DECISION RECORD
Yates Petroleum Corporation, Sirocco II Plan of Development (POD)
Environmental Assessment (EA), WY-070-EA12-004
Bureau of Land Management, Buffalo Field Office

DECISION

I approve Yates Petroleum Corporation's (Yates or Operator) Sirocco II coalbed natural gas (CBNG) POD as described in Alternative C of the EA, WY-070-EA12-004, which BLM incorporates here by reference. This approved POD includes: 28 CBNG and 2 water injection applications for permit to drill (APDs), a water management plan (WMP), and associated infrastructure.

Compliance. This decision complies with:

- Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701); DOI Order 3310.
- Mineral Leasing Act of 1920 (30 U.S.C. 181) and 43 CFR Part 3160 to include On Shore Order No. 1.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- Buffalo Final Environmental Impact Statement (FEIS) (1985), and FEIS for the Powder River Basin (PRB) Oil and Gas Project, 2003.
- Buffalo Resource Management Plan (RMP), 1985, Amendments 2001, 2003, and 2011.

The Selected Alternative. BLM summarizes the details of the approval of Alternative C, below. The EA includes the project description, changes made at the onsites, and site-specific mitigation measures.

Well Sites. BLM approves the following CBNG and water injection APDs and support facilities:

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II CLOUDBURST CS FED	1	NENW	31	46N	77W	WYW129554
2	SIROCCO II DRAFT CS FED	1	NWSE	27	46N	77W	WYW146305
3	SIROCCO II DRAFT CS FED	2	NESW	27	46N	77W	WYW146305
4	SIROCCO II DRAFT CS FED	4	SESE	27	46N	77W	WYW146305
5	SIROCCO II DRAFT CS FED	5	NENE	28	46N	77W	WYW146305
6	SIROCCO II DRAFT CS FED	6	SWNE	28	46N	77W	WYW146305
7	SIROCCO II DRAFT CS FED	11	NENE	29	46N	77W	WYW146305
8	SIROCCO II DRAFT CS FED	13	NESE	29	46N	77W	WYW146305
9	SIROCCO II DRAFT CS FED	15	NENW	33	46N	77W	WYW146305
10	SIROCCO II DRAFT CS FED	16	SWNW	33	46N	77W	WYW146305
11	SIROCCO II DRAFT CS FED	18	NESE	33	46N	77W	WYW146305
12	SIROCCO II DRAFT CS FED	19	NESW	33	46N	77W	WYW146305
13	SIROCCO II SIROCCO S&R FED	8	NESW	29	46N	77W	WYW134919
14	SIROCCO II WHISK S&R FED	14	SENW	32	46N	77W	WYW130108
15	SIROCCO II SIROCCO CS FED	5	NESW	29	46N	77W	WYW134919
16	SIROCCO II SIROCCO CS FED	4	SWNW	29	46N	77W	WYW134919
17	SIROCCO II SIROCCO CS FED	3	NENW	29	46N	77W	WYW134919
18	SIROCCO II SIROCCO CS FED	6	SWSW	29	46N	77W	WYW134919
19	SIROCCO II WHISK CS FED	3	NESE	31	46N	77W	WYW130108
20	SIROCCO II WHISK CS FED	2	SWNE	31	46N	77W	WYW130108
21	SIROCCO II WHISK CS FED	1	NENE	31	46N	77W	WYW130108
22	SIROCCO II WHISK CS FED	7	SWNW	32	46N	77W	WYW130108
23	SIROCCO II WHISK CS FED	10	NESW	32	46N	77W	WYW130108
24	SIROCCO II WHISK CS FED	12	SWSE	32	46N	77W	WYW130108
25	SIROCCO II WHISK CS FED	11	SWSW	32	46N	77W	WYW130108

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
26	SIROCCO II WHISK CS FED	9	NESE	32	46N	77W	WYW130108
27	SIROCCO II DRAFT CS FED	12	SWNE	29	46N	77W	WYW146305
28	SIROCCO II WHISK CS FED	8	SWNE	32	46N	77W	WYW130108
29	SIROCCO II WHISK CS FED	5	NENE	32	46N	77W	WYW130108
30	SIROCCO II SIROCCO CS FED	7	SWSE	29	46N	77W	WYW134919

Water Management. BLM approves the water management strategy. APDs for the injection wells are located: SIROCCO S&R FED 8 NESW 29 T46N R77W on lease WYW134919, and WHISK S&R FED 14 SENW 32 T46N R77W on lease WYW130108. The WHISK S&R FED 14 injection well does have an associated off channel pit named Bobs Pit with 4.3 AC-FT of storage. An engineered reclamation bond estimate dated May 19, 2010 of $14, 575 was included with the Bobs Pit. However, this pit is a secondary water management proposal as it is not bonded through BLM and as such will require a sundry with proof of adequate bond for approval.

Rights-of-Way. BLM identified rights-of-way (ROWs) for existing and proposed roads, water pipelines, buried power lines, and gas pipelines on BLM surface for off-lease development, see administrative record. BLM will issue separate ROW grants prior to the use or construction of the existing and proposed roads, water pipelines, buried power lines, and gas pipelines on BLM surface for off-lease development.

Limitations. BLM denies 2 APDs and defers its decision on 6 APDs, see decision rationale. Bobs Pit is considered a secondary water management proposal and will require a sundry with proof of adequate bond for approval. Also see the conditions of approval (COAs).

Denial. BLM denies the following CBNG APDs and associated infrastructure:

#	Well Name	Well #	Environmental Issue/Justification
1	SIROCCO II SIROCCO CS FED	2	Impacts to soils rated as limited reclamation absent mitigating design features and /or mitigation.
2	SIROCCO II WHISK CS FED	6	Impacts to soils rated as limited reclamation absent mitigating design features and /or mitigation.

Deferrals. BLM defers decision on the following CBNG APDs and associated infrastructure:

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II DRAFT CS FED	3	SWSW	27	46N	77W	WYW146305
2	SIROCCO II DRAFT CS FED	7	NESE	28	46N	77W	WYW146305
3	SIROCCO II DRAFT CS FED	9	SWSW	28	46N	77W	WYW146305
4	SIROCCO II DRAFT CS FED	10	SWSE	28	46N	77W	WYW146305
5	SIROCCO II DRAFT CS FED	14	NENE	33	46N	77W	WYW146305
6	SIROCCO II DRAFT CS FED	17	SWNE	33	46N	77W	WYW146305

THE FINDING OF NO SIGNIFICANT IMPACT (FONSI). Analysis of Alternative C of EA, WY-070-EA12-004, and the FONSI found the Sirocco II project will have no significant impacts on the human environment beyond those in the PRB FEIS. There is no requirement for an EIS. Similarly the EAs and CX3 the Sirocco II analysis incorporated by reference also received FONSIs, as appropriate.

COMMENT OR NEW INFORMATION SUMMARY. BLM publically posted the proposed APDs for 30 days, received no comments, and then internally scoped them. BLM's experience in the PRB (outside of the Fortification Creek Planning Area) found little public input or new issue discovery other than those revealed after rigorous public scoping during development of the PRB Oil and Gas Project. Since

initiation of the Yates Sirocco II proposal BFO received a new policy on management of Sage-grouse and a population viability analysis. BLM included this analysis in the EA.

DECISION RATIONALE.

1) The denial of SIROCCO CS FED 2 APD and its infrastructure is because the impacts associated with the APD are outside the analysis parameters found in the PRB RMP FEIS ROD (p. 11-12, A-19 to A-20, A-24, A-31), Onshore Oil and Gas Order No. 1, IV.c, FLPMA, Section 302 to prevent unnecessary and undue degradation, and the Wyoming BLM Reclamation Policy (see Appendix B of the EA) to avoid highly erodible areas when possible and when these cannot be avoided they must be mitigated. Here the Operator did not avoid an area with low reclamation potential (LRP) and offered no mitigation (see EA, pp. 29-33, and the correspondence section of the administrative record); (also see letter to BLM received on May 16, 2012).
2) The denial of WHISK CS FED 6 APD and its infrastructure is because the impacts associated with the APD are outside the analysis parameters found in the PRB RMP FEIS ROD (p. 11-12, A-19 to A-20, A-24, A-31), Onshore Oil and Gas Order No. 1, IV.c, FLPMA, Section 302 to prevent unnecessary and undue degradation, and the Wyoming BLM Reclamation Policy (see Appendix B of the EA) to avoid highly erodible areas when possible. Here the Operator did not avoid an area with LRP and refused to move the location or offer an acceptable alternative. At the onsite BLM identified and provided 3 reasonable alternatives (2 within 180 feet of the original APD - within 200 meters, per 43 CFR 3101.1-2. 1) (see EA, pp. 29-33, and the correspondence section of the administrative record).
3) The deferral of the wells in the deferral table, above, is because the impacts associated with the APDs are outside the analysis parameters found in the PRB RMP FEIS ROD (p. 11-12, A-19 to A-20, A-24, A-31), Onshore Oil, Gas Order No. 1, IV.c, FLPMA, Section 302 to prevent unnecessary and undue degradation, and the Wyoming BLM Reclamation Policy (see Appendix B of the EA) to avoid highly erodible areas when possible and when these cannot be avoided they must be mitigated. However, these impacts clearly can be avoided or minimized. See accompanying deferral letter for more detail.
4) BLM and Yates included mitigation measures to reduce environmental impacts while meeting the project's need. See the project's COAs for a complete description of all site-specific COAs.
5) Yates will conduct operations to minimize adverse effects to surface and subsurface resources, prevent unnecessary surface disturbance, and conform to currently available technology and practice. Alternative C, as approved, will not result in any undue or unnecessary environmental degradation. The PRB FEIS analyzed and predicted that the PRB oil and gas development would have significant impacts to the region's Sage-grouse population. The impact of the Sirocco II development cumulatively contributes to the potential for local extirpation; yet its effect is acceptable because it is outside priority habitats and is within the parameters of the PRB FEIS/ROD and current BLM and Wyoming sage-grouse conservation strategies.
6) The selected alternative will help meet the nation's energy needs and stimulate local economies by maintaining workforce stability.
7) Yates committed to: comply with the approved APD, applicable laws, regulations, orders, and notices to lessees; obtain necessary permits from agencies; offer water well agreements to the owners of record for permitted wells; provide water well analysis from a known reference point; and incorporate measures to alleviate resource impacts into their submitted surface use and drilling plans.
8) Yates certified it has a surface use agreement with the landowners or bonded.
9) The project area is clearly lacking wilderness characteristics as it is amidst mineral development.
10) These APDs are pursuant to the Mineral Leasing Act for the purpose of exploring or developing oil or gas and do not satisfy the categorical exclusion directive of the Energy Policy Act of 2005, Section 390 because of heightened conservation concerns for soil erosion and Sage-grouse populations.

ADMINISTRATIVE REVIEW AND APPEAL This decision is subject to administrative review according to 43 CFR 3165. Request for administrative review of this decision must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, P.O. Box 1828, Cheyenne, Wyoming 82003, no later than 20 business days after this Decision Record is received or considered to have been received. Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Acting Field Manager: _____ Date: 6/19/12

FINDING OF NO SIGNIFICANT IMPACT
Yates Petroleum Corporation, Sirocco II Plan of Development (POD)
Environmental Assessment (EA), WY-070-EA12-004
Bureau of Land Management, Buffalo Field Office

FINDING OF NO SIGNIFICANT IMPACT (FONSI). On the basis of the information in the EA and all other information available to me, I determination that: (1) the implementation of Alternative C from EA, WY-070-EA12-004, which BLM incorporates here by reference, will not have significant environmental impacts beyond those already addressed in the Power River Basin Final Environmental Impact Statement (PRB FEIS) to which the EA tiers, in addition to other the EAs to which this Sirocco II EA tiers also received a FONSI; (2) Alternative C conforms to the Buffalo Field Office (BFO) Resource Management Plan (RMP) (1985, 2001, 2003, 2011) and DOI Order 3310.; and (3) Alternative C does not constitute a major federal action having a significant effect on the human environment. Therefore an EIS is not required. BLM bases this finding on 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 is a PRB common land use - sourcing 42% of the nation's coal. The PRB FEIS reasonably foreseeable development analyzed the development of 54,200 fluid mineral wells. The development described in Alternative C is insignificant in the national, regional, and local context.

INTENSITY. The implementation of Alternative C 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 in Alternative C will minimize adverse environmental effects. The preferred alternative does not pose a significant risk to public health and safety. The geographic area of project does not contain unique characteristics identified in the 1985 RMP, 2003 PRB FEIS, or other legislative or regulatory processes. BLM used relevant scientific literature and professional expertise 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. The PRB FEIS predicted and analyzed development of the nature proposed with this project and similar projects. The selected alternative does not establish a precedent for future actions with significant effects. The alternative relates to the PRB sage-grouse and its habitat decline having cumulative significant impacts, yet the small size of this project is within the analysis parameters of the impacts denoted in the PRB FEIS. There are no cultural or historical resources present that will be adversely affected by the selected alternative. The project area is clearly lacking wilderness characteristics as it is amidst fluid mineral development. The project will not adversely affect any designated critical habitat or species listed under the Endangered Species Act. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law imposed for the protection of the environment.

ADMINISTRATIVE REVIEW AND APPEAL. This finding is subject to administrative review according to 43 CFR 3165. Request for administrative review of this finding 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 FONSI is received or considered to have been received. Any party who is adversely affected by the State Director's finding may appeal that finding to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

Acting Field Manager: Clark C. Bennett Date: 6/18/12

ENVIRONMENTAL ASSESSMENT (EA), WY-070-EA12-004
Yates Petroleum Corporation, Sirocco II
Coalbed Natural Gas (CBNG) Plan of Development (POD)
BUREAU OF LAND MANAGEMENT, BUFFALO FIELD OFFICE

1. INTRODUCTION

This site-specific analysis tiers into and incorporates by reference the information and analysis in the Powder River Basin (PRB) Oil and Gas Project Final Environmental Impact Statement (FEIS) (2003) and Resource Management Plan (RMP) Amendment, WY-070-02-065 (2003), pursuant to 40 CFR 1508.28 and 1502.21. This EA also tiers to the Buffalo RMP, 1985, and amendments, 2001, 2003, and 2011. These documents are available for review at the BLM Buffalo Field Office (BFO) and on our website. This project EA addresses site-specific resources and impacts that the PRB FEIS could not cover.

1.1. Background

Yates Petroleum Corporation (Yates or Operator) submitted the Sirocco II POD on October 7, 2010 to the BFO with 36 applications for permit to drill (APDs) in federal leases to develop CBNG from coal formations of the PRB and 2 APDs proposing injecting produced water into the lower Fort Union sands. Yates and BFO conducted onsite visits in 2011 and 2012, November 15-18, 28-30, December 5-6, 13, 28, January 31, 2012, and February 1, 9, 2012 to evaluate the proposal and modify it as necessary to alleviate environmental impacts. BLM sent a post-onsite deficiency letter via certified mail.

On February 24, 2012 the U.S. Fish and Wildlife Service (FWS) provided post onsite comments and recommendations per the Memorandum of Understanding (MOU) implementing Section 365 of the Energy Policy Act of 2005. BLM and FWS alleviated most of the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668 concerns. Yet FWS has concerns with some locations, see the correspondence tab of the administrative record.

The project proposal and APDs were complete when Yates provided the deficiency response packet on April 16, 2012 including: Deficiency Response Letter and Tracking forms; Well spreadsheet #1 (revised); Drilling Plan for the S&R wells (revised), Variance request and attachment (addition); M SUP pp. 1, 6, 8, 9, 10 – revised; SUP – Sirocco Road description Document – revised; SUDS form – revised; Reclamation Plans (revisions and additions) (under tab 5 – SUP); Engineered Pad diagrams (revisions); Engineered Road Plans (revisions); Maps B and D (revised); 7 APDs and Plats (revised); WMP (various revisions). Remaining resource concerns were shared with the operator via phone conversation on April 26, 2012 (see email in administrative record).

On May 3, 2012, Yates submitted revisions for the Sirocco II POD including: Cover letter and tracking form for revisions and additions; Well spreadsheet – p. 1; Road Description document (p. 5); Proposed Staging area Layout Diagrams; Typical well site Layout drawing for DRAFT CS FED 2 well; Engineered Well Pad Diagram (cover sheet); Engineered Resource Road Plans (revised Sheet 1 and added sheet 4A); Maps B & D; Revised APDs for DRAFT CS FED wells 1, 6, 7, 11, 14, 17, 18, WHISK CS FED 12, revised APD and Plat for the DRAFT CS FED 2 location.

BLM shared its remaining resource concerns with the operator telephonically on May 9, 2012 (See email in administrative record). Again, BLM shared remaining resource concerns with the operator telephonically on May 11, 2012 (See email in administrative record sent May 14, 2012; also note typographical error on date in subject line).

Yates' letter addressing the issues discussed telephonically and acknowledged the BLM's drilling safety

concern for DRAFT WHISK CS FED 10 APD (see letter to BLM on May 16, 2012). On May 17, 2012 BLM informed Yates that: WHISK CS FED 6 should have been moved to 1 of 3 reasonable alternate locations provided at the onsite or an alternative; BLM is processing SIROCCO CS FED 2 as proposed since no reasonable alternate location exists; BLM will likely defer WHISK CS FED 10 since Yates is considering increasing safety at the original location and needs more time to design a pad.

The private landowner was not at the onsite but BLM did contact the private landowner to discuss the project and his wishes for project layout. The private landowner requested minimal surface disturbances on his private surface and that cross country pipelines be co-located with other disturbances. (See administrative record and the correspondence tab of the project for details of this request.).

On May 29, 2012 BLM sent the draft COAs to Yates via email for review. Yates was also asked in the email to consider moving the WHISK CS FED 6 to one of the locations provided in the field at the onsite.

There is a direct relationship between Sirocco II POD and surrounding PODs. The majority of the infrastructure serving the Sirocco II POD wells, such as access into the project was earlier approved in Yates Sirocco I project. The Sirocco I project roads are engineered or of template design which supported "exploratory" wells Yates used to determine the economic feasibility of full scale development in Sirocco II project. Other recent, overlapping, and/or adjacent projects are in Table 3.1.

1.2. Need for the Proposed Action

The BLM's need for the action is how to support the goals of the Buffalo RMP and its 2003 Amendment to development an oil and gas lease through APDs on federal land under the Mineral Leasing Act (MLA), Onshore Order No. 1, the Federal Land Policy and Management Act (FLPMA), and other laws while complying with the BLM's mandates of multiple-use and natural resource conservation and support conditional leasehold rights.

1.3. Decision to be Made

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

1.4. Scoping and Issues

BFO posted Yates APDs for public notice and comment and received no input. This project is similar in scope to other CBNG PODs that the BFO analyzed. The BLM conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resource and land uses. Appendix A identifies those resources and land uses present and affected by the proposed project. Resources and land uses that are either not present, not affected, or were adequately covered by the PRB FEIS will not be discussed in this EA. The ID team identified important issues for the affected resources to further focus the analysis. This EA addresses the site-specific impacts beyond those analyzed in the PRB FEIS and identifies potentially significant effects of the proposed project to help the decision maker come to a reasoned decision. Project issues include:

1. Soils and Vegetation: erosion hazard, slope hazard, reclamation potential, riparian and wetland communities, and weed species;
2. Wildlife: raptor productivity, greater sage-grouse lek occupancy and persistency
3. Cultural Resources: potential for buried cultural material;
4. Water: groundwater depletion, quality and quantity of produced water, and;
5. Economic resources.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

BFO evaluated 3 alternatives in this EA and their brief description follows, below. Programmatic

mitigation measures, as determined in PRB FEIS ROD apply to all alternatives, including the no action alternative (Alternative A), and are included in Appendix C, Standard Mitigation Measures. Operator-committed mitigation measures and site-specific conditions of approval (COAs) would apply only to action alternatives (a combination of Alternatives B and C) and also are included in Appendix C.

2.1. Alternative A - No Action

The PRB FEIS considered a no action alternative, pp. 2-54 to 2-62. This alternative must also consider and combine, using the aggregate effects approach, the PRB FEIS analysis with the subsequent analysis and development from the adjacent and intermingled PODs in Table 3.1: Sirocco I, Kingsbury Federal, Kingsbury 4, Kingsbury Unit 5, and Table Mountain Phase II. This supports the PRB FEIS which analyzed the reasonably foreseeable development rolling across the PRB of over 51,000 CBNG and 3,200 oil and gas wells. The no action alternative would consist of no new federal wells. This alternative would deny the APDs and /or POD requiring the operator to resubmit APDs or a POD that complies with statutes and the reasonable measures in the PRB RMP Record of Decision (ROD) in order to lawfully exercise conditional lease rights. This alternative also could, through secretarial discretion suspend the leasehold, or could administratively cancel or withdraw the lease if improperly awarded, or seek to cancel the lease. It is not possible in the abstract to identify every interest and that is beyond the scope here.

2.2. Alternative B - Operator Proposed Action

Alternative B contains complete APDs and is a result of the operator and BLM working to reduce many, but not all environmental impacts. This alternative summarizes the POD submitted to the BLM by Yates on September 24, 2010 – after site visits and the Operator's design modifications.

Proposed Action Title/Type: Yates Petroleum Corporation's Sirocco II POD

Proposed Well Information: Yates proposed 36 CBNG and 2 water injection wells in this POD. The proposed wells are vertical bores on an 80 acre spacing pattern with 1 well per location. Each CBNG well will produce from Big George coal seam with proposed well house dimensions being 8.0 feet wide x 8.0 feet length x 8.0 feet height. Each water injection well is to be on an engineered pad 200 ft. by 200 ft. with an enclosed 24 ft. by 40 ft. building containing 400 barrel water storage tanks and large horse power pumps. Table 2.1 has a list of proposed wells.

County: Campbell

Applicant: Yates Petroleum Corporation (Yates)

Surface Owners: Larry Brubaker, State of Wyoming, and BLM.

