No	Yes	
Invasive Species	Yes	Yes	Yes	Addressed in EA. PRB FEIS: 3-103-108, 4-153-172
Wetlands/Riparian	Yes	Yes	Yes	PRB FEIS: 4-117 to 124 3-108-113, 4-172-178, 4-406
Special Designations	No	No	Yes	
Proposed ACEC	No	No	Yes	

Wild & Scenic River	No	No	Yes	PRB FEIS: 3-273
Wilderness Characteristics/Citizen Proposed	No	No	Yes	
WSA	No	No	NA	
Visual Resources	Yes	Yes	No	Add in EA
Class II	No	No	NA	
Class III	No	No	NA	
Water	Yes	Yes	No	Add in EA
Floodplains	Yes	Yes	No	Add in EA
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 to 86, 4-117 to 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	No			
Wildlife	Yes	Yes	No	Add in EA
ESA listed, proposed, or candidate species	Yes	Yes	No	Add in EA
BLM sensitive species	Yes	Yes	No	Add in EA
General wildlife	Yes	Yes	No	Add in EA
West Nile virus potential	Yes	No	No	Add in EA

Threatened, Endangered, Proposed, and Candidate Species Worksheet

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Endangered					
Black-footed ferret	Black-tailed prairie dog colonies or complexes > 1,000 acres.	Y	N	N	4-251 & BA
Blowout penstemon	Sparsely vegetated, shifting sand dunes	N	N	N	Not in FEIS
Threatened					
Ute ladies'-tresses orchid	Riparian areas with permanent water	N	N	N	4-253 & BA
Proposed					
Candidate					
Greater sage-grouse	Basin-prairie shrub, mountain-foothill shrub	Y	Y	Y	4-257 to 4-273

Non-designated wildlife worksheet

Common Name / Group	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Big Game	Yes	Yes	Yes	No 4-181 to 4-215
Aquatics	no	No	No	4-235 to 4-249
Migratory Birds	Y	Y	Y	N 4-231 to 4-235
Raptors	Y	Y	Y	N 4-216 to 4-221
Plains Sharp-tailed Grouse	Y	N	N	N 4-221 to 4-226

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	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.	Y	S	N	N
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.	N	N	N	N
Fish					**4-259 & 4-260**
Yellowstone cutthroat trout	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	N	N	N	N
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.	S	N	N	N

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Bald eagle	Mature forest cover often within one mile of large water body with reliable prey source nearby.	Y	Y	N	4-251 to 4-253 & BA
Brewer's sparrow	Sagebrush shrubland	Y	Y	Y	N
Ferruginous hawk	Basin-prairie shrub, grasslands, rock outcrops	Y	Y	Y	N
Loggerhead shrike	Basin-prairie shrub, mountain-foothill shrub	Y	S	Y	N
Long-billed curlew	Grasslands, plains, foothills, wet meadows	Y	S	N	N
Mountain plover	Short-grass prairie with slopes < 5%	Y	S	Y	4-254, 4-255 & BA
Northern goshawk	Conifer and deciduous forests	N	N	N	N
Peregrine falcon	Cliffs	N	N	N	N
Sage sparrow	Basin-prairie shrub, mountain-foothill shrub	N	N	N	N
Sage thrasher	Basin-prairie shrub, mountain-foothill shrub	Y	S	Y	N
Trumpeter swan	Lakes, ponds, rivers	N	N	N	N
Western Burrowing owl	Grasslands, basin-prairie shrub	Y	S	N	N
White-faced ibis	Marshes, wet meadows	N	N	N	N
Yellow-billed cuckoo	Open woodlands, streamside willow and alder groves	N	N	N	N
Mammals					**4-264 &4-265**
Black-tailed prairie dog	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	Y	K	Y	4-255, 4-256
Fringed myotis	Conifer forests, woodland chaparral, caves and mines	N	N	N	N
Long-eared myotis	Conifer and deciduous forest, caves and mines	N	N	N	N
Spotted bat	Cliffs over perennial water.	N	N	N	N
Swift fox	Grasslands	Y	S	N	N
Townsend's big-eared bat	Caves and mines.	N	N	N	N
Plants					**4-258**
Limber pine	Mountains, associated with high elevation conifer species	N	N	N	N

Common Name	Habitat	Habitat Present?	Individuals Present?	Direct Impacts Anticipated?	Impacts anticipated beyond the level analyzed within the PRB FEIS?
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5300-6500 ft.	N	N	N	N
William's wafer parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6000-8300 ft.	N	N	N	N