DECISION RECORD
Yates Petroleum Corporation, Caliente Plan of Development (POD)
Environmental Assessment (EA), WY-070-EA12-057
Bureau of Land Management, Buffalo Field Office, Wyoming

DECISION. The BLM approves Yates Petroleum Corporation (Yates) Caliente POD coalbed natural gas (CBNG) well applications for permit to drill (APDs) as described in Alternative C of the EA, WY-070-EA12-057. This approval includes the wells' support facilities.

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 (MLA) (30 U.S.C. 181); to include On Shore Order No. 1.
- National Environmental Policy Act of 1969 (NEPA) (42 USC 4321).
- National Historic Preservation Act of 1966 (NHPA) (16 USC 470).
- Buffalo Resource Management Plan (RMP) 1985, Amendments 2001, 2003, 2011.

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

Approvals. BLM approves the following 15 APDs and support facilities:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Heat CS Federal	#9	NENE	29	45N	76W	WWY147323
2	Heat CS Federal	#10	NENW	29	45N	76W	WWY147323
3	Heat CS Federal	#12	SWNE	29	45N	76W	WWY147323
4	Heat CS Federal	#13	NESE	29	45N	76W	WWY147323
5	Heat CS Federal	#16	SWSE	29	45N	76W	WWY147323
6	Heat CS Federal	#19	SWNW	30	45N	76W	WWY147323
7	Heat CS Federal	#22	NESW	30	45N	76W	WWY147323
8	Heat CS Federal	#23	SWSW	30	45N	76W	WWY147323
9	Heat CS Federal	#24	SWSE	30	45N	76W	WWY147323
10	Heat CS Federal	#25	NESE	33	45N	76W	WWY147323
11	Heat CS Federal	#26	NESW	33	45N	76W	WWY147323
12	Heat CS Federal	#27	SWSW	33	45N	76W	WWY147323
13	Heat CS Federal	#28	SWSE	33	45N	76W	WWY147323
14	Caliente CS Federal	#1	NWNE	32	45N	76W	WYW149968
15	Caliente CS Federal	#2	SENE	32	45N	76W	WYW149968

Denials. BLM denies the following 7 APDs and support facilities:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #
1	Heat CS Federal	#11	SWNW	29	45N	76W	WWY147323
2	Heat CS Federal	#14	NESW	29	45N	76W	WWY147323
3	Heat CS Federal	#15	SWSW	29	45N	76W	WWY147323
4	Heat CS Federal	#17	NENE	30	45N	76W	WWY147323
5	Heat CS Federal	#18	NENW	30	45N	76W	WWY147323
6	Heat CS Federal	#20	SWNE	30	45N	76W	WWY147323
7	Heat CS Federal	#21	NESE	30	45N	76W	WWY147323

Deferrals. BLM defers the following 8 APDs and their infrastructure until the design features of two of their servicing proposed utility corridors, see table below, align with the site specific mitigation measures,

or design features, conforming to Pumpkin Buttes Traditional Cultural Property (TCP) Programmatic Agreement (PA) and its appendices A through G.

Well Names & #s	Environmental Issue/Deficiency	Remedy
Heat CS Federal #1; Heat CS Federal #2; Heat CS Federal #3; Heat CS Federal #4; Heat CS Federal #5; Heat CS Federal #6; Heat CS Federal #7; Heat CS Federal #8	Per the visual contrast rating (VCR) performed to assess effects of the Caliente POD to the Pumpkin Buttes traditional cultural property (TCP) two proposed corridors will result in an adverse effect to the TCP. The two corridors include the proposed utility corridor between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6.	BLM requires in order to mitigate the adverse effect to the Pumpkins Buttes Traditional Cultural Property (TCP) that all mitigation measures as described in appendices A-G of the Pumpkin Buttes Programmatic Agreement be applied as design features to the two proposed corridors. Corridoring the proposed roads and utilities with existing roads and utilities and following natural contours or locating alternate routes that do not create a moderate or strong contrast to the setting of the TCP will accomplish this goal. Alternatively BLM could begin consultation with adversely affected Tribes.

Water Management: BLM approves the use of federal water in the following water management infrastructure (including the new Scald #2 Injector Well APD):

	Facility Name / Number	Qtr/Qtr	Sec	Twp	Rng	Capacity (Acre Feet)	Surface Disturbance
1	Scald #1 Injector Well	SENW	31	45	76	NA	1.0 acre (existing)
2	Scald #2 Injector Well	SESE	32	45	76	NA	1.0 acre
3	Loop Road Pit	SWNE	31	45	76	3.01	1.7 acres

Limitations. See the conditions of approval (COAs).

THE FINDING OF NO SIGNIFICANT IMPACT (FONSI). Analysis of Alternative C of the EA, WY-070-EA12-057, and the FONSI found Yates proposal for Caliente POD will have no significant impacts on the human environment, beyond those described in the PRB FEIS, thus there is no requirement for an EIS.

COMMENT OR NEW INFORMATION SUMMARY. Since development of the Yates Caliente POD proposal BFO received a new policy on management of Greater Sage-Grouse (GSG) populations and habitats and a population viability analysis.

DECISION RATIONALE. BLM bases the decision authorizing the selected project on:

1. The denial of 7 APDs: Heat CS Federal #s 11, 14, 15, 17, 18, 20, and 21, and their associated infrastructure is because the proposal does not conform to the BLM Wyoming Greater Sage-Grouse management, the State of Wyoming's Governor's Executive Order, EO-2011-5, and the Buffalo RMP (also see: preventing unnecessary and undue degradation). The policy of the BLM in Wyoming is summarized in Instruction Memorandum (IM) 2012-019, *Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands Including the Federal Mineral Estate*. IM 2012-019 reads that for areas outside of core and connectivity habitats, "surface occupancy and/or disruptive activities are prohibited on or within one-quarter (0.25) mile radius of the perimeter of occupied sage-grouse leks." The IM describes that field offices must consider an alternative that does not authorize new surface facilities within a 0.25 mile buffer of leks, including roads. The BFO amended their RMP with a maintenance action on September 17, 2010 to

include a similar provision and to be consistent with guidance set forth in the preceding IM, WY-2010-012. The management action reads: "Surface disturbing activities or surface occupancy is prohibited or restricted on or within one quarter (0.25) mile radius of the perimeter of occupied or undetermined sage-grouse leks." The Wyoming Governor's Executive Order, EO-2011-5 alludes to, and a Wyoming Game and Fish Department consultation on this project reads that, Wyoming does not consider Greater Sage-Grouse habitats outside of priority habitats as "sacrifice zones" and the State intends to maintain populations and habitats where possible. The BLM here sought use of a previously permitted alternate access to service these 7 APDs that would eliminate increased traffic through the Christensen Ranch 5 Lek. Yates indicated that no other routes would be proposed at the request of the landowner, John Christensen. Yates had agreed to install signs at the edge of the CSU limiting travel to the hours of 9:00am – 3:00pm during the GSG breeding season: however, compliance with the travel limitation will be difficult to enforce. The BLM balanced the proposal it had (permitting access to the 7 APDs through the Christensen Ranch 5 Lek) with the best science and policy of the BLM and State of Wyoming in deciding to deny the 7 APDs and their associated infrastructure. The fact that there is an existing two-track through the Christensen Ranch 5 Lek is not conclusive because the operator's design features would "improve" the road and would allow greater surface disturbances and more frequent travel from servicing 7 wells, their infrastructure, utility corridors, and power-drop resulting in large detrimental effects on the local population and habitat. The absence of an alternative access to these 7 APDs placed BLM in a situation where it could not approve APDs that had no access for support infrastructure. The rationale for these denials also finds support in WY BLM IM WY-2010-012, BLM IM 2012-044 (BLM Greater Sage-Grouse Plan Use Planning Strategy), BLM IM 2012-043 (Greater-Sage-Grouse Interim Management Policies and Procedures), and the analysis provided in the EA. This rationale also supports the spirit of BLM-WY-MOU-930-1106 (for the purpose of coordinating and cooperating in resource plan amendments and environmental analysis and preparing for the Greater Sage-Grouse policy amendments).

2. The deferral of 2 utility corridors - the proposed utility corridor between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6 - their associated 8 APDs (APDs: Heat CS Federal #s 1, 2, 3, 4, 5, 6, 7, and 8) and those APDs' infrastructure is to allow Yates and BLM additional time to refine, submit, and analyze design features to conform to the BLM and Wyoming State Historical Preservation Office Programmatic Agreement (PA) for the Pumpkin Buttes Traditional Cultural Property from Anticipated Federal Minerals Development in Campbell County, Wyoming, to include Appendices A-G. Alternatively the deferral gives BLM time for formal consultation with adversely affected federally recognized Tribes. The following references, in addition to the PA, also support this deferral decision: Buffalo RMP Record of Decision 2003 (pp. 8-9, 18), 43 CFR 1610.3-2, National Historic Preservation Act of 1966, the above deferral table, and the analysis provided in the EA. This rationale incorporates by reference the traditional cultural property analysis and decisions found in WY State Director Review (SDR)-2010-030, pp. 25-28, and 31-33.

3. BLM and Yates included mitigation measures to reduce environmental impacts while meeting the project's need. The PRB FEIS analyzed and predicted that the PRB oil and gas development would have significant impacts to the region's GSG population. The impact of this 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 and ROD and current BLM and Wyoming GSG conservation strategies. For a complete description of all site-specific COAs associated with this approval, see the project's COAs.

4. BLM adopts the analysis and condition of approval for burrowing owl conservation from the similarly situated sagebrush and short grass prairie found in the Thunder Basin National Grassland Land and RMP, 2002, 2006, pp. 1-13 to 1-22; the supporting FEIS, 2002, and its Records of

Decision, 2002, p. D-15, 2006. This is the least restrictive COA for burrowing owl conservation benefiting the owl and this project.

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.

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

7. The operator committed to:
   1. Comply with the approved APD, applicable laws, regulations, orders, and notices to lessees.
   2. Obtain necessary permits from agencies.
   3. Offer water well agreements to the owners of record for permitted wells.
   4. Provide water well analysis from a known reference point.
   5. Incorporate several measures to alleviate resource impacts into their submitted surface use plan and drilling plan.

8. The operator certified it has a surface access agreement with the landowners or bonded.

9. The project is clearly lacking wilderness characteristics as it lacks federally owned surface.

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 the individual surface disturbances are greater than 5 acres and / or the total surface disturbance on the lease is greater than 150 acres.

11. BLM incorporates by reference the portions addressing Reclamation/Dry Hole from SDRs WY-2012-010, WY-2012-009, WY-2012-008, and WY-2011-022.

12. This decision does not foreclose the lessee or operator to propose a new or supplementary plan for developing the federal oil and gas lease(s) in this project area, including submission of additional APDs to drain minerals in accord with lease rights and law. This decision does not foreclose the lessee or operator to propose using external pumping units via a sundry application process.

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.

Field Manager: _____ Date: 9/26/12

FINDING OF NO SIGNIFICANT IMPACT
Yates Petroleum Corporation, Caliente Plan of Development (POD)
Environmental Assessment (EA), WY-070-EA12-057
Bureau of Land Management, Buffalo Field Office, Wyoming

FINDING OF NO SIGNIFICANT IMPACT (FONSI). Based on the information in the EA, WY-070-EA12-057, which BLM incorporates here by reference; I find that: (1) the implementation of Alternative C will not have significant environmental impacts beyond those already addressed in the Buffalo Final Environmental Impact Statement (FEIS) 1985, and the Powder River Basin (PRB) FEIS, 2003; (2) Alternative C conforms to the Buffalo Field Office (BFO) Resource Management Plan (RMP) (1985, 2001, 2003, 2011); and (3) Alternative C does not constitute a major federal action having a significant effect on the human environment. There is no requirement for an EIS. I base this finding on consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), with regard to the context and to the intensity of the impacts described in the EA, and in consideration of Interior Department Order 3310.

CONTEXT. Mineral development is a common PRB land use, sourcing over 42% of the nation's coal. The PRB FEIS reasonably foreseeable development analyzed building of 54,200 fluid mineral wells. The additional development 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 included 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 oil 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 proposal may relate to the PRB Greater Sage-Grouse and its habitat decline having cumulative significant impacts; yet the small size of this project is within the parameters of the impacts in the PRB FEIS. There are cultural or historical resources present that will be adversely affected by Yates original proposal– so BLM deferred portions of the project (2 utility corridors, 8 applications for permit to drill, and their associated infrastructure) in BLM's selected alternative. The project area is clearly lacking in wilderness characteristics because there is no federally owned surface. The project does not adversely affect any species listed under the Endangered Species Act or their designated critical habitat. The selected alternative will not have any anticipated effects that would threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment.

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.

Field Manager: _____ Date: 9/26/12

ENVIRONMENTAL ASSESSMENT (EA), WY-070-EA12-057
Yates Petroleum Corporation, Caliente Plan of Development (POD)
Bureau of Land Management, Buffalo Field Office, Wyoming

1. INTRODUCTION

BLM provides an environmental assessment (EA) for Yates Petroleum Corporation (Yates) Caliente POD coalbed natural gas (CBNG) well applications for permit to drill (APDs). This site-specific analysis tiers to and incorporates by reference the information and analysis in the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (PRB FEIS), WY-070-02-065, 2003, and the PRB FEIS Record of Decision (ROD) pursuant to 40 CFR 1508.28 and 1502.21. One may review these documents at the BLM Buffalo Field Office (BFO) and on our website. 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 the individual surface disturbances are greater than 5 acres and / or the total surface disturbance on the lease is greater than 150 acres.

Congress made a 4-part process for federal land and mineral decisions under the long-term needs of multiple-use. First is the land use / resource management plan (RMP); here it is the PRB FEIS and ROD amendment to the BFO RMP. Second are the decisions of whether and, if so, under what conditions, to lease lands for fluid mineral development. Courts held leasing decisions are an almost irrevocable resource commitment. Third, (this phase) is deciding on the proposed POD or APD, or both: the site-specific analysis, and mitigation. Fourth is the monitoring and reclamation of wells and their features.

1.1. Background

Bill Ostheimer, Casey Freise, Stephanie Connolly, and George Soehn met with Yates on June 11, 2010 to discuss access issues within the Caliente project. In particular, use of the existing primitive road intersecting the controlled surface use (CSU) buffer on Christensen Ranch 5 Lek. At that time the BLM suggested that Yates should investigate all of their options and come forward with their best proposal, demonstrating that it is the best alternative. Prior to onsites on November 29, 2011 an e-mail was sent to Yates stating the North #3 road runs directly through a sage grouse lek. It was strongly encouraged that Yates had an alternative route staked prior to onsites. Additionally, the e-mail encouraged Yates to corridor the water and gas line running through section 34 with Christensen Road due to archaeological concerns. Yates did not provide an alternative and chose not to corridor the water and gas line (see administrative record). Yates submitted the Caliente POD on January, 31 2011 to the BFO with 30 federal applications for permit to drill (APDs) to develop and produce natural gas within coal bearing formations of the PRB (Yates' 31st APD is for water injection). BLM addresses the new water injection APD and the use of an existing water injection well in the water management discussions and analysis of this EA.) BLM conducted onsite visits on December 19 and 20, 2011, January 17, 18, February 7, and April 24, 2012 to evaluate the proposal and modify as necessary to alleviate environmental impacts. On January 18, 2012 an alternative route that avoids intersecting the controlled surface use (CSU) buffer on Christensen Ranch 5 Lek was identified to the north (see administrative record). BLM also requested during the onsites that, in order to minimize visual contrast, all proposed utility corridors be placed immediately next to or within existing roads or corridors and/or follow natural contours. Specifically, the water and gas line running through section 34. BLM sent Yates a post-onsite deficiency on June 7, 2012.

On July 25, 2012 Yates submitted deficiencies for the Caliente POD. In the deficiency letter the BLM biologist requested that Yates use the alternative route instead of the currently proposed route, in order to avoid causing unnecessary impacts to the lek. The BLM archaeologist again requested that in order to corridors be placed immediately next to or within existing roads or corridors and/or follow natural

contours. Yates chose not to use the alternative route or to corridor and/or follow natural contours of the water and gas line running through section 34 (see administrative record). BLM shared proposed conditions of approval (COAs) and decision record (DR) with Yates on September 24, 2012. Yates responded to the COAs and DR on September 24, 2012.

1.2. Need for the Proposed Project

The need for this project is to determine whether, how, and under what conditions to support the Buffalo Resource Management Plan's (RMP) goals, objectives, and management actions (2003 Amendment) while allowing the exercise of the operator's conditional lease rights to develop fluid minerals on federal leases. APD information is an integral part of this EA, which BLM incorporates here by reference (CFR 1502.21). Conditional fluid mineral development supports the RMP and the Mineral Leasing Act of 1920, the Federal Land Policy Management Act (FLPMA), and other laws and regulations.

1.3. Decision to be Made

The BLM will decide whether or not to approve the proposed development, and if so, under what terms and conditions to comport with the Bureau's multiple use mandate, environmental protection, and RMP.

1.4. Scoping and Issues

The BFO provided this project's external scoping as a 30 day posting of proposed APDs and the EA's publication on the BFO website. Previously BFO conducted extensive external scoping for the PRB FEIS - discussed on p. 2-1 of the PRB FEIS and on p. 15 of the PRB ROD. This project is similar in scope to other fluid mineral development analyzed by the BFO. External scoping would be unlikely to identify new issues, as verified by the recent external scoping in 2010 and 2011 for a geographically-focused proposed RMP amendment that revealed no new issues outside of the geographically-specific issues.

The BFO interdisciplinary team (ID team) conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resources and land uses. This EA will not discuss resources and land uses that are either not present, not affected, or that the PRB FEIS adequately addressed. The ID team identified important issues for the affected resources to focus the analysis. This EA addresses the project and its site-specific impacts that were unknown and unavailable for review at the time of the PRB FEIS analysis to help the decision maker come to a reasoned decision. Project issues include:

- Air quality
- Soils and vegetation: site stability, reclamation potential, riparian and wetland communities, invasive species
- Geological resources/ locatable minerals
- Water: ground water depletion, quality, and quantity of produced water.
- Wildlife: raptor productivity, migratory birds, special status species
- Greater Sage-Grouse: proposed surface occupancy within ¼ mile of a lek.
- Cultural: National Register eligible sites, alluvial deposits, Pumpkin Buttes Traditional Cultural Property (TCP).

Caliente POD is within 2 miles of the base of Pumpkin Buttes TCP. BLM and the Wyoming State Historic Preservation Officer (SHPO) created a Programmatic Agreement (PA) addressing mitigation of adverse effects to the Pumpkin Buttes TCP from anticipated federal minerals development. Site specific mitigation measures exist for adherence to this PA.

These issues are not present, or minimally so. BLM analyzed them in the PRB FEIS and not in this EA:

Recreation	Environmental justice	Wilderness characteristics
Fire, fuels management, and rehabilitation	Visual resources	Livestock & grazing
Cave and karst resources	Forest products	Cave and karst resources
Areas of critical environmental concern	Lands & realty	Paleontological resources
	Rights of way & corridors	Tribal treaty rights

2. PROPOSED PROJECT AND ALTERNATIVES

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 aggregate the effects analyzed in the PRB FEIS analysis with the subsequent analysis and development from the adjacent and intermingled PODs (See Table 3.1, incorporated here by reference, for POD names, EA numbers, and an approximation of the disturbance in the current situation.) The PRB FEIS analyzed the reasonably foreseeable development rolling across the PRB of over 51,000 CBNG and 3,200 natural gas and oil wells. The no action alternative would deny these APDs and /or POD requiring the operator to resubmit APDs or a POD that complies with statutes and the reasonable measures in the PRB FEIS Record of Decision (ROD) in order to lawfully exercise conditional lease rights. This alternative could, through secretarial discretion suspend the senior 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 Proposed Action

Alternative B contains complete APDs and is based on Yates' project proposal. This alternative summarizes the POD submitted by Yates on January 31, 2011, and subsequently revised following the onsite visits by Yates and BLM.