Table 2.1. Proposed Wells (36 CBNG and 2 Water Injection) – Alternative B

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II CLOUDBURST CS FED	1	NENW	31	46N	77W	WYW129554
2	SIROCCO II DRAFT CS FED	1	NWSE	27	46N	77W	WYW146305
3	**SIROCCO II DRAFT CS FED**	**2**	**NESW**	**27**	**46N**	**77W**	**WYW146305**
4	SIROCCO II DRAFT CS FED	3	SWSW	27	46N	77W	WYW146305
5	**SIROCCO II DRAFT CS FED**	**4**	**SESE**	**27**	**46N**	**77W**	**WYW146305**
6	**SIROCCO II DRAFT CS FED**	**5**	**NENE**	**28**	**46N**	**77W**	**WYW146305**
7	SIROCCO II DRAFT CS FED	6	SWNE	28	46N	77W	WYW146305
8	SIROCCO II DRAFT CS FED	7	NESE	28	46N	77W	WYW146305
9	SIROCCO II DRAFT CS FED	9	SWSW	28	46N	77W	WYW146305
10	SIROCCO II DRAFT CS FED	10	SWSE	28	46N	77W	WYW146305
11	SIROCCO II DRAFT CS FED	11	NENE	29	46N	77W	WYW146305

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
12	SIROCCO II DRAFT CS FED	12	SWNE	29	46N	77W	WYW146305
13	SIROCCO II DRAFT CS FED	13	NESE	29	46N	77W	WYW146305
14	**SIROCCO II DRAFT CS FED**	**14**	**NENE**	**33**	**46N**	**77W**	**WYW146305**
15	**SIROCCO II DRAFT CS FED**	**15**	**NENW**	**33**	**46N**	**77W**	**WYW146305**
16	SIROCCO II DRAFT CS FED	16	SWNW	33	46N	77W	WYW146305
17	**SIROCCO II DRAFT CS FED**	**17**	**SWNE**	**33**	**46N**	**77W**	**WYW146305**
18	**SIROCCO II DRAFT CS FED**	**18**	**NESE**	**33**	**46N**	**77W**	**WYW146305**
19	SIROCCO II DRAFT CS FED	19	NESW	33	46N	77W	WYW146305
20	**SIROCCO II SIROCCO S&R FED**	**8**	**NESW**	**29**	**46N**	**77W**	**WYW134919**
21	**SIROCCO II WHISK S&R FED**	**14**	**SENW**	**32**	**46N**	**77W**	**WYW130108**
22	SIROCCO II SIROCCO CS FED	2	SWNW	28	46N	77W	WYW134919
23	SIROCCO II SIROCCO CS FED	5	NESW	29	46N	77W	WYW134919
24	SIROCCO II SIROCCO CS FED	4	SWNW	29	46N	77W	WYW134919
25	SIROCCO II SIROCCO CS FED	3	NENW	29	46N	77W	WYW134919
26	SIROCCO II SIROCCO CS FED	7	SWSE	29	46N	77W	WYW134919
27	SIROCCO II SIROCCO CS FED	6	SWSW	29	46N	77W	WYW134919
28	SIROCCO II WHISK CS FED	3	NESE	31	46N	77W	WYW130108
29	SIROCCO II WHISK CS FED	2	SWNE	31	46N	77W	WYW130108
30	SIROCCO II WHISK CS FED	1	NENE	31	46N	77W	WYW130108
31	SIROCCO II WHISK CS FED	7	SWNW	32	46N	77W	WYW130108
32	SIROCCO II WHISK CS FED	10	NESW	32	46N	77W	WYW130108
33	SIROCCO II WHISK CS FED	8	SWNE	32	46N	77W	WYW130108
34	SIROCCO II WHISK CS FED	9	NESE	32	46N	77W	WYW130108
35	SIROCCO II WHISK CS FED	12	SWSE	32	46N	77W	WYW130108
36	**SIROCCO II WHISK CS FED**	**6**	**NENW**	**32**	**46N**	**77W**	**WYW130108**
37	SIROCCO II WHISK CS FED	11	SWSW	32	46N	77W	WYW130108
38	**SIROCCO II WHISK CS FED**	**5**	**NENE**	**32**	**46N**	**77W**	**WYW130108**

Bold font indicates this will likely have an engineered pad, see below and Section 4.2.1.1.

Water Management Proposal: Table 2.2 includes the water management infrastructures proposed for use. The WHISK S&R FED 14 injection well does have an associated off channel pit named Bobs Pit with 4.3 AC-FT of storage. An engineered reclamation bond estimate dated May 19, 2010 of $14,575 was included with the Bobs Pit. However, this pit is considered a secondary water management proposal as it is not bonded through BLM.

Table 2.2 Proposed Water Management Injection Wells – Alternative B (Included in Table 2.1)

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II SIROCCO S&R FED	8	NESW	29	46N	77W	WYW134919
2	SIROCCO II WHISK S&R FED	14	SENW	32	46N	77W	WYW130108

Drilling and Construction:

- Drilling of 36 federal CBNG wells in Big George coal zone is to depths of approximately 1600 feet. Eleven locations will use engineered pads, 9 locations will use slots of 30 feet x 120 feet; 23 well locations will not use a constructed or slotted pad.
- Drilling of 2 water injector wells in Fort Union formation is to depths ranging from 3,800 feet to 4,500 feet. These wells have engineered pads with cut/fill slopes.
- A water management plan (WMP) that involves the following water management strategies. Yates proposes accomplishing produced water management from the 36 CBNG wells through a combination of:
  - Reinjection to the Fort Union formation using 2 deep injection disposal wells;

- Emergency containment within 1 off-channel pit considered secondary and will not be constructed until sundry approval.

- Yates anticipates completing drilling and construction within 2 years, the term of an approved APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire project.
- 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 road network consisting of improved and primitive roads, see administrative record.
- Both above ground and below ground power line network to be constructed. Above ground work will be performed by Powder River Energy Corporation (PreCorps); below ground work will be performed by Yates or a contractor hired by Yates. If the power line network is not completed before the wells are in production, then temporary diesel generators may be placed at the 6 power drops.
- Yates may locate fuel storage tanks of 500 gallon capacity at 6 power drops along with each diesel generator. Generators may operate for 24 months. The analysis anticipates that fuel deliveries may be 2-3 times per week during the summer and 4 times per week during the winter. Fuel delivery duration should be from 30 to 60 minutes. The generator noise level is about 100.5 decibels at 3-feet distance.
- Yates will install a buried gas and water line network along existing or proposed disturbances.

<u>Rights-of-Way:</u>
Rights-of-way were identified for existing and proposed roads, water pipelines, buried power lines, and gas pipelines on BLM surface for off-lease development, see administrative record. Use or construction of the existing and proposed roads, water pipelines, buried power lines, and gas pipelines on BLM surface for off-lease development proceeds after the separate issuance of right-of-way grants. PreCorps may file an overhead power line right-of-way application when they receive a work order from the operator. Construction of overhead power lines by PreCorps on BLM surface proceeds after the separate issuance of a right-of-way grant. BLM encourages the use of buried power line.

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

This alternative also incorporates and analyzes the implementation of committed mitigation measures contained in the MSUP, drilling plan, and WMP, in addition to the Standard COAs found in the PRB FEIS ROD's, Appendix A.

2.3. Alternative C – Modified Action

Alternative C is a modification of Alternative B based on BLM removing, therefore denying 2 APDs from the project proposal which would have large, direct impacts to an area which has virtually no reclamation potential or suitability. Alternative C specifically represents BFO efforts to reduce project-specific impacts to highly erosive soils while trying to maintain proposed spacing and infrastructure requirements consistent with the need for the proposal. BLM recommended the removal of 2 APDs and associated infrastructure from the project; therefore they are not considered in this Alternative C.

2.4. Design Features – Generally Common to both Alternatives B and C

BLM received the original Sirocco II POD on October 7, 2010 with 38 federal APDs. This EA analyzes a subsequent proposal upon which Yates and the BFO collaborated to minimize environmental impacts;

therefore BFO does not analyze the original POD submittal. Yates' and BFO's discussions and onsite visits based on the initial project description, led to adjustments to the initial proposal.

These changes, as documented in a revised project description provided as Yates' response to BLM's deficiency letter, resulted in a refined proposed project, which is discussed in this document as Alternative B. The initial POD, the post-onsite deficiency letter, and the company's response to the deficiency letter are in the project administrative record.

Construction of 23 wells listed below shall not have earth work preparation (no engineered pad/no slot) other than digging of drilling pits and digging in wheels to level the drilling rig. Drilling of these wells on the natural topography would result in less initial disturbance to the soil resource: CLOUDBURST CS FED 1, DRAFT CS FED 1, DRAFT CS FED 3, DRAFT CS FED 4, DRAFT CS FED, DRAFT CS FED 10, DRAFT CS FED 11, DRAFT CS FED 12, DRAFT CS FED 13, DRAFT CS FED 16, DRAFT CS FED 19, SIROCCO CS FED 5, SIROCCO CS FED 4, SIROCCO CS FED 3, SIROCCO II SIROCCO CS FED 7, SIROCCO II WHISK CS FED 3, WHISK CS FED 2, WHISK CS FED 1, WHISK CS FED 7, WHISK CS FED 10, WHISK CS FED 8, WHISK CS FED 9, and WHISK CS FED 11. Actual turning of the soil will occur where the reserve pits are located and constructed; soil productivity and soil quality will be maintained when top soil is segregated and saved for distribution on pit disturbances. Exceptions for compaction reduction via deep ripping will be granted by the Authorized Officer.

Yates proposes the following wells in areas of low reclamation potential (LRP) - including miscellaneous areas such as coal seam outcrops: DRAFT CS FED 4, DRAFT CS FED 12, SIROCCO CS FED 4, and WHISK CS FED 9. Yates will apply rock aggregate to the well area to protect erosive coal fines.

WHISK CS FED 8, DRAFT CS FED 10 will have utilities placed within the road disturbance due to impacts to sand blowouts and to minimize erosion.

Yates proposed surfacing roads in the project.

Yates letter the BLM received on May 16, 2012 obligated Yates to additional operator committed measures that should avoid unnecessary and undue degradation to: the access road south of the previously approved APD - SIROCCO I DRAFT CS FED 8, to SIROCCO II DRAFT CS FED 15. Yates in the same letter also committed for the APD WHISK CS FED 8, to place utilities within the access road disturbance; for the APD WHISK CS FED 5 to place utilities within the access road disturbance; for the APD WHISK CS FED 9 to place utilities within the access road disturbance and its APD (well site) to apply rock aggregate to the well site to protect sands and install a pit liner, see administrative record.

Yates committed to monitor the proposed culverts at these locations: DRAFT CS FED 5, DRAFT CS FED 6, DRAFT CS FED 7, DRAFT CS FED 12, DRAFT CS FED 13, DRAFT CS FED 17, DRAFT CS FED 18, SIROCCO S&R FED 8, WHISK S&R FED 14, SIROCCO CS FED 2, and WHISK CS FED 6 that may direct surface water flows into head-cuts – increasing erosion potential and mitigate if necessary.

2.5. Alternatives Considered but Not Analyzed in Detail

BFO analyzed the effects of multiple cross country utility corridors on public, state, and federal lands within this project. The effects were sufficiently compelling to reduce the impacts to steep slopes by placing most of these cross county utilities with other infrastructure.

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

The proposed project generally conforms to the terms and the conditions of the 1985 BFO RMP (BLM 1985), the amendments, (BLM 2001), (BLM 2003), and the PRB FEIS (including the PRB Record of Decision (ROD) (BLM 2003a, b). The proposal complies with all federal laws, regulations, and policies.

This includes, but is not limited to, the following Acts and Orders, as amended: FLPMA, MLA, National Historic Preservation Act (1966), Endangered Species Act (ESA) (1973), Clean Water Act (1972), Clean Air Act (1970), National Environmental Policy Act (NEPA) (1969), and DOI Order 3310.

3. AFFECTED ENVIRONMENT

Section 3 describes and analyzes the physical and regulatory environment existing and trends of issue-related items for the project area described in Section 2. Aspects of the affected environment described in this section focus on the relevant major issues. Find a screening of all resources and land uses potentially affected in Appendix A. This EA does not discuss or analyze resources that would be unaffected, or not affected beyond the level analyzed in the PRB FEIS.

3.1. Project Area Description

The Sirocco II POD is approximately 28 miles southwest of Gillette, Campbell County, Wyoming, see Table 2.1 and administrative record. The project area encompasses 4,181 acres. Elevations in the area are from approximately 4,400 feet to 4,924 feet above sea level. Topography in the area ranges from rolling hills interspersed with long ridges and low, rocky knolls to steep and broken terrain featuring several deep, eroded draws with exposed pares soil and sandstone. The relatively level areas are primarily isolated to the Powder River drainage area which traverses the project area on the west. The area is in a 10-14 inch precipitation zone, with most of the precipitation falling during late winter and spring. Existing land practices in the area include livestock grazing and CBNG development.

The Sirocco II project is adjacent to the boundaries of 4 approved CBNG projects, which the BLM incorporates by reference. These projects include the analysis for 286 wells, 13 of which are within the Sirocco II POD boundary, see Table 3.1. The Sirocco II POD area is clearly lacking wilderness characteristics because of CBNG infrastructure development.

Table 3.1. CBNG POD Development Adjacent or Overlapping with the Sirocco II POD

Project Name	NEPA Document	Number of Wells	Decision Date
Kingsbury Federal	WY-070-03-122	33	8/15/2003
Kingsbury 4	WY-070-07-220	82	10/26/2007
Kingsbury Unit 5	WY-070-09-96	85	9/25/2009
Table Mountain Phase II	WY-070-10-376	86	9/30/2010

BFO analyzed, in part, Sirocco II's existing main access road under the Sirocco I project road which travels north/south through Sections 21 and 28 and east/west in S ½ of Sections 31 and 32 of T46N/R77W. This project provided the basic road structure for full field development of the Sirocco II project and as such provided the rational for reasonably foreseeable development to include these wells in Sirocco II – and BLM incorporates by reference the analysis from the Sirocco I CX3, CX09-3-018 to 021.

3.2. Soils, and Ecological Sites

3.2.1. Soils

Soils developed in alluvium and residuum derived mainly from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams resulting in a wide variety of surface and subsurface textures. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Differences in lithology produced topographic and geomorphic variations in the area. Ridges and hills are often protected by an erosion resistant cap of clinker, terrace gravels, or sandstone. Parent material chemistry may result in local concentration of salts.

Soils differ with topographic location, slope, and elevation. Topsoil depths to be salvaged for reclamation

range from 0 to 4 inches on ridges to 8+ inches in bottomland. Erosion potential varies depending on the soil type, vegetative cover, and slope. Reclamation potential of soils also varies throughout the project area. The main soil limitations in the project area include: depth to bedrock, low organic matter content, and high erosion potential especially in areas of steep slopes.

Detailed soils identification and data for the project area are from the South Campbell County Survey Area, Wyoming Soil Survey Geographic (SSURGO) Database (WY605). The Natural Resource Conservation Service (NRCS) performed the soil survey according to National Cooperative Soil Survey standards. The BLM uses county soil survey information to predict soil behavior, limitations, or suitability for a given activity or action. The agency's long term goal for soil resource management is to maintain, improve, or restore soil health and productivity, and to prevent or minimize soil erosion and compaction. Soil management objectives are to ensure that adequate soil protection is consistent with the resource capabilities. Many of the area's soils and landforms present distinct challenges for development, and /or eventual site reclamation. A tabulated summary of the dominant and important soil map units follows, Table 3.2, with their individual acreage and percentage of the area within the project boundary.

Table 3.2. Dominant and Important Soils

Map Unit Symbol	Map Unit Name	Approximate Acres	Project Area %
SNe	Shingle-Tassel association	3131.3	75%
STd	Stoneham-Cushman association	259.2	6%
AL	Alluvial land	142.8	3%
TE	Terry-Tassel association	115.5	3%
VC	Valent-Cushman association	111.7	3%
RED	Renohill-Razor association, rolling	105.2	3%
SNd	Shingle-Kim association, valleys	92.2	2%
REC	Renohill-Razor association, undulating	79.7	2%
SNb	Shingle-Cushman association	64.9	2%
STg	Stoneham-Zigweid association	54.4	1%

Source: NRCS 2010.

See the NRCS Soil Survey WY619 – South Johnson–County (SSURGO) data for more detailed soil information. Ecological Site interpretations include additional site-specific soil information.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to a taxonomic class other than those of the major soils. Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called non-contrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components were perhaps unobserved, and consequently are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource

plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

3.2.2. Limited Reclamation Potential (LRP)

Scientists identify LRP soils using SSURGO Data and onsite investigation. The onsite investigation found the 4 prominent and visible LRP areas in the project boundary.

1) Miscellaneous areas: have essentially no soil and support little or no vegetation and include sand blowouts which have low potential for restoration, high susceptibility for site degradation, and poor reclamation suitability. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities. Some miscellaneous areas can be made productive, but only after major reclamation efforts. (430-VI-NSSH, 1996)
2) Badlands: A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such gypsum or halite. (430-VI-NSSH, 1996)
3) Rock outcrop: Consists of exposures of bare bedrock. Most rock outcrops are hard rock, but some are soft. (430-VI-NSSH, 1996)
4) Slopes in Excess of 25%: Greater slopes usually increase the potential for slumping, landslides and water erosion (see chapter heading below Slopes in Excess of 25 Percent for complete description).

Other important though less visible soil characteristics were identified in the project area using SSURGO Data and onsite investigation, these are listed below.

3.2.2.1. Depth to Paralithic Bedrock

The SNe map unit Shingle-Tassel association comprises about 75% of the project area. This map unit description is has paralithic bedrock at 8 to 10 inches.

3.2.2.2. Available Water Holding Capacity

The SNe map unit Shingle-Tassel association comprises about 75% of the project area. This map unit description is either well drained or excessively drained which results in low water holding capacity.

3.2.2.3. Restoration Potential

This interpretation rates each soil for its inherent ability to recover from degradation, which is often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance. Both the rate and degree of recovery need to be considered. Soil functions that are important include sustaining biological activity, diversity and productivity; capture, storage and release of water; storing and cycling nutrients and other elements; filtering, buffering, degrading, immobilizing and detoxifying contaminants; providing support for plant and animal life. Restoration goals may include re-establishment of a preferred natural plant assemblage of the ecological site that existed prior to decline to a degraded state. Soil resilience is dependent upon adequate stores of organic matter, good soil structure, low salt and sodium levels, adequate nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties. Dynamic soil properties, such as microbial biomass and diversity or carbon nitrogen ratio, are not used for this rating since they are not contained within the soil database. NRCS SURGGO data.

Table 3.3 summarizes the project area's restoration potential, with the individual acreage, and percentage of the area in the project boundary. As depicted in the table and verified at the onsite 75% of the area has the soil map unit SNe soil type Shingle-Tassel association with a low potential for restoration.

Table 3.3. Restoration Potential

Map Unit Symbol	Restoration Potential	Acres	Percent
He	High potential	629.2	15%
SNe	Low potential	3131.3	75%
SNb	Moderate potential	272.6	7%
AL	Not Rated	148.8	4%

NRCS 2010

3.2.2.4. Site Degradation Susceptibility

This interpretation rates each soil for its susceptibility for soil degradation to occur during disturbance, which is a function of resistance to degradation. Resistance to degradation of a rangeland or woodland site is a measure of its ability to function without change throughout a disturbance. The magnitude of decline in the capacity to function determines the degree of resistance to change. Resistance to degradation thus could be described as an area's buffering capacity. This depends upon soil type, vegetation, climate, land use, disturbance regime, temporal and spatial scales. The disturbance regime determines the type of stresses placed upon the soil, vegetation, and wildlife components of the site. Thus, soil factors of vulnerability will vary based upon the disturbance regime for a particular site. The ratings represent the relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and/or redistribution, and loss of adequate rooting depth to maintain desired plant communities. Dynamic soil properties which vary with time, e.g. microbial biomass/diversity and carbon/nitrogen ratio, are not used since they are not contained within the soil database.

Steep slopes increase the potential for water erosion. Shallow rooting depth, and excess salt or sodium can reduce plant diversity, resistance to stress, and seedling survival. This rating should be used with the objective to protect vulnerable sites from the type of degradation that would result in accelerated erosion, reduction in water and air quality, invasion by annual grasses or noxious weeds, and other large scale potential natural plant community conversions. When degradation of soil and natural plant community characteristics goes beyond the threshold for the ecological site, the ecological site characteristics cannot be restored without artificial restoration efforts. NRCS SURGGO data.

A tabulated summary of the project areas site degradation susceptibility follows, Table 3.4, along with their individual acreage and percentage of the area within the project boundary.

Table 3.4. Degradation Susceptibility

Site Degradation Susceptibility	Map Unit Symbol	Acres	Percent
Highly susceptible	SNe	3131.3	75%
Moderately susceptible	He	822.1	20%
Not rated	AL	148.8	4%
Slightly susceptible	REC	79.7	2%

NRCS 2010

3.2.2.5. Slopes in Excess of 25 Percent

A soil’s stability is greatly affected by the slope on which it occurs. Greater slopes usually increase the potential for slumping, landslides, and water erosion. Approximately 699 acres (17%) in the project area have slopes of 25% or more.

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 project area with severe erosion potential and slopes 25% or greater, as defined by the NRCS; (USDA NRCS 2007), are in Table 3.5 along with the number of acres and percentage of the project area.

Other contributing factors to slope stability include slope length, slope aspect and colluvium. Slope length has considerable control over runoff and potential accelerated water erosion. Slope aspect is the direction which the surface of the soil faces. Slope aspect may affect soil temperature, evapotranspiration, wind contact and soil moisture. Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash. It consists largely of material that has rolled, slid or fallen down the slope under the influence of gravity. The rock fragments in colluvium are usually angular, in contrast to the rounded, water-worn cobbles and stones in alluvium and glacial outwash. These factors in combination with slope determine soil stability and the potential for mass soil movement. A tabulated summary of the project areas slopes follows, Table 3.5, along with their individual acreage and percentage of the area within the project boundary.