Project Name: Caliente POD

Well Name/#/Lease/Location/County:

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #	County
1	Heat CS Federal	#1	NENE	26	45N	76W	WWY147323	Campbell
2	Heat CS Federal	#2	NENE	26	45N	76W	WWY147323	Campbell
3	Heat CS Federal	#3	SWNW	26	45N	76W	WWY147323	Campbell
4	Heat CS Federal	#4	SWNE	26	45N	76W	WWY147323	Campbell
5	Heat CS Federal	#5	NESE	26	45N	76W	WWY147323	Campbell
6	Heat CS Federal	#6	NESW	26	45N	76W	WWY147323	Campbell
7	Heat CS Federal	#7	SWSW	26	45N	76W	WWY147323	Campbell
8	Heat CS Federal	#8	SWSE	26	45N	76W	WWY147323	Johnson
9	Heat CS Federal	#9	NENE	29	45N	76W	WWY147323	Johnson
10	Heat CS Federal	#10	NENW	29	45N	76W	WWY147323	Johnson
11	Heat CS Federal	#11	SWNW	29	45N	76W	WWY147323	Johnson
12	Heat CS Federal	#12	SWNE	29	45N	76W	WWY147323	Johnson
13	Heat CS Federal	#13	NESE	29	45N	76W	WWY147323	Johnson
14	Heat CS Federal	#14	NESW	29	45N	76W	WWY147323	Johnson
15	Heat CS Federal	#15	SWSW	29	45N	76W	WWY147323	Johnson
16	Heat CS Federal	#16	SWSE	29	45N	76W	WWY147323	Johnson
17	Heat CS Federal	#17	NENE	30	45N	76W	WWY147323	Johnson
18	Heat CS Federal	#18	NENW	30	45N	76W	WWY147323	Johnson

	Well Name	Well #	Qtr/Qtr	Section	TWP	RNG	Lease #	County
19	Heat CS Federal	#19	SWNW	30	45N	76W	WWY147323	Johnson
20	Heat CS Federal	#20	SWNE	30	45N	76W	WWY147323	Johnson
21	Heat CS Federal	#21	NESE	30	45N	76W	WWY147323	Johnson
22	Heat CS Federal	#22	NESW	30	45N	76W	WWY147323	Johnson
23	Heat CS Federal	#23	SWSW	30	45N	76W	WWY147323	Johnson
24	Heat CS Federal	#24	SWSE	30	45N	76W	WWY147323	Johnson
25	Heat CS Federal	#25	NESE	33	45N	76W	WWY147323	Campbell
26	Heat CS Federal	#26	NESW	33	45N	76W	WWY147323	Campbell
27	Heat CS Federal	#27	SWSW	33	45N	76W	WWY147323	Campbell
28	Heat CS Federal	#28	SWSE	33	45N	76W	WWY147323	Campbell
29	Caliente CS Federal	#1	NWNE	32	45N	76W	WYW149968	Johnson
30	Caliente CS Federal	#2	SENE	32	45N	76W	WYW149968	Johnson

Water Management Facilities: Yates proposes the use of following water management infrastructure:

Table 2.1 Existing.

	Facility Name / Number	Qtr/Qtr	Sec	Twp	Rng	Capacity (Acre Feet)	Surface Disturbance
1	Scald #1 Injector Well	SENW	31	45	76	NA	1 acre

Table 2.2 Proposed.

	Facility Name / Number	Qtr/Qtr	Sec	Twp	Rng	Capacity (Acre Feet)	Surface Disturbance
2	Scald #2 Injector Well	SESE	32	45	76	NA	1 acre
3	Loop Road Pit	SWNE	31	45	76	3.01	1.7 acre

Operator/Applicant: Yates Petroleum Corporation (Yates).

Surface Owners: Bob Christensen (26.7% of the POD) and John Christensen (73.3% of the POD). The proposed project includes approximately 2633 acres and is 100% private surface. The project is clearly lacking wilderness characteristics as it lacks federally owned surface.

The proposed project is to drill and develop CBNG wells. The project would be subject to the COAs for drilling a CBNG well in the BFO jurisdiction. For a detailed description of design features and construction practices associated with the proposed project, refer to the surface use plan (SUP) and drilling plan included with the APDs. Also see the subject APDs for maps showing the proposed well location and associated facilities described above.

Yates is proposing to access 7 wells via an existing two-track, which will be improved, directly through the center of the Christensen Ranch 5 Lek and the 0.25 miles controlled surface use (CSU) on the lek. Allowing surface occupancy within 0.25 miles of the lek is not consistent with WY BLM policy or the State of Wyoming's Greater Sage-Grouse (GSG) conservation strategy (Executive Order 2011-5 Greater Sage-Grouse Core Area Protection). In addition, Yates proposed to install an overhead power drop in SESW Section 29, T45N R76W. The drop is proposed within 0.37 miles of the Christensen 5 Ranch Lek, inconsistent with the PRB FEIS ROD stating that "Companies will locate aboveground power lines, where practical, at least 0.5 miles from any sage grouse breeding or nesting grounds."

BLM incorporated and analyzed the implementation of committed mitigation measures in the SUP and drilling plan, in addition to the COAs in the PRB FEIS ROD, in this alternative.

Drilling and Construction:

- Yates proposes drilling 30 wells to the Big Gorge Coal Seam, to depths of approximately 1390-1955 feet.

- Yates anticipates completing drilling and construction activities within 2 years, the term of an APD. Drilling and construction occurs year-round in the PRB. Weather may cause delays lasting several days but rarely do delays last multiple weeks. Timing limitations in the form of COAs and/or agreements with surface owners impose longer temporal restrictions on portions of this POD, but rarely do these restrictions affect an entire POD.

- The company's proposed wells are vertical bores on a generally 80 acre spacing pattern with 1 well per location. The company will cover the wellheads with an insulated well house (8' x 6' x 7') colored (Covert Green), selected to blend with the vegetation.

- Yates shall accomplish well metering by telemetry and well visitation. Metering reduces field traffic but an estimate of well visits per month was not disclosed. Typically metering would entail approximately 4 visits per month to each well for maintenance, calibration, sampling, etc. More frequent visits will likely occur during the first several months of operation.

- A water management plan (WMP) that includes the following infrastructure and strategy: One (1) proposed full containment, lined, fenced, off-channel pit, the existing Scald #1 storage and retrieval well, and 1 proposed (Scald #2) storage and retrieval injection well. The produced water is be injected into the Fort Union geologic formation.

- A road network consisting of existing and proposed improved (i.e., template or engineered) roads and primitive roads, including appropriately designed drainage. The project will have 2.8 miles of improved road and 2.2 miles of primitive road; the remainder of the roads proposed for use are existing.

- Powder River Energy Corporation will build an above ground powerline network. Yates proposed power drop locations should not change. In the event the company alters the proposed drop locations, then the company will apply for the new locations via sundry application and BLM will analyze it in a separate NEPA document. The CBNG wells likely will produce before construction of the powerline. In that case the temporary diesel/gas generators shall be placed at 5 power drops.

- The operator is proposing to use portable generators: A storage tank of 1000 gallon capacity shall be located with each propane/methane or diesel/gas generator. Fuel deliveries are anticipated to be about 1-2 times per week.

- A buried gas, water, and power line network, and 2 water storage/injection facility.

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), Caliente POD: Construction Summary Table of Improved Roads and Well Locations, Transportation Plan, Appendix A: Site Specific Reclamation Plan, Drilling Plan, Water management Plan (WMP), and individual APDs. Also see the subject POD for maps showing the proposed well locations and associated facilities described above. More information on CBNG well drilling, production, and standard practices also is available in the PRB FEIS, pp. 2-9 to 2-40.

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

Additionally, the Operator, in their APD, committed to:

1. Comply with an approved APD, applicable laws, regulations, orders, and notices to lessees.
2. Obtain the necessary permits from other agencies for the drilling, completion and production of these wells including water rights appropriations, and relevant air quality permits.
3. The Operator certified he has a surface use agreement with the landowner(s) or bonded.
4. The Operator certified that a copy of the SUP was provided to the relevant landowner(s).
5. Restricting travel through the Christensen Ranch 5 Lek to the hours of 9:00am – 3:00pm during the breeding season.
6. Installing signs at the perimeter of the 0.25 mile CSU on the Christensen Ranch 5 Lek, limiting travel through the lek.
7. Offer water well agreements to the owners of record for permitted wells.
8. Provide water well analysis from a known reference point.

2.3. Alternative C

Alternative C is a modification of Alternative B based on BLM removing 7 APDs and their infrastructure from the project proposal; and deferring 2 utility corridors, the 8 wells serviced by them, and the 8 wells' infrastructure. A full description of Alternative C is included in Section 5 of this document (Modified Action), and a summary table of wells considered since initial POD submittal is in Appendix A of this document. Alternative C represents BFO's efforts to maintain proposed spacing and infrastructure requirements consistent with the project's need. It incorporates sage-grouse habitat mapping, site verification of habitat suitability, and includes mitigation to reduce environmental effects to multiple resources. The specific changes identified for the Caliente POD are listed below.

By denying the 7 wells and associated infrastructure, an access road directly through the center of the Christensen Ranch 5 Lek and the 0.25 miles CSU will be eliminated. Eliminating surface occupancy within 0.25 miles of the lek is consistent with WY BLM policy or the State of Wyoming's GSG conservation strategy (Executive Order 2011-5 Greater Sage-Grouse Core Area Protection).

Because the Caliente POD is within two miles of the base of North Butte, part of the Pumpkin Buttes, all stipulations of the PA between BLM and WY SHPO regarding mitigation of adverse effects to the Pumpkin Buttes TCP are applied to the Caliente POD project. The site specific mitigation measures this project is required to adhere to are located in Appendices A through G of the PA. These mitigation measures incorporate standard BMPs to reduce visual contrast and are incorporated during all phases (drilling, construction, operation, reclamation) of all wells and their associated infrastructure. Appendices A through G of the Pumpkin Buttes PA are site specific mitigation measures which address:

Surface reclamation	Well locations	Other facilities
Access roads	Power lines	
Gathering pipelines	Water discharge	

The Pumpkin Buttes PA including Appendixes A through G is attached as Appendix C in this EA.

BLM also performed a visual contrast rating (VCR) analysis on all proposed surface disturbance within 2 miles of the Pumpkin Buttes TCP boundary as required by the Pumpkin Buttes PA. This analysis as described in *BLM Handbook H-8431-1, Visual Resource Contrast Rating*, determines the potential visual impacts from the proposed surface disturbing activities by comparing the project features with the major features in the existing landscape using basic design elements of form, line, color, and texture. Portions of

the Caliente project adhere to the mitigation and COAs described in this PA. BLM deferred portions of the Caliente project that were found to have an adverse effect to the Pumpkin Buttes TCP and do not adhere to the PA.

Table 2.3 - Summary of Disturbance (Acres or mileage in the action alternatives represent additional facilities and do not include the existing facilities.)

Facility	Alternative A (No Action) Existing Number/ Acres/Miles	Alternative B (Operator Proposal) Proposed Number/ Acres/Miles	Alternative C (Operator Proposal) Proposed Number/ Acres/Miles
Total CBNG Wells	0	30 CBNG	15 CBNG
Well Locations Nonconstructed Constructed Slotted	 0 0 0	 23 (11.5 acres) 2 (1.4 acres) 5 (0.4 acres)	 11 (5.5 acres) 2 (1.4 acres) 2 (0.2 acres)
Conventional Wells	0	0	0
Number of Ancillary Facilities (Staging/Storage Areas)	0	4 (3.7acres)	4 (3.7acres)
Acres (Miles) of Template/ Spot Upgrade Roads No Corridor With Corridor	 4.2 miles (31.8 acres)	0.5 miles (2.6 acres) 6.3 miles (57.5 acres)	0.3 miles (1.6 acres) 5.8 miles (52.8 acres)
Acres (Miles) of Engineered Roads No Corridor With Corridor	0	6.0 acres	1.4 acres
Acres (Miles) of Primitive Roads No Corridor With Corridor	 1.9 miles (8.5 acres)	0.05 miles (0.1 acres) 1.7 miles (9.5 acres)	0.05 miles (0.1 acres) 1 miles (5.6 acres)
Miles of Pipeline No Corridor With Corridor	 0 0	 3.8 miles (23.6 acres)	 1.4 miles (10.1 acres)
Miles of Overhead Powerlines	0.3 miles (1.3 acres)	2.1 miles (10.1 acres)	2.1 miles (10.1 acres)
Number of Monitor Wells	0	0	0
Number of Impoundments On-channel Off-channel Lined Unlined	0	1 1 (1.7Acres - lined)	1 1 (1.7Acres - lined)
Underground Injection Well	1 (1 acre)	1 (1 acre)	1 (1 acre)
TOTAL ACRES DISTURBANCE	**~ 42.6 Acres**	**129.1 Acres**	**95.2 Acres**

2.4. Conformance with the Land Use Plan and Other Program Guidance

The proposed action generally conforms to the 1985 Buffalo RMP, the 2001 and 2011 amendments, and the 2003 PRB FEIS and RMP Amendment and ROD. The proposed project generally conforms to federal laws, regulations, and policies including FLPMA, the National Historic Preservation Act, the Endangered Species Act, the Migratory Bird Treaty Act, the Clean Water Act, the Clean Air Act, the National Environmental Policy Act, and DOI Order 3310.

3. AFFECTED ENVIRONMENT

This section briefly describes the physical and regulatory environment affected by implementation of the alternatives in section 2. Aspects of the affected environment here focus on the major issues. Find a screening of all resources and land uses potentially affected in administrative record. Resources unaffected, or not affected beyond the level analyzed in the PRB FEIS, are outside the scope of this EA.

Project Area Description and Land Use

Yates' Caliente POD is in western Johnson County and eastern Campbell County, 34 miles south of Gillette, on Wyoming Highway 50. The POD is approximately 11 miles southwest of Savageton, WY, on the Black and Yellow Road. The topography is moderately rough terrain with many ridges and deep draws. The elevation ranges from approximately 4700 to 5240 feet above sea level. Livestock grazing is the primary historic land use in the project area. Oil development, CBNG production, existing fee developments, uranium developments, and ranching are the current land uses. Active uranium mining occurs in and adjacent to the project area.

Table 3.1 Adjacent/Overlapping Fluid Mineral Development within 1 mile of the Caliente POD.

	Development Name	Operator	Approval Date	Well Type/#	BLM NEPA #
1	HDU Federal	XTO Energy	11/22/2005	Oil/16	WY-070-05-250
2	Table Mountain Phase I	Anadarko	9/14/2006	CBNG/50	WY-070-06-288
3	Willow Creek	Bill Barrett	9/13/2006	CBNG/88	WY-070-06-211
4	HD CBM POD 2	XTO Energy	2/6/2007	CBNG/47	WY-070-07-011
5	HD 3	XTO Energy	9/24/2008	CBNG/44	WY-070-07-174
6	N Butte Obligation 1&2	Williams	9/14/2011	CBNG/7	WY-070-CX1-10-233
7	Table Mountain Phase 4	Anadarko	9/30/2010	CBNG/52	WY 070-EA10-258
8	Willow Creek NC	Bill Barrett	6/14/2010	CBNG/36	WY-070-CX3-10-196-225
9	Culp Draw Federal POD /Hartzog Draw Federal	Williams	5/27/10 9/28/2011	CBNG/53 CBNG/8	WY-070-10-121 Modified Decision Record
10	Table Mountain Phase 2	Anadarko	9/30/2010	CBNG/86	WY-070-10-376

Cameco's uranium project is the North Butte Mine and occurs on private surface mining private minerals.

3.1. 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. The Environmental Protection Agency (EPA) established ozone standards in 2008, finalizing them in 2011. Existing air quality in the PRB is "unclassified/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 became 1 of the nation's 40 "nonattainment" zones for ozone in 2012; 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 nitrogen oxides (NOx)) from existing natural gas fired compressor engines used in production of natural gas and CBNG; and, gasoline and diesel vehicle tailpipe emissions of combustion pollutants;
- PM (dust) generated by vehicle travel on unpaved roads, windblown dust from neighboring areas, road sanding during the winter months, and coal mines and trains;
- Transport of air pollutants from emission sources located outside the region;
- NOx, PM, and other emissions from diesel trains and,
- SO2 and NOx from power plants.

3.2. Soils and Vegetation

Soils have developed in alluvium and residuum derived from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams. Soils surface and subsurface textures vary widely from clay loams to sands. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though varies with texture, slope and other characteristics. Soils differ with topographic location, slope and elevation. Topsoil depths to be salvaged for reclamation range from 0 to 4 inches on ridges and shallow soils to 8+ inches in bottomland. Erosion potential varies from moderate to severe depending on the soil texture, 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 available water holding capacity (sandy soils), low organic matter content, and high erosion potential.

Soils within the project area were identified from the *South Campbell (WY605) and South Johnson (WY619) County Survey Areas, Wyoming.* The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. The BLM used 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 soils and landforms of this area present distinct challenges for development, and /or eventual site reclamation.

A tabulated summary of the dominant and important soil map units follows, along with their individual acreage and percentage of the area within the POD boundary.

The map unit symbols within this project area were filtered and map units representing 3.0% or greater in extent within the pod boundary are displayed. Dominant soil map units are listed in the table below with their individual acreage and percentage of the area within the POD boundary.

Table 3.2 Dominant or Important Soils by Map Unit Symbol (MUS)

MUS	Map Unit Name	Acres	Percent
SNe	Shingle-Tassel association,	890.3	33.8
233	Ustic Torriorthents, gullied	178.2	6.8
STd	Stoneham-Cushman association	173.6	6.6

MUS	Map Unit Name	Acres	Percent
VC	Valent-Cushman association	153.3	5.8
146	Forkwood-Cushman loams, o to 6 percent slopes	147.2	5.6
158	Hiland-Bowbac fine sandy loams, 6 to 15 percent slopes	130.8	5.0
170	Keeline-Tullock loamy sands, 6 to 30 percent slopes	98.7	3.7
194	Pugsley-Decolney sandy loams, 6 to 15 percent slopes	86.1	3.3
217	Theedle-Shingle loams, 3 to 30 percent slopes	69.9	2.7
206	Samday-Shingle-Badland complex, 10 to 45 percent slopes	67.7	2.6
SNf	Shingle-Worf association	55.2	2.1
180	Maysdorf-Pugsley sandy loams, 6 to 15 percent slopes	54.5	2.1
121	Cushman-Cambria loams, 0 to 6 percent slopes	53.8	2.0

Source: NRCS 2010.

For more detailed soil information, see the NRCS Soil Survey (WY605 and WY619). Additional site specific soil information is included in the Ecological Site interpretations.

Mapping a single taxonomic soil class is rare without including areas of other taxonomic classes. Consequently, every map unit comprises the soils or miscellaneous areas for of its name and some minor components that belong to taxonomic classes 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 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 contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Map unit descriptions mention the contrasting components. In complex soil patterns minor components may avoid observation and mention as it's impractical to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit does not diminish the usefulness or accuracy of the data. The objective of mapping is to separate the landscape into landforms or landform segments that have similar use and management requirements, and to delineate pure taxonomic classes. The delineation of such segments on the map provides sufficient information for the development of resource plans. Onsite investigation defines and locates the soils and miscellaneous areas where plans call for intensive use of small areas.

3.2.1. Limited Reclamation Potential (LRP)

Scientists identify LRP soils using NRCS SSURGO Data and onsite investigation. For preliminary analysis BLM filters the SSURGO data soil mapping units by the "most limiting" aggregation method. Thus any soil mapping unit containing a named component described as a miscellaneous area would be designated as an LRP area. BLM used the SSURGO Data to determine that 5.6% of the project area soils contain LRP areas. The area consisting of the miscellaneous component (LRP area) would be substantially less; and then BLM verifies and describes these areas during the onsite investigation. Onsite investigation verified the LRP areas identified in the SSURGO data as well as identified the entire Caliente to have LRP due to the sandy soils in the area.

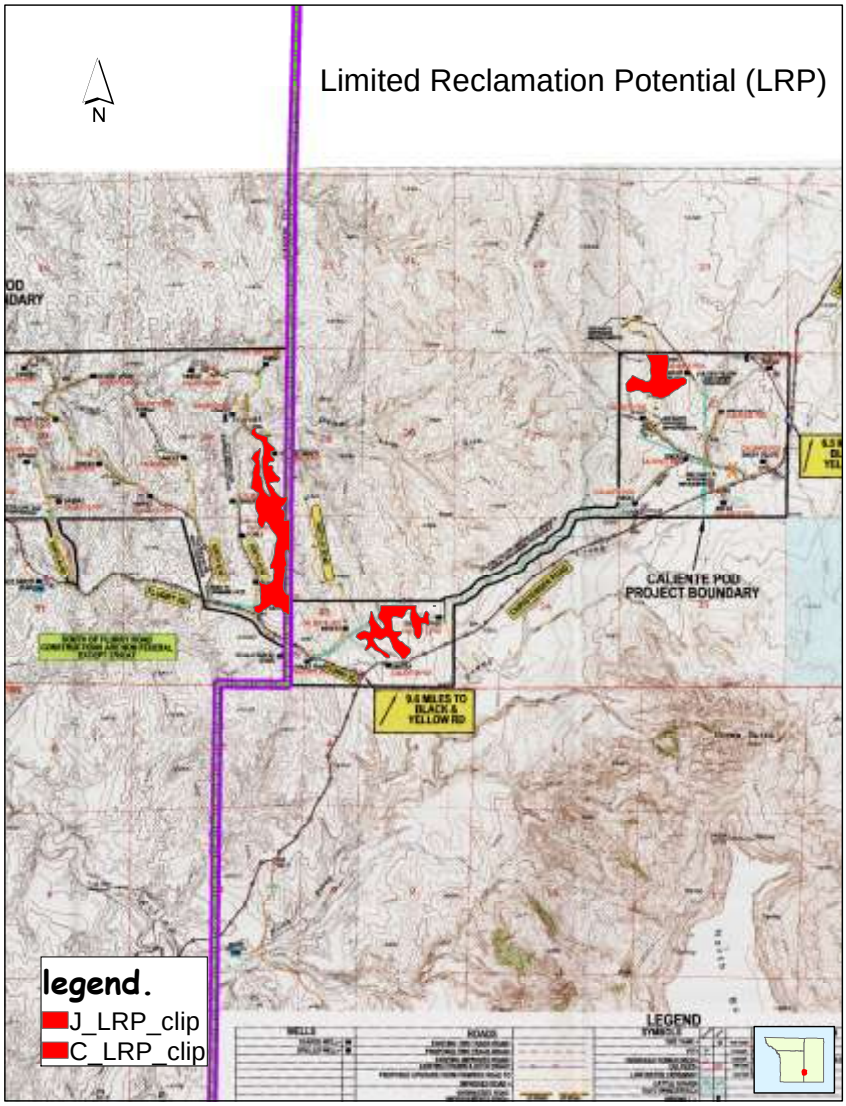
Miscellaneous areas have essentially no soil and support little or no vegetation. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities. Some miscellaneous areas can be made productive, but only after major reclamation efforts. (430-VI-NSSH, 1996)

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)

Rock outcrop: Consists of exposures of bare bedrock. Most rock outcrops are hard rock, but some are soft. (430-VI-NSSH, 1996).
Biological crusts: A living community of bacteria, microfungi, cyanobacteria, green algae, mosses, liverworts, and lichens that grow on or just below the soil surface. Biological crusts can heavily influence the morphology of the soil surface, stabilize soil, fix carbon and nitrogen, and can either increase or decrease infiltration. The percent cover and the components of the crust can vary across short distances. (USDA Natural Resources Conservation Service)

Figure 3.1 The LRP Areas in Caliente POD.



3.2.2. Vegetation and Ecological Sites

Species typical of short grass prairie comprise the project area flora. Three major vegetation and habitat types occur within the project area including Mixed-grass prairie, Sagebrush grassland, and Junipers.

Differences in dominant species within the project area vary with soil type, aspect and topography. The dominant species include Wyoming big sagebrush (Artemisia tridentata var. wyomingensis), and silver sagebrush (Artemisia cana) mixed with various types of grasses. Some Rocky Mountain juniper (Juniperus scopulorum) is present. Junipers are not found in large numbers and are only found in some draws on north facing aspects. Plains cottonwoods (Populus deltoids) is also evident in some of the draw bottoms throughout the project area.

Ecological Site Descriptions are used to provide soils and vegetation information needed for resource identification, management and reclamation recommendations. To determine the appropriate Ecological Sites for the area contained within this proposed action, BLM specialists analyzed data from onsite field reconnaissance and Natural Resources Conservation Service published soil survey soils information. The soils and the associated ecological sites found within the POD boundary are Shallow Loamy (10-14 NP), Loamy (10-14 NP), and Sandy (10-14 NP).

Dominant Ecological Sites and Plant Communities identified in this POD and its infrastructure, by dominant soil series are:

Loamy Sites:
This site occurs on gently undulating to rolling land on landforms which include hill sides, alluvial fans, ridges and stream terraces, in the 10-14 inch precipitation zone.

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

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

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

Dominant grasses identified include: mixed wheatgrasses, cheatgrass and crested wheatgrass. Forbs identified include: phlox and wild parsley. Other vegetative species identified at onsite: Sagebrush, lichens, and prickly pear.

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

Sandy Sites:
This site occurs on nearly level to 50%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 Historic Climax Plant Community (HCPC - defined as the plant community that was best adapted to the unique combination of factors associated with this ecological site) for this site would be a Needleandthread/Prairie sandreed Plant Community. Potential vegetation is about 75% grasses or grass-like plants, 15% forbs, and 10% woody plants. The state is a mix of warm and cool season midgrasses.

The present plant community is a *Needleandthread/threadleaf sedge/Fringed sagewort* plant community. Compared to the HCPC, prairie sandreed and Indian ricegrass have decreased. Threadleaf sedge, needleandthread and fringed sagewort have increased. Dominant grasses identified include: prairie junegrass and prairie sandreed. Forbs identified include: sand lily. Other vegetative species identified at onsite: yucca and threadleaf sedge. A summary of the ecological sites within the project area are in the table below along with the individual acreage and the percentage of the total area identified within the POD boundary.

Table 3.3 Ecological Sites and Soils Map Units in the Caliente POD

Map Unit	Ecological Site	Approximate Acreage[1]	% of Project Area
SNe, 210, SNf	Shallow Loamy (SwLy) 10-14 NP	959	36%
STd, 146, 217, 121, 122, 116, 216, MR,CV, 144, 147, 128, 145, KZB	Loamy (Ly) 10-14 NP	683	26%
158, 170, 194, 180, 171, 157, CW, 221, 213	Sandy (Sy) 10-14 NP	535	20%

[1] Ecological site information is available for 98% of the project area; 2% (approximately 131 acres) is unassigned. Source for Table 3.3: USDA 2010a.

3.3. Water Resources

Caliente POD is in the Upper Powder River drainage. The POD boundary overlaps into 3 main subdrainages of the Upper Powder River: Hartzog Draw, Heldt Draw, and the North Prong Willow Creek. Ephemeral drainages are prevalent which drain and dissect the area into these more prominent draws and creek. The ephemeral drainages are typically steep banked, narrow drainages with headcuts in their upper reaches and broaden out to a flat valley bottom near their confluence with the more major drainages. The potential for sheet and or flash flows from these drainages is moderate to high as vegetation is mainly low grass and sage on the broad open slopes surrounding the ephemeral draws. Wyoming Department of Environmental Quality (WDEQ) assumed primacy from U.S. Environmental Protection Agency for maintaining the State's water quality. The Wyoming State Engineer's Office (WSEO) has authority for regulating water rights issues and permitting impoundments for the containment of the State's surface waters. The Wyoming Oil and Gas Conservation Commission (WYOGCC) has authority for permitting and bonding off channel pits located over state and fee minerals.

3.3.1. Groundwater

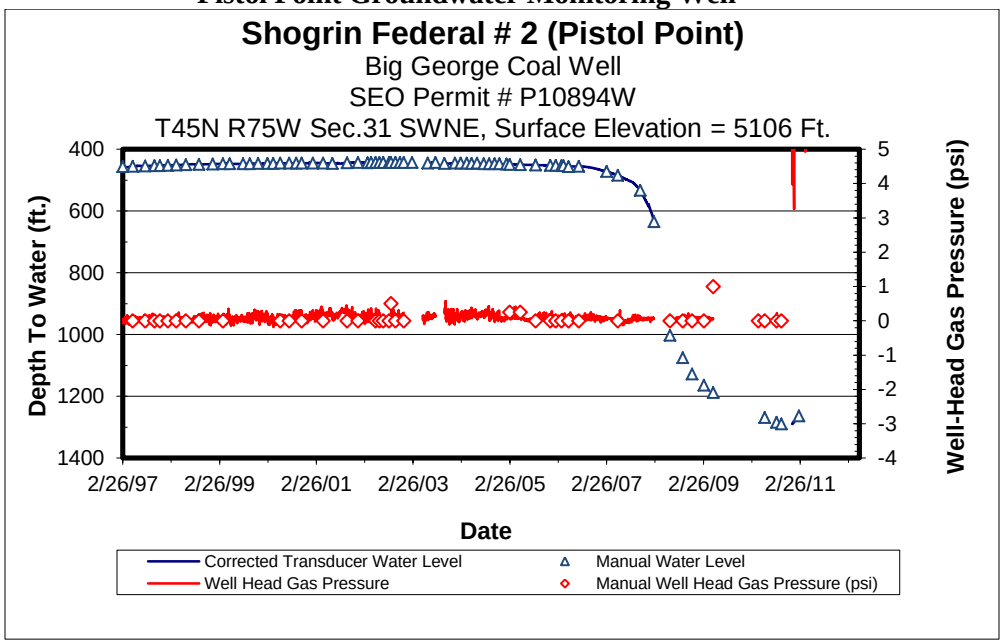
The historical use for groundwater in this project area is for stock water or domestic purposes. A search of the WSEO Ground Water Rights Database for this area showed 23 registered stock and domestic water wells within 1 mile of the POD boundary with depths ranging from 4 to 9,537 feet. For additional information on water, refer to the PRB FEIS (2003), 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, please 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 has been monitoring coal zone pressures and water levels since the early 1990s in the PRB.

The Caliente POD is surrounded by many approved federal, fee, and state CBNG projects. The Pistol Point groundwater monitoring well, at SWNE Section 31T45N R75W, is within 1.5 miles of the Caliente POD boundary and was installed as a part of the BLM deep groundwater monitoring program. The initial water level of the Big George coal seam, measured on February 26, 1997, was 457 feet below ground level. The most recent measurement, from February 16, 2011, recorded the water level at 1,263 feet below ground level, for a decline of 806 feet since the well was completed. Since February 2011, the well has had too high of gas pressure to obtain water level readings either through manual or digital transducer method. Refer to the PRB FEIS, Chapter 4, Groundwater for further information and to the Wyoming State Geological Survey's Open File Report 2009-10 titled, "1993-2006 CBNG Regional Groundwater Monitoring Report: Powder River Basin, Wyoming," which is available at: http://www.wsgs.uwyo.edu.

Figure 3.2. Depth to Static Water Level from the Ground Surface at the Pistol Point Groundwater Monitoring Well



3.3.2. Surface Water

The project area is within the Hartzog, Heldt, and North Prong Willow Creek drainages which are tributaries to the Upper Powder River. 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 grassy swales, without defined bed and bank.

3.4. Wetlands/Riparian

Based on National Wetland Inventory (NWI) data interpreted from the BLM GIS maps, there is approximately 10 acres of wetland riparian habitat present within the Caliente POD boundary. Wetland types represented in the POD boundary are freshwater emergent (9.6 acres) and freshwater pond (0.4 acre). The two identified riparian areas are associated with the Heldt and North Prong Willow Creek drainages. For additional discussions on surface water refer to the PRB FEIS (pp. 3-36 to 3-56).

3.5. Invasive Species

State-listed noxious weeds and invasive/exotic plant infestations were discovered by a search of inventory maps and/or databases or during subsequent field investigation by the proposed project proponent and the BLM. Specific species of concern include:

- Canada thistle is found throughout the POD.
- Scotch thistle was identified and found near existing roads and oil infrastructure in the POD.
- Cheat grass invaded the state of Wyoming, and occurs throughout the project area.

The operator developed a Management Plan for Noxious Weeds.
The state-listed noxious weeds are in PRB FEIS Table 3-21 (p. 3-104) and the Weed Species of Concern are listed in Table 3-22 (p. 3-105). Cheatgrass or downy brome (*Bromus tectorum*) and to a lesser extent, Japanese brome (*B. japonicus*) exist in the affected environment. These two species are found in high densities and numerous locations throughout NE Wyoming.

3.6. Locatable Minerals

Uranium One's, Willow Creek Uranium ISR Project, sites lie in and adjacent to the Caliente POD project area. Approved uranium mining currently exists in the Caliente POD in Sections 30, 31, and 33 of T45N, R76W. Adjacent approved uranium mining currently exists in Sections 19, 20, 31, 32 and 33 of T45N, R76W, Section 24, 25, 34, and 35 of T45N, R77W, and Sections 3, 4, 5, 6, 7, 8, 9, 10, 16, 17, 18, 19, 20, and 21 of T44N, R76W. These areas are directly south, east, and north of the POD.

3.7. Fish and Wildlife

The PRB FEIS identified wildlife species occurring in the PRB, pp. 3-113 to 3-206. ICF International (ICF) conducted wildlife surveys in the project area in 2009, 2010, 2011, and 2012. BLM wildlife biologists performed a habitat assessment in the project area on December 19 and 20, 2011 and on January 17 and 18, 2012. The biologist evaluated impacts to wildlife resources and recommended project modifications where wildlife issues arose. BLM wildlife biologists also consulted databases compiled and managed by BLM BFO wildlife staff, the PRB FEIS, WGFD datasets, and the Wyoming Natural Diversity Database (WYNDD) to evaluate the affected environment for wildlife species that may occur in the project area. This section describes the affected environment and impacts to wildlife known or likely to occur in the area of the proposed project.

3.7.1. Big Game

The big game species occurring in the project area are mule deer and pronghorn. The area may also occasionally be visited by elk; however, the WGFD does not consider the area to have seasonal habitats that support a herd. The PRB FEIS discussed the affected environment for pronghorn and mule deer, pp. 3-117 to 3-122 and pp. 3-127 to 3-132, respectively. Table 3.4 below indicates the delineated seasonal ranges for each species that occur in the project area, the herd units affected by the project, the WGFD population objective, and the WGFD current population estimate for each species (WGFD 2011a).

Table 3.4 Big Game Species, Seasonal Ranges, Herd Units, Population Objectives, and Population Estimates for Big Game Species Likely to Occur in the Caliente Project Area

Species	Seasonal Range in Project Area	Herd Unit	WGFD Population Objective	% Above (+) or Below (-) Objective	WGFD Report Year
Mule Deer	Yearlong, winter yearlong	320 – Pumpkin Buttes	11,000	- 12.7%	2011
Pronghorn	Yearlong, winter yearlong	309 – Pumpkin Buttes	18,000	+ 46%	2011

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, but during the winter months there is a significant influx of additional animals into the area from other seasonal ranges.

3.7.2. Migratory Birds

The PRB FEIS discussed the affected environment for migratory birds, pp. 3-150 to 3-153. A wide variety of migratory birds may occur in the proposed project area at some point during the year. Migratory birds are birds that migrate for breeding and foraging at some point in the year. The BLM-Fish and Wildlife Service (FWS) Memorandum of Understanding (MOU) (2010) promotes the conservation of migratory birds, complying with Executive Order 13186 (Federal Register V. 66, No. 11). BLM must include migratory birds in every NEPA analysis of actions that have potential to affect migratory bird species of concern to fulfill obligations under the Migratory Bird Treaty Act (MBTA). The MBTA (and Bald and Golden Eagle Protection Act (BGEPA)) are strict liability statutes so require no intent to harm migratory birds through prosecuting a taking. Recent prosecutions or settlements in Wyoming and the west cost companies millions of dollars in fines and restitution (which was usually retrofitting powerlines to discourage perching to minimize electrocution or shielding ponds holding toxic substances). BLM encourages voluntary design features and conservation measures supporting migratory bird conservation, in addition to appropriate restrictions.

A wide variety of migratory birds may be found in the proposed project area at some time throughout the year. Many species that are of high management concern use shrub-steppe and shortgrass prairie areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds declined more consistently than any other ecological association of birds over the last 30 years (WGFD 2009). The WGFD Wyoming Bird Conservation Plan (Nicholoff 2003) identified 3 groups of high-priority bird species in Wyoming: Level I – those that clearly need conservation action, Level II – species where the focus should be on monitoring, rather than active conservation, and Level III – species that are not otherwise of high priority but are of local interest.

Shrub-steppe and mixed grassland habitat types dominate the project area, with scattered juniper and cottonwood trees occurring in draws. Approximately 188 acres of prairie dog colonies are also present in the project area. Many species that are of high management concern use shrub-steppe areas for their primary breeding habitats (Saab and Rich 1997). Nationally, grassland and shrubland birds declined more consistently in the last 30 years than any other ecological association of birds (WGFD 2009). Species that may occur in these vegetation types in northeast Wyoming, according to the Wyoming Bird Conservation Plan, appear Table 3.5., grouped by level as identified in the plan.

Table 3.5 Migratory Bird Species in Shrub-Steppe Habitat, NE Wyoming (Nicholoff 2003)

Level	Species	Wyoming BLM Sensitive
Level I	Brewer's sparrow	Yes
	Ferruginous hawk	Yes
	McCown's longspur	No
	Sage sparrow	Yes

Level	Species	Wyoming BLM Sensitive
Level II	Lark bunting	No
	Lark sparrow	No
	Loggerhead shrike	Yes
	Sage thrasher	Yes
	Vesper sparrow	No
Level III	Common poorwill	No
	Say's phoebe	No

The discussion included habitat requirements and foraging patterns for the species listed above, with the exception of common poorwills, and Say's phoebes, addressed below. Common poorwills inhabit sparse rocky sagebrush, open prairies, mountain-foothills shrublands, juniper woodlands, brushy rocky canyons, and ponderosa pine woods. They prefer clearings, like grassy meadows, riparian zones, and forest edges for foraging. They lay eggs directly on gravelly ground, flat rock, or litter of woodland floor. Nests are often near logs, rocks, shrubs, or grass for some shade. They feed exclusively on insects. Say's phoebes inhabit arid, open country with sparse vegetation, including shrub-steppe, grasslands, shrublands, and juniper woodlands. They nest on cliff ledges, banks, bridges, eaves, and road culverts and often reuse nests in successive years. They eat mostly insects and berries.

Several migratory species are also BLM special status (sensitive) species (SSS). Those known or suspected of occurring in the project area include Baird's sparrow, Brewer's sparrow, ferruginous hawk, loggerhead shrike, long-billed curlew, mountain plover, sage sparrow, sage thrasher, and western burrowing owl.

3.7.3. Raptors

The PRB FEIS discussed the affected environment for raptors, pp. 3-141 to 3-148. According to the BLM raptor database, 26 nests occur within 0.5 miles of the project area. These nests are in Table 3.6 below. Of those, 7 were active in 2012 (ICF 2012). Red-tailed hawks, long-eared owls, great horned owls, and ferruginous hawks have all been documented nesting in the project area. Other species documented in the surrounding area, and are suspected to forage or nest in the project area, include: golden eagle, sharp-shinned hawk, short-eared owl, American kestrel, and prairie falcon.

Table 3.6 Survey Results for Nests Within 0.5 Miles of the Caliente Project Area. (ICF 2012)

BLM ID	Year	Species	Status
634	2012	Red-tailed Hawk	Active
647	2012	Red-tailed Hawk	Active
3644	2012	Great Horned Owl	Active
3709	2012	n/a	Inactive
3990	2012	n/a	Inactive
5673	2012	Red-tailed Hawk	Active
8389	2012	n/a	Inactive
8393	2012	n/a	Inactive
8394	2012	Red-tailed Hawk	Active
10350	2012	n/a	Inactive
10351	2012	n/a	Inactive
10357	2012	n/a	Inactive
10363	2012	Great Horned Owl	Active
10366	2012	n/a	Inactive
10367	2012	n/a	Inactive
10797	2012	n/a	Did Not Locate

BLM ID	Year	Species	Status
10807	2012	n/a	Inactive
12102	2012	n/a	Inactive
12139	2012	n/a	Inactive
12226	2012	n/a	Inactive
12227	2012	n/a	Did Not Locate
12228	2012	n/a	Inactive
12495	2012	n/a	Inactive
13097	2012	n/a	Inactive
13330	2012	n/a	Inactive
13331	2012	Long-eared Owl	Active

Most raptor species nest in a variety of habitats including (but not limited to): grasslands, agricultural lands, live and dead trees, cliff faces, rock outcrops, and tree cavities. Suitable nesting habitat is present throughout the project area.