Table 3.5. Percent Slope

% Slope	Acres	% of Project Area
0-24%	3,481	83
Greater than or Equal to 25%	699	17

Source: NRCS 2010

3.2.2.6. Reclamation Suitability

Currently soil conditions in the project area are impacted by CBNG development as well as traditional activities, including livestock grazing and wildlife use. Much of the area is covered with soils that are easily damaged by use or disturbance or are difficult to re-vegetate or otherwise reclaim. Soil impacts (e.g., roads, linear pipeline scars, and artificial wet areas) can be readily observed in the area.

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

Reclamation potential of soils varies throughout the project area. The main soil limitations in the project area include: depth to bedrock, low organic matter content, and high erosion potential especially in areas of steep slopes. Many of the soils and landforms of this area present distinct challenges for development. Approximately 87 % of the area within the boundary of the proposed action contains soil mapping units having poor reclamation suitability. The remaining soils have slight or moderate reclamation suitability.

A tabulated summary of the project areas reclamation suitability follows, along with their individual acreage and percentage of the area within the project boundary. As depicted in Table 3.6, and verified at the onsite 87% of the project area has poor reclamation suitability.

Table 3.6. Reclamation Suitability

Reclamation Suitability Rating	Acres	Percent
Poor	3636.4	87%
Fair	402.6	10%
Not rated	142.8	3%

3.2.3. Vegetation and Ecological Sites

BLM staff identified the dominant vegetation community types in the project area are mixed-grass prairie and sagebrush shrubland. Species typical of the mixed-grass prairie community type are western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), and Wyoming big sagebrush (*Artemisia tridentate* var. *wyomingensis*), while species typical of the sagebrush shrubland include Artemisia spp. (*Chrysothamnus* spp.), western wheatgrass, prairie junegrass (*Koeleria macrantha*), and plains pricklypear (*Opuntia* spp.).

In addition, bluebunch wheatgrass (*Pseudoroegneria spicata*), green needlegrass (*Nassella viridula*) were identified in the project area. Additional forb and shrub species observed during the site visit included yucca (*Yucca glauca*), common yarrow (*Achillea millefolium*), penstemons (*penstemon* spp.), American vetch (*Vicia americana*), and milkvetch (*Astragalus* spp.). Non-native graminoids present included cheatgrass (*Bromus tectorum*), which is quite extensive in the project area. Cheatgrass is the dominant species present in some locations.

The site visits confirmed the presence of tree species in draws, along the creeks. Cottonwoods (*Populus* spp.) are present in many of the drainage bottoms.

Ecological site descriptions provide site and vegetation information needed for resource identification, management and reclamation recommendations. BLM specialists used NRCS published soil survey information, verified through onsite field reconnaissance, to determine the appropriate ecological sites for this POD area.

Dominant or important ecological sites and plant communities identified in the project area are listed in Table 3.7. Refer to ecological site narrative sections below for description of vegetation species observed during onsite field visits. Table 3.7 summarizes the project area's ecological sites.

Table 3.7. Summary of Ecological Sites

Ecological site	Approximate Acreage	Project Area (%)
Shallow Loamy (SwLy) 10-14 NP	3288.4	79%
Loamy (Ly) 10-14 NP	313.5	7%
Sands (Sa) 10-14 NP	254.5	6%
Clayey (CY) 10-14 NP	200.5	5%
Sandy (Sy) 10-14 NP	115.5	3%

Source NRCS 2010

Shallow Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides and ridge tops. The present plant community is a mixed sagebrush/grass. Wyoming big sagebrush is a significant component of this mixed sagebrush/grass plant community. Cool-season mid-grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant vegetation includes needleandthread, western wheatgrass, green needlegrass, blue grama, prairie junegrass and Sandberg bluegrass. Other grasses occurring on the state include Cusick's and Sandberg bluegrass, and prairie junegrass. Cheatgrass has invaded the state. Other vegetative species identified at onsite include pricklypear and fringed sagewort.

Loamy Sites occur on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone. These soils are moderately deep to very deep (greater than 20 inches to bedrock), well drained soils that formed in alluvium and residuum derived from sandstone and shale. These soils have moderate permeability. The present plant community is a mixed sagebrush/grass. Wyoming big sagebrush is a significant component of this mixed sagebrush/grass plant community. Cool-season mid-grasses make up the majority of the understory with the balance made up of short warm-season grasses, annual cool-season grass, and miscellaneous forbs. Dominant vegetation includes needle and thread, western wheatgrass, green needlegrass, blue grama, prairie junegrass and Sandberg bluegrass. Other grasses occurring include Cusick's and prairie junegrass. Cheatgrass invaded the state. Other vegetative species identified at onsite include prickly pear and fringed sagewort.

Sands Sites occur on nearly level to steep slopes on landforms which include alluvial fans, hillsides, plateaus, ridges, and stream terraces in the 10-14 inch precipitation zone. The soils of this site are

moderately deep to very deep (greater than 20 inches 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 present plant community is the similar to the Loamy site listed above with the following exception: Wyoming big sagebrush not as dominant.

Clayey Sites occur on the same landforms as Sands and are similar in depth. These soils have slow permeability. The bedrock is clay shale which is virtually impenetrable to plant roots.

Sandy Sites occur on the same landforms as Sands and are similar in depth. The soils have 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 present plant community is the similar to the Loamy site listed above with the following exception: Wyoming big sagebrush not as dominant.

3.3. Wetlands/Riparian

The project areas are primarily upland. Upper ephemeral drainages flow into the larger ephemeral creeks namely: Windmill Draw. The ephemeral swales and side drainages consist of upland vegetation while the Windmill Draw has limited riparian vegetation. There are cottonwoods along Powder River. Based on National Wetland Inventory data available for the project area (FWS 2009), 0.4% of the project area is herbaceous wetlands, while there are 7.03 miles (11.32 km) of intermittent streams. For more information regarding wetland and riparian refer to the PRB FEIS, pp. 3-36 to 3-56.

3.4. Invasive Species

The Wyoming Energy Resource Information Clearinghouse (WERIC) maintains a database listing invasive species locations and other data. The University of Wyoming, BLM, and county Weed and Pest offices cooperatively created the WERIC database. BFO found the following state-listed noxious weeds and/or weed species of infestation concern for the project area in the WERIC database (www.weric.info):

- Russian Knapweed
- Diffuse Knapweed
- Salt Cedar
- Russian Olive

The Operator or BLM confirmed the following infestations and/or documented additional weed species during field investigations: • Canada Thistle • Cheatgrass

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

3.5. Wildlife

BFO and Yates consulted several resources to identify wildlife species that may occur in the proposed project area. Resources included the wildlife database compiled and managed by the 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). ICF Jones & Stokes, now ICF International, (ICF) performed a habitat assessment and wildlife inventory surveys. ICF surveyed for mountain plover, sharp-tailed grouse, greater sage-grouse, bald eagle winter roost, raptor nests, and prairie dog colonies in 2008-2011 (ICF Jones & Stokes 2008-2011). A habitat assessment occurred in 2008 (ICF Jones & Stokes 2008). Ute ladies'-tresses orchid surveys occurred in 2008-2009 (ICF 2009), as were surveys for blowout penstemon. There were no formal surveys done for any species not mentioned above; however ICF biologists documented any sightings of BLM sensitive species and reported those observations to BFO. ICF conducted surveys according to the PRB Interagency Working Group's protocols, available at: http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife.html.

BLM wildlife biologists conducted field visits on November 17, 22, 29, and 30, 2011. The biologists

reviewed the wildlife survey information for accuracy, evaluated impacts to wildlife resources, and provided modification recommendations where wildlife issues arose.

WGFD is responsible for management of wildlife populations in the state of Wyoming. WGFD 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.

3.5.1. Threatened, Endangered, Proposed, Candidate Species Special Status (Sensitive) Species (SSS)

3.5.1.1. Threatened and Endangered Species

Project effects will not impact threatened, endangered, candidate, and proposed species occurring in the area beyond the level analyzed in the PRB FEIS. A discussion of the affected environment is in the PRB FEIS, pp. 3-174 to 3-179; also see Table 4.4, below for specific species and their habitats.

3.5.1.1.1. Ute Ladies'-Tresses Orchid

The Ute ladies'-tresses orchid (ULT) is listed as threatened under the ESA. The PRB FEIS discussed the affected environment for ULT, p. 3-175. Ute ladies'-tresses (ULT) habitat is not present in the project area and the species is not expected to occur. ICF did a survey for the species during November 2008. The findings of the survey concluded that areas of potential habitat were completely dry.

Moist areas along Windmill Draw showed no signs of moist soil or surface water except for the followings; two small pools (3 feet wide by 2 inches deep) and one moderately sized pool (8 feet wide by 2 inches deep) of water were present In NW NE and NE NE Section 29 and NW NE Section 28 T46N:R77W. The pool of water in Section 28 was a result of a leaking stock tank. Windmill Draw is deeply gorged with steeply cut banks (up to 50 feet tall) on each side. Upland species such as field brome, Indian ricegrass, and cheatgrass composed the majority of the vegetation. Soil samples collected from Windmill Draw were primarily silt and sand (ICF 2008). All other minor drainages have little or no potential to provide habitat for the species due to steep topography and the presents of upland grass species. For additional information and pictures of the habitat in the proposed project area, see ICF 2008 report in the case file.

3.5.1.2. Candidate Species– Greater Sage-grouse (sage-grouse)

The PRB FEIS addressed the affected environment for sage-grouse, pp. 3-194 to 3-199. The sage-grouse's regulatory and biologic status changed since issuance of the FEIS:

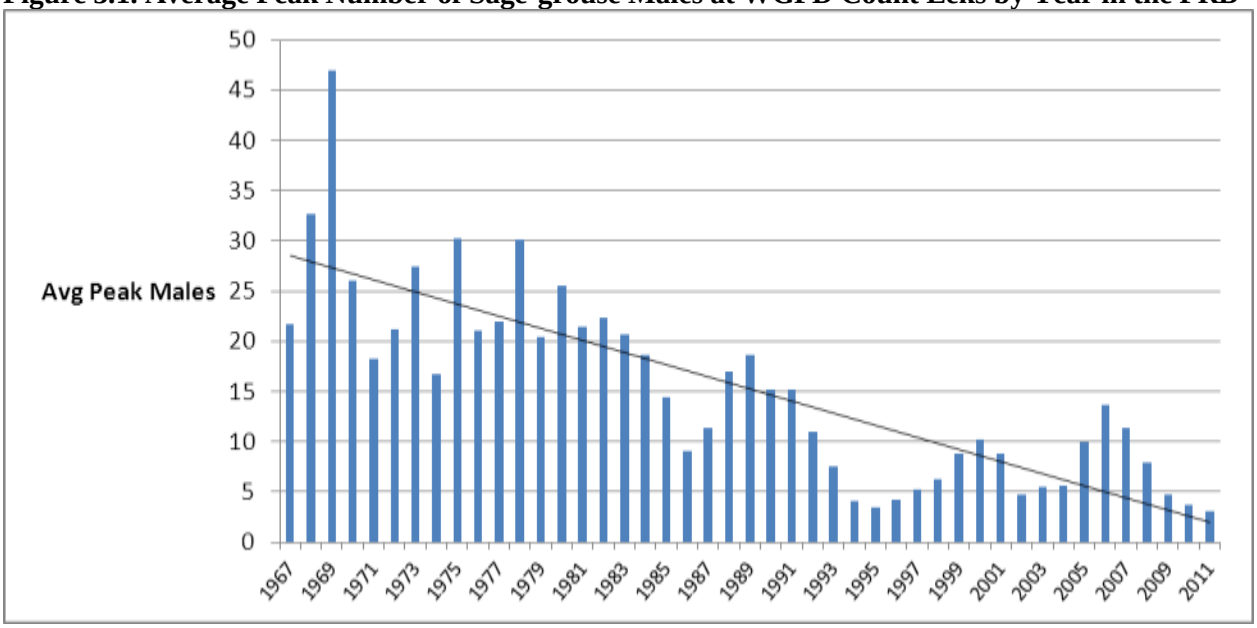
1. 2005-2007: The PRB FEIS predicted that a ¼ mile year-round controlled surface use lek buffer, and timing limitations restricting surface disturbance within 2 miles of leks, would be sufficient for protection of sage-grouse populations. Several recent studies and literature reviews indicate that the restrictions' spatial scale, and timing limitations, may not be large enough to alleviate impacts to sage-grouse (Holleran 2005, Walker et al 2007, Taylor et al 2012).
2. January, 2005: U.S. Fish and Wildlife Service (FWS) warranted that the sage-grouse was inappropriate for listing under the Endangered Species Act.
3. December, 2007: The U.S. District Court remanded the "not warranted" decision, finding a flawed decision-making process and ordered the FWS to conduct a new Status Review; Western Watersheds Project v. FWS, 535 F. Supp. 2d 1173 (D. Idaho 2007).
4. August, 2008: The WY BLM implemented management of identified connectivity habitats in support of the population management objectives set by the State of Wyoming (Wyoming Governor's Executive Order (EO) 2011-5), in accordance with the BLM Wyoming Instruction Memorandums (IM), most recently, IM- WY-2012-019.
5. January 2008: The State Wildlife Agencies' Ad Hoc Committee for Consideration of Oil and Gas

Development Effects to Nesting Habitat recommended land managers consider impacts on leks within 4 miles of oil and gas developments.

6. September, 2009: In its Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats, WGFD categorized impacts to sage-grouse by number of well pad locations per square mile within 2 miles of a lek.
7. November, 2010: FWS warranted that the sage-grouse justified listing across its range, but precluded listing due to higher priorities (FWS 2010). The sage-grouse is a listing candidate.
8. March, 2012: WY BLM released the report, "Viability analyses for conservation of sage-grouse populations: Buffalo Field Office, Wyoming," indicating that a viable population of sage-grouse remains in the PRB, but the combined impacts of multiple stressors, including West Nile virus (WNv) and energy development, threaten that viability (Taylor et al 20012).

The sage-grouse population in northeast Wyoming is exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2011b). Figure 3.1 illustrates a 10-year cycle of periodic highs and lows. Each subsequent population peak is lower than the previous peak. Research suggests that the declines since 2001 are a result, in part, of energy development (FWS 2010, Taylor et. al. 2012).

Figure 3.1. Average Peak Number of Sage-grouse Males at WGFD Count Leks by Year in the PRB



WGFD records indicate 1 sage-grouse lek, the Pumpkin Creek II (SE SW Section 2, T46N:R77W) is located within 4 miles of the project area. Currently there are 809 existing (producing or approved) wells within a 4 mile radius of the Pumpkin Creek II Lek, (Automated Fluid Minerals Support System [AFMSS] and Wyoming Oil and Gas Commission [WOGCC], May15, 2012) resulting in a density of 16.1 wells per square mile.

Impacts from oil and gas development are most discernible at the spatial scale of 20 km (12.4 mi) (Taylor et al. 2012). These findings echo results from previous studies conducted in the basin, wherein biologists observed basin-wide population declines (Walker et al. 2007).

There are 30 documented leks within 12.4 miles of the proposed project boundary, 7 of which are in the Buffalo core area. Currently there are 5,260 existing wells within 12.4 miles of the project area, an area of

482 square miles (an average of 10.9 wells per square mile). For a breakdown of existing wells within 12.4 miles of each individual lek within the core area, refer to Table 4.5.

Site Specific Habitat
The southwest portion of the proposed project is within one mile of the Buffalo core area, as identified in EO 2011-5, Greater Sage-grouse Core Area Protection. Sage-grouse habitat models indicate that approximately 15% the project area may contain high quality sage-grouse nesting habitat (Walker et al. 2007). A BLM biologist confirmed suitable brood rearing habitat located in the bottom of the steep draws throughout the project area nesting habitat is limited within the boundary of the project. The majority(more than 80%) of the project has existing mineral development and habitat fragmentation except for the bottom lands within the steep (less than 25%) draws.

3.5.2. BLM Special Status (Sensitive) Species

BLM incorporates by reference here, Section 3.3.7.2, Sensitive Species, from Kingsbury Unit 5 POD and West Kingsbury 1 POD EA, WY-070-EA09-96. A description of habitat and species presence for BLM sensitive species is in Table A.2, in Appendix A, below.

3.5.2.1. Bald Eagle

The PRB FEIS described the affected environment for bald eagles, p. 3-175. The bald eagle was a threatened species under the ESA during the PRB FEIS drafting and approval. Due to successful recovery efforts the bald eagle lost ESA-protective status on August 8, 2007. The bald eagle remains under the protection of the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Bald eagle winter roosting and nesting habitat exists in the project area, and the species is known to occur. Large galleries of mature cottonwoods are common along the Powder River, two small (less than 10 acres each) prairie dog colonies and nearby sheep operations provide reliable prey sources. Winter roost surveys were conducted by ICF. Observations of bald eagle in the project area during winter roost surveys are in the Table 3.8 below.

Table 3.8. Bald Eagle Observations during 2011/2012 Winter Surveys by ICF (ICF 2012)

Date	Adults	Juveniles	UTMS	¼ ¼ Section Township Range
12/12/2011	1	0	407700E 4866300N	NE SE 19 46N 77W
12/12/2011	1	0	407582E 4866148N	NE SE 19 46N 77W
12/12/2011	0	1	406228N 4862365N	SW SW 31 46N 77W
2/13/2012	2	0	408839N 4860771N	SW SE 5 45N 77 W
2/13/2012	1	0	409524N 4860694N	SW SW 4 45N 77W

According to the BLM raptor data base, 1 active bald eagle nest is within 1 mile of the project area(UTM 406927 E, 4865041 N). The nest (BLM #13114) was active with chicks during spring survey in 2012.

Power poles provide attractive perch sites in areas where mature trees and other natural perches are lacking. From May 2003 through December 28, 2006, FWS Law Enforcement salvage records for northeast Wyoming identified that 156 raptors, including 1 bald eagle, 93 golden eagles, 1 unidentified eagle, 27 hawks, 30 owls, and 4 unidentified raptors were electrocuted on power poles in the PRB (FWS 2006a). Of the 156 raptors electrocuted 31 were at power poles that are considered new construction (post 1996 construction standards). Additionally, 2 golden eagles and a Cooper's hawk were killed in apparent mid span collisions with power lines (FWS 2006a).

Typically two-tracks and improved project roads pose minimal eagle and vehicle collision risk while moving vehicles travel the road. In one year of monitoring road-side carcasses the BLM BFO reported 439 carcasses, 226 along Interstates (51%), 193 along paved highways (44%), 19 along gravel county

roads (4%), and one along an improved CBNG road (<1%) (Bills 2004). No road-killed eagles were reported. BFO observed eagles (bald and golden) feeding on 16 of the reported road-side carcasses (<4%). The risk of big-game vehicle-related mortality along CBNG project roads is so insignificant or discountable that when combined with the lack of bald eagle mortalities associated with highway foraging leads to the conclusion that CBNG project roads affect bald eagles

3.5.2.2. Brewer's Sparrow

The PRB FEIS discussed the affected environment for Brewer's sparrow on p. 3-200. Brewer's sparrow habitat exists, and the species is not known to occur in the project area. Refer to Section 3.3.2.2. Greater sage-grouse, for a detailed description of the sagebrush type habitats in the project area.

3.5.2.3. Ferruginous Hawk

The PRB FEIS discussed the affected environment for ferruginous hawk, p. 3-183. Ferruginous hawk nests are located throughout the PRB. Foraging habitat and prey is limited throughout the project area. Two small (less than 10 acres each) prairie dog colonies exist in the project area. No known ferruginous hawk nests exist in the project area.

3.5.2.4. Loggerhead Shrike

The PRB FEIS discussed the affected environment for loggerhead shrike on p. 3-187. Loggerhead shrike habitat exists and the species is suspected to occur in the project area. Refer to Section 3.3.2.2, Greater sage-grouse, for a detailed description of the sagebrush type habitats also used by loggerhead shrikes in the project area. BLM and ICF found no loggerhead shrike in the project area during field inspection.

3.5.2.5. Mountain Plover

The PRB FEIS discussed the affected environment for mountain plover (plover), pp. 3-177 to 3-178. Habitat for Mountain plover does not exist within the project area and species is not suspected to occur.

3.5.2.6. Sage Sparrow

The PRB FEIS discussed the affected environment for sage sparrow, pp. 3-200 to 3-201. Sage sparrow is undocumented in the Powder River breaks but suspected to occur in the area. Please refer to Section and 3.3.2.2., Greater sage-grouse, for a detailed description of the sagebrush habitats. BLM and ICF documented no known sage sparrow in the project area during field inspection.

3.5.2.7. Sage Thrasher

The PRB FEIS discussed the affected environment for sage thrasher on pp. 3-199 to 3-200. Sage thrasher habitat exists, and the species is suspected to occur in the project area. Please refer to Section 3.3.2.2., Greater sage-grouse, for a detailed description of the sagebrush habitats in the project area. BLM and ICF documented no known sage thrasher in the project area during field inspection.

3.5.2.8. Western Burrowing Owl

The PRB FEIS discussed the affected environment for Western burrowing owl (burrowing owl), p. 3-186. Burrowing owl habitat (prairie dog colonies) is in the project area, and the species is suspected to occur. See Black-tailed Prairie Dog Section, below, for locations of prairie dog colonies. BLM and ICF documented no known burrowing owl in the project area during field inspection.

3.5.2.9. Black-tailed Prairie Dog

The PRB FEIS discussed the affected environment for black-tailed prairie dogs, p. 3-179. When the PRB FEIS was written, the black-tailed prairie dog was on the list of candidate species for federal listing in 2000 (FWS 2000). FWS vacated the proposal in 2004. Wyoming BLM considers black-tailed prairie dogs a sensitive species and affords this species the protections described in the PRB FEIS. Two occupied

black-tailed prairie dog colonies, totaling 18 acres, exist in the POD in NW NW Section 29, T46N:R77W, and NE NW S20, T46N:R78W.