3.7.4. Plains Sharp-tailed Grouse

Plains sharp-tailed grouse are discussed in this document because specific concerns for this species were identified during the scoping process for the PRB FEIS. The PRB FEIS discussed the affected environment for plains sharp-tailed grouse on pp. 3-148 to 3-150. Sharp-tailed grouse inhabit short and mixed-grass prairie, sagebrush shrublands, woodland edges, and river canyons. In Wyoming, this species is found where grasslands are intermixed with shrublands, especially wooded draws, shrubby riparian area, and wet meadows. Habitats in the Caliente project area have limited potential to support sharp-tailed grouse. The mosaic of grasslands and sagebrush-grasslands that occurs in the area may provide nesting and brood-rearing habitat, but limited availability of berry producing shrubs limit the likelihood of plains sharp-tailed grouse occurrence. The nearest known plains sharp-tailed grouse lek is approximately 18 miles north of the project area. No plains sharp-tailed grouse were noted in the project area (ICF 2012).

3.8. Threatened, Endangered, or Candidate Species

The Buffalo BLM received a species list on July 22, 2011 from the FWS concerning threatened, endangered, and candidate species. The list included Ute Ladies'-tresses orchid (threatened) and Greater Sage-Grouse (candidate). In addition to the listed species, the FWS letter also included migratory birds and wetland/riparian habitats.

3.8.1. Ute Ladies'-Tresses Orchid (ULT)

The Ute ladies'-tresses orchid (ULT) is threatened under the ESA. The PRB FEIS discussed the affected environment for ULT on p. 3-175. This orchid occurs in moist, sub-irrigated or seasonally flooded soils at elevations between 1,780 and 6,800 feet above sea level. Habitat includes wet meadows, abandoned stream channels, valley bottoms, gravel bars, and near lakes or perennial streams that become inundated during large precipitation events. A Wyoming Natural Diversity Database model predicts undocumented populations may be present particularly within southern Campbell and northern Converse Counties. This model does not show any potential habitat in the Caliente project area. Prior to 2005, only 4 orchid populations were documented in Wyoming. Five additional sites were found in 2005 and one in 2006.

The new locations were in the same drainages as the original populations, with 2 on the same tributary and within a few miles of an original discovery. Drainages with documented orchid populations include Antelope Creek in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. In Wyoming, *Spiranthes diluvialis* blooms from early August to early September. The Caliente project area contains marginal potential habitat for ULT. Ephemeral and intermittent draws in the project area are dominated

by upland vegetation, with steep rising banks and limited surface water. Heldt Draw, North Prong Willow Creek, and their minor tributaries were completely dry during habitat assessments in 2009, with the exception of one spring located in NWNE Section 33 (ICF 2009). The species is not suspected to occur in the project area.

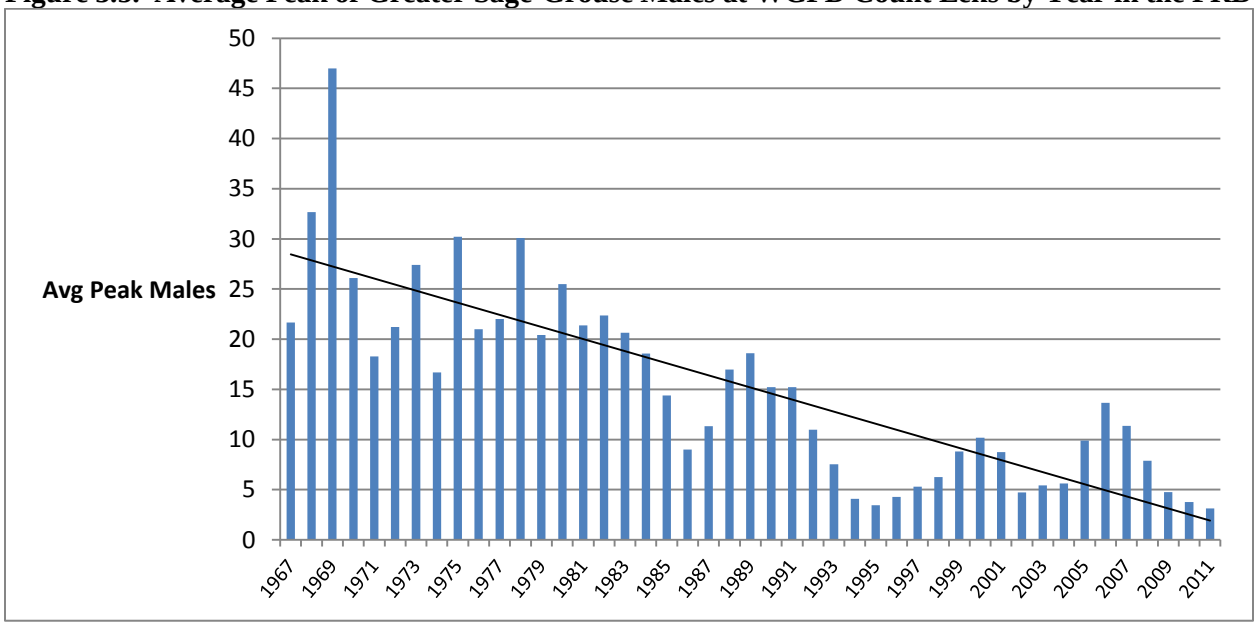
3.8.2. Greater Sage-Grouse (GSG) (Candidate Species)

The PRB FEIS addressed the affected environment for sage-grouse, pp. 3-194 to 3-199. GSG'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 GSG 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: FWS warranted that the GSG 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 GSG by number of well pad locations per square mile within 2 miles of a lek.
7. March, 2010: FWS warranted that the GSG justified listing across its range, but precluded listing due to higher priorities (FWS 2010). The GSG is a listing candidate.
8. March, 2012: WY BLM released the report, "Viability analyses for conservation of GSG populations: Buffalo Field Office, Wyoming," indicating that a viable population of GSG 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 2012).

The GSG population in northeast Wyoming is exhibiting a steady long term downward trend, as measured by lek attendance (WGFD 2011b). Figure 3.5 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 3.5. Average Peak of Greater Sage-Grouse Males at WGFD Count Leks by Year in the PRB



Research showed that declines in lek attendance correlate with oil and gas development. In a typical landscape in the PRB, energy development within 2 miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007). Several studies have shown that well density can be used as a metric for evaluating impacts to GSG, as measured by declines in lek attendance (Braun et al. 2002, Holloran et al. 2005, and Walker et al. 2007). These studies indicated that oil or gas development exceeding approximately 1 well pad per square mile, resulted in calculable impacts on breeding populations, as measured by the number of male GSG attending leks (State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development 2008).

Impacts from oil and gas development are 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 45 documented leks within 12.4 miles of the Caliente project area. Currently there are 9,462 existing and approved wells within 12.4 miles of the 45 leks, an area of 1,902 square miles.

Site Specific Habitat

WGFD records indicate that 10 GSG leks occur within 4 miles of the project area (Table 3.7, below). The project area is not in a core or connectivity habitat area, as identified in EO 2011-5, Greater Sage-grouse Core Area Protection. GSG habitat models indicate that the project area contains high quality GSG nesting and winter habitat (Walker et al. 2007). BLM confirmed suitable nesting, brood rearing, and winter habitat is present throughout the Caliente project area. BLM also observed GSG sign during the onsites. ICF reported a group of 10 individuals in SWSE Section 29, T45N R76W (ICF 2012). ICF survey results for the Caliente project area indicate that ICF observed GSG strutting at locations other than WGFD accepted lek sites. In 2011, ICF observed birds strutting 0.3 miles south of the Christensen Ranch 5 Lek (ICF 2011b). In 2012, they observed birds strutting 0.44 miles to the SE of the lek (ICF 2012). It is unknown at this time whether these 2 areas should be considered satellite leks. The Christensen Ranch 5 Lek site was active in 2010 and 2011 by other consultants.

Table 3.7 Greater Sage-Grouse Leks Within 4 Miles of the Hartzog/Culp Draw POD Boundary.

Lek Name	Legal Location	Distance from Project Area	2012 Peak Males	Existing Wells Within 4 Miles of Lek/Wells per Mi²
Christensen Ranch 1	T44N, R76W, S19 SWSW	3.9 miles	21	378/7.5
Christensen Ranch 2	T44N, R77W, S24 NENE	3.7 miles	0	424/8.4
Christensen Ranch 3	T44N, R77W S12 NENE	1.9 miles	0	381/7.6
Christensen Ranch 4	T45N, R76W S19 NESE	0.6 miles	17	399/7.9
Christensen Ranch 5	T45N, R76W S32 NWNE	within POD	1	307/6.1
Christensen Ranch 7	T44N, R77W S11 NWSW	2.9 miles	1	451/9
Irigaray	T45N, R77W S29 SENE	3.9 miles	0	336/6.7
Irigaray II	T45N, R77W S28 SESW	3.3 miles	3	369/7.3
North Butte	T44N, R75W, S18 SENW	3.6 miles	5	423/8.4
Willow Creek	T45N, R76W S23 SWNE	0.5 miles	17	480/9.5

3.9. Special Status (Sensitive) Species (SSS) – Plants, Fish, and Wildlife

Wyoming BLM annually updates its list of SSS to focus management to maintain habitats to preclude listing as a threatened or endangered species. The policy goals are:

- Maintaining vulnerable species and habitat components in functional BLM ecosystems;
- Ensuring sensitive species are considered in land management decisions;
- Preventing a need for species listing under the ESA; and
- Prioritizing needed conservation work with an emphasis on habitat.

Table 1 in Appendix B lists SSS that may occur in the project area. The table also includes a brief description of the habitat requirements for each species. The authority for the SSS comes from the ESA, as amended; Title II of the Sikes Act, as amended; the FLPMA; Department Manual 235.1.1A, and BLM Manual 6840.

3.9.1. Mountain Plover

The PRB FEIS discussed the affected environment for mountain plover on pp. 3-177 to 3-178. When BLM wrote the PRB FEIS, the mountain plover was proposed for listing as a threatened species under the ESA. In 2003, FWS withdrew the proposal, finding that the population was larger than had been thought and was no longer declining. On June 29, 2010 the FWS reinstated a December 5, 2002 proposed rule (67 FR 72396) to list the mountain plover as a threatened species. On May 12, 2011, the FWS withdrew the proposal to list the mountain plover as a threatened species. Prairie dog colonies and flat ridge tops containing bare ground, found in the project area, all have the potential for plover use. The BLM identified the prairie dog town in Section 33 T45N R76W and Section 4 T44N R76W as potential habitat for plover. While the height of current grass cover in some potential habitat is likely to preclude mountain plover from using these areas, disturbances such as intensive grazing, drought, or wildfire would make these areas suitable for mountain plover. Suitable mountain plover habitat is present in the Caliente project area. No mountain plover were observed during surveys (ICF 2009, 2011a, 2011b, 2012).

3.9.2. Western Burrowing Owl

The PRB FEIS discussed the affected environment for western burrowing owl (burrowing owl) on p. 3-186. In addition to being a Wyoming BLM sensitive species, burrowing owls are a WGFD SGCN, with a rating of NSS4 because the species is widely distributed, population status and trends are unknown but are suspected to be stable, habitat is restricted or vulnerable without substantial recent or on-going loss, and it may be sensitive to human disturbance. The Wyoming Bird Conservation Plan rates them as a Level I species, indicating they are clearly in need of conservation action, and they are also a FWS BCC in Region 17. No burrowing owl nests were observed by ICF within 0.25 miles of the project area (ICF 2009, 2011a, 2011b, 2012), nor were there any documented in the BLM-BFO raptor database, but the black-tailed prairie dog colonies listed in section 3.9.3 (Black-tailed Prairie Dog) provide suitable habitat

for burrowing owls. BLM documented burrowing owls nesting in prairie dog towns within 3 miles of the Caliente POD.

3.9.3. Black-tailed Prairie Dog

The PRB FEIS discussed the affected environment for black-tailed prairie dogs (p 3-179). Approximately 188 acres of black-tailed prairie dog towns occur in the project area, in Sections 33 T45N R76W, Section 4 T44N R76W, and Section 36 T45N R77W. The town in Sections 4 and 33 is the only active town, consisting of 177 acres.

3.10. West Nile Virus

West Nile virus (WNv) is a mosquito-borne disease that can cause encephalitis or brain infection. Mosquitoes spread this virus after they feed on infected birds and then bite people, other birds, and animals. WNv is not spread by person-to-person contact, and there is no evidence that people can get the virus by handling infected animals. Since its discovery in 1999 in New York, WNv has become established and spread across the United States. Birds are the natural vector host and serve not only to amplify the virus, but to spread it. *Culex tarsalis* appears to be the most common mosquito vector. Mosquitoes can hatch from standing water in as few as four days. Data collected by the CDC and published by the USGS at www.westnilemaps.usgs.gov are summarized in Table 3.8. Reported data from the PRB includes Campbell, Sheridan, and Johnson Counties.

Table 3.8 Historical West Nile Virus Information

Year	Total WY Human Cases	Human Cases PRB	Equine Cases PRB	Bird Cases PRB
2001	0	0	0	0
2002	2	0	15	3
2003	392	85	46	25
2004	10	3	3	5
2005	12	4	6	3
2006	65	0	2	2
2007	155	22	Unk	1
2008	10	0	0	0
2009	10	1	1	No record
2010	6	0	0	0
2011	3	0	Unk	No record

Source: Wyoming Department of Health, http://diseasemaps.usgs.gov/wnv_wy_human.html

Human cases of WNv in Wyoming occur primarily in the late summer or early fall. 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 corvids (crows, jays). Raptor species also appear to be highly susceptible to WNv. During 2003 scientists documented that 36 raptors died from WNv in Wyoming including golden eagle, red-tailed hawk, ferruginous hawk, American kestrel, Cooper's hawk, northern goshawk, great-horned owl, prairie falcon, and Swainson's hawk (Cornish et al. 2003). The Wyoming State Vet Lab determined 22 GSG 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). Current science suggests a synergy between WNv and energy development that amplifies the negative impact GSG (FWS 2010 p. 13947).

In the PRB, there may be increased surface water associated with CBNG development. This increase in potential mosquito breeding habitat provides opportunities for mosquito populations to increase. 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). 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.

3.11. Economics and Recovery of CBNG Resources

Caliente POD proposes a maximum of 30 CBNG wells, Table 2.1. BLM petroleum engineers reviewed well logs from in or near the project area to determine what Caliente 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 Caliente wells. The BLM findings are in Table 3.9 and Table 3.10.

The project would potentially produce (in the course of project life span approximately 10-15 years) 18,270,000 thousand cubic feet (MCF) of CBNG and would generate about $41 million 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 $5.1 million paid to the US Government general treasury. Of those federal royalties, the State of Wyoming would receive a little over $2.5 million.

Table 3.9 Prediction of Total Produced CBNG by Section

Section #	Number of Wells in Section	Average MCF Per Well	Total Gas (MCF)
26, 29, 30, 32, 33	30	609,000	18,270,000

Table 3.10 Prediction of Total Revenue

Number of Wells	Total Gas (MCF)	Total Revenue @ $3.5/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)
30	18,270,000	$63,945,000	$41,043,862	$7,993,125	$5,130,482	$2,513,937

3.12. Cultural Resources

A Class III cultural resource inventory was performed for the Caliente POD prior to on-the-ground project work (BFO project no. 70110028). A Class III cultural resource inventory following the Archeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (48CFR190) and the Wyoming State Historic Preservation Office Format, Guidelines, and Standards for Class II and III Reports was provided to BFO by Yates. Ardeth Hahn, BLM Archaeologist, reviewed the report for technical adequacy and compliance with BLM standards, and determined it to be adequate. The following resources are in or near the project area.

Table 3.11 Cultural Resources Inventory Results

Site Number	Site Type	National Register Eligibility
48CA268	Pumpkin Buttes TCP	Eligible
48CA5416	Prehistoric Site	Eligible
48CA5417	Prehistoric Site	Not Eligible
48CA5418	Historic & Prehistoric Site	Not Eligible
48CA5419	Prehistoric Site	Not Eligible

Site Number	Site Type	National Register Eligibility
48CA6596	Prehistoric Site	Unevaluated
48CA7008	Prehistoric Site	Eligible
48CA6214	Historic Black & Yellow Trail: Sussex Variant, Segment 1	Not Eligible
48CA6214	Historic Black & Yellow Trail: Sussex Variant Segment 2	Not Eligible
48CA6595	Prehistoric Site	Not Eligible
48CA7091	Prehistoric Site	Unevaluated
48CA7092	Historic & Prehistoric Site	Not Eligible
48JO4238	Historic Site	Not Eligible
48JO4239	Historic Site	Not Eligible

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

The Pumpkin Buttes (48CA268) TCP is eligible for the National Register of Historic Places for its association with significant historical events; for its association with significant historic individuals; for its ability to provide significant historic and prehistoric information; as a location associated with the traditional beliefs of numerous Native American groups about their cultural history; and as a location where Native American religious practitioners have historically gone to perform ceremonial activities in accordance with traditional cultural rules of practice. Although there is currently ongoing energy development in the vicinity, the site retains integrity of setting. The Caliente POD will not physically impact the TCP but infrastructure is proposed within the setting of the site. WY BLM earlier analyzed and provided direction about the TCP in WY SDR-2010-030, pp. 25-28, and pp. 31-33, which BLM incorporates here by reference.

4. ENVIRONMENTAL EFFECTS

This section analyzes and describes the environmental effects of Alternatives B and C, on the affected environment described in Section 3. (BLM accomplished the analysis of Alternative A through the aggregate of the effects analysis of the situation found in the PRB FEIS and updated with the subsequent development in the project area, see Table 3.1.) 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 effect 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. Air Quality

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

4.2. Soils and Vegetation

4.2.1. Direct and Indirect Effects

Anticipated impacts occurring include soil rutting and mixing, compaction, increased erosion potential, and loss of soil productivity. The most notable impacts 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. Construction activities mix the soil profiles 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 compaction results from the construction of wells and associated facilities, 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 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, thus reducing soil aeration and infiltration thereby degrading the rooting environment. Rutting may result in topsoil and subsoil mixing, thereby reducing soil productivity. Rutting also disrupts natural surface water hydrology by diverting and concentrating water flow thus accelerating erosion. Soil mixing typically results in a decrease in soil fertility and a disruption of soil structure.

Operator proposed engineered sections of road to gain access to the wells due to steep slopes, with cuts/fills exceeding 5 feet. The operator is responsible for having the licensed professional engineer(s) certify that the construction of those roads meet the design criteria and are built to Bureau standards. These engineered road segments should be completed, including any culverts, low water crossings and required surfacing, before the drilling rig or other drilling equipment moves onto the pad in order to protect erodible soils.

Low water crossings (LWC) are a BLM approved construction technique to allow all weather access though drainages where culverts are not appropriate or desired. BLM recommends specific design criteria for a typical LWC which must be shown in proposed road designs. Construction completed to BLM approvable standards will reduce down drainage sedimentation, erosion and scouring caused by frequent failure of in-channel structures.

Within the operator Master Surface Use Plan there is a landowner preferred seed mixture provided. For further detail on the seed mixes please refer to p. 12 of the Caliente POD Master Surface Use Plan.

The BLM will evaluate reclamation success using the requirements in the BLM State Wide Reclamation Policy found at: http://www.blm.gov/wy/st/en/programs/reclamation, incorporated here by reference.

Expanded gas, water, and electric ROW infrastructure linking POD support facilities are part of reasonably foreseeable development (RFD) additions to the proposed action (PRB ROD, p. 2). A foreseeable addition may be a request for a ROW to connect roads, gas and water utility lines.

4.2.2. Limited Reclamation Potential (LRP)

Evaluation of the NRCS SSURGO data and subsequent onsite field inspections identified, BLM staff observed site conditions for well pads and access roads within areas of limited reclamation potential. The entire Caliente POD lies on soils that have LRP. Disturbance would further increase this potential. Disturbance in these areas are difficult if not impossible to meet the goals of the WY-BLM reclamation policy, control erosion, and the suitability of the material for construction (roads, pad, etc.) is in question. Disturbance in these areas is likely to compromise the health and productivity of the surrounding lands through sediment transport and contamination.

4.2.2.1. Cumulative Effects

For details on expected cumulative impacts, refer to the referenced PRB FEIS, Chapter 4. The PRB FEIS defines the designation of the duration of disturbance (pp. 4-1 and 4-151). Most soil disturbances would be short term impacts with expedient interim reclamation and site stabilization.

4.2.2.2. Mitigation Measures

Mitigation measures, surface upgrades, applicant committed measures, and adherence to COAs and the WY Reclamation Policy would help to mitigate or reduce the impacts described above. Yates and BLM should apply the following mitigation to reduce impacts to soils and vegetation from surface disturbance.

For safety of travel, to reduce rutting and increase traction, place a minimum average of 4 inches of gravel aggregate on road segments where grades exceed 8%.

To protect erodible soils, all engineered road segments should be completed, including any culverts, low water crossings and required surfacing, before the drilling rig or other drilling equipment moves onto the pad.

A company licensed professional engineer(s) will certify that the construction of engineered roads meet the design criteria(s) and are built Bureau standards.

Provide erosion control along pipeline routes to achieve successful reclamation. Erosion control features include water bars, mulching, straw crimping, or erosion blankets, etc.

Cross country pipeline routes will not become roads after construction is complete. All sections of pipeline will be fully reclaimed to blend with the surrounding topography. Pipeline inspections should be conducted by ATV, foot, or air.

The BLM will evaluate reclamation success using the requirements set forth in the State Wide Reclamation Policy revised 2011, see above.

Culverts will be at the appropriate locations for streams and channels crossed by roads specified in the

BLM Manual 9112, Bridges and Major Culverts and Manual 9113, Roads. Streams will be perpendicular to flow, where possible, and all design of stream crossing structures will carry the 25-year discharge event or other capacities as directed by the BLM.

4.2.2.3. Residual Effects

Residual effects across the POD would include a long-term loss of soil productivity associated with well pads and roads. The PRB FEIS identified residual effects (p. 4-408) such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established. In spite of the above residual effects, the BLM considers that Alternative B is within the parameters for surface disturbance and surface disturbance reclamation in PRB FEIS ROD.

4.3. Vegetation and Ecological Sites

4.3.1. Direct and Indirect Effects

The PRB FEIS discusses most direct and indirect effects to ecological sites and vegetation (p. 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, 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).

4.3.2. Cumulative Effects

The PRB FEIS discusses the cumulative effects to ecological sites (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.

4.3.3. Mitigation Measures

Implementation of the mitigation measures in the COAs, Caliente POD, and its associated plans including the Integrated Weed and Pest Management Plan, the WMP, and the MSUP (specifically Plans for Reclamation of the Surface) will reduce surface disturbance impacts to ecological sites and vegetation. See the administrative record for some of these documents. The operator should follow the reclamation requirements in the BLM State Wide Reclamation Policy found at: http://www.blm.gov/wy/st/en/programs/reclamation. See mitigation section in the soils section above for a full description of the policy as it applies equally to ecological sites.

The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. Broadcast seeding can be used instead of a drill, but the seed mix must be doubled. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

Loamy Ecological Site Seed Mix

Species	% in Mix	Lbs PLS*
Western Wheatgrass (Pascopyrum smithii)/or ***Thickspike Wheatgrass*** (Elymus lanceolatus ssp. lanceolatus)	30	3.6
Bluebunch Wheatgrass (Pseudoroegneria spicata ssp. Spicata)	10	1.2
Green needlegrass (Nassella viridula)	25	3.0
Slender Wheatgrass (Elymus trachycaulus ssp. trachycaulus)	20	2.4
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
Rocky Mountain beeplant (Cleome serrulata) /or ***American vetch***(Vicia americana)	5	0.6
Totals	**100%**	**12 lbs/acre**

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

Sandy Ecological Site Seed Mix

Species	% in Mix	Lbs PLS*
Thickspike Wheatgrass (Elymus lanceolatus ssp. lanceolatus)	25	3.0
Prairie sandreed (Calamovilfa longifolia)	35	4.2
Indian ricegrass (Achnatherum hymenoides)	25	3.0
Prairie coneflower (Ratibida columnifera)	5	0.6
White or purple prairie clover (Dalea candidum, purpureum)	5	0.6
Scarlet Globemallow (Sphaeralcea coccinea) / or ***Blue flax***(Linum lewisii)	5	0.6
Totals	**100%**	**12 lbs/acre**

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

These are recommended seed mixes based on the native plant species listed in the NRCS Ecological Site descriptions, U.W. College of Agriculture and seed market availability.

4.3.4. 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 disturbance, alterations in vegetation in reclaimed areas, and the spread and establishment of weed species. The seed mix selected on private land is selected by the surface owner and may be designed to be more beneficial to cattle grazing than to soil stabilization. The result may be long term wind and water erosion with little or no re-vegetation success. The BLM considers these residual effects from Alternative B with proposed wells are likely within the parameters for acceptable surface disturbance and surface disturbance reclamation in PRB FEIS ROD and Onshore Order Number 1.

4.4. Water Resources

The operator submitted a WMP for this project. It is incorporated-by-reference into this EA pursuant to 40 CFR 1502.21. The WMP incorporates sound water management practices and commitment to comply with Wyoming State water laws/regulations. It also addresses potential impacts to the environment and landowner concerns. Adherence with the plan, in addition to BLM applied mitigation (in the form of COAs), would reduce project area impacts from proposed water management strategies. Yates is proposing to use two injection wells and a lined, fenced, off-channel pit for the disposal method for the

produced water from their CBNG wells of the Caliente POD. They propose to inject the produced water into the Fort Union Formation under an Underground Injection Control (UIC) permit issued by the Wyoming Department of Environmental Quality (WDEQ). The Scald #1 S&R well will be the primary well for produced water disposal and is an existing facility. The Scald #2 S&R well has not been added to the UIC permit as of the date of this EA, and is a secondary water disposal method per correspondence with the operator. The lined, fenced, off channel, pit is proposed for construction and would allow for storage of water for well maintenance. Water would be contained in the pit and evaporate over time. No on-surface discharge is proposed or permitted.

The maximum water production is predicted to be 30 gpm per well or 420 gpm (0.9 cubic feet per second (cfs) or 677 acre-feet per year) for this POD. The PRB FEIS projected the total amount of water that anticipated from CBNG development per year, (Table 2-8, p. 2-26). For the Upper Powder River drainage, the projected volume produced in 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 2.9% of the total volume projected for 2012. This volume of produced water is within the predicted parameters of the PRB FEIS.

4.4.1. Groundwater

4.4.1.1. Direct and Indirect Effects

No on-site surface discharge is proposed within the Caliente POD boundary except for temporary discharge to the lined pit for maintenance of the storage and retrieval injection wells. Therefore, no infiltration near surface discharge points or impoundments would occur within the Caliente POD boundary. Saturation of near-surface alluvium by production water would not occur within the POD boundary.

In the process of dewatering the coal zone, this project may affect the static water level of wells in the area. The WMP states that there are 23 registered stock and domestic water wells within a 1 mile radius of the proposed POD wells (Yates WMP App. D). Well depths range from 4 to 9,537 feet. The Big George coal zone is targeted for CBNG development in this POD and dewatering ranges in depths below ground surface from 1,215 to 1,665 feet. The operator has 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. (MSUP p. 15)

The proposed disposal method for the CBNG produced water is to re-inject the water into the Fort Union Formation. The State issues and regulates the Underground Injection Control (UIC) permits within which is stated that the operator will not pollute ground or surface water, endanger public health, or create adverse environmental impacts. Therefore, no adverse direct, indirect, cumulative, or residual impacts to the Fort Union aquifer is anticipated from the proposed reinjection of CBNG produced water.

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

4.4.1.2. Cumulative Effects

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

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

The two proposed storage and retrieval wells will possibly re-inject 420 gpm of produced water into the Fort Union formation which could offset some of the groundwater withdrawn through other energy activities.

4.4.1.3. Mitigation Measures

Adherence to the requirement in Onshore Order #2, the drilling COAs, setting casing at appropriate permitted 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.

4.4.1.4. Residual Effects

As described in section 3.5, the production of CBNG in this project area has already lowered the water saturation in the coal zones for the production of gas. This POD is anticipated to draw ground water down an additional amount; however that amount has not been quantified and there are too many variables to quantify reliably.

4.4.2. Surface Water

4.4.2.1. Direct and Indirect Effects

There are no new proposed surface discharge points within the POD boundary except to one lined pit for the maintenance needs of the storage and retrieval wells.

Based on the analysis in the PRB FEIS, the primary beneficial use of the surface water in the PRB is the irrigation of crops (p. 4-69), Direct land application or discharge is not included as a disposal method in the Caliente WMP. If at any future time the operator entertains the possibility of irrigation, unlined reservoir storage, misters, or land application with the water produced from these wells, the proposal must be submitted as a Sundry notice for separate environmental assessment and approval by the BLM. BLM analyzed the results from a representative water sample from a well drilled to the same coal zone near to the named POD. Yates predicts the water quality for the water produced from the named target coal zone from these wells to be similar to the sample water quality collected. For complete analysis and results see the company laboratory analytical report in the WMP's Attachment A.

Storm Water Controls

A WYPDES non-point source permit for construction activities would address potential surface water impacts from storm water runoff. The potential for in-channel impacts and proposed measures to avoid or mitigate them are addressed in the WMP for this POD. All culverts would be designed and installed in accordance with BLM guidelines. Based on the project proposal, including the WMP and operator-committed mitigation measures, negligible impacts to stream channels or banks would result from road crossings.

4.4.2.2. Cumulative Effects

The analysis in this section includes cumulative data from fee, state, and federal CBNG development in the Upper Powder River watershed. These data were obtained from the WOGCC.

As of December 2011, all producing CBNG wells in the Upper Powder River watershed have discharged a cumulative volume of 342,027 acre-ft of water (WOGCC 2011) compared to the predicted 1,240,055 acre-ft disclosed in the PRB FEIS (Table 2-8 p. 2-26). This volume is 27.6 percent of the total predicted produced water analyzed in the PRB FEIS for the Upper Powder River -watershed. These volumes are tabulated in Table 4.1.

Table 4.1 Actual vs Predicted Water Production in the Upper Powder River Watershed *2011 Data Update 3-30-2012*

Year	Predicted Annual (acre-feet)[1]	Predicted Cumulative from 2002 (acre-feet)	Actual Annual (acre-feet)[2]	Percent of Predicted Annual	Actual Cumulative from 2002 (acre-feet)	Percent of Predicted Cumulative
2002	100,512	100,512	15,872	15.8%	15,872	15.8%
2003	137,942	238,454	18,584	13.5%	34,456	14.4%
2004	159,034	397,488	21,084	13.3%	55,540	14.0%
2005	167,608	565,096	27,659	16.5%	83,199	14.7%
2006	171,423	736,519	40,851	23.8%	124,050	16.8%
2007	163,521	900,040	43,652	26.7%	167,702	18.6%
2008	147,481	1,047,521	45,995	31.2%	213,697	20.4%
2009	88,046	1,135,567	43,085	48.9%	256,782	22.6%
2010	60,319	1,195,886	43,275	71.7%	300,057	25.1%
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			

[1] USDI BLM 2003a
[2] WOGCC 2011

The PRB FEIS identified downstream irrigation water quality as the primary issue for CBNG produced water. EC and SAR are the parameters of concern for suitability of irrigation water. The water quality analysis in the PRB FEIS was conducted using produced water quality data, where available, from existing wells within each of the ten primary watersheds in the PRB. These predictions of EC and SAR can only be reevaluated when additional water quality sampling is available. The PRB FEIS disclosed that cumulative impacts may occur as a result of discharged produced CBNG water. The cumulative effects relative to this project are within the analysis parameters and impacts described in the PRB FEIS for the following reasons:

1. They are proportional to the actual amount of cumulatively produced water in the Upper Powder River, which is approximately 27.6 percent of the total predicted in the PRB FEIS.
2. The commitment by the operator to manage the volume of water injected.

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

4.4.2.3. Mitigation Measures

Channel crossings by road and pipelines will be constructed perpendicular to flow. Culverts will be installed at appropriate locations for streams and channels crossed by roads as specified in the BLM Manual 9112-Bridges and Major Culverts and Manual 9113-Roads. Streams will be crossed

perpendicular to flow, where possible, and all stream crossing structures will be designed to carry the 25-year discharge event or other capacities as directed by the BLM. Channel crossings by pipelines will be constructed so that the pipe is buried at least four feet below the channel bottom.

4.4.2.4. Residual Effects

The lifespan of a CBNG POD project is estimated to last 10-12 years if the wells are in producing mode during the whole time span. The pit for the produced water disposal is to be full containment with no discharge to the channels downstream. Once the wells have been plugged and abandoned, there should not be any noticeable residual effects to the environment if reclamation of the soil at the pit and the well sites is completed to BLM standards.

4.5. Wetland/Riparian

The PRB FEIS disclosed the effects to wetland and riparian areas from CBNG development, pp. 4-173 to 4-179; these include analysis of direct and indirect impacts, cumulative impacts, and residual impacts. Unavoidable impacts from linear features crossing wetlands and riparian areas are mitigated through application of the measures in described in the operator's WMP and the measures included in the COA document. The produced CBNG water from the proposed POD would be disposed on-site through WDEQ permitted injection storage and retrieval wells. These options avoid additional impacts from discharged produced CBNG water in the project area.

4.5.1. Cumulative Effects

The PRB FEIS discussed the cumulative effects to wetland/riparian areas from oil and gas development, pp. 4-178 and 4-179. Proposed surface disturbances would result in temporary, construction-related impacts to wetlands which would be reclaimed through interim reclamation and site stabilization, as committed to by the operator and as required by the BLM in COAs. Changes in surface water flow due to project disturbances associated with construction and operation activities could lead to increased erosion, increased sediment in streams, and changes in water levels in channels located within and near the project site. These impacts would be mitigated by expediently stabilizing the disturbance and reducing the amount of sediment reaching the streams.

4.5.2. Mitigation Measures

Crossings of wetland/riparian areas by linear features, such as pipelines, roads, and power lines were avoided to the extent practicable. Impacts will be minimized through use of appropriate sediment and erosion control structures, the implementation of the operator's project specific reclamation plan and BLM applied COAs. Erosion control fabric used for reclamation of steep slopes should be photodegradable or biodegradable. Non-photodegradable/biodegradable erosion control fabric will be removed from the federal leases following establishment of a self-perpetuating native plant community and sustained soil stability.

In the absence of manufacture's specifications included in the operator's MSUP, erosion control fabric will be installed as follows:

a. The fabric will be 'keyed' into the slope by digging a small trench at the top of the slope;
b. Lay the top end of the material into the trench to line it;
c. To line it the edge is folded underneath itself and then it is secured using staples;
d. The trench is then filled in to the previous soil level; and
e. Fabric should be overlapped no less than 0.3 meter on edges and stapled on 1 meter spacing and at every seam.

Stabilization of steep slopes greater than 4:1 will include but is not limited to the following components to minimize soil erosion and loss of seed:

a. Surface roughening/pocking or scarification perpendicular to the slope;

b. Install slope breakers such as waddles and water bars at the appropriate spacing;
c. Seed with appropriate seed mix; and
d. Apply straw mulch or bio/photodegradable erosion control fabric on highly erodible soils.

Straw/Excelsior wattles are most effective as erosion control if applied on slopes less than 3:1. The table below is an example of appropriate spacing of straw or excelsior wattles commonly applied as slope breakers recommended by American Excelsior Company. Tighter spacing may be required based on soil type and seasonal precipitation. In the absence of manufacture's specifications included in the operator's MSUP, the minimum spacing requirements will be as follows:

Slope	**6-inch waddle**	**9-inch waddle**	**12-inch waddle**
≤4:1	20 feet	40 feet	60 feet
3:1	15 feet	30 feet	45 feet
2:1V	10 feet	20 feet	30 feet
Slope	**6-inch waddle**	**9-inch waddle**	**12-inch waddle**
≥1:1	5 feet	10 feet	15 feet

The Caliente project area is dominated by sensitive soils features that exhibit severe erosion potential that will require disturbed areas to be stabilized (stabilization efforts may include mulching, matting, soil amendments, et. cetera) in a manner which eliminates accelerated erosion until a self-perpetuating native plant community has stabilized the site in accordance with the Wyoming Reclamation Policy.

Stabilization efforts shall be finished within 30 days of the initiation of construction activities. This applies to all surface disturbances within the entire Caliente project area.

4.5.3. Residual Effects

Turbidity and sediment loading in the streams would probably increase due to erosion of project disturbed areas and sediment transport to the associated drainages due to storm water runoff. Residual effects to riparian and wetlands areas will be similar to sensitive areas identified under soils, ecological sites and vegetation section.

4.6. Invasive Species

4.6.1. Direct and Indirect Effects

The use of existing facilities could reduce the opportunity for spread of invasive species by minimizing additional disturbance. New construction of proposed access roads, pipelines, and related facilities would disturb soils and present opportunities for weed invasion and spread. The activities related to the performance of the proposed project would create a favorable environment for the establishment and spread of noxious weeds/invasive plants such as cheatgrass, salt cedar, Canada thistle, and perennial pepperweed. However, mitigation as required by BLM applied COAs will reduce potential impacts from noxious weeds and invasive plants.

Vectors (livestock, vehicles, recreationists, water, wind, wildlife) and disturbances (roads, natural gas development, grazing, interstate pipelines, fuel treatments, water developments, recreation developments, etc.) will continue to be present in the POD area. These factors have contributed in the past and currently to the establishment of cheatgrass and other invasive species populations. Project-specific mitigations, incorporated into all new projects help to reduce the risk of new infestations and the spread of invasives associated with new disturbance. Small acreage developments on adjacent lands, streams and watersheds that traverse differing lands owners and, interstate corridors can contribute to the introduction of invasives over time.

Over a few years the cumulative effects of not treating invasives could be biologically significant and outweigh most concerns about effects of herbicides on non-target plants and native plant communities. Overall, treatment would have an insignificant biological effect as far as harming native plants and plant communities if the project is implemented with the appropriate mitigation measures, as required by the BFO Invasive Species Management Environmental Assessment (ISM EA WYW070-09-099, 2010). Treatments could be expected to benefit native plants and plant communities and special status plants by restoring native habitats and plant communities.

4.6.2. Cumulative Effects

Treatment for persistent infestations that may require repetitive herbicide applications for 3 to 5 years which would increase the potential for non-target plants to be negatively affected (harmed, weakened, or killed). Many of the invasive plant populations in the treatment areas could require successive years of herbicide application to be effectively treated depending on the extent and severity of the infestation and how invasive plant populations respond to a given treatment. Refer to the ISM EA, p. 29 and the PRB FEIS, p.4-154 to 170 for additional information.

4.6.3. Mitigation Measures

The operator committed to the control of noxious weeds and species of concern using the following measures identified in their Management for Noxious Weeds for Caliente POD:

4.6.4. Residual Effects

Possible adverse residual effects from invasive species and treatments are in Chapter 4 of the Vegetation Treatments Using Herbicides in 17 Western States, Programmatic Environmental Impact Statement, (BLM 2007), incorporated here by reference.

4.7. Locatable Minerals

4.7.1. Direct and Indirect Effects

Uranium recovery would entail the addition of disturbance activities for construction of roads, facilities and well locations. Earth-moving activities associated with in situ uranium recovery are nearly the same for those of CBNG projects. It involves construction of surface facilities, access roads, well fields, and pipelines and would include clearing of top soil, land grading, and interim reclamation.

Uranium One's, Willow Creek Uranium ISR Project is an approved plan. There is potential for timing and/or location conflicts between the Yate's Caliente POD and Uranium One's projects. Different situations may occur that could change the location or layout of the approved CBNG APD or the infrastructure associated with the APD. It is important both companies take the initiative to keep the other informed about their status and design plans for pipelines, electrical power, roads, so they may optimize their own project without impeding the others – and thus preclude top-down federal or state solutions.