3.5.3. 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. Big game species expected to occur in the project area include pronghorn and mule deer. WGFD data indicates that the project area contains yearlong range for pronghorn and winter-yearlong range for mule deer. Yearlong use is when a population of animals makes general use of suitable documented habitat sites within the range on a year-round basis. Animals may leave the area under severe conditions. Winter-yearlong use is when a population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges. 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.

3.5.4. Migratory Birds

The PRB FEIS discussed the affected environment for migratory birds, pp. 3-150 to 3-153. Migratory birds migrate for breeding and foraging at some point in the year. The BLM-FWS MOU (2010) promotes the conservation of migratory birds, as directed through Executive Order 13186 (Federal Register V. 66, No. 11). BLM includes migratory birds in every NEPA analysis of actions having potential to affect migratory bird species of concern to fulfill obligations under the Migratory Bird Treaty Act (MBTA). BLM encourages voluntary design features and conservation measures agreeing with those in the programmatic mitigation in Appendix A of the PRB ROD.

Habitats occurring near the proposed well locations include sage-brush steppe grasslands, mixed grass prairie, and mature deciduous trees. Many species that are of high management concern use these areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds declined more consistently than any other ecological association of birds over the last 30 years (WGFD 2009). The FWS's Birds of Conservation Concern (BCC 2008) report identifies species of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act. Species in this list that have the potential to occur in the project area are: Brewer's sparrow, sage thrasher, loggerhead shrike, short-eared owl, and grasshopper sparrow. Of these, 3 species are identified on the BLM Wyoming Sensitive Species list.

The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified 3 groups of Wyoming's high-priority bird species: 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 of high priority but are of local interest. Species likely occurring in the project area are in Table 3.9.

Table 3.9. Migratory Birds Occurring in Shrub-Steppe Habitat in NE Wyoming (Nicholoff 2003)

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
Level II	Lark bunting	No
	Lark sparrow	No
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	No

3.5.5. Raptors

The PRB FEIS discussed the affected environment for raptors on pp. 3-141 to 3-148. Twenty-five known

raptor nests occur within 0.5 miles of the Sirocco II POD, and 5 of those nests are active. The BFO RMP (1985, 2001 Amendment) defines an active nest as, "one that has been used at least once during the previous three years." BLM documented species using these nests: red-tailed hawk, bald eagle, golden eagle, great horned owl, long-eared owl, and black –billed magpie. For locations and a description of the nests, refer to the "Spring 2011 Wildlife Survey Results" (Addendum D) (ICF 2011) in the project file. See also the powerline analysis in the Bald Eagle subsection, above.

3.5.6. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection. Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals. WNv firmly established and spread across the US since its discovery in 1999 in New York. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. Though less than 1% of mosquitoes carry WNv, they still are effective in transmitting the virus to humans, horses, and wildlife. *Culex tarsalis* appears to be the most common mosquito to vector, WNv. The human health issues related to WNv are well documented and appear to have leveled off. Historic data collected by the CDC and published by the USGS at: www.westnilemaps.usgs.gov is summarized in Table 3.10 shows data from the PRB - Campbell, Sheridan, and Johnson Counties.

Table 3.10. Historical West Nile Virus Information in Campbell, Sheridan, and Johnson Counties

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

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

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

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

WNv have many of the same symptoms as infected humans, they appear to be more sensitive to the virus (Rinkes 2003, Holloran 2005, Clark 2006, Walker 2011, 2007).

Mosquitoes can potentially breed in any standing water that lasts more than 4 days. In the PRB there is generally increased surface water availability associated with CBNG development. This increase in potential mosquito breeding habitat provides opportunities for mosquito populations to increase. (See Zou 2006.) Preliminary research conducted in the PRB indicates WNv mosquito vectors were notably more abundant on a developed CBNG site than 2 similar undeveloped sites (Walker et al. 2003). Reducing the population of mosquitoes, especially species that are apparently involved with bird-to-bird transmission of WNv, such as *Culex tarsalis*, can help to reduce or eliminate the presence of virus in a given geographical area (APHIS 2002). The most important step any property owner can take to control such mosquito populations is to remove all potential man-made sources of standing water in which mosquitoes might breed (APHIS 2002).

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

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

3.6. Water Resources

The project area is in the Upper Powder River drainage. The Sirocco II POD is in the Willow Creek, Upper Willow Creek, and Curtis Draw drainages - tributaries of the Upper Powder River. The ephemeral drainages have gentle slope with well vegetated bottoms with numerous small head-cut features.

The Wyoming Department of Environmental Quality (WDEQ) 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.

3.6.1. Groundwater

The historical use for groundwater in this project area is for stock or domestic water. The WSEO Ground Water Rights Database for this area showed numerous registered stock and domestic water wells within 1 mile of a federal CBNG producing well in the POD with depths averaging 10 to 620 feet deep in Wasatch sands (See Sirocco II WMP's Appendix D). For additional information on water, refer to the PRB FEIS, Chapter 3, Affected Environment, pp. 3-1 to 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, refer to the WDEQ web site.

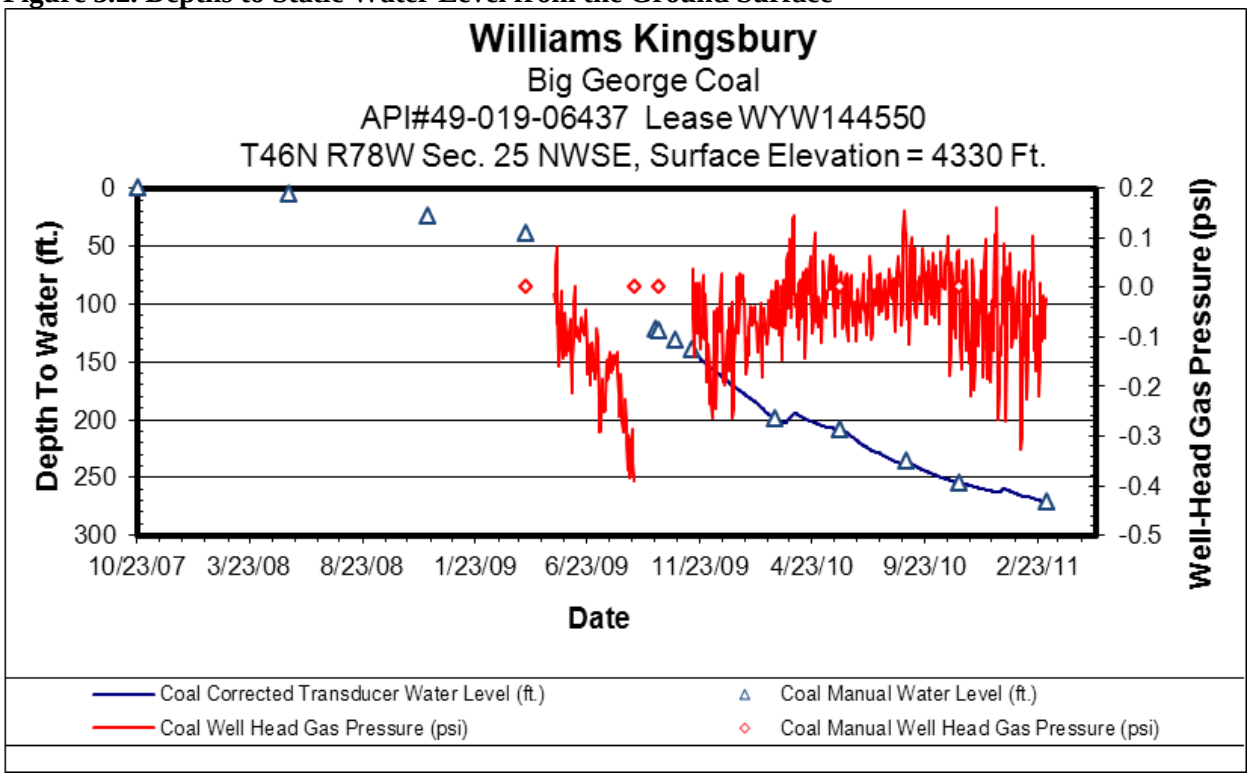
The production of CBNG necessitates the removal of some degree of the water saturation in the coal zones to temporarily reduce the hydraulic head in the coal. BFO monitors coal zone pressures as expressed in depth to water from surface since the early 1990s in the PRB, Figure 3.3.

Williams Production LLC Kingsbury projects have 200 approved federal wells drilled in the vicinity of Sirocco II POD. As a result the target coal zone pressure may have been reduced through off set water production. The Kingsbury groundwater monitoring well was installed by Williams Production RMT Company as a part of the BLM deep groundwater monitoring program.

Kingsbury Monitor Well: The initial water level of the Big George coal was recorded at 0 feet below ground surface on October 23, 2007. The Lower Big George Sand was also drilled through and completed in this borehole. The sand well also had a water level at 0 feet below ground surface on October 23, 2007. Both the coal and sand wells were artesian at their initial completion. The water levels in both the coal and sand wells at this location are lowering at the same rate and are at the same measured depths below ground surface. BLM presumes the well packer was not successfully seated in this dual completion, single casing well thus allowing the well waters' to comingle. The most recent measurement, February 8, 2012 recorded the water levels at 305 feet below ground surface, for a decline of 305 feet since completion of the wells.

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, 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 at: http://www.wsgs.uwyo.edu.

Figure 3.2. Depths to Static Water Level from the Ground Surface



3.6.2. Surface Water

The project area is in the Willow Creek, Upper Willow Creek, and Curtis Draw drainages - tributaries of the Upper Powder River just to the east of the project. Most of the area drainages 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 sage brush 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 USGS Gauging Stations in Table 3-11 (PRB FEIS, p. 3-49). These water quality parameters "illustrate the variability in ambient EC and SAR in streams in the project area. The representative stream water quality is used in the impact analysis presented in Section 4 as the baseline for evaluating potential impacts to water quality and existing uses from future discharges of CBM[NG] produced water of varying chemical composition to surface drainages within the project area" (PRB FEIS, p. 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 4.7 at maximum monthly flow to 7.8 at low monthly flow. The USGS station at Arvada, WY determined these values (PRB FEIS, p. 3-49).

The Operator did not identify any natural springs within this POD boundary.

For more information see the PRB FEIS, pp. 3-36 to 3-56.

3.7. Economics of CBNG Resource Extraction

Three types of fluid minerals are known in the Sirocco II project area: conventional natural gas, oil, and CBNG. Natural gas and oil production are declining in the Sirocco II project area and the PRB in general. (BLM-Wyoming Reservoir Management Group)

Wyoming's annual oil production peaked at 160 million barrels in the early 1970s and declined since (WOGCC 1998). Three hundred thirty-six fields were producing nearly 25 million barrels of oil and 60 MMCF of conventional natural gas in Wyoming in 2000 (WOGCC 2001). Production in the PRB comes from upper and lower Cretaceous sediments and from upper Paleozoic sediment in the northeastern part of the basin (Lageson and Spearing 1991).

It is estimated that approximately 28 trillion cubic feet (tcf) of CBNG may be recoverable from the coal beds in Wyoming's PRB. CBNG in the PRB is almost entirely methane (CH_4) and nitrogen (N). A large percentage of the CBNG escapes to the surface or migrates into nearby rocks during the coalification process. Some of the gas is trapped and stored in coal beds in 1 of the following 4 ways:

- As free gas in tiny pores or fracture within the coal;
- As dissolved gas in water with the coal;
- As adsorbed gas on the coal surfaces; or
- As adsorbed gas with coal molecules (Debruin et al. 2001).

3.7.1. Current Conditions and Trends

This project's development will affect the local, state, and national economies. Based on the estimates in the BLM's 2009 reasonably foreseeable development (RFD) scenario, the drilling of the CBNG wells in the PRB 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 would have several benefits. The federal government collects 12.5% of the royalties from all federal wells, which offsets the costs of maintaining the federal agencies that oversee permitting. In addition to generating federal revenue, approximately 49% of the royalties from the federal wells would return to the State of Wyoming. Mineral development revenue contributes to Wyoming's economy, and allows for improvements in state funded programs such as infrastructure and education. Federal wells also contribute to local economic development by employing workers in the area to build the roads and project infrastructure, drill the wells, and maintain and monitor the project area.

There are 11 existing CBNG wells on federal and non-federal mineral estate in Sirocco II POD boundary. Assuming an 80 acres spacing pattern (8 wells per square mile), the proposed Sirocco II CBNG wells would bring the total wells to a fully developed field according to WOGCC. It is RFD that this POD and those adjacent may add wells to the 80-acre spacing industry convention, or increase oil drilling.

3.8. Cultural Resources

Yates performed a class III cultural resource inventory for the Sirocco II POD prior to on-the-ground project work (BFO project no. 70110016). Yates provided BFO with a class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the *Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports*. Seth Lambert, BLM Archaeologist, reviewed the report for technical adequacy and compliance with BLM standards, and determined it adequate. The resources in Table 3.11 are in or near the project area.

Table 3.11. Cultural Resources in the Sirocco II Project Area

Site #	Site Type	Eligibility	Site #	Site Type	Eligibility
48JO695	Historic	Not Eligible	48JO4022	Prehistoric	Not Eligible
48JO699	Historic	Not Eligible	48JO4034	Prehistoric	Not Eligible
48JO700	Historic	Not Eligible	48JO4035	Prehistoric	Not Eligible
48JO1544	Prehistoric	Not Eligible	48JO4222	Prehistoric	Not Eligible
48JO1546	Historic	Not Eligible	48JO4223	Prehistoric	Eligible

Site #	Site Type	Eligibility	Site #	Site Type	Eligibility
48JO1549	Prehistoric	Not Eligible	48JO4224	Prehistoric	Not Eligible
48JO4020	Historic	Not Eligible	48JO4225	Prehistoric	Not Eligible
48JO4021	Historic & Prehistoric	Not Eligible	48JO4234	Prehistoric	Not Eligible

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

3.9. Air Quality

Refer to the PRB FEIS pp. 3-291 to 3-299, for a 2003-era description of the air quality conditions. BLM incorporates by reference, Update of Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2020, BLM (AECOM), 2009, (Cumulative Air Quality Effects, 2009) as it captures the cumulative air quality effects of present and projected PRB fluid and solid mineral development. Existing air quality in the PRB is in attainment with all ambient air quality standards. It is also in an area that is in prevention of significant deterioration zone. PRB air quality is a rising concern due to ozone in the oil and gas producing Upper Green River Basin that exceeded EPA limits for 13 days in 2011 requiring 10 warnings to stay indoors; in addition to PRB-area air quality alerts issued in 2011 for particulate matter (PM), attributed to coal dust. Four sites monitor the air quality in the PRB: Cloud Peak in the Bighorn Mountains, Thunder Basin northeast of Gillette, Campbell County south of Gillette, and Gillette. In addition, the Wyoming Air Resource Monitoring System (WARMS) measures meteorological parameters from 6 sites, and particulate concentrations from 5 of those sites, monitors speciated aerosol (3 locations), and evapotranspiration rates (3 locations). These sites are at Sheridan, Taylor Reservoir, South Coal Reservoir, Buffalo, Juniper, and Newcastle. The northeast Wyoming visibility study is ongoing by the Wyoming Department of Environmental Quality (WDEQ). Sites adjacent to the Wyoming PRB-area are at Birney on the Tongue River 24 miles north of the Wyoming-Montana border, Broadus on the Powder River in Montana, and Devils Tower.

Existing air pollutant emission sources in the region include:

- Exhaust emissions (primarily CO and nitrous oxides [NO_X]) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- Dust (particulate matter) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas and road sanding during the winter months, and from coal mines;
- Transport of air pollutants from emission sources located outside the region;
- NO_X, particulate matter, and other emissions from diesel trains; and
- SO_2 and NO_X from power plants.
- For a description of the 2003-era air quality conditions in the PRB, refer to the PRB FEIS, Chapter 3, pp. 3-291 to 3-299.

4. ENVIRONMENTAL EFFECTS

This section analyzes and describes the environmental effects of Alternatives B, p. 32, and C, p. 66, on the affected environment described in Section 3. This section analyzes Alternative B in total and only then in turn, analyzes Alternative C. This is because Alternative C comprises 2 changes from Alternative B. The effects analysis addresses the direct and indirect effects of implementing the proposed action, the cumulative effects of the proposed action, combined with reasonably foreseeable federal and non-federal actions, identifies and analyzes mitigation measures (COAs), and discloses any residual effects remaining following mitigation.

4.1. Alternative A

The PRB FEIS analyzed the No Action Alternative as Alternative 3. Additionally the recent analyses and approved CBNG developments listed in Table 3.1, in and around this POD, updated the baseline present circumstances using the aggregate effects approach to collectively, cumulatively comprise the No Action Alternative. BLM incorporates by reference those analyses into this EA. Information specific to resources for this alternative is in the PRB FEIS on pages shown in Table 4.1 aggregated with the analysis in the EAs found in Table 3.1, along with the Sirocco I CX3, CX09-3-018 to 021.

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

Resource		Type of Effect	Page(s) of PRB FEIS
Project Area Description	Geologic Features and Mineral Resources	Direct and Indirect Effects	4-164 and 4-134
		Cumulative Effects	4-164 and 4-134
Soils, Vegetation, and Ecological Sites	Soils	Direct and Indirect Effects	4-150
		Cumulative Effects	4-152
	Vegetation	Direct and Indirect Effects	4-163
		Cumulative Effects	4-164
	Wetlands/Riparian	Direct and Indirect Effects	4-178
		Cumulative Effects	4-178
Wildlife	Sensitive Species - Greater Sage-Grouse	Direct and Indirect Effects	4-271
		Cumulative Effects	4-271
	Aquatic Species	Direct and Indirect Effects	4-246
		Cumulative Effects	4-249
	Migratory Birds	Direct and Indirect Effects	4-234
		Cumulative Effects	4-235
	Waterfowl	Direct and Indirect Effects	4-230
		Cumulative Effects	4-230
	Big Game	Direct and Indirect Effects	4-186
		Cumulative Effects	4-211
	Raptors	Direct and Indirect Effects	4-224
		Cumulative Effects	4-225
Water	Ground Water	Direct and Indirect Effects	4-63
		Cumulative Effects	4-69
	Surface Water	Direct and Indirect Effects	4-77
		Cumulative Effects	4-69
Economics and Recovery of CBNG Resources		Direct and Indirect Effects	4-362
		Cumulative Effects	4-370
Cultural Resources		Direct and Indirect Effects	4-286
Air Quality		Direct and Indirect Effects	4-386
		Cumulative Effects	4-386

4.2. Alternative B: The Operator's Proposed Action

Alternative B contains 36 CBNG and 2 water injection APDs along with their infrastructure, 1 off channel pit considered secondary (i.e. not needed at this time but will be analyzed in this EA), and ROWs. This alternative is a result of Yates and BLM working to reduce many, but not all, environmental impacts.

4.2.1. Soils, Vegetation, and Ecological Sites

4.2.1.1. Direct and Indirect Effects

The PRB FEIS analyzed direct and indirect impacts to soils associated with fluid mineral development. For these affects refer to p. 4-134 of the PRB FEIS. Impacts anticipated to occur include soil rutting and

mixing, compaction, increased erosion potential, and loss of soil productivity. The most notable impacts to soils would occur in association with the construction of well pads, staging areas, and roads. Construction of these facilities requires grading and leveling, with the greatest level of effort required on more steeply sloping areas. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. Mixing may result in removal, dilution, or relocation of organic matter and nutrients to depths where it would be unavailable for vegetative use. Less desirable inorganic compounds such as carbonates, salts, or weathered materials could be relocated and have a negative impact on revegetation.

Soils would be compacted as a result of the construction of wells and associated facilities, with compaction maintained, at least in part, by continued vehicle and foot traffic as well as operational activities. 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. Compaction leads to a loss of soil structure; decreased infiltration, permeability, and soil aeration; as well as increased runoff and erosion.

Increased erosion can lead to a decrease in soil fertility and an increase in sedimentation. The duration and intensity of these impacts would vary according to the type of construction activity to be completed and the inherent characteristics of the soils to be impacted.

The potential for erosion would increase through the loss of vegetation cover and soil structure as compared to an undisturbed state. Soil productivity would decrease, primarily as a result of profile mixing and compaction along with the loss in vegetative cover. These impacts would begin immediately as the soils would be subjected to grading and construction activities and impacts would continue for the term of operations. The impacts on soils would move to a steady state as construction activities were completed and well production/maintenance operations begin.

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 (Belnap et al. 2001). They are adapted to growing in severe climates; however, they take many years to develop (20 to 100) and can be easily damaged or destroyed by surface disturbances associated with construction activities.

Rutting affects the surface hydrology of a site as well as the rooting environment. The process of rutting physically severs roots and reduces the aeration and infiltration of the soil, thereby degrading the rooting environment. Rutting may result in mixing of topsoil and subsoil, thereby reducing soil productivity. Rutting also disrupts natural surface water hydrology by diverting and concentrating water flows creating accelerated erosion. Soil mixing typically results in a decrease in soil fertility and a disruption of soil structure.

Construction of 23 wells see Table 2.1. Proposed Wells – Alternative B, and Section 2.4, will not require earth work preparation (no engineered pad/no slot) other than digging of drilling pits and digging in wheels to level the drilling rig. Drilling of these wells on the natural topography would result in less initial disturbance to the soil resource. No additional soil would be tilled, bladed, removed or graded. Actual turning of the soil will occur where the reserve pits are constructed; soil productivity and soil quality will be maintained when top soil is segregated and saved for distribution on pit disturbances. Exceptions for compaction reduction via deep ripping will be considered by the Authorized Officer.