4.7.2. Cumulative Effects

Drilling of wells and installation of pipelines will occur. Low levels of traffic generated by construction activities and daily operations when the project is operational would not significantly increase traffic or accidents on roads in the vicinity. However the addition of ISR uranium recovery project within the Caliente POD project vicinity will add to the cumulative effect of soil disturbances and may delay interim and final reclamation on some of the roads proposed for use in Caliente POD.

4.7.3. Mitigation Measures

It is between the operators to coordinate their projects as the BLM has little jurisdiction over this. In the event the company alters the approved CBNG location, then the company will need to apply for the changes via Sundry Notice (Form No. 3160-5) and BLM will analyze it in a separate NEPA document.

4.7.4. Residual Effects

Residual effects across the POD would include a long-term loss of soil productivity associated with uranium recovery, well pads, roads, and associated infrastructure. The PRB FEIS identified residual effects (p. 4-408) such as the loss of vegetative cover, despite expedient reclamation, for several years until reclamation is successfully established.

In spite of the above residual effects, the BLM considers that Alternative B with is within the parameters for surface disturbance and surface disturbance reclamation in PRB FEIS ROD.

4.8. Fish and Wildlife

4.8.1. Wildlife Threatened, Endangered, Proposed and Candidate Species

4.8.1.1. Threatened and Endangered Species

Based on the last species list for the Buffalo Field Office, dated July 22, 2011, the Ute Ladies'-tresses Orchid is the only listed species requiring an effects determination (ESA Section 7 (2).

4.8.1.1.1. Ute Ladies'-Tresses Orchid

4.8.1.1.1.1. Direct and Indirect Effects

Limited potential habitat is present in the project area, however, no surface disturbance is planned in any areas with potential habitat. Implementation of the proposed project will have "*no effect*" on ULT.

4.8.1.1.1.2. Cumulative Effects

The PRB FEIS discussed the cumulative effects to ULT (p. 4-253 to 4-254).

4.8.1.1.1.3. Mitigation Measures

No mitigation is proposed with alternative B.

4.8.1.1.1.4. Residual Effects

No residual effects are anticipated.

4.8.1.2. Candidate Species

4.8.1.2.1. Direct and Indirect Effects

Implementation of the proposed project will impact GSG habitat and individuals. Impacts to GSG are generally a result of loss and fragmentation of sagebrush habitats associated with roads and infrastructure. Research indicates that GSG hens also avoid nesting in developed areas.

Impacts to GSG associated with energy development are discussed in detail in the *12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered* (USFWS 2010) and chapters 15-21 of Greater Sage-grouse Ecology and Conservation of a Landscape Species and its Habitats (Knick and Connelly 2011).

The Caliente project area contains suitable nesting, brood-rearing, and winter habitat. Construction of the wells, access roads, utility corridors, and overhead power lines will cause fragmentation of sagebrush stands and result in the direct loss of approximately 104 acres of GSG habitat. Implementation of the project will adversely impact nesting habitat, both through direct loss and avoidance of the area by GSG due to fragmentation and anthropogenic activity.

During onsite visits, the BLM made specific recommendations to avoid placement of facilities in sagebrush to reduce direct loss of GSG habitat. This included recommendations to eliminate cross-country utility corridors and to instead co-locate utilities with proposed access routes. In some cases, infrastructure could not be moved due to soil or topography issues. In other cases, the landowner and

Yates refused to revise the routes due to other issues. Yates agreed to the following well moves in order to avoid sagebrush loss:

- The Heat CS Federal #3 was shifted east to a grassy area.
- The Heat CS Federal #17 was moved approximately 400 feet in order to remove a pipeline across the draw and approximately 0.5 miles of road.
- The Caliente CS Federal #2 well was moved in order to avoid the CSU on the Christensen Ranch 5 Lek.
- The cross country utility corridor connecting the Heat CS Federal #14 and Heat CS Federal #16 wells was dropped.

Yates proposed use of an existing two-track road (North #3 Road), which will be improved, directly through the Christensen Ranch 5 Lek (intersecting the 0.25 mile CSU for approximately 0.5 miles) in order to access the 7 wells: Heat CS Federal #s 11, 14, 15, 17, 18, 20, and 21. Currently, the road is used by ranch personnel. An alternate route was looked at during the onsite, accessing the wells from the north using a road previously authorized for use in the Culp Draw POD. The road also intersects the CSU of another lek, Christensen Ranch 4, for approximately 0.3 miles coming within 0.18 miles of the lek itself. However, the BLM ran a viewshed analysis on the lek, and determined that a vehicle traveling the road within the CSU, with a height of approximately 9 feet, would not be visible from the Christensen Ranch 4 lek site, except approximately 180 feet on the west end.

The BLM requested that Yates propose an alternate route to access the wells, outside of the CSU on the Christensen Ranch 5 Lek in order to reduce unnecessary impacts (see above and below). In the response to deficiencies (dated July 25, 2012), Yates indicated that no other routes would be proposed at the request of the landowner, John Christensen, and that BLM should approve or deny as proposed (see Yates Post Onsite Reply, p. 15 of 16). Yates has agreed to install signs at the edge of the CSU limiting travel to the hours of 9:00am – 3:00pm during the GSG breeding season. Compliance with the timing limitation will be difficult to enforce. The lek and road occur on privately owned surface. The project area is approximately 50 miles SE of Buffalo, and takes approximately 2 hours to get to. The workload of BLM personnel and time it takes to access the area would make it difficult to conduct compliance checks at the lek more than once or twice a season. The ability of the BLM to bury traffic counters or install trail cameras to determine compliance is dependent on permission from the landowner, John Christensen.

Yates has also proposed a power drop in SESW Section 29 T45N R76W. The power drop is approximately 0.37 miles from the Christensen Ranch 5 Lek, and will eventually have overhead power built to it. The PRB FEIS ROD stating that "Companies will locate aboveground power lines, where practical, at least 0.5 miles from any sage grouse breeding or nesting grounds." The line may increase predation on birds using the lek for breeding or surrounding nesting habitat. In addition, prior to construction of the line, a generator may be placed at the location.

Authorizing use of the North #3 Road is likely to cause GSG to abandon the Christensen Ranch 5 Lek due to increased traffic during the breeding and nesting season. Noise from the generator and use of the North #3 Road is likely to disrupt breeding behavior of GSG using the lek by interfering with the ability to hear vocalizations, increasing stress to individuals, and causing changes in strutting patterns and avoidance of the lek (Patricelli et al. 2012, Blickley et al. 2012, Blickley and Patricelli 2012). Studies have shown that intermittent noise (such as that associated with traffic) can have a greater impact on GSG than continuous drilling noise, and cause immediate reduction in attendance at leks (Blickley et al. 2012). Light vehicular traffic (1–12 vehicles per day) has been shown to substantially reduce nest initiation rates and increase the distance of nests from lek sites (Lyon and Anderson 2003). Holloran (2005) found that traffic on roads within 0.8 miles of the lek during the early morning while males are strutting is related to declines in male

attendance. Due to the increased noise levels and vertical intrusion of the power line, GSG may avoid the Christensen Ranch 5 Lek and surrounding nesting habitat, and eventually abandon the area.

Birds using the SE alternate lek location may be negatively impacted by the authorization of the North #2 Road to access 3 wells and the Caliente CS Federal #2 well, all of which intersect a 0.25 mile buffer of the alternate lek location. GSG are anticipated to abandon the Christensen Ranch 5 Lek and alternate locations once the POD has been constructed due to increased traffic during the breeding season and proximity to infrastructure.

4.8.1.2.2. Cumulative Effects

The PRB FEIS (BLM 2003) states that "the synergistic effect of several impacts would likely result in a downward trend for the sage-grouse population, and may contribute to the array of cumulative effects that may lead to its federal listing. Local populations may be extirpated in areas of concentrated development, but viability across the Project Area [PRB] or the entire range of the species is not likely to be compromised (pg. 4-270)." Based on the impacts described in the PRB FEIS and the findings of more recent research, the proposed action may contribute to a decline in male attendance at the 10 leks that occur within four miles of the project area, and, potentially, extirpation of the local grouse population. Authorization of surface occupancy within 0.25 miles of a non-core habitat lek is inconsistent with the WY BLM and State of Wyoming GSG policies, and would set a precedent that these policies do not require compliance outside of GSG priority habitats.

There are currently 1,519 wells (Wyoming Oil and Gas Conservation Commission [WOGCC] September 6, 2012) in the cumulative impact assessment area, an area of 191 square miles, which is a density of approximately 8 wells per square mile. Currently, there are approximately 69 proposed wells (Automated Fluid Minerals Support System [AFMSS] September 6, 2012) (including those from this project) within 4 miles of the 10 leks. With the addition of the proposed wells, the well density within 4 miles of the leks increases to 8.3 wells per square mile, which is 8 times the 1 well per square mile recommendation by the State Wildlife Agencies' Ad Hoc Committee for Sage-Grouse and Oil and Gas Development.

In its Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (2009), WGFD categorized levels of oil and gas development into thresholds that correspond to moderate, high, and extreme impacts to habitat effectiveness for various species of wildlife, based on well pad densities and acreages of disturbance. All 3 levels of impact result in a loss of habitat function by directly eliminating habitat; disrupting wildlife access to, or use of habitat; or causing avoidance and stress to wildlife. Impacts to GSG are categorized by number of well pad locations per square mile within 2 miles of a lek and in identified nesting/brood-rearing habitats greater than 2 miles from a lek. Moderate impacts occur when well density is between 1 and 2 well pad locations per square mile or where there is less than 20 acres of disturbance per square mile. High impacts occur when well density is between 2 and 3 well pad locations per square mile or when there are between 20 and 60 acres of disturbance per square mile. Extreme impacts occur when well density exceeds 3 well pad locations per square mile or when there are greater than 60 acres of disturbance per square mile. Extreme impacts mean those where the function of an important wildlife habitat is substantially impaired or lost.

The proposed project is within 2 miles of 4 GSG leks. These leks have more than 3wells per square mile within 2 miles of the leks and are therefore are experiencing extreme impacts according to the WGFD recommendations. Implementation of the proposed project will not alter those categorizations.

Declines in lek attendance associated with oil and gas development may be a result of a suite of factors including avoidance (Holloran et al. 2005, Holloran et al. 2007, Aldridge and Boyce 2007, Walker et al. 2007, Doherty et al. 2008, WGFD 2009), loss and fragmentation of habitat (Connelly et al. 2000, Braun et al. 2002, Connelly et al. 2004, WGFD 2004a, Rowland et al. 2005, WGFD 2005, Naugle et al. in press),

reductions in habitat quality (Braun et al. 2002, WGFD 2003, Connelly et al. 2004, Holloran et al. 2005) and changes in disease mechanisms (Naugle et al. 2004, WGFD 2004b, Walker et al. 2007, Cornish pers. comm.).

The Buffalo Resource Management Plan (BLM 2001) and the PRB FEIS Record of Decision (BLM 2003) included a 2-mile timing limitation on surface-disturbing activities around GSG leks. The 2-mile measure originated with the Western Association of Fish and Wildlife Agencies (WAFWA) (BLM 2004). Wyoming BLM adopted the two-mile recommendation in 1990 (BLM 1990). The 2-mile recommendation was based on early research which indicated between 59% and 87% of GSG nests were located within 2 miles of a lek (BLM 2004). These studies were conducted in vast contiguous stands of sagebrush, such as those that occur in Idaho's Snake River plain.

Additional research across more of the GSG's range has since indicated that nesting may occur much farther than 2 miles from the breeding lek (BLM 2004). Holloran and Anderson (2005), in their Upper Green River Basin study area, reported that only 45% of their GSG hens nested within 1.9 miles of the capture lek. Moynahan and Lindberg (2004) found that only 36% of their GSG hens nested within 1.9 miles of the capture lek. Habitat conditions, and, thus, GSG biology, in the PRB area are more similar to Moynahan's north-central Montana study area than the Upper Green River area. Moynahan's study area occurred in mixed-grass prairie and sagebrush steppe, dominated by Wyoming big sagebrush (Moynahan et al. 2007). Recent research in the PRB suggests that impacts to leks from energy development are discernible out to a minimum of 4 miles, and that some leks in this radius have been extirpated as a direct result of energy development (Walker et al. 2007, Walker 2008, Naugle et al. In press). BLM determined, based on these studies, that a 2-mile timing limitation is insufficient to reverse the population decline.

The 2012 population viability analysis for the Northeast Wyoming GSG found there remains a viable population of GSG 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.

Studies document the additive impacts of energy development and WNv as a threat to GSG 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 GSG 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)." (Taylor et al. 2012).

Current well densities reduce the effectiveness of PRB core areas (Taylor et al. 2012). Continued energy development around the core areas will impact the core areas remaining value. WNv outbreaks and energy development reduce sage-grouse populations and 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 is unlikely. Results suggest that if current oil and gas development rates continue, they may compromise future viability of NE Wyoming GSG, with an increased chance of extirpation with additional WNv outbreaks (Taylor et al. 2012).

A timing limitation does nothing to mitigate loss and fragmentation of habitat and changes in disease mechanisms. Rather than limiting mitigation to only timing restrictions, more effective mitigation strategies may include, at a minimum, burying power lines (Connelly et al. 2000b); minimizing road and well pad construction, vehicle traffic, and industrial noise (Lyon and Anderson 2003, Holloran 2005); and managing produced water to prevent the spread of mosquitoes with the potential to vector WNv in GSG habitat (Walker et al 2007). Walker et al. (2007) recommend maintaining extensive stands of sagebrush habitat over large areas (at least 1 mile in size) around leks to ensure GSG persistence. The size of such a

no-development buffer would depend on the amount of suitable habitat around the lek and the population impact deemed acceptable. Connelly et al. (2000) recommended locating all energy-related facilities at least 2 miles from active leks.

Several guidance documents are available that recommend practices that would reduce impacts of development on GSG. These include Northeast Wyoming Sage-Grouse Conservation Plan (Northeast Wyoming Sage-grouse Working Group 2006), Sage-Grouse Habitat Management Guidelines for Wyoming (Bohne et al. 2007), Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (WGFD 2009), Bureau of Land Management National Sage-Grouse Habitat Conservation Strategy (USDI 2004), Greater Sage-Grouse Comprehensive Conservation Strategy (Stiver et al. 2006), and BLM National Greater Sage-Grouse Land Use Planning Strategy (USDI 2011).

4.8.1.2.3. Mitigation Measures

Based on the summary of research describing the impacts of energy development on GSG, efforts to reduce habitat loss and fragmentation are likely to be the most effective in ensuring long-term lek persistence.

In order to reduce the likelihood that noise, construction, and human disturbance impact nesting GSG, BLM will implement a timing limitation on all surface-disturbing activities within GSG habitat during the construction phase. The intent of this timing restriction is to decrease the likelihood that GSG will avoid these areas and increase habitat quality by reducing noise and human activities during the breeding season. The BLM will also implement a limitation on noise levels at the edge of occupied leks in the project area.

Yates committed to installing signs to limit travel through the Christensen Ranch 5 Lek during the breeding season. The BLM will apply a condition of approval in order to ensure that this commitment is maintained through the life of the project.

4.8.1.2.4. Residual Effects

A timing limitation does nothing to mitigate loss and fragmentation of habitat or changes in disease mechanisms. Noise and human disturbance resulting from maintenance and production activities are likely to impact GSG nesting in the area for the life of the project. Suitability of the project area for GSG will be negatively affected due to habitat loss and fragmentation and proximity of human activities associated with CBNG development.

The BLM made a commitment to support the management objectives set by the State of Wyoming, to maintain populations and habitats. In addition, the BFO identified the following objectives in the current RMP: maintain a biological diversity of animal species, support the WGFD population objectives, maintain or improve quality of wildlife habitat, and provide habitat for special status habitat species (BLM 2001). The RMP identified that these goals would be achieved by implementing species specific stipulations, including the 0.25 mile controlled surface use (CSU) around GSG leks, Allowing surface occupancy within 0.25 miles of the Christensen Ranch 5 Lek is not in compliance with WY BLM policy, the State of Wyoming's Greater Sage-Grouse conservation strategy (Executive Order (EO) 2011-5 Greater Sage-grouse Core Area Protection), or the BFO RMP.

A timing limitation will not alleviate the impacts from noise and human disturbances to GSG using the lek or surrounding nesting habitat to the degree that the lek is expected to persist. Approval of Alternative B, and authorizing surface occupancy within 0.25 miles of the lek is likely to cause GSG to abandon the lek, and eventually abandon the suitable nesting habitat in the project area.

The PRB EIS analyzed the removal of all CBNG wells and most infrastructures at final well abandonment after the CBNG played out 7-12 years after drilling. Leaving infrastructure on the landscape will hamper restoration efforts (Taylor et al. 2012). The PRB FEIS predicted that the PRB oil and gas development would have significant impacts to the GSG population. The impact of the Caliente development cumulatively contributes to the potential for local extirpation.

Current research does not identify specific components of energy development that measurably decrease impacts to GSG or their habitats. Even in areas where a variety of mitigation measures were applied, negative population impacts were still measurable when well density exceeded 1 well per square mile. Management of energy development based on current core area configurations and associated lease stipulations, conditions of approval, and best management practices (BMPs), may not be sufficient to protect the population viability of PRB GSG.

4.8.2. Special Status (Sensitive) Species (SSS)

BLM supports the policies set forth in SSS policy (BLM Manual 6840). BLM Manual 6840.22A states that "The BLM should obtain and use the best available information deemed necessary to evaluate the status of special status species in areas affected by land use plans or other proposed actions and to develop sound conservation practices. Implementation-level planning should consider all site-specific methods and procedures which are needed to bring the species and their habitats to the condition under which the provisions of the ESA are not necessary, current listings under special status species categories are no longer necessary, and future listings under special status species categories would not be necessary." The PRB FEIS discusses impacts to SSS on pp. 4-257 to 4-265. The effects to sensitive species resulting from implementation of the project are in Table 1 in Appendix B. Site specific effects to SSS are described below in sections 4.2.2.8 (Migratory Birds), 4.8.1.2.1 (Greater Sage-Grouse), 4.2.2.2 (Mountain Plover), 4.2.2.3 (Western Burrowing Owl), and 4.2.2.4 (Black-tailed Prairie Dog).

4.8.2.1. Mountain Plover

4.8.2.1.1. Direct and Indirect Effects

Suitable mountain plover habitat is present within the project area. Development of the Caliente project may impact mountain plovers. Flat ridge tops and the black-tailed prairie dog colonies described in section 3.9.3 (Black-tailed Prairie Dog) may provide suitable mountain plover habitat in some years, depending on precipitation and grazing pressure. The construction of well Heat CS Federal #28 and associated infrastructure will directly impact plover nesting habitat. Although the well location is near the edge of the prairie dog town in section 33, it is likely that plover will avoid human disturbance in the area up to 0.25 miles from the well location, making the area unsuitable for the species. Projections of overhead power routing based on power drop locations show the potential for a line to be built within 0.25 miles of the active portion of the prairie dog town, which may also preclude plover use of the area.

Mineral development has mixed effects on mountain plovers. Disturbed ground, such as buried pipeline corridors and roads, may be attractive to plovers, while human activities within one-quarter mile may be disruptive. Use of roads and pipeline corridors by mountain plovers may increase their vulnerability to vehicle collision. Limiting travel speed to 25mph provides drivers an opportunity to notice and avoid mountain plovers and allows mountain plovers sufficient time to escape from approaching vehicles. Even if a nesting plover flushes in time, the nest would likely still be destroyed. Overhead power lines provide perch sites for raptors that could result in increased mountain plover predation. CBNG infrastructure such as well houses and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes. Displaced mountain plovers may choose to nest in poor quality habitat when loss or alteration of their natural breeding habitat (predominantly prairie dog colonies) occurs, such as heavily grazed land, burned fields, fallow agriculture lands, roads, oil and gas well pads, and pipelines. These areas could become reproductive sinks. Adult mountain plovers may breed there, lay eggs and hatch chicks; however, the young may not reach fledging age due to the poor quality of the habitat. An analysis

of direct and indirect impacts to mountain plover due to oil and gas development is included in the PRB FEIS (4-254-255).