An engineered pad is needed at 11 wells in Table 2.1. Proposed Wells – Alternative B, to safely drill the wells on steep topography, with cuts/fills exceeding 5 feet, and are proposed on the SNe Shingle-Tassel

association soils. The MSUP states production facilities will have cut and fill slopes at 1.5: 1 (66.7 % slope) with no definitive commitment included for decreasing the slopes for interim reclamation. Onshore Oil and Gas Order No. 1, III.D.4.j. requires the operator submit a plan for surface reclamation, the plan must address interim (during production) reclamation. (e.g. "Reduce the backslope to 2:1 and the foreslope to 3:1, unless otherwise directed by the BLM Authorized Officer. Reduce slopes by pulling fill material up from foreslope into the toe of cut slopes.") The operator is responsible for having the actual construction of the pads meet Bureau standards. Yates would not commit to reductions of slopes at the 11 engineered pad locations nor did they present adequate mitigating design features and/or mitigation for the wells by the time of this analysis. Wells already constructed in the project area by Yates have shown slope failure on fill slopes and active erosion on slopes where interim reclamation has not been attempted. BLM may require slope reduction mitigation to engineered pads as required by Onshore Oil and Gas Order No. 1 in the form of COAs.

The BLM will evaluate reclamation success using the requirements in the BLM State Wide Reclamation Policy revised in 2011, see Appendix B, below, for application of the requirement with the COAs, will ameliorate the direct and indirect effects on soils and erosion – except as highlighted in the analysis of APD recommended for deferral or denial, below.

Expanded gas, water, and electric ROW infrastructure linking POD support facilities are part of reasonably foreseeable development (RFD) to this proposal (PRB ROD, p. 2). These include trends toward 80 acre spacing (8 wells per section) and changes in associated infrastructure. Such is the case with Sirocco II. A foreseeable addition may be a request for a ROW to connect roads, gas and water utility lines of Sirocco I and Sirocco II projects, in addition to the potential for oil well development.

4.2.1.2. Limited Reclamation Potential (LRP)

This proposal is about 75% in LRP areas, see Section 3, above. LRP areas have little or no reclamation potential. BLM's current policy is to avoid these areas; see Onshore Oil and Gas Order No. 1, IV.c; PRB ROD pp. 10-13, A-19 to A-21; Buffalo RMP ROD, pp. 17-18; and FLPMA, Section 302. Since avoidance is not always possible BLM carefully considers these surface disturbance impacts and their effects.

Coal Seams

The following wells are proposed in LRP areas including miscellaneous areas such as coal fines: DRAFT CS FED 4, DRAFT CS FED 12, SIROCCO CS FED 4, and WHISK CS FED 9. These locations in coal fines have low potential for restoration, high susceptibility for site degradation, and poor reclamation suitability. Yates presented adequate mitigating design features and/or mitigation for these well locations.

Yates chose not to move 2 APDs in their revised MSUP for wells that were moved at the onsite. Revised APD cover sheets and plats were needed to be submitted for DRAFT CS FED 10 and WHISK CS FED 6 which were moved [at the onsites] to reduce impacts to LRP areas.

Miscellaneous areas, badlands, rock outcrop, sand blowout and slopes in excess of 25%

Yates indicated in their MSUP and stated at the onsite template roads and/or engineered roads with utility corridors (on this project) will require 75 feet disturbance width (see SUDS form Tab 4 last page). Access roads, utility corridors, and in some cases well locations to the wells listed here, below, will have direct and indirect impacts to LRP areas including: miscellaneous areas, badlands, rock outcrop, slopes in excess of 25%, and will have impacts to map unit SNe soil type Shingle Tassel association which has low potential for restoration, high susceptibility for site degradation, poor reclamation suitability, and very shallow soils: DRAFT CS FED 3, DRAFT CS FED 7, DRAFT CS FED 9, DRAFT CS FED 10, DRAFT CS FED 14, DRAFT CS FED 17, WHISK CS FED 5,WHISK CS FED 6, WHISK CS FED 8, WHISK CS FED 9, SIROCCO CS FED 2.

When added together the following project components (wells, roads, corridored utilities, and cross country utilities) will impact approximately 30.5 acres of LRP. BLM emphasized the importance of project minimization in these highly erosive areas at the onsite, in the deficiency letter, and in phone conversations with the operator on April 30 through May 18, 2012. BLM asked the operator for operator committed mitigation measures which will limit disturbance in these areas by narrowing the proposed disturbance width by placing pipeline/utilities within the road disturbance (see p. 3 Deficiency Letter dated March 1, 2012). Note: DRAFT CS FED 17 is included in this list as shared with the operator via phone conversation on April 26, 2012 due to impacts to thin sandy soils and slopes in excess of 25%.

DRAFT CS FED 3 Access road will have approximately 3.45 acres of unnecessary and undue degradation to avoidable LRP areas listed above when there was a slightly longer but reasonable alternative which would have eliminated all but 0.05 acres of impact to steep slopes. (The term "unacceptable degradation" "or "undue and unnecessary degradation" summarizes and supports the concepts found in: Onshore Oil and Gas Order No. 1, IV.c; PRB ROD pp. 10-13, A-19 to A-21; Buffalo RMP ROD, pp. 17-18; and FLPMA, Section 302.) BLM stated the road alignment should be shifted to follow the existing primitive road to avoid highly erodible areas when possible. The operator chose not to move the proposed road to the existing primitive road.

DRAFT CS FED 7 Access road will have approximately 4.39 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated all but ½ (2.17 acres) impact to steep slopes and sandy soils. BLM stated the utilities would need to be placed in the road disturbance to avoid highly erodible areas when possible The LRP areas identified at the onsite which need utilities placed in the road disturbance are as follows: NE Section 28 Access Road Sheet 15 of 24 as revised April 13, 2012, Stations 38+50 through 43+00 and the typical in-slope and or side hill template section to within 300 feet of the DRAFT CS FED 7 well location. The operator chose not to commit to placing the pipeline within the road disturbance.

DRAFT CS FED 9 Access road will have approximately 1.35 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated all but ½ (0.67 acres) impact to steep slopes and sandy soils. BLM stated the utilities would need to be placed in the road disturbance to avoid highly erodible areas when possible. The operator chose not to commit to placing the pipeline within the road disturbance.

DRAFT CS FED 10 This well was identified in the deficiency letter to be moved 200 feet SE. BLM has determined the location as proposed presents a safety hazard and does not provide adequate space for vehicles to turn around. BLM located an alternative location for DRAFT CS FED 10 200 feet SE within 200 meters (656 feet) of the proposed APD; off the narrow ridge to flat topography with no pad no slot needed. The template design and road exhibit access road to well Draft CS Federal 10 will have approximately 3.00 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated all but ½ (1.50 acres) impact to sand blowouts, sands, sandy soils, rock outcrop. BLM stated the utilities would need to be placed in the road disturbance to avoid highly erodible areas when possible. Yates provided a typical in slope and/or side hill template road with gravel surfacing for all weather purposes and stabilization soon after construction. Yates provided Road Exhibit Draft 10 Sand blowout to address 248 feet of impact to the sand blowout.

BLM stated at the onsite the utilities would need to be placed in the road disturbance due to deep sands and sandy soils for approximately 900 feet through the sand blowout to the BLM alternate well location. Yates did not present adequate mitigating design features and/or mitigation for this access road, nor could Yates commit to limiting the disturbance by placing the pipeline in the road disturbance for any length other than the 248 feet indicated in the road exhibit. The operator chose not to move the well (see letter to BLM received on May 16, 2012).

DRAFT CS FED 14 Access road will have approximately 0.86 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated approximately ½ (0.43 acres) impact to rock outcrops. BLM stated the utilities would need to be placed in the road disturbance to avoid highly erodible areas when possible. The operator chose not to commit to placing the pipeline within the road disturbance.

DRAFT CS FED 17 Access road/utilities will have approximately 3.00 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated approximately ½ (1.50 acres) impact to thin soils, badland components, rock outcrops. BLM stated the utilities would need to be placed in the road disturbance from station 17+00 through 27+00 to avoid highly erodible areas when possible. The operator chose not to commit to placing the pipeline within the road disturbance. The well will impact slopes in excess of 25 % with badland components. The operator redesigned the pad to limit disturbance of slopes in excess of 25 % with badland components.

WHISK CS FED 6 This well was identified in the deficiency letter to be moved 180 feet west (or 180 feet south if the operator wished) to avoid LRP areas. The well location and road/utilities will have approximately 2.00 acres of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated approximately ½ (1.00 acre) of direct impacts to rock outcrop, slopes in excess of 25%, drainages, head cuts, and very shallow soils. The engineered design access to well will access road will impact 200 feet of LRP areas including: miscellaneous areas, badlands, rock outcrop, slopes in excess of 25%, drainages head cuts, and very shallow soils. A separate utility corridor proposed adjacent to the engineered road will have an additional 200 linear feet of similar impact on even steeper slopes. At the onsite BLM identified and provided 3 reasonable alternatives (2 within 180 feet of the original APD) within 200 meters per 43 CFR 3101.1-2. 1) Moved 400 feet back to avoid rock outcrop, slopes in excess of 25%, drainages head cuts, and very shallow soils and reduce road to a template design. 2) moved south approximately 180 feet to avoid, rock outcrop, slopes in excess of 25%, drainages, head cuts, and very shallow soils but keep; 3) moved east approximately 180 feet along main road to eliminate engineered pad and engineered road. The operator chose not to move the well but did apply head cut mitigation to the head cut and culvert interface near the pad.

For the SIROCCO CS FED 2, BLM determined the location as proposed presents a safety hazard and does not provide adequate turn around. The engineered and template design access road to well SIROCCO CS FED 2 will have approximately 2,500 linear feet of direct and indirect impacts to LRP areas including: miscellaneous areas, badlands, rock outcrop, slopes in excess of 25%, drainages head cuts and will have impacts to map unit SNe soil type Shingle Tassel association which has low potential for restoration, high susceptibility for site degradation, poor reclamation suitability, and very shallow soils. This access is proposed over topography with 25-45% slopes with highly erosive soils. Portions of the proposed road have poor road suitability as the design shows load bearing portion of the road cut and fill falling over slopes greater than 25%. Portions of the alignment lie over large active head-cuts and numerous drainages while the entire proposal portion lies parallel with the drainage. The combination of steep slopes, severe erosion potential, and shallow soil limit soil stability and promote road failure and indicate that there is little or no reclamation potential. A separate utility corridor proposed adjacent to the engineered and template design access road will have an additional 2,500 linear feet of similar impact on even steeper slopes in excess of 50-65%. Since the surface is managed by the State of Wyoming, BLM contacted the State to for their recommendation. The State said they would support our decision. At the onsite there was no readily apparent option to gain access to this well. BLM recommended removal of the well from the project since Yates had it adequately surrounded by other Sirocco II wells to where drainage losses to other competitors should not be an issue. Yates did not present adequate mitigating design features and/or mitigation for this access road (see letter BLM received on May 16, 2012).
Cross country pipeline/utilities in NESW and SWSW Section 27 T46N/R77W, NESW Section 27 T46N/R77W, and NWSE Section 29 T46N/R77W will have direct and indirect impacts to approximately

0.80 miles (4,235 linear feet) of LRP areas including miscellaneous areas, badlands, rock outcrop, slopes in excess of 25%, impacts to map unit SNe soil type Shingle Tassel association which has low potential for restoration, high susceptibility for site degradation, poor reclamation suitability, and very shallow soils. On these cross country pipeline/utilities BFO requested plan and profile designs to determine the exact steepness, and disturbance widths associated with large scale drainage crossings. Yates didn't provide this information, but did provide a narrative description for reclamation plans on buried utility lines. BLM presented 3 alternatives to the proposal which has little if any reclamation potential: 1) Co-located with the existing resource road in the NW ¼ of Section 27 T46N/R77W, and NE ¼ of Section 28 T46N/R77W; 2) or shall be co-located with the existing resource road in the E ½ and S ½ Section 34 T46N/R77W; 3) or shall be installed with pipeline boring equipment. The operator chose the boring option to reduce impacts. The boring proposal for cross country pipeline NESW Section 27 T46N/R77W is shown on the maps. In the proposal Yates committed to boring both sides of the pipeline route via phone conversation on April 30, 2012 and May 2, 2012. This would still require about 1,393 feet of cross country pipeline construction on map unit SNe soil type Shingle Tassel association to get to the boring locations just before the slope gradient, but would eliminate 800 horizontal feet of impact to the steepest slopes. These boring locations did not present any topography issues according to Yates and are not on slopes in excess of 25%.

This road provides access south from the previously approved SIROCCO I DRAFT CS FED 8 to SIROCCO II DRAFT CS FED 15 and would have directly impacted a sand blowout. Access road as previously designed would have approximately 0.7 acre of unnecessary and undue degradation to avoidable LRP areas listed above when a reasonable alternative which would have eliminated approximately ½ (0.35 acre) impact to sand blowout and rock outcrops. BLM stated the utilities would need to be placed in the road disturbance to avoid highly erodible areas when possible. The operator committed to place the utilities within the road disturbance (see letter to BLM received on May 16, 2012).

There is a discrepancy between what the operator proposes and what is actually available on the ground create a safe well site. BLM, at the onsite, determined there is not enough working area for either the operators requested well site layout at the locations listed at these wells: SIROCCO CS FED 2 (slot), and DRAFT CS FED 10 (slot).

There is not enough working area for either the operators requested 75 foot wide road and pipeline corridor or do not have enough room at the APD's well location for the operator's well site layout. This discrepancy between what the operator proposes and what is actually available on the ground create an unsafe proposal and should be carefully considered due to safety concerns. The APDs listed here do not have enough room for the operator's proposal while avoiding LRP areas if the pipeline is placed outside of the road disturbance: DRAFT CS FED 3, DRAFT CS FED 7, DRAFT CS FED 9, DRAFT CS FED 10, DRAFT CS FED 14, and DRAFT CS FED 17.

The culverts proposed for access roads to the following wells DRAFT CS FED 5, DRAFT CS FED 6, DRAFT CS FED 7, DRAFT CS FED 12, DRAFT CS FED 13, DRAFT CS FED 17, DRAFT CS FED 18, SIROCCO S&R FED 8, WHISK S&R FED 14, SIROCCO CS FED 2, and WHISK CS FED 6 will direct surface water flows into head-cuts – increasing erosion potential and potential head-cut migration. BLM asked the operator to shift the culvert locations to direct water away from head-cuts or revise the MSUP to present adequate mitigating design features and/or mitigation for these culverts (See p. 4 Deficiency Letter dated March 1, 2012). Yates committed to monitor these locations and mitigate if necessary.

4.2.1.3. Cumulative Effects

For details on expected cumulative impacts, refer to the referenced PRB FEIS, Chapter 4.

The designation of the duration of disturbance is defined in the PRB FEIS (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization. However, the soil disturbances associated with the project components listed in Table 4.2 as proposed would result in long term, severe detrimental impacts. However, impacts can be avoided by moving the road/utility proposal for access to DRAFT CS FED 3 to follow an existing primitive road, and mitigated by the operator's commitment to placing utilities within the road disturbance for access to DRAFT CS FED 7, DRAFT CS FED 9, DRAFT CS FED 10, DRAFT CS FED 14, and DRAFT CS FED 17. For that reason BLM recommends the deferral of the APDs in Table 4.2 to allow the operator to present the identified reasonable mitigation through LRP areas.

Table 4.2. Project Components Recommended for Deferral Due to Impacts to LRP

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II DRAFT CS FED	3	SWSW	27	46N	77W	WYW146305
2	SIROCCO II DRAFT CS FED	7	NESE	28	46N	77W	WYW146305
3	SIROCCO II DRAFT CS FED	9	SWSW	28	46N	77W	WYW146305
4	SIROCCO II DRAFT CS FED	10	SWSE	28	46N	77W	WYW146305
5	SIROCCO II DRAFT CS FED	14	NENE	33	46N	77W	WYW146305
6	SIROCCO II DRAFT CS FED	17	SWNE	33	46N	77W	WYW146305

Separate Road Components with Impacts to LRP: The access road beginning 430 feet south of the previously approved SIROCCO I DRAFT CS FED 8 in NESW 28 T46N R77W will have direct impacts to a sand blowout. The operator's proposal for 75 feet (max) including separate road and pipeline corridors through this sand blowout would result in long term, severe detrimental impacts. Approximately 530 feet of this access road though the sand blowout is recommended to be removed due to impacts to LRP areas. However, impacts can be mitigated by the operator's commitment to placing utilities within the road disturbance. The operator committed to place the utilities within the road disturbance (see letter to BLM received on May 16, 2012). BFO recommend this road be approved with COAs.

The project components in Table 4.2 include the engineered access road in SE Section 32: This road provides access to 4 wells: WHISK CS FED 8, WHISK CS FED 5, SIROCCO CS FED 7, and DRAFT CS FED 12. From station 54+00 to Station 57+00 (300 feet) this road will directly and indirectly impact a sand blowout. With removal of this access road the wells in Table 4.2 lack access. On May 16, 2012 Yates committed to place buried utility within the road disturbance for WHISK CS FED 8 from station 54+00 to station 57+00 (300 feet). BLM recommends deferring the wells in Table 4.2, pending improved, mitigating designs and or thorough COAs that Yates and the BLM have yet to agree upon.

There is a discrepancy between what the operator proposes and what is actually available on the ground create a safe well site. BLM, at the onsite, determined there is not enough working area for the operators. BLM requested well site layout at the locations in Table 4.3. However, Yates agreed to consider alternatives to the well site lay out at the DRAFT CS FED 10, while they said there was no reasonable alternative to the SIROCCO CS FED 2. BLM recommends denial of the SIROCCO CS FED 2 from the project; and the deferral of the DRAFT CS FED 10 pending review of Yates proposal and other reasonably safe alternatives that either may propose.

Table 4.3. Project Components with Unsafe Well Site Layout

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II DRAFT CS FED	10	SWSE	28	46N	77W	WYW146305
2	SIROCCO II SIROCCO CS FED	2	SWNW	28	46N	77W	WYW134919

BLM recommended an alternative site within 200 meters per 43 CFR 3101.1-2 and the Operator rejected

those sites, see Table 4.3A. However, Yates is considering alternatives to the well site at the DRAFT CS FED 10 and BLM recommends deferring the DRAFT CS FED 10 pending review of Yates proposal. Yates and BFO agree the WHISK CS FED 9 can be mitigated through COAs and no move is necessary. Yates has refused to move the WHISK CS FED 6 to 1 of 3 reasonable alternate locations provided for WHISK CS FED 6; BLM recommends denial of the WHISK CS FED 6. If Yates chose to submit an APD for any of 3 reasonable alternate locations the WHISK CS FED 6 may have been approved.

Table 4.3A. BLM Suggested Alternative Sites within 200 meters of these APDs

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II DRAFT CS FED	10	SWSE	28	46N	77W	WYW146305
2	SIROCCO II WHISK CS FED	9	NESE	32	46N	77W	WYW130108
3	SIROCCO II WHISK CS FED	6	NENW	32	46N	77W	WYW130108

4.2.1.4. Mitigation Measures.

BLM will consider the application of standard (i.e. industry accepted) COAs listed below:

1. A 30 day stabilization requirement is applied to wells and access/pipelines which will have impacts to sensitive areas identified in the field.
2. A sandy seed mix is applied to wells and access/pipelines which impact sands and sandy ecological sites; and
3. A shallow loamy seed mix is applied to wells and access/pipelines which impact shallow loamy ecological sites.
4. Pits shall be lined in sands and sandy soils.

BLM identified and provided in writing alternate routes and suggested numerous BMPs and design features which would have reduced the project impacts to LRP areas. The following construction practices were provided at the onsite and in the deficiency letter: Through LRP areas and Sand blowouts: 1) Avoid LRP areas by rerouting to adjacent primitive roads where there would be less of impact; or 2) Narrow the proposed disturbance width by placing pipeline/utilities within the road disturbance.

Impacts to soils and vegetation from surface disturbance will be reduced by following the BLM and Yates applied design features, apart from the analysis of project components listed in Tables 4.2, 4.3, and 4.3A.

1. The seed mixes for re-vegetation in the Sirocco II POD are determined based on soil map unit types, the dominant ecological sites found in the project area, and the mixing of soil horizons in disturbed areas. Shallow Loamy and Sandy seed mixes are recommended for the POD. The sandy seed mix is applied to wells and access/pipelines which impact sands and sandy ecological sites at the locations listed in Table 4.8; while the remainder of the project shall have the shallow loamy seed mix.
2. 30 day stabilization requirement is applied to wells and access/pipelines which impact sands and sandy ecological sites at these locations: SIROCCO I DRAFT CS FED 8, DRAFT CS FED 10, WHISK CS FED 8, WHISK CS FED 9, DRAFT CS FED 4, DRAFT CS FED 12, SIROCCO CS FED 4 This shortened time frame for application of stabilization measures must be applied 30 days from the start of construction.
3. The following wells are proposed in are in LRP areas including miscellaneous areas such as coal fines: DRAFT CS FED 4, DRAFT CS FED 12, SIROCCO CS FED 4, and WHISK CS FED 9. These locations shall have rock aggregate applied to the well area to protect erosive coal fines.
4. WHISK CS FED 8 shall have utilities placed within the road disturbance from station 54+00 to station 57+00 (300 feet).
5. WHISK CS FED 9 shall have liner placed in drilling pits. Utilities shall be placed within the road disturbance.
6. Place a minimum average of 4 inches of aggregate on road segments where grades exceed 8%.

7. The BLM will evaluate reclamation success using the requirements set forth in the State Wide Reclamation Policy revised 2011, see Appendix B of this EA and incorporated herein.
8. The operator is responsible for having the licensed professional engineer(s) certify that the actual construction of the road meets the design criteria and is constructed to Bureau standards.

4.2.1.5. Residual Effects

Residual effects in the project area would include a long-term loss of soil productivity associated with well pads and roads. Residual effects were identified in the PRB FEIS (p. 4-408) such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

The identified residual effects associated with the approval of the SIROCCO CS FED 2 and WHISK CS FED 6 APDs are as follows:

1. BLM considers this proposal to have little to no reclamation potential with final reclamation bordering on difficult if not impossible to achieve.
2. The surrounding area which would be impacted by these wells includes drainages with side slopes and fragile soils. These impacts would initiate long term site instability and likely would not be able to be reclaimed meeting the requirements of the Wyoming BLM Reclamation Policy, see Appendix B of this EA.

BLM provided Yates with 3 alternate locations for the WHISK CS FED 6. Had the operator chose to incorporate one of these reasonable alternate locations the avoidable adverse impacts to fragile soils may have been reduced to a level already analyzed and disclosed in the PRB FEIS, Chapter 4.

For the above reasons linked to soils with limited reclamation potential the BLM will consider denying the SIROCCO CS FED 2 and WHISK CS FED 6 APDs and their associated infrastructure with its proposed location, design features, and mitigation; for as shown above the proposal falls short of site-specific needs and requirements in soil with limited reclamation potential as identified in the PRB FEIS and Buffalo RODs, the Wyoming BLM Reclamation Policy (see Appendix B, below), Onshore Oil and Gas Order No. 1, IV.c; and FLPMA, Section 302.

4.2.2. Vegetation and Ecological Sites

4.2.2.1. Direct and Indirect Effects

The PRB FEIS discussed most direct and indirect effects to ecological sites and vegetation, pp. 4-153 to 4-164. The proposed action would impact the common plant communities that occur on the site and the transition between the communities.

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

Sagebrush does not regenerate easily after human disturbance such as urban or agricultural development, or even after natural occurrences such as wildfire. It takes years, even generations, for sagebrush to fully grow back. Sagebrush still has not 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).

Vegetation impacted by the roads and well locations listed in Tables 4.2, 4.3, and 4.3A is thin and

susceptible to wind and water erosion. This is primarily due to the SNe soil type. The SNe map unit Shingle-Tassel association comprises about 75% of the project area. This map unit description is has paralithic bedrock at 8 to 10 inches, is either well drained or excessively drained which results in low water holding capacity, and has low potential for restoration. These properties create unstable soils and physical and chemical properties that limit plant growth along the access routes. These locations have very thin fragile topsoil with fragile root systems used to stabilize the surface and allow plant growth. BLM calculated the entire road disturbance would amount to approximately 2.55 miles (13,468 linear feet) of road constructed to reach the wells. Of that length nearly all is constructed through very thin top soil, badlands, blown-out lands and rock outcrops. Authorizations for surface disturbing actions are based upon the assumptions that a disturbance can ultimately be successfully reclaimed. BLM has evaluated the operator's proposal and determined the disturbance should be avoided for the following reasons:

1. The amount of quality topsoil salvaged along the access roads for the wells in the Tables 4.2, 4.3, and 4.3A, will be inadequate to prepare the seed bed for interim and final reclamation. The soils at this location will not provide suitable surface and subsurface physical, chemical, and biological properties to support the long term establishment and viability of the desired plant community.
2. Blade work along these routes would remove root zones which have held in place a fragile and naturally unstable landform, a disturbance in this landform would create an erosional condition that will preclude BLM and the operator from reaching goals set forth the in the Wyoming Reclamation policy. The fragile plant communities along these routes will be difficult if not impossible to restore, which is why these land form are commonly recommended to be avoided.
3. There are alternate well locations, access routes, and design features which could limit or completely avoid disturbance to these landforms and fragile plant communities which the operator chose not to accept.

Template access road and the well location of WHISK CS FED 9: This road provides access to WHISK CS FED 9. This road and well will directly and indirectly impact a historic sand blowout with a thin minimally protective vegetation layer on the surface. Shovel testing (or "a shovel test") at this location confirmed the vegetation root zone is about 1 – 2 inches with deep sands below. Adjacent sand dunes and active sand blowout indicated this site has the likely potential, with more surface disturbance, to revert back to an active sand blowout with little or no reclamation potential. Canada thistle is abundant at this location there is a need for treatment/removal prior to construction activities to prevent further spread to adjacent lands. Cheatgrass is abundant at this location prior to construction there is a need for treatment/removal prior to construction activities to prevent further spread to adjacent lands.

4.2.2.2. Cumulative Effects

The PRB FEIS discussed cumulative effects to ecological sites, including vegetation, pp. 4-153 to 4-172. Cumulative effects to ecological sites include the further alteration of disturbance regimes from the increased disturbance, increase in noxious weeds, and alterations in vegetation community's diversity and cover.

4.2.2.3. Mitigation Measures

BLM will consider the application of standard (i.e. industry accepted) COAs listed below:

1. A 30 day stabilization requirement is applied to wells and access/pipelines which will have impacts to sensitive areas identified in the field.
2. A sandy seed mix is applied to wells and access/pipelines which impact sands and sandy ecological sites; and
3. A shallow loamy seed mix is applied to wells and access/pipelines which impact shallow loamy ecological sites.
4. Whisk CS Fed 9 shall have Canada thistle and cheat grass treatment/removal prior to construction activities to prevent further spread to adjacent lands.

If applied correctly, BLM selected seed mixes which contain native grasses and forbs could restore disturbed areas to properly functioning vegetation communities with the exception of sage-brush since it's not in the current seed mixes. These mitigation measures will be applied to 3.35 miles or 17,703 feet of sandy ecological sites (Sandy 10-14NP) or shallow loamy (Shallow Loamy 10-14NP) which will require expedient reclamation. BLM can only require their use on BLM surface. The seed mix for private land is selected by the surface owner and may be more beneficial to ranch operations.

If chemical and physical treatment of known weed infestations at WHISK CS FED 9 location is applied before construction activities the change of spreading these weeds to adjacent lands will be reduced.

BLM will recommend the Operator follow the reclamation requirements in Appendix B. See mitigation section in the soils section above for full description of the policy as it applies equally to ecological sites.

4.2.2.4. Residual Effects

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

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

The wells listed in Tables 4.2, 4.3 and 4.3A their associated access roads would present a long term challenge for BLM and the operator to reclaim, and stabilize according to guidance provided in the Wyoming Reclamation Policy. Specifically it is highly likely that reclamation may never be successful for APDs SIROCCO CS FED 2 and WHISK CS FED 6 for the reasons described above.

4.2.3. Wetlands/Riparian

4.2.3.1. Direct and Indirect Effects

The PRB FEIS identified direct and indirect effects to wetlands and riparian areas, p. 4-175. Additionally, the PRB FEIS identified effects to gallery forests of mature cottonwood trees (ROD, p. A-30). The Sirocco II POD manages produced water from the CBNG wells through reinjection to the Fort Union formation using 2 deep injection disposal wells therefore no direct or indirect effects from the produced water to wetlands or riparian areas are anticipated.

4.2.3.2. Cumulative Effects

The PRB FEIS adequately covered the potential cumulative effects to the wetland and riparian areas, pp. 4-178 to 179.

4.2.3.3. Mitigation Measures

Mitigation measures that will help to protect the riparian and wetland habitat potentially affected by the activities described in this EA include, but are not limited to, the control of noxious weeds, adherence to the WYPDES permit requirements for the water quality and quantity monitoring of the discharges tied to this POD development, road crossing maintenance, and enforcement of the COAs and BMPs associated with this CBNG development.

4.2.3.4. Residual Effects

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

4.2.4. Invasive Species

4.2.4.1. 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, and related facilities would present opportunities for weed invasion and spread. Canada thistle is abundant at the WHISK CS FED 9 well location; prior to construction there is a need for treatment/removal prior to construction activities to prevent further spread to adjacent lands. Cheatgrass is abundant at this location prior to construction there is a need for treatment/removal prior to construction activities to prevent further spread to adjacent lands.

4.2.4.2. Cumulative Effects

Cumulative effects related to the spread of noxious weeds/invasive plants are in the PRB FEIS 4-164.

4.2.4.3. Mitigation Measures

BLM will consider the application COAs listed below:

1. WHISK CS FED 9 shall have Canada thistle treatment/removal prior to construction activities to prevent further spread to adjacent lands.
2. WHISK CS FED 9 shall have cheatgrass treatment/removal prior to construction activities to prevent further spread to adjacent lands.
3. Yates shall consult with BLM for appropriate chemicals used to treat cheat grass on federal lands.
4. Written documentation of weed treatment shall be required prior to construction at the WHISK CS FED 9.

4.2.4.4. Residual Effects

It is reasonable to limit the operator's control efforts to the surface disturbance associated the implementation of the project. Cheatgrass 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 in the project area.

It is reasonable to limit construction activities in known areas of Canada thistle infestation and heavy cheatgrass until those areas treated and these weed populations are brought under control.

4.2.5. Wildlife

4.2.5.1. Threatened, Endangered, Proposed, and Candidate Species

4.2.5.1.1. Threatened and Endangered Species

Table 4.4. Summary of Threatened and Endangered Species Habitat and Project Effects

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Threatened				
Ute ladies'-tresses orchid	Riparian areas with permanent water	NP	NE	Windmill Creek does not contain a perennial water source and is dominated by upland vegetation. Habitat not present.
Candidate				
Greater Sage-grouse	Basin-prairie shrub, mountain-foothill shrub	K	WIPV	Suitable nesting and brood rearing habitat is present and the project will negatively affect sage-grouse.

Presence	Project Effects
K – Known, documented observation in project area. **NP** – Habitat not present and species unlikely to occur in project area.	**NE** – No Effect **WIPV -** Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

4.2.5.2. Candidate Species – Greater Sage-grouse (sage-grouse)

4.2.5.2.1. Direct and Indirect Effects

The, *12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (FWS 2010) offers a detailed discussion of impacts to sage-grouse associated with energy development. The best available science describing both the range-wide and PRB current status, habitat needs, threats, and projections for the species can be found in the FWS Proposed Rule (FWS 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 addressing habitat characteristics (p. 13917), connectivity (pp. 13923 to 41392), energy development (pp. 13942 to 13949), and projections of future populations (pp. 13958 to 13961). Impacts to sage-grouse are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Research indicates that sage-grouse hens also avoid nesting in developed areas.

Implementation of the Sirocco II project will adversely impact nesting and brood-rearing habitat through direct loss, fragmentation, and avoidance of habitats. The development of the 38 CBNG well pads will remove approximately 6 acres of sage-grouse habitat because three wells are located within sagebrush shrub lands. The associated access roads to the wells will remove approximately 1 acres of sage-grouse habitat. One cross-country utility pipeline will remove approximately 8 acres of sage-grouse habitat. The Sirocco II POD area includes 1,896 acres of high quality nesting habitat and 158 acres of high quality winter habit (some of which overlap each habitat use).

4.2.5.2.2. Cumulative Effects

BLM expects the cumulative effects to sage-grouse to be similar to those described in the Kingsbury Unit 5 POD and West Kingsbury 1 POD EA, WY-070-EA09-96, incorporated here by reference (Section 4.1.5.9.3.1., pp. 52-53, respectively). The 38-Pumkin Creek II Lek has 809 existing wells within 4 miles of the lek. The average well spacing is 16.1 wells per square mile, with the development of the Sirrocco II POD, 3 wells from the project plus proposed projects within the 38-Pumkin Creek II Lek (located 3.8 miles from project boundary) will add an additional 318 wells into the analysis area, an average of 22.4 wells per square mile.

Table 4.5. Description of proposed wells within 12.4 miles of Documented Leks inside of Buffalo Core Area located within 12.4 miles from the Sirocco II POD

Lek #	Lek Name	Existing Wells (Producing or Approved)	Proposed Wells	Wells per Square Mile (Existing only)	Wells per Square Mile (Existing & proposed wells)
1	Curtis Draw	2093	96	4.3	4.5
2	Fourmile Rd	1541	95	3.2	3.4
3	Garrett	2255	699	4.7	6.1
4	Garrett II	2343	964	4.9	6.7
5	Nine Mile	1231	96	2.5	2.8
6	Phinney Draw	1546	113	3.2	3.4
7	Reno Draw	1694	1526	3.5	6.7

The 2012 BLM-contracted population viability analysis for the Northeast Wyoming sage-grouse found there remains a viable population of sage-grouse in the PRB (Taylor et al. 2012). Threats from energy development and West Nile Virus (WNv) are impacting future viability (Taylor et al. 2012). The study indicated that effects from energy development, as measured by male lek attendance, are discernible out to a distance of 12.4 miles and will consequently impact 7 leks inside of the Buffalo Core area. [Some researchers found the best-fit spatial scale of impact from the lek 2 miles to over 8 miles, presumed as a function of the differing levels of oil and gas development in the analyzed region. (Harju, Walker, Holloran 2005)]

Studies document the additive impacts of energy development and WNv as a threat to sage-grouse persistence in the PRB (Taylor et al. 2012, Garton et al. 2011). The cumulative and synergistic effects of CBNG development and WNv in the PRB area will continue to impact the local sage-grouse population, causing further declines in lek attendance, and could result in local extirpation: "[f]indings reflect the status of a small remaining sage-grouse population that has already experienced an 82% decline within the expansive energy fields (Walker et al. 2007a), a level of impact that has severely reduced options for delineating core areas that are large enough and in high enough quality habitats to sustain populations." (Taylor et al. 2012).

Current well densities reduced the function of PRB core areas, affecting all of the remaining active leks within core (Taylor et al. 2012). Continued energy development around the core areas will continue to degrade their remaining value. Declines in active leks and male attendance indicate that the WNv outbreaks and energy development reduce sage-grouse populations and that they interact to exacerbate population declines. The effects of one WNv outbreak year could cut a population in half. Absent a WNV outbreak, or another stochastic event of similar magnitude, immediate extirpation in the PRB is unlikely. Results suggest that if current oil and gas development rates continue, they may compromise future viability of NE Wyoming sage-grouse, with an increased chance of extirpation with additional WNv outbreaks (Taylor et al. 2012).

4.2.5.2.3. Mitigation Measures

The BLM agreed to implement the State of Wyoming's Sage-grouse Core Area Strategy (IM 2012-019); which protects approximately 80% of sage-grouse leks in the State. However, in the PRB approximately 20% of leks are in core designated habitats, and the shape and size of the core areas in the BFO limits the protections afforded these leks. Additional mitigation may be necessary to maintain populations in the PRB. Such mitigation could include; increasing WNv control efforts, avoiding/minimizing surface water discharges, enhancing core area habitat quality, accelerating the pace of development by modifying or eliminating timing restrictions in some areas, efficiently suspending leases in (or habitats supporting) core, identifying areas in core, or undeveloped areas adjacent to core, that are appropriate for off-site mitigation, reducing supplemental predator habitat, and increased reclamation.

Aggressive reclamation of plugged and abandoned well fields, combined with habitat enhancements in functional core and supporting areas, may provide a source of birds to re-populate areas where sage-grouse are extirpated but the habitat can be successfully reclaimed.

Sage-grouse habitat restoration efforts in the PRB are ongoing. The BLM identified historical sage-grouse population centers that are ready for oil and gas reclamation where stakeholders will apply enhanced reclamation techniques. The intent is maintaining and enhancing those areas with remaining sage-grouse and increase suitability of currently uninhabited areas that are important for connectivity. The WY BLM initiated the PRB Restoration Program to implement strategies for accelerated reclamation and sage-grouse habitat in areas affected by federal oil and gas developments.

4.2.5.2.4. Residual Effects

Suitability of the project area for sage-grouse will be negatively affected due to habitat loss and fragmentation and proximity of unrestricted human activities associated with CBNG operations and maintenance activities. The residual effect of diminished sage brush habitat will continue since by sage brush's very nature and the limits of modern plant science it may take years and even generations to promote sage brush re-population unless best management practices, quality reclamation and adequate moister persist.

4.2.5.3. Special Status (Sensitive) Species (SSS)

BLM will take necessary actions to meet the policies set forth in SSS policy (BLM Manual 6840). BLM Manual 6840.22A requires that "The BLM should obtain and use the best available information deemed necessary to evaluate the status of special status species in areas affected by land use plans or other proposed actions and to develop sound conservation practices. Implementation-level planning should consider all site-specific methods and procedures which are needed to bring the species and their habitats to the condition under which the provisions of the ESA are not necessary, current listings under special status species categories are no longer necessary, and future listings under special status species categories would not be necessary." The PRB FEIS discusses impacts to SSS on pp. 4-257 to 4-265.

4.2.5.3.1. Bald Eagle

4.2.5.3.1.1. Direct and Indirect Effects

Active bald eagle nest #13144 is within 0.5 to 1 mile of 7 proposed wells from the Sirocco II POD. The nest is on the west of the Powder River, opposite side of the project and in a mature stand of cottonwood trees. Human activities in close proximity to active eagle nests may interfere with nest productivity. Romin and Muck (1999) indicate that activities within 0.5 miles of a nest are prone to cause adverse impacts to nesting raptors. If mineral activities occur during nesting, they could be sufficient to cause adult birds to remain away from the nest and their chicks for the duration of the activities. This absence can lead to overheating or chilling of eggs or chicks. Prolonged disturbance can also lead to the abandonment of the nest by the adults. Both actions can result in egg or chick mortality (take). In addition, routine human activities near these nests can draw increased predator activity to the area and increase nest predation. BLM's PRB ROD requires a 1 mile radius timing limitation during the breeding season (February 15- August15) around active bald eagle nests to reduce risk of decreased nest production or nest failure. The BLM must comply with the terms and conditions set forth in the Migratory Bird Treaty Act (MBTA) (1918), and the Bald and Golden Eagle Protection Act (1940) - both administered by the FWS. The BLM is also required to comply with BLM MOU WO-230-2010-04, 50 CFR 22.

The presence of overhead power lines may impact foraging bald eagles. Bald eagles forage opportunistically throughout the PRB, particularly during the winter when migrant eagles join the small number of resident eagles. Power lines not built to Avian Power Line Interaction Committee (APLIC) standards pose an electrocution hazard for eagles and other raptors perching on them especially when

overhead power is near roosting and nesting habitats. The FWS developed additional specifications improving on the APLIC suggestions. Constructing power lines to the APLIC suggestions and FWS standards minimizes but does not eliminate electrocution potential. BLM will analyze site-specific effects of any powerline proposed for this project upon receipt of the sundry application.

4.2.5.3.1.2. Cumulative Effects

The PRB FEIS discusses impacts to bald eagles on pp. 4-251 to 4-253.

4.2.5.3.1.3. Mitigation Measures

To reduce the risk of decreased eagle productivity or nest failure, the PRB FEIS analyzed a 1 mile radius timing limitation during the breeding season around active bald eagle nests, p. 4-251-252. BLM recommends a 1 mile radius timing limitation (TLS) during the breeding season(February 15 –April 15) around active bald eagle nests, see also PRB 2003 ROD, A-35, #8.This timing limitation will apply to the following wells in the Sirocco POD: SIROCCO II CLOUDBURST CS FED #1, SIROCCO II WHISK CS FED #1, SIROCCO II SIROCCO CS FED #'s 3, 4, 5, 6,and 8.

4.2.5.3.1.4. Residual Effects

None identified.

4.2.5.3.2. Black-tailed Prairie Dog

4.2.5.3.2.1. Direct and Indirect Effects

No impacts are anticipated to the 2 prairie dog colonies within the project area because there is not any project related infrastructure proposed through the colonies.

4.2.5.3.2.2. Cumulative Effects

The PRB FEIS discussed the cumulative effects for black-tailed prairie dogs associated with circumstances similar with those in Alternative B, pp. 4-255 to 4-256.

4.2.5.3.2.3. Mitigation Measures

No mitigation measures are required.

4.2.5.3.2.4. Residual Effects

No residual impacts are anticipated if overhead power is not built within active prairie dog colonies

4.2.5.3.3. Brewer's Sparrow, Loggerhead Shrike, Sage Thrasher

4.2.5.3.3.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. BFO expects the project impacts to these species from habitat removal, disruption caused by increased human presence, and reduced habitat suitability from fragmentation. See migratory bird section for more detail.

4.2.5.3.3.2. Cumulative Effects

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

4.2.5.3.3.3. Mitigation Measures

BFO recommends applying no further mitigation measures.

4.2.5.3.3.4. Residual Effects

None identified.

4.2.5.3.4. Migratory Birds

4.2.5.3.4.1. Direct and Indirect Effects

The PRB FEIS discussed the direct and indirect effects to migratory birds, pp. 4-231 to 4-235. Stock water tanks will be constructed at each water impoundment proposed in the Sirocco II POD. Some migratory birds will more than likely drown in stock water tanks if a bird escape ramp is not installed. Migratory birds drowning in a stock water tanks that receives water from the Sirocco II wells may have the operator in violation of MBTA.

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

Habitat fragmentation will result in more than just a quantitative loss in the total area of habitat available; the remaining habitat area will also be qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m (328 feet) of dirt roads within a natural gas field. Effects occurred along roads with light traffic volume (<12 vehicles per day). The increasing density of roads constructed in developing natural gas fields exacerbated the problem creating substantial areas of impact where indirect habitat losses through displacement were much greater than the direct physical habitat losses.

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

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

Overhead power lines may affect migratory birds in several ways. Power poles provide raptors with perch sites and may increase predation on migratory birds. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation.

4.2.5.3.4.2. Cumulative Effects

The cumulative effects associated with Alternative B are within the analysis parameters and impacts described in the PRB FEIS. For details on expected cumulative impacts, refer to the PRB FEIS, p. 4-235.

4.2.5.3.4.3. Mitigation Measures

Where raptor or sage-grouse nesting timing limitations are applied, nesting migratory birds will also receive protection. No additional mitigation measures are required.

4.2.5.3.4.4. Residual Effects

Those species and individuals that are nesting in areas unprotected by sage-grouse timing limitations or raptor timing limitations may have nests destroyed, or be disturbed, by construction activities. This is also the case for migratory birds that are still nesting after sage-grouse timing limitations are over (after 30 June). Protections around active raptor nests (Feb 1- July 31) extend past most migratory bird nesting seasons, but only a small portion of known nests are active in any given year, so the protections for migratory birds from June 30 - July 31 will only be in place for those that are nesting within 0.5 miles of that small portion of active nests.