4.8.2.1.2. Cumulative Effects

The PRB FEIS discussed the cumulative effects to mountain plover (pp. 4-245 to 4-255).

4.8.2.1.3. Mitigation Measures

To reduce impacts to nesting mountain plovers, BFO will require a 0.25 mile timing limitation on surface-disturbing activities for suitable nesting habitat during the nesting season (March 15 – July 31).

4.8.2.1.4. Residual Effects

Even with timing limitations on surface-disturbing activities, mountain plovers may be displaced by other activities associated with development. Traffic and construction activities that are not prohibited by the timing limitations may degrade habitat quality sufficiently to render the area unsuitable for some mountain plovers. Timing limitations do not reduce impacts to habitat: drilling and construction outside the nesting season will result in habitat loss for this species. Mortalities associated with maintenance and non-surface-disturbing activities will still occur.

4.8.2.2. Western Burrowing Owl

4.8.2.2.1. Direct and Indirect Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. See the direct and indirect effects section for black-tailed prairie dog (4.2.3.2.3.1) for site specie effects to burrowing owl habitat.

4.8.2.2.2. Cumulative Effects

The PRB FEIS discusses impacts to sensitive species on pp. 4-257 to 4-273. Practices such as poisoning or shooting of prairie dogs or other intentional methods of extermination can potentially affect burrowing owl productivity through a reduction in nest site availability.

4.8.2.2.3. Mitigation Measures

The Thunder Basin National Grasslands in Campbell County, WY, has a NEPA analysis recommending a 0.25 mile timing restriction buffer zone on surface disturbing activities for burrowing nest locations during their nesting season (April 15 to August 31). BLM will consider adopting this analysis since it concerns the same species in the same short grass – sagebrush prairie ecosystem. Instruction Memorandum No. 2006-197, directs the field offices to "use the least restrictive stipulations that effectively accomplish the resource objectives or uses." Alteration of the general raptor nest timing limitation (Feb 1 to July 31) to a more specific burrowing owl nesting season timing limitation will effectively reduce the vulnerability of owls to collision while shortening the timing restriction period to four and one half months from six and one half months, and from 0.5 mile to 0.25 mile.

4.8.2.2.4. Residual Effects

Timing limitations do not mitigate habitat loss. Wells, pipelines, and roads that are built in prairie dog colonies will directly impact nesting habitat and may reduce the quality of adjacent habitats for burrowing owls, regardless of the timing of their construction.

4.8.2.3. Black-tailed Prairie Dog

4.8.2.3.1. Direct and Indirect Effects

The affected environment for black-tailed prairie dogs is discussed in the PRB FEIS, p. 3-179. At the time the PRB FEIS was written, the black-tailed prairie dog was added to the list of candidate species for federal listing in 2000 (FWS 2000). It was removed from the list in 2004. BLM Wyoming considers black-tailed prairie dogs a sensitive species and continues to afford this species the protections described

in the PRB FEIS. The black-tailed prairie dog is a WGFD SGCN, with a rating of NSS3, because populations are declining, and habitat is vulnerable but not undergoing significant loss.

The Heat CS Federal #28 well and associated infrastructure is proposed within the prairie dog colony in sections 33 and 4, resulting in the direct loss of habitat. Yates agreed to move the well north, adjacent to Christensen Road in order to reduce infrastructure in the town. In addition, the Heat CS Federal #25 well is proposed on the northern edge of the same town in section 33. Although this portion of the town does not exhibit signs of recent activity, prairie dogs moving back into the area may be disturbed by human activities associated with the well. Degradation of habitat may also result from construction of overhead power lines bisecting the town.

4.8.2.3.2. Cumulative Effects

The PRB FEIS discusses impacts to black-tailed prairie dog on pp. 4-255 and pp. 4-256. Throughout Northeastern Wyoming black-tailed prairie dogs are poisoned on private lands. BLM does not poison prairie dogs and as such those lands, along with USDA National Grasslands, have become essential to the species.

4.8.2.3.3. Mitigation Measures

No mitigation is proposed with Alternative B.

4.8.2.3.4. Residual Effects

No residual impacts are anticipated.

4.8.2.4. Big Game

4.8.2.4.1. Direct and Indirect Effects

The PRB FEIS discusses impacts, including direct and indirect effects, cumulative effects, and residual effects to big game on pp. 4-181 to 4-215. Yearlong and winter yearlong range for pronghorn antelope and mule deer would be directly disturbed with the construction of wells, pipelines and roads. Long term disturbance would be direct habitat loss. Short-term disturbances also result in direct habitat loss; however, they should provide some habitat value as these areas are reclaimed and native vegetation becomes established.

In addition to the direct habitat loss, big game would likely be displaced from the project area during drilling and construction. A study in central Wyoming reported that mineral drilling activities displaced mule deer by more than 0.5 miles (Hiatt and Baker 1981). The WGFD indicates a well density of 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 2004). A multi-year study on the Pinedale Anticline suggests not only do mule deer avoid mineral activities, but after 3 years of drilling activity the deer have not become accustomed to the disturbance (Madson 2005).

Big game animals are expected to return to the project area following construction; however, populations will likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not readily habituate. A study in North Dakota stated, “although the population (mule deer) had over 7 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.

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

4.8.2.4.2. Cumulative Effects

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

4.8.2.4.3. Mitigation Measures

No mitigation is proposed with Alternative B.

4.8.2.4.4. Residual Effects

No residual impacts are anticipated.

4.8.2.5. Migratory Birds

4.8.2.5.1. Direct and Indirect Effects

The PRB FEIS discussed direct and indirect effects to migratory birds, pp. 4-231 to 4-235. The PRB FEIS states on p. 4-231, "Surface disturbance associated with construction, operation, and abandonment of facilities, including roads, has the potential to result in direct mortality of migratory birds. Most birds would be able to avoid construction equipment; however, nests in locations subject to disturbance would be lost, as would any eggs or nestlings." Direct mortality of a bird or destruction of an active nest due to construction activities would result in a "take" as defined (and prohibited) by the MBTA, a non-discretionary statute, and in turn a violation of the law.

Disturbance of habitat in the project area is likely to impact migratory birds. Native habitats will be lost directly with the construction of the wells, roads, and utility corridors. Surface disturbing activities that occur in the nesting season may kill migratory birds. Prompt re-vegetation of short-term disturbance areas should reduce habitat loss impacts. Construction, drilling, and to a lesser degree production, will displace edge sensitive migratory birds from otherwise suitable habitat adjacent to the well locations. Drilling and construction noise can be troublesome for songbirds by interfering with the males' ability to attract mates and defend territory, and the ability to recognize calls from conspecifics (BLM 2003).

Habitat fragmentation will result in more than just a quantitative loss in the total area of habitat available; the remaining habitat area will also be qualitatively altered (Temple and Wilcox 1986). Ingelfinger (2004) identified that the density of breeding Brewer's sparrows declined by 36% and breeding sage sparrows declined by 57% within 100 m of dirt roads in a natural gas field. Effects occurred along roads with light traffic volume (less than 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 in the PRB nest in the spring and 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. Surface disturbing activities associated with the project will have sage-grouse and raptor timing limitations applied, thereby providing protection to migratory birds until June 30. Whether migratory birds still receive protection until July 31 is dependent on whether an active raptor nest is located within 0.5 miles of the project area.

4.8.2.5.2. 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.

4.8.2.5.3. Mitigation Measures

BLM proposes no timing limitations on surface disturbing activities for migratory birds. GSG and raptor timing limitations on surface disturbing activities will also serve to mitigate impacts to nesting migratory birds.

4.8.2.5.4. Residual Effects

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

4.8.2.6. Raptors

4.8.2.6.1. Direct and Indirect Effects

The PRB FEIS discussed direct and indirect effects to raptors (pp. 4-216 to 4-221). This project will result in disturbance in proximity of nesting raptors, including direct and indirect habitat losses associated with declines in habitat effectiveness.

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

Raptor nests in relation to project infrastructure are found in the administrative record. BLM recommends the location of all infrastructures requiring human visitation be designed to provide an adequate biologic buffer for nesting raptors. A biologic buffer is a combination of distance and visual screening that provides nesting raptors with security such that routine activities preclude flushing the raptors.

During the onsite visits, the BLM biologist and Yates worked to try and reduce impacts to raptors from placement of wells and infrastructure. The following change was made as a result of the onsite:

- Well Heat CS Federal #27 was moved approximately 300 feet north to get further than 0.25 miles from nests #s 10797 and 12139.

4.8.2.6.2. Cumulative Effects

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

4.8.2.6.3. Mitigation Measures

To reduce the risk of decreased productivity or nest failure, the BLM BFO requires a 0.5 mile radius timing limitation during the breeding season around active raptor nests.

4.8.2.6.4. Residual Impacts

Even with timing restrictions, raptors may abandon nests due to foraging habitat alteration associated with development or sensitivity to well or infrastructure placement. All raptors using nests in the vicinity of the project will likely be impacted to some extent by the human disturbance associated with operation and maintenance of the project. Routine human activities near these nests can draw increased predator activity to the area and increase nest predation. Declines in breeding populations of some species that are more sensitive to human activities may occur.

4.8.2.7. Plains Sharp-tailed Grouse

4.8.2.7.1. Direct and Indirect Effects

Direct and indirect effects to sharp-tailed grouse are described in the PRB FEIS pp. 4-221 to 4-226. Sharp-tailed grouse may avoid habitats adjacent to the project area. The nearest known lek is not expected to be impacted.

4.8.2.7.2. Cumulative Effects

The PRB FEIS described the cumulative effects to sharp-tailed grouse, pp. 4-221 to 4-226.

4.8.2.7.3. Mitigation Measures

No mitigation is proposed with Alternative B.

4.8.2.7.4. Residual Impacts

No residual impacts are anticipated.

4.9. West Nile Virus

4.9.1. Direct and Indirect Effects

Yates is proposing to either re-inject produced water, or hold it in an evaporation pit. Yates anticipates building the pit in such a way that emergent vegetation and shallow water will not be present. This project is not likely to result in standing surface water that would increase mosquito breeding habitat.

4.9.2. Cumulative Effects

There are many sources of native standing water throughout the PRB that add mosquito habitat. Summer thunderstorms, that pool water for more than 4 days in hot weather, can result in large Culex mosquito hatches. Other sources of water include; natural flows, livestock watering facilities, coal mining operations, and human outdoor water use and features in and around communities.

4.9.3. Mitigation Measures

No mitigation is proposed with Alternative B.

4.9.4. Residual Effects

No residual effects are anticipated

4.10. Cultural Resources

4.10.1. Direct and Indirect Effects

Non eligible sites 48CA5417, 48CA5418, 48CA5419, 48CA6595, and 48CA7092 will be impacted by the proposed project. Eligible sites 48CA5416 and 48CA7008 and unevaluated sites 48CA6596 and 48CA7091 are outside of the area of potential effect (APE) and will not be impacted. The Caliente project is proposed within 2 miles of the Pumpkin Buttes TCP (48CA268) and infrastructure is proposed within the setting of the site. As a result of project redesign the linear corridor to the Heat CS Federal #28 well will create a weak contrast resulting in a finding of no adverse effect to the TCP. Approval of the linear corridors between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6 will create a moderate contrast in which proposed project elements tend to dominate within the existing setting of the TCP. These corridors are integral to the operation of wells Heat CS Federal #s 1, 2, 3, 4, 5, 6, 7 and 8. Following Appendix C of the *State Protocol Between The Wyoming Bureau of Land Management State Director and The Wyoming State Historic Preservation Officer* (State Protocol) for a finding of a moderate visual contrast, "The agency determination should be 'Historic Properties Adversely Affected'". No mitigation that would address the adverse effect caused by the approval of the corridor was identified during the project onsites, and compliance with the State Protocol could not be completed if the project were approved as designed.

4.10.2. 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 in the proposed project areas serve to partially mitigate potential cumulative effects to cultural resources.

Fee actions built 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, which information can potentially get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to site impacts from increased public visitation.

4.10.3. 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 by the archeologist, construction is halted and the BLM consults with the State Historic Preservation Office (SHPO) on mitigation or avoidance. Due to the presence of alluvial and/or Aeolian deposits

identified by the NRCS soil survey (NRCS n.d.) and areas of High to Very High Sensitivity Zones per the PUMP III Model (Eckerle 2005), the operator will be required to have an archeologist monitor all earth moving activities associated with certain construction, as described below.

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

1. All surface disturbing activity associated with the construction of the Heat CS Federal #7 well pad and the associated utility corridor between the wells: Heat CS Federal #s 6 and 7 in the SW quarter of T45N R76W Section 2.
2. All surface disturbing activity associated with the construction of the Heat CS Federal #6 well pad located in NE/SW quarter of T45N R76W Section 2.
3. All surface disturbing activity associated with the construction of the Heat CS Federal #3 well pad and the associated utility corridor between the wells: Heat CS Federal #s 3and 5 pads located in T45N R76W Section 2.
4. All surface disturbing activity associated with the construction of the Heat CS Federal #1 well pad and the associated utility corridor between the wells: Heat CS Federal #s 1 and 4 pads located in NE quarter of T45N R76W Section 2.
5. All surface disturbing activity associated with the construction of the Heat CS Federal #4 well pad and the associated utility corridor between the Heat CS Federal #4 and the tie in to the utility corridor between the wells: Heat CS Federal #s 3and 5 located in NE and NW/SE quarters of T45N R76W Section 2.
6. All surface disturbing activity associated with the construction of the Heat CS Federal #5 well pad located in NE/SE quarter of T45N R46W Section 2.
7. All surface disturbing activity associated with the construction of the Heat CS Federal #8 well pad and the associated utility corridor between the Heat CS Federal #8 well and Christiansen Road located in SE quarter of T45N R46W Section 2.

4.10.4. Residual Effects

Despite all the mitigation and project redesign, approval of the linear corridors between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6 will result in an adverse effect for which no mitigation has been applied resulting in a failure to comply with the BLM – State of Wyoming Protocol Agreement.

4.11. Alternative C – Modified Action

Alternative C is a modification of Alternative B based on BLM removing 7 APDs and their infrastructure and the power drop in SESW Section 29T45N R76W from the project proposal; as the implementation of the APDs and power drop location would impact the following resources:

- Greater Sage Grouse (APDs denied under alternative C and their infrastructure are - Heat CS Federal #s11, 14, 15, 17, 18, 20, and 21).

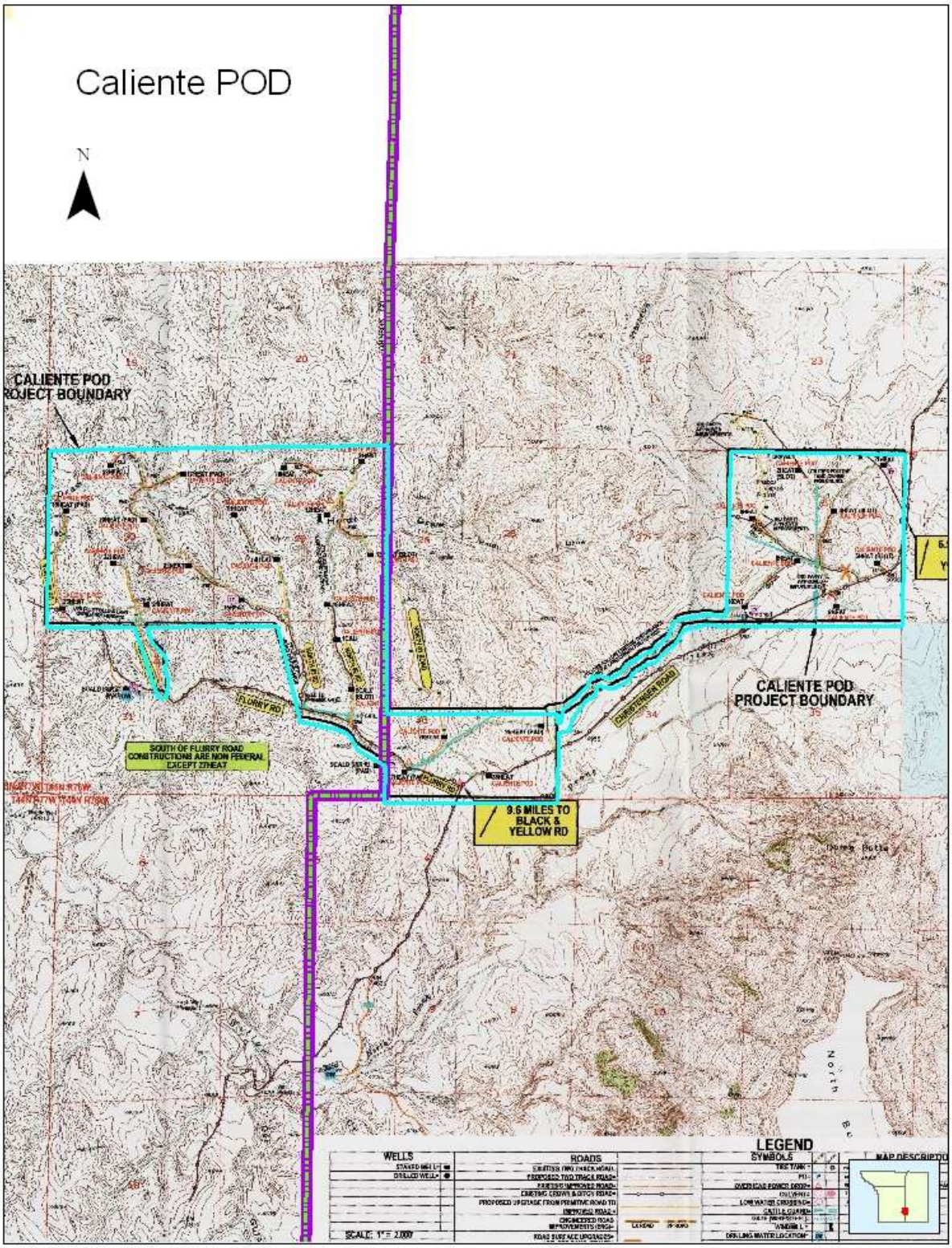
Additionally alternative C proposes deferring 2 utility corridors, the 8 wells, and their infrastructure until resolution of archeological issues.

- Traditional cultural property / Pumpkin Buttes Programmatic Agreement (utility corridors, APDs, and their infrastructure) deferred under alternative C include – the proposed utility corridor between the Heat CS Federal #25 and the Heat CS Federal #7, the proposed corridor between the Heat CS Federal

#7 and the Heat CS Federal #6, wells and infrastructure for Heat CS Federal #s 1, 2, 3, 4, 5, 6, 7, and 8.

The Caliente POD remains viable as of POD (i.e, gas gathering, WMP, electrical power, etc.) with 7 APDs (23%) denied and 8 APDs (25%) deferred due to the POD layout. No redesigns will be needed as a result of the denials and deferrals. If Yates, however, finds it more advantageous as a result of the denials and deferrals to change designs Yates may do so by submitting a via Sundry Notice (Form No. 3160-5) and BLM will analyze it in a separate NEPA document. The 7 APDs denied are located along North #3 Road. The APDs and infrastructure are located in the NENW and SENW section 32 and the SESW, NEWS, and SWNW of section 29. Removal of these wells will not segregate WMP, roads, etc. All approved APDs and infrastructure will be functional. The 8 APDs deferred are located in the eastern part of the POD and includes all of section 26 and the corridor running through section 34 and 27. Removal of these wells will not segregate gas gathering, WMP, electrical power, etc. All approved APDs and infrastructure will be functional. Additionally, the Caliente POD remains viable with removal of the power drop in SESW Section 29T45N R76W because this power drop only served removed APDs and has no impact on the rest of the POD. See the map below for exact locations.

This analysis of Alternative C only addresses resources affected differently by Alternative C than from Alternative B. alternative C incorporates by reference all other mitigation measures and analysis from Alternative B.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SCALE: 1" = 2,000'

4.11.1. Soils & Vegetation

The soil and vegetation impacts and effects would be the same as those addressed in Alternative B. By denying the 7 APDs and deferring the decision on 8 APDs the access roads, pipelines, well locations, and other associated infrastructure will not be built thus no erosion will occur. There would be 33.9 acres less disturbance due to the denial of 7 CBNG APDs and deferring 8 APDs and their associated infrastructure from the POD.