4.2.5.4. Big Game

4.2.5.4.1. Direct and Indirect Effects

The yearlong range for pronghorn and yearlong and winter yearlong range for mule deer would be directly disturbed with the construction of wells, pipelines, and roads. Table 4.12 summarizes the proposed activities. Items identified as long term disturbance would cause direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they may provide some habitat value as they are reclaimed, and native vegetation becomes established. In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD indicates a well density of 8 wells per section creates a high level of impact for big game and that avoidance zones around mineral facilities overlap, creating contiguous avoidance areas (WGFD 2004a). A multi-year study on the Pinedale Anticline suggests that, not only do mule deer avoid mineral activities, but, after 3 years of drilling activity, they had not become accustomed to the disturbance (Madson 2005).

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

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

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

4.2.5.4.2. Cumulative Effects

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

4.2.5.4.3. Mitigation Measures

BLM recommends no further mitigation measures.

4.2.5.4.4. Residual Impacts

While big game animals are expected to return to the project area following construction, likely in reduced numbers due to the previously cited avoidance and displacement of surface disturbed and adjacent to surface disturbances of habitats, the continued human-caused disturbance associated with operation and maintenance may result in reduced local populations because big game may fail to habituate to the new disturbances (Lustig 2003). Habitat effectiveness for big game is anticipated to be reduced in the project area.

4.2.5.5. Raptors

4.2.5.5.1. Direct and Indirect Effects

The PRB FEIS analyzed direct and indirect impacts to raptors, pp. 4-216 to 4-221. Overhead power lines may affect raptors. Power lines placed in flight corridors may result in collision mortalities. Some species may avoid suitable habitat near power lines in an effort to avoid predation. For further impacts on raptors from OHP and human activities in close proximity to active nest see Section 4.2.5.3.1. on bald eagle direct and indirect effects.

4.2.5.5.2. Cumulative Effects

The PRB FEIS analyzed the cumulative effects associated with raptors, p. 4-221.

4.2.5.5.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure (PRB FEIS, p. 4-218), the PRB FEIS analyzed a 0.5 mile radius timing limitation during the breeding season around active raptor nests. In order to further understand the degree of potential population effects to raptor species (PRB FEIS, p. 4-219 to 4-220), BLM recommends that annual surveys for new raptor nests and nest occupancy checks shall be completed, see also PRB 2003 ROD, A-12, #38, and if nests are active, that timing limitations apply.

4.2.5.5.4. Residual Impacts

The timing restrictions analyzed in the PRB ROD can only be applied to surface disturbing activities. These restrictions do not protect nesting raptors from human disturbance or maintenance actions (disruptive activity that can last from several days to weeks) associated with later phases of CBNG operations at well locations during breeding/nesting season. Impacts associated with noise, additional traffic, human presence, and equipment disruption associated with maintenance actions from well operations remain.

4.2.6. Water Resources

The operator submitted a comprehensive WMP for this project. It is incorporated-by-reference into this EA per 40 CFR 1502.21. The WMP incorporates sound water management practices, and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Qualified hydrologists developed the water management plan. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area and downstream impacts from proposed water management strategy.

The Sirocco II POD will use reinjection to the Fort Union at 4,600 feet below surface formation using 2 deep injection disposal wells. The maximum water production is predicted to be 10 gpm per well or 360 gpm for this POD. The PRB FEIS projected the total amount of water that anticipated from CBNG development per year, (Table 2-8, Projected Amount of Water Produced from CBM Wells under Alternatives 1, 2A, and 2B p. 2-26). For the Upper Powder River drainage, the projected volume produced within the watershed area was 23,697 acre-feet in 2012 (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

2.5% of the total volume projected for 2012. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.2.6.2. Groundwater

4.2.6.2.1. Direct and Indirect Effects

The PRB FEIS predicts that one of the environmental consequences of CBNG production is possible impacts to the groundwater. "The effects of development of CBNG on groundwater resources would be seen as a drop in the water level (drawdown) in nearby wells completed in the developed coal aquifers and underlying or overlying sand aquifers." (PRB FEIS, p. 4-1) In the process of dewatering the coal 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 CBNG wells produce from depths which range from 1,445to 1585 feet compared to 10 and 620 feet deep Wasatch sands in the water wells. The operator committed to offer water well agreements to holders of properly permitted domestic and stock wells within the circle of influence (0.5 mile of a federal CBNG producing well) of the proposed wells.

The PRB FEIS anticipated that recovery of the coal bed aquifer should ". . . 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 [found in PRB FEIS, Table 3-5]. Redistribution is projected to result in a rapid initial recovery of water levels in the coal. The model projects that this initial recovery period would occur over 25 years." (PRB FEIS, p. 4-38)

Deep injection of produced water is the water management strategy proposed for the Sirocco II POD. Reinjection to the Fort Union Sand Formation is anticipated to be at 360 gpm. The injected water is to have water quality at the same or better than the projected aquifer in order to meet the UIC permit requirements. The water quality standards for the re-injection are enforced by the WDEQ.

Produced water infiltration will not impact near surface groundwater. Lined pits that BLM will consider upon receipt of a future sundry application and analysis, should contain any start-up or maintenance discharge at the injection wells.

4.2.6.2.2. Cumulative Effects

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

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

4.2.6.2.3. 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 using 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.

4.2.6.2.4. Residual Effects

The production of CBNG in this project area may cause groundwater levels to drop due to the CBNG dewatering. The PRB FEIS analyzed groundwater recharge post-CBNG development. ”Redistribution of pressure within the coals after water production ends would allow the hydraulic pressure head to recover within approximately 50 feet or less of pre-project levels within 25 years after the project ends. Complete recovery of water levels likely would take tens to hundreds of years, depending on the location.” (PBR FEIS, p. 4-65).

4.2.6.3. Surface Water

4.2.6.3.1. Direct and Indirect Effects

Produced Water Quality

Table 4.6 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 4.6. Comparison of Regulated Water Quality Parameters to Predicted Water Quality

Sample location or Standard	TDS mg/l	SAR	EC µmhos/cm
Primary Watershed at Arvada, WY Gauging Station			
Historic Data Average at Maximum Flow		4.76	1,797
Historic Data Average at Minimum Flow		7.83	3,400
WDEQ Quality Standards for Wyoming Groundwater (Chapter 8)			
Drinking Water (Class I)	500		
Agricultural Use (Class II)	2,000	8	
Livestock Use (Class III)	5,000		
Predicted Produced Water Quality			
Coal Zone (Big George)	1,740	29.1	2,780

Based on the analysis performed in the PRB FEIS, the primary beneficial use of the surface water in the PRB is the irrigation of crops, p. 4-69). However, irrigation use is not proposed in the WMP, rather the water will be disposed of in deep injection wells.

The water quality projected for this POD is 1,740 mg/l TDS. 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 10.0 gallons per minute (gpm) is projected is to be produced from these 36 wells, for a total of 360 gpm for the POD.

In order to determine the actual water quality of the producing formations in this POD and to verify the water analysis submitted for the pre-approval evaluation, the operator committed to designate a reference well to each coal zone within the POD boundary. A water sample will be collected from the reference well at the wellhead for WDEQ standard water quality analysis. The analysis is to be completed within 60 days of initial production and a copy of the water analysis is to be submitted to the BLM Authorized Officer. For more information refer to this POD’s WMP.

Produced Water Control

Management of produced water: 2 injections wells will be drilled. These are the SIROCCO S&R FED 8 located at NESW 29. T46N, 77W, Lease Number WYW134919; and the WHISK S&R FED 14 SENW 32, T46NR, 77W, Lease Number WYW130108. One (1) lined and fenced emergency pit, (Bob’s Pit) may

be constructed near WHISK S&R FED 14 which Yates has designated as secondary and not immediately needed unless sediment trapped in filters becomes an issue and regular cleaning is required. If the Bob's Pit becomes necessary for the management of produced water, Yates will submit a sundry and impoundment reclamation bond prior to construction of pit and the discharge of produced water into Bob's Pit. The sundry process will confirm whether there are any changes in features or use not analyzed in this EA. Shallow groundwater monitoring may be required based upon shallow groundwater investigations required for new impoundments by the WDEQ. Bonding of the pit will occur prior to beginning pit construction.

Bob's Pit associated with the proposed injection wells provides two main functions in the water management strategy:

1. If the injection filters need to be back-flushed the back flushed water will be directed to Bob's Pit. During the back-flush cycle the back-flush water is routed to the associated pit. This removes the coal fines and sand from the filters and the system.
2. Bob's Pit will also serve as emergency water storage in case the injection wells stop operating.

BFO evaluated all water management facilities for compliance with best management practices during the onsite.

Produced Water Quantity

The maximum amount of produced water from the 36 wells proposed is 360 gpm. Yates is proposing to re-inject the produced water via two injection wells. The maximum daily disposal capacity of the wells will be determined by testing after the well is completed but is estimated to be 6000 barrel per day per well or 175 gpm. With two injector wells Yates can inject 12,000 barrels per day (350 gpm) wells which leaves 10 gpm potential produced water unaccounted for. However, the phasing in of new wells takes several years; and not all wells will come on at max production rate at the same time (per conversation with Yates Tony Wyllie on May 18, 2012).

Springs

There were no natural springs identified by the operator for the Sirocco II POD within 0.5 mile radius of the POD boundary, therefore effects to natural springs were not evaluated

4.2.6.3.2. Cumulative Effects

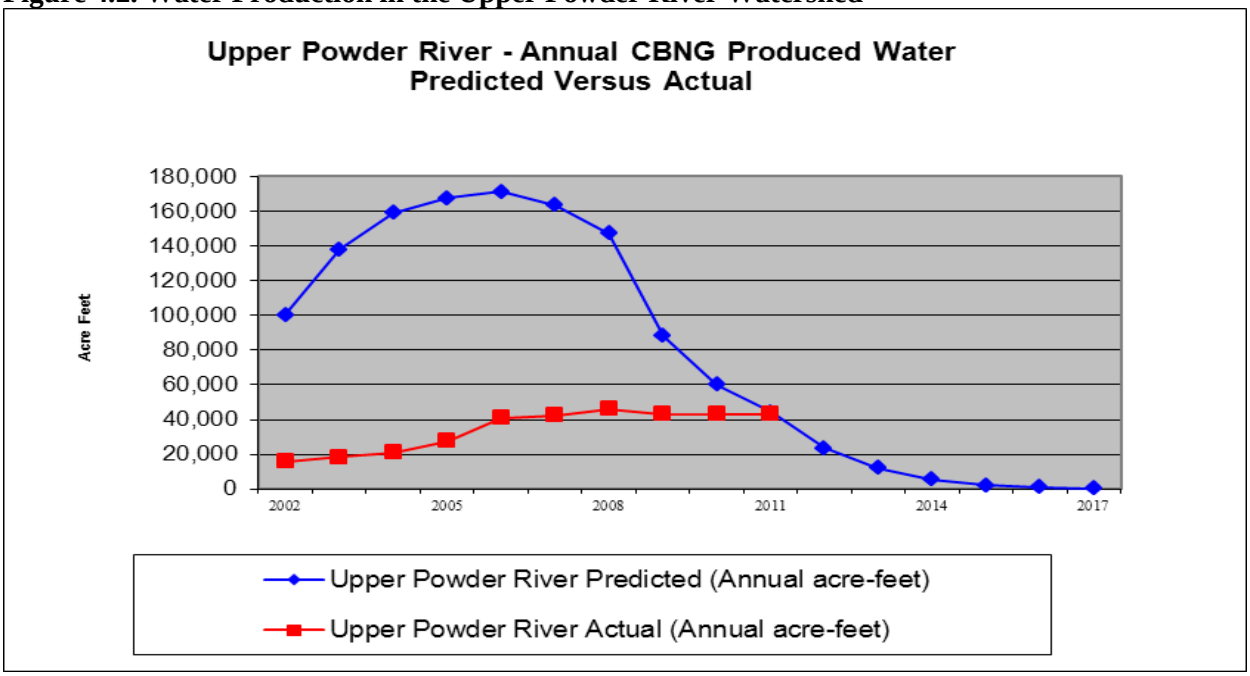
This analysis includes cumulative data from fee, state and federal CBNG development in the Upper Powder River watershed. These data were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC).

As of December 2011, all producing CBNG wells in the Upper Powder River watershed discharged a cumulative volume of 342,027 acre-feet of water compared to the predicted 1,240,055 acre-feet disclosed in the PRB FEIS (Table 2-8, p. 2-26). These figures are presented graphically in Figure 4.2 and Table 4.7 following. This volume is 27.6 % of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River watershed.

Table 4.7. Actual vs Predicted Water Production in the Upper Powder River Watershed

Year	Upper Powder River Predicted (Annual acre-feet)	Upper Powder River Predicted (Cumulative acre-feet from 2002)	Upper Powder River Actual (Annual acre-feet)		Upper Powder River Actual (Cumulative acre-feet from 2002)	
			A-ft	% of Predicted	A-Ft	% of Predicted
2002	100,512	100,512	15,846	15.8	15,846	15.8
2003	137,942	238,454	18,578	13.5	34,424	14.4
2004	159,034	397,488	20,991	13.2	55,414	13.9
2005	167,608	565,096	27,640	16.5	83,054	14.7
2006	171,423	736,519	40,930	23.9	123,984	16.8
2007	163,521	900,040	42,112	25.8	166,096	18.5
2008	147,481	1,047,521	45,936	31.1	212,522	20.3
2009	88,046	1,135,567	43,079	48.9	255,601	22.5
2010	60,319	1,195,886	43,263	71.7	298,864	25.0
2011	44,169	1,240,055	43,163	97.7	342,027	27.6
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**		**342,027**	***2011 Data Update 03-30-12***		

Figure 4.2. 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 10 primary watersheds in the PRB. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available.

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

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River drainage, which is approximately 27.6% of the total predicted in the PRB FEIS.
2. There is no surface discharge of CBNG produced water proposed by the Operator.

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

4.2.6.3.3. Mitigation Measures

Mitigation measures the BFO should consider include the following: 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.

4.2.6.3.4. Residual Effects

The production of CBNG in this project area may cause groundwater levels to drop due to the CBNG dewatering. The PRB FEIS analyzed groundwater recharge post-CBNG development. ”Redistribution of pressure within the coals after water production ends would allow the hydraulic pressure head to recover within approximately 50 feet or less of pre-project levels within 25 years after the project ends. Complete recovery of water levels likely would take tens to hundreds of years, depending on the location.” (PBR FEIS p. 4-65).

4.2.7. Economics of CBNG Resource Extraction

4.2.7.1. Direct and Indirect Effects

Alternative B includes the proposed roads and pipeline networks needed to support the proposed gas wells. Under Alternative B, 38 wells with timing limitations and COAs applied could eventually be approved. The project would potentially produce (in the course of project life span approximately 10-15 years) 13,689,263 MCF of CBNG and would generate about $49.4 million in measured in the present value (PV) of the revenue stream. Payments in the form of the PV of the royalty stream would amount to nearly $5.2 million paid to the US Government general treasury. Of those federal royalties, the State of Wyoming would receive a little over $2.5 million.

Sirocco II POD proposed 36 CBNG wells, Table 2.1. BLM petroleum engineers reviewed well logs from within or near the project area to determine what Sirocco II CBNG wells potentially could produce. It is worth noting that many of the CBNG wells in the project vicinity were not producing gas long enough to determine peak values for gas production and therefore no production curves were analyzed. Since all wells do not produce the same amount of gas due to the thickness or quality of coal formation which lie below each well, BLM grouped the wells in the POD boundary into areas where data was obtainable and created a weighted average for predicting CBNG production resulting from Sirocco II wells. The BLM findings are in Table 4.8E and Table 4.9E.

Table 4.8E. Prediction of Total Produced CBNG by Project Area

Section #	Number of Wells	Average MCF/Well	Total Gas (MCF)
27, 28, 29, 31, 32, 33	36	853,000	30,708,000

Table 4.9E. Prediction of Total Revenue

Number of Wells	Total Gas (MCF)	Total Revenue @ $4.00/MCF	PV of Total Revenue Stream Discounted @ 3.00%	Federal Royalties @ 12.5%	PV of Federal Royalties Discounted @ 3.00%	State of Wyoming - (49% of PV of Federal Royalty)
36	30,708,000	$107,478,000	$68,986,038	$13,434,750	$8,623,255	$4,225,395

4.2.7.2. 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 referenced PRB FEIS, p. 4-336.

4.2.7.3. Mitigation Measures

Management actions specific to Alternative B require that drilling and construction activities are subject to timing restrictions and limitations for wildlife values such as timing limitations for special status species: raptors, and sage-grouse. Additionally, COAs and BMPs for exploration, development, production, and reclamation will be applied to ensure that activities would not impact other resource values in the project area.

4.2.7.4. Residual Effects

The PRB FEIS described residual effects that fall within the analysis parameters for Alternative B.

4.2.8. Cultural Resources

4.2.8.1. Direct and Indirect Effects

The project will impact non-eligible sites 48JO695, 48JO699, 48JO700, 48JO1544, 48JO1546, 48JO1549, 48JO4020, 48JO4021, 48JO4035, 48JO4222 and 48JO4225. The project will not impact any historic properties. The BLM BFO followed the Wyoming State Protocol Section VI(A)(1) and electronically notified the Wyoming State Historic Preservation Officer (SHPO) on April 25, 2012 that no historic properties exist within the area of potential effect. If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS and ROD)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. The Standard COAs (General)(A)(1) explain further discovery procedures.

4.2.8.2. Cumulative Effects

Construction and development of oil and gas resources impacts cultural resources through ground disturbance, unauthorized collection, and visual intrusion of the setting of historic properties. This results in fewer archaeological resources available for study of past human life-ways, changes in human behavior through time, and interpreting the past to the public. Additionally, these impacts may compromise the aspects of integrity that make a historic property eligible for the National Register of Historic Places.

Recording and archiving basic information about archaeological sites and the potential for subsurface cultural materials in the proposed project area serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions constructed in support of federal actions can result in impacts to historic properties.

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

4.2.8.3. Mitigation Measures

If any cultural values [sites, artifacts, human remains (Appendix L PRB FEIS and ROD)] are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. Further discovery procedures are explained in the Standard COA (General)(A)(1).

When a project is constructed in an area with a high potential for buried cultural material, archaeological monitoring is often included as a condition of approval. Construction monitoring is performed by a qualified archeologist working in unison with construction crews. If buried cultural resources are located, construction is halted and the BLM consults with the 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 COAs.

4.2.8.4. Residual Effects

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

4.3. Alternative C – Modified Action

Alternative C is a modification of Alternative B based on BLM removing 2 APDs Table 4.10 and their infrastructure from the project proposal; as those APDs would have exceptional direct and residual impacts to surface disturbance in an area which has little or no reclamation suitability which could have been avoided. Alternative C also analyzes economic projections of CBNG extraction and cultural resources based on the denial of the above APDs. Alternative C incorporates by reference all the mitigation measures and their analysis from Alternative B – except that for the 2 denied APDs and the changes inherent in Alternative C's economic and cultural resource analysis.

Table 4.10. APDs BLM Recommends for Removal for the APDs Proposed in Table 2.1.

#	Well Name	Well #	Qtr/Qtr	Sec.	Township	Range	Lease #
1	SIROCCO II SIROCCO CS FED	2	SWNW	28	46N	77W	WYW134919
2	SIROCCO II WHISK CS FED	6	NENW	32	46N	77W	WYW130108

4.3.1. Soils

4.3.1.1. Direct and Indirect Effects

The impacts to soils under Alternative C will be the within the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS and ROD.

4.3.1.1.1. Limited Reclamation Potential (LRP)

The impacts to LRP areas under Alternative C will be the within the parameters for surface disturbance and surface disturbance reclamation found in PRB FEIS and ROD.

4.3.1.1.2. Miscellaneous Areas

Construction impacts discussed specific to 2 APDs (See Section 4, Soils Direct and Indirect Effects, Alternative B) will be avoided with the denial of these APDs. Thus impacts under Alternate C to miscellaneous areas have reasonable likelihood of minimizing adverse effects from surface disturbance and are likely to receive successful reclamation.

Badlands, Blown-out Lands, and Rock Outcrops:

Most landscapes can be reclaimed using established conventional reclamation methods. However, some areas have unique characteristics that make achieving all the reclamation requirements unrealistic. Areas posing the most extreme reclamation challenges will be identified as having Limited Reclamation Potential (LRP). Such is the case with access road to SIROCCO CS FED 2 and WHISK CS FED 6; these locations have highly sensitive and erosive soils, extremely sensitive vegetation types, soils with severe physical or chemical limitations (See WY Reclamation Policy, Appendix C of this EA). Alternatives considered throughout the process were avoidance or minimization. BLM will strongly consider avoidance in order to retain the project within the parameters of the PRB ROD and the Wyoming Reclamation Policy. This is in line with BFOs current policy to avoid impacts to LRP areas. Authorizations for surface disturbing actions are based upon the assumption that a disturbance can ultimately be successfully reclaimed. BLM evaluated the operator's proposal and determined the disturbance associated with SIROCCO CS FED 2 and WHISK CS FED 6 APDs could not be successfully reclaimed (See Section 4, Soils, Alternative B).

4.3.1.2. Cumulative Effects

The cumulative effects associated with implementation of Alternative C are likely inside analysis parameters and impacts described in the Buffalo and PRB RMP Amendment's RODs and the Wyoming BLM Reclamation Policy because the project's features under this alternative, avoid the most fragile LRP areas. For details on expected cumulative impacts, refer to the referenced PRB FEIS, Chapter 4.

The designation of the duration of disturbance is defined in the PRB FEIS (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization (with the exception of course, of the impacts previously analyzed for the 6 APDs in Table 4.2, that BLM recommends for deferral).

4.3.1.3. Mitigation Measures

COAs, mitigation measures, surface upgrades, and applicant committed measures discussed in the MSUP would help to mitigate or reduce the impacts described above areas of this POD. In POD areas of steep topography, erosive soils and/or poor reclamation suitability, BLM will consider requesting a plan to stabilize topsoil within a 30-day period from the start of construction in those areas.

4.3.1.4. Residual Effects

Residual effects across the POD under Alternative C would include a long-term loss of soil productivity associated with well pads and roads. Residual effects were identified in the PRB FEIS (p. 4-408) such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established. Removing the 2 APDs in Table 4.10 still leaves Yates and the BLM with major reclamation challenges among the APDs and infrastructure in this POD. Yet the likely reclamation success for the POD is greatly enhanced if BLM denies the 2 APDs for there is far less opportunity for unnecessary and undue degradation to soils, slopes, and erosion.

4.3.2. Water Resources

The water resource impacts and effects would be similar as those addressed in Alternative B. There would be a negligible reduction water volume.

4.3.3. Economics of CBNG Resource Extraction

4.3.3.1. Direct and Indirect Effects

Alternative C includes much of the proposed roads and pipeline networks needed to support the proposed wells but would result in the elimination of up to 2 wells and associated infrastructure. Under Alternative C, 36 wells with timing limitations and / or COAs applied (largely analyzed under Alternative B) would be approved. The project would potentially produce 30,708,000 MCF of CBNG reserves and would generate about $69 million measured in the PV of the total revenue stream. The PV of the royalty stream would be nearly $8.6 million paid to the US Government general treasury. Of those federal royalties, the State of Wyoming would receive about $4.2 million, Table 4.11.

Table 4.11. Comparison of Impacts of Fluid Minerals

Management Action	Total Gas (MCF)	Total Revenue @ $3.50/MCF	PV of Total Revenue Stream Discounted @ 3.00%	Federal Royalties @ 12.5 %	PV of Federal Royalties Discounted @ 3.00%	State of Wyoming - (49% of PV of Federal Royalty)
Alternative B	$30,708,000	$107,478,000	$68,986,038	$13,434,750	$8,623,255	$4,225,395
Management Action	**Total Gas (MCF)**	**Total Revenue @ $3.50/MCF**	**PV of Total Revenue Stream Discounted @ 3.00%**	**Federal Royalties @ 12.5 %**	**PV of Federal Royalties Discounted @ 3.00%**	**State of Wyoming - (49% of PV of Federal Royalty)**
Alternative C (Modified Action)	$29,002,000	$101,507,000	$65,153,481	$12,688,375	$8,144,185	$3,990,651

Alternative C will yield approximately 6% less revenue measured in the PV of the revenue stream to the Operator and about 6% less discounted royalties to the federal government and the State of Wyoming.

BLM located an alternative location for WHISK CS FED 6 not approved within 200 meters (656 feet) of the proposed APD. BLM and the operator could not find a reasonable alternate well location for SIROCCO CS FED 2. If Yates chose to submit an APD for this location WHISK CS FED 6 there will be approximately ½ the loss in revenue stream to the operator and ½ the reduction in royalties to the federal government and the State of Wyoming.

4.3.3.2. Cumulative Effects

Cumulative effects for Alternative C are similar to those identified in Alternative B, but it is important to acknowledge there would be a reduction in revenue associated with not approving up to 2 wells, which translates into about a 6% reduction in the PV of the total revenue stream associated with these wells.

The impact from the reduction in wells would reduce the drilling activities in conjunction with lowering production and associated revenue to the operators. Moreover, there would be a loss of about $207 thousand dollars in the PV of federal and state royalties, which translates into a loss of about 4 percent. Property taxes and severance taxes would also go down as a result of not approving these wells. The reduction in drilling and subsequent production would also produce a minor impact on the local economy measured in terms of the loss in personal income and employment. But without running a regional economic model, those impacts cannot be quantified. However, the loss in economic activity would be, to some unknown extent, offset by the benefits to other resources and activities. For example, there are both

market and non-market benefits associated with the preservation of wildlife habitat, maintenance of open space, maintaining buffer zones around nesting areas for ferruginous hawks and creating and maintaining wildlife viewing areas for nonconsumptive recreation use. But in the absence of quantifying these values, the benefits and costs associated with the reduction in oil wells compared to enhancing the area for wildlife and wildlife viewing cannot be made. Nonetheless, these tradeoffs need to be considered, at least qualitatively, when making these decisions. And while the Sirocco II POD project is primarily on private surface and/or landlocked federal surface, the benefit of a reduction in the number of wells approved is not just limited to private ranchers and those individuals that have access to the area, but there is also a non-use value component that would also add to the overall benefits of protecting this area.

4.3.3.3. Mitigation Measures

Mitigation measures for Alternative C are the same as those identified in Alternative B.

4.3.3.4. Residual Effects

Residual effects for Alternative C are the same as those identified in Alternative B.

4.3.4. Cultural

4.3.4.1. Direct and Indirect Effects

The impacts to cultural resources under Alternative C will be the same as Alternative B.

4.3.4.2. Cumulative Effects

Cumulative effects for Alternative C are the same as those identified in Alternative B.

4.3.4.3. Mitigation Measures

Mitigation measures Alternative C are the same as those identified in Alternative B.

4.3.4.4. Residual Effects

Residual effects for Alternative C are the same as those identified in Alternative B.

4.3.5. Summary of Wildlife Effects

Table 4.12. A Comparison of the Wildlife Cumulative Effects Associated with the Alternatives.

Resource/Species	Alternative A	Alternative B	Alternative C
Wildlife			
Big Game	No habitat loss or fragmentation. Would likely see increased traffic passing through due to surrounding mineral development	Greatest habitat loss.	Least habitat loss.
		Greatest habitat fragmentation.	Least habitat fragmentation.
Raptors	No habitat loss.	Greatest foraging habitat fragmentation.	Least foraging habitat fragmentation. Some nests will become precluded from future use.
	No wells authorized near nests.		

Resource/Species	Alternative A	Alternative B	Alternative C
Migratory Birds	No habitat loss.	Greatest habitat loss.	Least habitat loss.
		Greatest habitat fragmentation.	Least habitat fragmentation.
	No habitat fragmentation.		
		Overhead electric poses predation & collision risk.	Overhead electric poses predation & collision risk.
Threatened and Endangered Species			
Bald eagle	No habitat loss	Overhead electricity increasing mortality risk from electrocution. Reduce overhead electricity will eliminate risk from electrocution.	Same as B.
Sensitive Species			
Greater Sage Grouse	No habitat loss.	Greatest habitat loss.	Least habitat loss.
	No decision on overhead electricity. Overhead power could be routed through project area on private surface increasing predation and collision risk. Grouse may avoid overhead power lines.	Greatest predation and collision risk associated with overhead power lines.	Same as B.
West Nile Virus	No Impact	Likely to have effect on the spread of WNV.	Same as B.

5. CONSULTATION & COORDINATION

BFO consulted with the agencies summarized in Table 5.1, on this proposed project to confirm compliance with applicable laws, regulations, and landowner wishes.

Table 5.1. Consultations

Contact	Title	Organization	Onsite Presence
John Vaselin	Federal Regulatory Agent	Yates Petroleum	Yes
Buster Ivory	Federal Regulatory Agent	Yates Petroleum	Yes
Tim Barber	Supervisory Regulatory Specialist	Yates Petroleum	No
Larry Brubaker	Landowner	Private Ranch	No
Mary Hopkins	Wyoming SHPO	WYSHPO	No

Preparers and Reviewers

Name	Duty	Name	Duty
Travis Kern	Lead Natural Resource Specialist, Hydrology	Stacy Gunderson	Civil Engineer
Matthew Warren	Petroleum Engineer	Kristine Phillips	Legal Instrument Examiner
Arnie Irwin	Soil Scientist	Casey Freise	Supervisory Natural Resource Specialist
Lois Jenkins	Legal Assistant	Norma Cope	Legal Land Examiner
Denise Oliverius	Realty Specialist	Kathy Brus	Acting Assistant Field Manager
Seth Lambert	Archaeologist	Scott Jawors	Wildlife Biologist
Kerry Aggen	Geologist	Shirley Green	Plans Coordinator
John Kelley	NEPA Coordinator	Chris Durham	Assistant Field Manager
Clark Bennett	Assistant Field Manager	Duane Spencer	Field Manager

6. REFERENCES AND AUTHORITIES

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

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

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

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

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

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

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

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

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

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and Gas Development in Western North America: Effects on Sagebrush Steppe Avifauna with Particular Emphasis on Sage Grouse. In: Transactions of the 67th North American Wildlife and Natural Resources Conference. pp. 337-349.

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

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

Clark, L., J. Hall, R. McLEan, M. Dunbar, K. Klenk, R. Bowen, and C. A, Smeraski. 2006. Susceptibility of greater

sage-grouse to experimental infection with West Nile virus. J. of Wildlife Diseases 42:14-22.

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

Code of Federal Regulations (CFR)
40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of 2012.
43 CFR All Parts and Sections inclusive - Public Lands: Interior. Revised as of 2012.

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

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

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

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

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

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

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

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

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

Ebert, Jamies I., and T. A. Kohler. 1988. The Theoretical Basis of Archaeological Predictive Modeling and a Consideration of Appropriate Data-Collection Methods, in Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archaeological Predictive Modeling ed. W. J. Judge and L. Sebastian, pp 97-171. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO.

Eckerle, William. 2005. Experimental: Archaeological Burial Model for Powder River and Tongue River Hydrological Basins, Wyoming. In Adaptive Management and Planning Models for Cultural Resource in Oil and Gas Fields in New Mexico and Wyoming, by E. Ingbar, L. Sebastian, J. Altschul, M. Hopkins, W. Eckerle, P. Robinson, J. Finley, S. A. Hall, W. E. Hayden, C. M. Rohe, T. Seaman, S. Taddie, and S. Thompson, pp. 39-102. Prepared for the Department of Energy, National Energy Technology Laboratory by Gnomon, Inc. Electronic Document, http://www.gnomon.com/DOEPumpIII/FinalCominedReport.pdf, accessed Sept. 2010.

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

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

Garton, E.O., J.W. Connelly, C.A. Hagen, J.S. Horne, A. Moser, and M.A. Schroeder. 2011. Greater Sage-grouse Population Dynamics and Probability of Persistence. Pages 293-381 in Greater sage-grouse: ecology and conservation of a landscape species and its habitats, S. T. Knick, J. W. Connelly, C. E. Braun (eds). Studies in Avian Biology, No. 38, University of California Press, Berkeley, CA.

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

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

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

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

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

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

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

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

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

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

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

Holloran, M.J., R.C. Kaiser, and W.A. Hubert. 2010. Yearling Greater Sage-grouse Response to Energy Development in Wyoming. Journal of Wildlife Management 74:65-72.

Holloran, M. J. 2005. Greater sage-grouse (Centrocercus urophasianus) population response to natural gas field development in western Wyoming. Dissertation, University of Wyoming, Laramie.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Lyon, A.G. and S.H. Anderson. 2003. Potential Gas Development Impacts on Sage Grouse Nest Initiation and Movement. Wildlife Society Bulletin 31:486-91.

Madson, Chris. 2005, March. Deer on the Anticline. Wyoming Wildlife, 69(3), 10-15.

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

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

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

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

Miller, B.K., G. Ceballos, and R.P. Reading. 1994. “The Prairie Dog and Biotic Diversity.” Conservation Biology 8(3):677-81.

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

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

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

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

Naugle, D. E. K. E. Doherty, B. L. Walker, M. J. Holloran, and H. E. Copeland. 2011. Energy Development and Greater Sage-Grouse. pp. 489-529 in Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats, S. T. Knick, J. W. Connelly, C. E. Braun (eds.) Studies in Avian Biology, Number 38, University of California Press, Berkley.

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

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

Nicholoff, S.H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners in Flight. Wyoming Game and Fish Department, Lander, Wy.

North Dakota Industrial Commission Oil and Gas Research Program. 2011. Investigation of Methodologies to Control Dust on County Roads in Western North Dakota. Grant Applicants: Dunn and Mckenzie County.

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

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

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

Olendorff, R.R. 1993. Status, Biology, and Management of Ferruginous Hawks: A review. Raptor Res. and Tech. Asst. Cen., Spec. Rep. USDI, BLM, Biose, ID.

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

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

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

Porneluzi, P, J. C. Bednarz, L. J. Goodrich, N. Zawada, and J. Hoover. 1993. Reproductive performance of

territorial Ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. Conservation Biology 7:618-622.

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

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

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

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

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

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

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

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

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

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

Smith D.G., and J.R. Murphy. 1978. Biology of ferruginous hawk in central Utah. Sociobiology 3:79-95.

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

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

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

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

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

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

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

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

U.S. Department of the Interior, Bureau of Land Management, WY Instruction Memorandum 2012-019, Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate, Attch. 1- 9.

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

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

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

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

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

U.S. Department of the Interior, Fish and Wildlife Service (FWS). Report Mountain Plover (Charadrius Montanus) Biological Evaluation. 2007.

U.S. Department of the Interior, Fish and Wildlife Service (FWS). 2010. Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered. 50 CFR Part 17.

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

U.S. Department of the Interior, Geological Service. 1996. Occurrences of Erionite in Sedimentary Rocks of the Western United States, R.A. Shepherd, Report 96-018.

U.S. Department of the Interior, Geological Service. 2011.Assessment of Potential Effects of Water Produced from Coalbed Methane Natural Gas Development on Macroinvertebrate and Algal Communities in the Powder River and Tongue River, Wyoming and Montana, 2010.

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

Walker, B. L., and D. E. Naugle. 2011.West Nile virus ecology in sagebrush habitats and impacts on greater sage-grouse populations. Pages 127-142 in Greater sage-grouse: ecology and conservation of a landscape species

and its habitats, S. T. Knick, J. W. Connelly, C. E. Braun (eds). Studies in Avian Biology, Number 38, University of California Press, Berkley.

Walker, B. L., D. E. Naugle, K. E. Doherty, and T. E. Cornish. 2007. West Nile virus and greater sage-grouse; estimating infection rate in a wild bird population. Avian Diseases 51:691-696.

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

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

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

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

Wyoming Executive Order 2011-5. Greater Sage-Grouse Core Area Protection.

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

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

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

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

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

WGFD. 2009. Minimum Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats on BLM Lands. WGFD. Cheyenne, WY.

White, C.M. and T.L. Thurow. 1985. Reproduction of Ferruginous Hawks exposed to controlled disturbance. Condor. 87:14-22.

Zou, L., S. N. Miller, and E. T. Schmidtmann. 2006. Mosquito larval habitat mapping using remote sensing and GIS: implications of coalbed methane development and West Nile virus. Journal of Medical Entomology 43:1034-1041.

APPENDIX A. Affected Resource List, Sensitive Species Worksheet

Table A.1. Affected Resources Worksheet

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Air quality	Yes	Yes	Yes	See PRB FEIS 3-291, 3-298, 4-404-4-406, 4-377, 4-386.
Cultural	Yes	Yes	No	Analyze in EA.
Native American religious concerns	No	No	No	Analyze in EA.
Traditional Cultural Properties	No	No	No	Analyze in EA.
Mineral Potential	-	-	-	See PRB FEIS 3-66, 3-70, 3-230, 4-127 through 4-129.
Coal	Yes	No	Yes	See PRB FEIS 3-66.
Fluid Minerals	Yes	Yes	Yes	See PRB FEIS 3-68, 3-69.
Locatable Minerals	Yes	No	Yes	Analyze in EA.
Other leasables	Yes	No	Yes	
Salable minerals	Yes	Yes	Yes	
Paleontology				See PRB FEIS 3-65-66, 4-125-127.
PFYC 3	-	-	-	
PFYC 5	-	-	-	
Rangeland management	Yes	Yes	Yes	
Existing range improvements	NA	NA	NA	
Proposed range improvements	NA	NA	NA	
Realty	No	No	NA	
Recreation	Yes	Yes	Yes	See PRB FEIS 3-263, 3-273, 4-319 -4-328.
Developed site	No	No	NA	See PRB FEIS 3-266, 4-326.
Walk-in-Area (2009 data)	No	No	NA	
Social & Economic	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-275-3-289, 4-336-4-370.
Soils & Vegetation	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-80-3-107, 4-134-4-152, 4-153-4-164, 4-343-4-391, 4-406.
Erosion Hazard	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-82, 4-35.
Poor Reclamation Potential	Yes	Yes	No	Analyze in EA.
Slope hazard	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-81, 4-135.
Forest products	Yes	Yes	Yes	

Table A.1. Affected Resources Worksheet

Resource	Resource Present	Resource Affected	PRB FEIS Sufficient	Notes
Invasive Species	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-103-3-108, 4-153.
Wetlands/Riparian	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-108-3-111, 4-172-4-178, 4-406, 4-395-4-396.
Special Designations	No	NA	NA	
Proposed ACEC	No	NA	NA	
Wild & Scenic River	No	NA	NA	
Wild Lands/Wilderness	No	No	No	DOI Order 3310, BLM 6301 & 6302
WSA	No	NA	NA	
Visual Resources	Yes	No	Yes	See PRB FEIS 3-252-3-263, 4-302-4-314, 4-403.
Class II	No			
Class III	Yes	Yes	Yes	Class IV bordered by Class III.
Water	Yes			
Floodplains	Yes	Yes	Yes	See PRB FEIS 3-1-3-56, 4-1-4-122, 4-135, 4-393, 4-405; ROD (A32), Vol. 1 (3-108 to 113).
Groundwater	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-1-3-30, 4-1-4-69, 4-392, 4-405; ROD pg 7&8 (App. D), Vol.1 (3-1 to 36).
Surface water	Yes	Yes	No	Analyze in EA. See PRB FEIS 3-36-3-56, 4-69-4-122, 4-393, 4-405; ROD pg 7&8 (App. D) (App. A pg 30 to 310, Vol.1 (3-36 to 56).
Drinking water	Yes	Yes	Yes	PRB ROD pp. 7&8 (App. D), (pp. 3-1 to 56).
Wildland Urban Interface	No			
Wildlife	Yes	Yes	No	
ESA listed, proposed, or candidate species	Yes	Yes	No	Analyze in EA. Sage-grouse would be affected by this proposal and would require thorough analysis of effects including cumulative effects.
BLM sensitive species	Yes	Yes	No	Analyze in EA. See attached sensitive species wildlife checklist.
General wildlife	Yes	Yes	No	Analyze in EA
West Nile virus potential	Yes	Yes	Yes	

Table A.2 Special Status (Sensitive) Species (SSS) Worksheet

Common Name	Habitat	Habitat Present?	Individual Presence	Project Effects	Direct, Indirect, and/or Cumulative Impacts Anticipated Beyond the Level Analyzed within the PRB FEIS?
Amphibians					**4-258**
Northern leopard frog	Beaver ponds and cattail marshes from plains to montane zones.	No	NS	NI	No
Columbia spotted frog	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	No	NP	NI	No
Fish					**4-259 & 4-260**
Yellowstone cutthroat trout	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	No	NP	NI	No
Birds					**4-260 to 4-264**
Baird's sparrow	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	No	NS	MIIH	No
Bald eagle	Mature forest cover often within one mile of large water body with reliable prey source nearby.	No	P	MIIH	No 4-251 to 4-253 & BA
Brewer's sparrow	Sagebrush shrubland	Yes	NS	MIIH	No
Ferruginous hawk	Basin-prairie shrub, grasslands, rock outcrops	No	NP	NI	No
Loggerhead shrike	Basin-prairie shrub, mountain-foothill shrub	Yes	NS	MIIH	No
Long-billed curlew	Grasslands, plains, foothills, wet meadows	Yes	NS	MIIH	No

Table A.2 Special Status (Sensitive) Species (SSS) Worksheet

Common Name	Habitat	Habitat Present?	Individual Presence	Project Effects	Direct, Indirect, and/or Cumulative Impacts Anticipated Beyond the Level Analyzed within the PRB FEIS?
Mountain plover	Short-grass prairie with slopes < 5 percent	No	NP	NI	4-254, 4-255 & BA; EA treatment required
Northern goshawk	Conifer and deciduous forests	No	NP	NI	No
Peregrine falcon	Cliffs	No	NP	NI	No
Sage sparrow	Basin-prairie shrub, mountain-foothill shrub	Yes	NS	NI	No
Sage thrasher	Basin-prairie shrub, mountain-foothill shrub	Yes	S	MIIH	No
Trumpeter swan	Lakes, ponds, rivers	No	NP	NI	No
Western Burrowing owl	Grasslands, basin-prairie shrub	Yes	NS	MIIH	No
White-faced ibis	Marshes, wet meadows	No	NP	NI	No
Yellow-billed cuckoo	Open woodlands, streamside willow and alder groves	No	NP	NI	No
Mammals					**4-264 &4-265**
Black-tailed prairie dog	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	Yes	K	MIIH	No
Fringed myotis	Conifer forests, woodland chaparral, caves and mines	Yes	S	NI	No
Long-eared myotis	Conifer and deciduous forest, caves and mines	Yes	S	NI	No
Spotted bat	Cliffs over perennial water.	No	NP	NI	No
Swift fox	Grasslands	YES	S	MIIH	No
Townsend's big-eared bat	Caves and mines.	No	NP	NI	No

Table A.2 Special Status (Sensitive) Species (SSS) Worksheet

Common Name	Habitat	Habitat Present?	Individual Presence	Project Effects	Direct, Indirect, and/or Cumulative Impacts Anticipated Beyond the Level Analyzed within the PRB FEIS?
Plants					**4-258**
Limber pine	Mountains, associated with high elevation conifer species	No	NP	NI	No
Porter's sagebrush	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5,300-6,500 ft.	No	NP	NI	No
William's wafer parsnip	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides, 6,000-8,300 feet.	No	NP	NI	No

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

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

Appendix B. RECLAMATION REQUIREMENTS, WY BLM

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

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

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

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

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

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

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

the long term establishment and viability of the desired plant community.

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

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

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

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

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