4.11.2. Water Resources

The denial of 7 APDs from potential production would decrease the volume of produced water by 23% of the maximum 420 gpm predicted in Alternative B. The maximum volume of water to be injected to the Fort Union formation would be 322 gpm in Alternative C. This assumes the 8 APDs proposed for deferral in Alternative C would be on-line in the future once other resource issues are addressed by the operator.

The denial and deferral of the wells proposed in Alternative C would still allow this POD to function in regards to water collection and disposal via the Scald #1 and Scald #2 Storage and Retrieval (Injection) wells. The utility corridors that are being denied and or deferred do not disrupt or disconnect utility corridors to approved well locations and therefore, the water lines would still be available to deliver produced water to the proposed injection wells as provided in the WMP.

The volume of water resulting from the production of the 23 wells proposed in Alternative C is 1.4% of the total volume projected for 2012 in the Upper Powder River watershed. This volume of produced water is within the predicted parameters of the PRB FEIS.

Direct, indirect, cumulative, and residual impacts on the water resources would be of the same type discussed in Alternative B. However the impacts, if measurable, would be to a lesser degree due to less volume of water produced.

4.12. Wildlife

4.12.1. Greater Sage-Grouse (GSG)

4.12.1.1. Direct and Indirect Effects

The direct and indirect impacts to GSG are anticipated to be similar to those described in Alternative B, with the exception that impacts to the Christensen Ranch 5 Lek and nesting and winter habitat in Sections 29, 30, and 32 will be greatly reduced from the denial of 7 wells. Deferral of 2 utility corridors and 8 APDs associated with the corridors will also reduce impacts to nesting and winter habitat in Section 25. Approval of this Alternative will be consistent with WY BLM and State of Wyoming GSG management strategies.

Yates is proposing to access 7 wells via an improved road directly through the center of the Christensen Ranch 5 Lek and the 0.25 miles CSU on the lek. Allowing surface occupancy within 0.25 miles of the lek is not consistent with WY BLM policy or the State of Wyoming's sage-grouse conservation strategy (Executive Order (EO) 2011-5 Greater Sage-grouse Core Area Protection). In a comment letter dated September 4, 2012, the WGFD identified that in order to be in compliance with EO 2011-5, "a 0.25 mile No Surface Occupancy (NSO) buffer should be established around any occupied sage-grouse lek." The letter goes on to state that although non-core areas do not receive as stringent protections as core, the intent of the strategy is not to consider those areas as "sacrifice" zones. The intent of EO 2011-5 management in non-core areas is to maintain populations and habitats where possible.

It is the policy of BLM WY to manage sage-grouse habitats consistent with the provisions set forth by the State of Wyoming, and as described in Instruction Memorandum (IM) No. WY-2012-019, *Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands Including the Federal Mineral Estate*. IM 2012-019 states that for areas outside of core and

connectivity habitats, "surface occupancy and/or disruptive activities are prohibited on or within one-quarter (0.25) mile radius of the perimeter of occupied sage-grouse leks." The IM goes on to describe that Field Offices must consider an alternative that does not authorize new surface facilities within a 0.25 mile buffer of leks, including roads. The BFO amended their RMP with a maintenance action on September 17, 2010 to include a similar provision and to be consistent with guidance set forth in the preceding IM, WY-2010-012. The management action reads: "Surface disturbing activities or surface occupancy is prohibited or restricted on or within one quarter (0.25) mile radius of the perimeter of occupied or undetermined sage-grouse leks."

Denial of the 7 APDs, roads, utility corridors, ancillary facilities, and power drop locations will result in lesser impacts to the Christensen Ranch 5 Lek and identified nesting habitat than those identified in Alternative B, reducing direct habitat loss by 20 acres. Impacts to the Christensen Ranch 5 Lek from increased traffic on North #3 Road, noise from traffic and the generator to be installed at the power drop in Section 29, and overhead power lines servicing the power drop would be eliminated. An additional reduction of 22 acres of habitat loss will result from deferral of 2 utility corridors, their associated 8 APDs and infrastructure due to cultural issues. If these wells and infrastructure are approved in the future, this habitat will be adversely impacted due to direct loss and habitat fragmentation. Construction of the wells, access roads, utility corridors, and overhead power lines in Alternative C will cause fragmentation of sagebrush stands and result in the direct loss of approximately 62 acres of sage-grouse habitat. Implementation of the project will adversely impact nesting habitat, both through direct loss and avoidance of the area by Greater Sage-Grouse due to fragmentation and anthropogenic activity. However, eliminating surface occupancy within 0.25 miles of the Christensen Ranch 5 Lek increases the probability of lek persistence and the chance that the area will be repopulated after the area has been abandoned and reclaimed.

4.12.1.2. Cumulative Effects

Cumulative impacts are expected to be similar to those described in Alternative B. Authorization of surface occupancy within 0.25 miles of a non-core habitat lek is inconsistent with the WY BLM and State of Wyoming GSG policies, and would set a precedent that these policies do not require compliance outside of GSG priority habitats. By being consistent with the strategies, the BFO is increasing the probability that GSG populations and habitats outside the core areas will be maintained, and that connectivity between priority habitats will persist.

4.12.1.3. Mitigation Measures

Proposed mitigation is the same as that proposed in Alternative B.

4.12.1.4. Residual Impacts

A timing limitation does nothing to mitigate loss and fragmentation of habitat or changes in disease mechanisms. Noise and human disturbance resulting from maintenance and production activities are likely to impact GSG nesting in the area for the life of the project. Suitability of the project area for GSG will be negatively affected due to habitat loss and fragmentation and proximity of human activities associated with CBNG development. While the Christensen Ranch 5 Lek may be impacted, it is anticipated to remain occupied.

The PRB FEIS analyzed the removal of all CBNG wells and most infrastructures at final well abandonment after the CBNG played out 7-12 years after drilling. Leaving infrastructure on the landscape will hamper restoration efforts (Taylor et al. 2012). The PRB FEIS predicted that the PRB oil and gas development would have significant impacts to the GSG population. The impact of the Caliente development cumulatively contributes to the potential for local extirpation. Alternative C and the COAs applied are consistent with current BLM and Wyoming GSG conservation strategies and the anticipated effects are within the parameters of the PRB FEIS/ROD.

Current research does not identify specific components of energy development that measurably decrease impacts to GSG or their habitats. Even in areas where a variety of mitigation measures were applied, negative population impacts were still measurable when well density exceeded 1 well per square mile. Management of energy development based on current core area configurations and associated lease stipulations, conditions of approval, and best management practices (BMPs), may not be sufficient to protect the population viability of PRB GSG.

4.13. Economics of CBNG Resource Extraction

4.13.1. Direct and Indirect Effects

Direct and indirect 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 the 7 wells, which translates into about a 23% reduction in the present value (PV) of the total revenue stream associated with these wells.

4.13.2. Cumulative Effects

The impact from the denial of 7 APDs could represent a speculative loss of about $1.2 million dollars in the PV of federal and state royalties, which translates into a loss of about 23% compared to Alternative B. 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 CBNG 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 Caliente POD project is primarily on private 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.

4.13.3. Mitigation Measures

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

4.13.4. Residual Impacts

Residual effects would be the same as cumulative effects.

4.14. Cultural Resources

4.14.1. Direct and Indirect Effects

Non eligible sites 48CA5417, 48CA5418, 48CA5419, 48CA6595, and 48CA7092 will be impacted by the proposed project. Eligible sites 48CA5416 and 48CA7008 and unevaluated sites 48CA6596 and 48CA7091 are outside of the APE and will not be impacted. The Caliente project is proposed within 2 miles of the Pumpkin Buttes TCP (48CA268) and infrastructure is proposed within the setting of the site.

As a result of project redesign per the Programmatic Agreement Appendices B and C of the linear corridor to the Heat CS Federal #28 well will result in no adverse effect to eligible site and TCP 48CA268,the Pumpkin Buttes. The 2 corridors between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6 will not be approved since they create an adverse effect to the TCP for which there is no mitigation. The 8 wells associated with these corridors: Heat CS Federal 1, 2, 3, 4, 5, 6, 7, and 8 will be deferred under

Alternative C until Yates modifies their proposal by corridoring the proposed roads and utilities with existing roads and utilities and following natural contours or until alternate routes that do not create a moderate or strong contrast are found. Following the Wyoming State Protocol Section VI(B)(1), the BLM determined that as a result of not approving the 2 corridors the project will result in "No Adverse Effect" under the State Protocol and electronically notified the Wyoming State Historic Preservation Officer (SHPO) on September 6, 2012. The determination is conditioned on Yates committing to the mitigation measures described in appendices A-G of the Programmatic Agreement between the BLM and the Wyoming SHPO Regarding Mitigation of Adverse Effects to the Pumpkin Buttes Traditional Cultural Property from Anticipated Federal Minerals Development in Campbell County, Wyoming (Pumpkin Buttes PA). The mitigation measures are standard BMPs intended to reduce visual contrast and will be incorporated during all phases (drilling, construction, operation, reclamation, etc.) of all approved wells in the Caliente POD and their associated infrastructure (new surface disturbance to junction with existing disturbance). As designed (including disapproval of the corridor between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6), the project complies with the mitigations described in the Pumpkin Buttes PA.

If Yates choses to submit wider corridors for accesses and pipelines than found in the PA, BFO would be required to initiate formal consultation with adversely affected tribes and the WY SHPO. The BLM agrees that the most expedient method of enabling the BLM to make a decision on the 2 utility corridors, their associated 8 APDs and infrastructure for the Caliente POD is by having the design features of the 2 utility corridors, all wells and infrastructure as designed with corridor widths conforming to the Pumpkin Buttes PA. Accordingly, all mitigation measures as described in appendices A-G of the Pumpkin Buttes PA will be applied as COAs to the Caliente POD.

4.14.2. Cumulative Effects

Although on a smaller scale as a result of well denials and deferrals, the cumulative impacts will be the same as described for Alternative B.

4.14.3. Mitigation Measures

Mitigation measures will be the same as described for Alternative B, with the following exceptions:

The incorporation of the mitigation measures to reduce visual contrast as outlined in the appendices of the Pumpkin Buttes PA will result in a finding of "no adverse effect" to the Pumpkin Buttes TCP. These mitigating measures include techniques such as narrow corridor widths and a reduction of vegetation and surface disturbance. The site specific mitigation measures this project is required to adhere to are located in Appendices A through G of the PA. A copy of the Pumpkin Buttes PA including Appendices A through G is attached as Appendix C in this EA document (BLM also incorporates it by reference).

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).

4.14.4. Residual Effects

As a result of the deferral of the 2 corridors between the Heat CS Federal #25 and the Heat CS Federal #7, and the proposed corridor between the Heat CS Federal #7 and the Heat CS Federal #6 along with deferral of the Heat CS Federal 1, 2, 3, 4, 5, 6, 7, and 8 the project will result in a finding of "No Adverse Effect" and BLM will be able to comply with the Pumpkin Buttes PA and the State Protocol.

5. CONSULTATION/COORDINATION:

Contact	Title	Organization	Onsite Presence?
Meleah Corey	Natural Resource Specialist	BLM	Yes
Darci Stafford	Wildlife Biologist	BLM	Yes
Kerry Aggen	Geologist	BLM	Yes
John Kelley	Planning Coordinator	BLM	No
Keith Anderson	Hydrologist	BLM	Yes
Ardeth Hahn	Archeologist	BLM	Yes
Stacy Gunderson	Civil Engineer	BLM	Yes
Arnie Irwin	Soils Specialist	BLM	No
Mary Hopkins	WY SHPO Officer	Wyoming SHPO	No
Brad Rogers	Wildlife Biologist	USFWS	No

References and Authorities:

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

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

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

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

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

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

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

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

Bohne, J., T. Rinkes, and S. Kilpatrick. 2007. Sage-Grouse Habitat Management Guidelines for Wyoming. Wyoming Game and Fish Department. Cheyenne, Wyoming.

Blickley, J. L., Blackwood, D. & Patricelli, G. L. 2012 Experimental Evidence for the Effects of Chronic Anthropogenic Noise on Abundance of Greater Sage-Grouse at Leks. *Conservation Biology* **26**, 461-471.

Blickley, J. L., Blackwood, D. L., Hardy, E. L. & Patricelli, G. L. in prep Temporal flexibility in greater sage-grouse (Centrocercus urophasianus) signaling behavior in response to chronic industrial noise playback.

Blickley, J. L. & Patricelli, G. L. 2010 Impacts of Anthropogenic Noise on Wildlife: Research Priorities for the Development of Standards and Mitigation. *Journal of International Wildlife Law and Policy* **13**, 274-292.

Blickley, J. L. & Patricelli, G. L. 2012 Potential acoustic masking of greater sage-grouse display components by chronic industrial noise. *Ornithological Monographs* **74**, 23-35.

Blickley, J. L., Word, K. R., Krakauer, A. H., Phillips, J. L., Sells, S. N., Wingfield, J. C. & Patricelli, G. L. In review Experimental chronic noise exposure is related to elevated fecal corticosteroid metabolites in lekking male greater sage-grouse (*Centrocercus urophasianus*). *PloS ONE*.

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

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

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

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

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

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

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

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

Clark, 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. Journal 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)

1. 40 CFR All Parts and Sections inclusive Protection of Environment. Revised as of 2012.
2. 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. 179pp.

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

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

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

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

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

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

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

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

Ebert, Jamies I., and Timothy 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* edited by W. James Judge and Lynne Sebastian, pp 97-171. U.S. Department of the Interior, BLM Service Center, Denver, CO.

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

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

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

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 (editors). Studies in Avian Biology, Number 38, University of California Press, Berkeley, CA, USA.

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

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

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

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

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

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

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

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

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

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

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

Holloran, M. J. 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, USA. 34pp.

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

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

ICF International (ICF) 2012. Caliente Plan of Development Addendum C: Wildlife Surveys. Gillette, WY. 13pp.

ICF International (ICF) 2011b. Caliente Plan of Development Addendum B: Wildlife Surveys. Gillette, WY. 17pp.

ICF International (ICF) 2011a. Caliente Plan of Development Addendum A: Wildlife Surveys. Gillette, WY. 17pp.

ICF International (ICF) 2009. Caliente Plan of Development Biological Surveys and Habitat Assessments. Gillette, WY. 18pp.

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

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

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

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

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

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

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

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

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

Knick, S. T., and J. W. Connelly. 2011. Greater Sage-grouse: Ecology and Conservation of a Landscape Species and Its Habitats. University of California Press, Berkeley, California.

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

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

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

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. & Anderson, S. H. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin, 31*, 486-491.

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*. *Presented at* Montana Sage-Grouse Workshop, Montana Chapter of The Wildlife Society, Billings.

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

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

Naugle, D. E. 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.

Patricelli, G. L., J. L. Blickley, and S. L. Hooper. 2012. The impacts of noise on greater sage-grouse: A discussion of current management strategies in Wyoming with recommendations for further research and interim protections. University of California, Davis, CA. 25pp.

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, Oregon, USA.

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.

Stiver, S. J., A. D. Apa, J. R. Bohne, S. D. Bunnell, P. A. Deibert, S. C. Gardner, M. A. Hilliard, C. W. McCarthy, and M. A. Schroeder. 2006. Greater Sage-grouse comprehensive conservation strategy. WAFWA, Cheyenne, WY. 21 August 2009.

Taylor, R. L., D. E. Naugle, L. S. Mills. 2012. Viability analyses for conservation of sage-grouse populations: Buffalo Field Office, Wyoming. Final Report. February 27, 2012. University of Montana, Missoula, MT.

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

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

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

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

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

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

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

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

U.S. Department of the Interior 2011, Bureau of Land Management. BLM National Greater Sage-Grouse Land Use Planning Strategy. IM 2012-044. December 27, 2011. 2 Attachments.
U.S. Department of the Interior 2007, US Fish and Wildlife Service. Reinitiation of Formal Consultation for Powder River Oil and Gas Project. March 23, 2007.

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

U.S. Department of the Interior, Fish and Wildlife Service (FWS). *Report Mountain Plover (Charadrius Montanus) Biological Evaluation*. March 9, 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, USA. Conservation Biology 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. Journal of Wildlife Management 71:2644-2654.

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

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

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

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

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

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.

WGFD. 2011a. 2011 Sheridan Region Annual Big Game Herd Unit Reports. WGFD. Cheyenne, WY.

WGFD. 2011b. 2011 Sheridan Region Lek Monitoring Results.

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 B. Table 4.4 Summary of Sensitive Species Habitat and Project Effects Associated with Caliente POD.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Amphibians				
Northern leopard frog (*Rana pipiens*)	Beaver ponds and cattail marshes from plains to montane zones.	S	NI	No surface disturbance is planned in habitat.
Columbia spotted frog (*R*anus pretiosa)	Ponds, sloughs, small streams, and cattails in foothills and montane zones. Confined to headwaters of the S Tongue R drainage and tributaries.	NP	NI	The project area is outside the species' range, and the species is not expected to occur.
Fish				
Yellowstone cutthroat trout (*Oncoryhynchus clarki bouvieri*)	Cold-water rivers, creeks, beaver ponds, and large lakes in the Upper Tongue sub-watershed	NP	NI	The project area is outside the species' range, and the species is not expected to occur.
Birds				
Baird's sparrow (*Ammodramus bairdii*)	Shortgrass prairie and basin-prairie shrubland habitats; plowed and stubble fields; grazed pastures; dry lakebeds; and other sparse, bare, dry ground.	S	MIIH	Direct loss of habitat will occur from construction of wells and associated infrastructure. Those birds still nesting after sage-grouse timing limitations have expired may have nests destroyed. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.
Bald eagle (*Haliaeetus leucocephalus*)	Mature forest cover often within one mile of large water body with reliable prey source nearby.	K	MIIH	Surface disturbing and maintenance activities may impact foraging eagles and the species may avoid the area.
Brewer's sparrow (*Spizella breweri*)	Sagebrush shrubland	K	MIIH	Direct loss of habitat will occur from construction of wells and associated infrastructure. Those birds still nesting after sage-grouse timing limitations have expired may have nests destroyed. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	S	MIIH	Nests have been documented within 0.5 miles of proposed activities. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Direct loss of habitat will occur from construction of wells and associated infrastructure. Those birds still nesting after sage-grouse timing limitations have expired may have nests destroyed. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	S	MIIH	Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.
Mountain Plover	Short-grass prairie with slopes < 5%	S	MIIH	Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area. A timing limitation will be applied to ensure that no active nests are destroyed during the construction phase of the project.
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	NP	NI	Habitat not present.
Peregrine falcon (*Falco peregrinus*)	Cliffs	NP	NI	Habitat not present.
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Direct loss of habitat will occur from construction of wells and associated infrastructure. Those birds still nesting after sage-grouse timing limitations have expired may have nests destroyed. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.

Common Name (scientific name)	Habitat	Presence	Project Effects	Rationale
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	S	MIIH	Direct loss of habitat will occur from construction of wells and associated infrastructure. Those birds still nesting after sage-grouse timing limitations have expired may have nests destroyed. Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area.
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	NS	NI	No surface disturbance is planned in habitat.
Western Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	S	MIIH	Nesting and foraging habitat may be impacted by dust, noise, human activities, and direct loss. Species may avoid area. A timing limitation will be applied to ensure that no active nests are destroyed during the construction phase of the project.
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	NS	NI	No surface disturbance is planned in habitat.
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	NP	NI	Habitat not present.
Mammals				
Black-tailed prairie dog (*Cynomys ludovicianus*)	Prairie habitats with deep, firm soils and slopes less than 10 degrees.	K	MIIH	Approximately 188 acres of prairie dog colonies present. Prairie dogs may be disturbed by construction of wells and infrastructure. Overhead power lines in proximity to the colonies may cause the species to avoid the area.
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	S	MIIH	Foraging habitat may be impacted by dust, noise, and human activities.
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	NS	NI	Habitat not present.
Swift fox (*Vulpes velox*)	Grasslands	NS	NI	Habitat not present.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Caves and mines.	NP	NI	Habitat not present.

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

Presence

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

Project Effects

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