

CHAPTER 2

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

Alternatives are required in a NEPA analysis, but alternatives must be "reasonable" and must accommodate the purpose and need of the project. Alternatives must be technically and economically feasible (CEQ, 1981). Alternatives should explore the range of potential issues and, thus, alternatives development is strongly influenced by the results of the scoping process.

Chapter 2 describes the Proposed Action and two alternatives to the Proposed Action, including the No Action alternative. The No Action alternative, Alternative A, assumes that development of the proposed 32 CBNG wells is precluded. The Proposed Action, Alternative B, considers the development of 32 CBNG wells within the TBNG. Alternative C, the modified development scenario, considers the development of 28 CBNG wells within the TBNG. A comparison among the alternatives is included at the end of this chapter.

2.2 ALTERNATIVE A - NO ACTION ALTERNATIVE

A No Action alternative is intended to provide a benchmark that enables the decision-maker to compare the magnitude of environmental effects among alternatives to existing management conditions. Consideration of the No Action alternative is required by 40 CFR 1502.14 (d).

Under the No Action alternative, the BLM or USFS would deny the proposal as currently described in the Proposed Action. The decision would apply only to federal surface and/or minerals. A decision for the No Action alternative could be considered under the following circumstances:

- If there were no acceptable means of mitigating significant adverse impacts to surface resources values; or
- If the USFWS were to conclude that the Proposed Action would likely jeopardize the continued existence of any threatened, endangered, proposed, or candidate species.

The ability of a decision-maker to select the No Action alternative is severely constrained by Lance's contractual rights to develop its mineral leases. Although the BLM can deny approval of a particular APD, it cannot, in general, deny approval of an APD that proposes to drill a well to federal minerals that have been leased. An oil and gas lease grants the lessee the "right to drill for, extract, remove, and dispose of all oil and gas deposits" from the leased lands, subject to the terms and conditions of the respective leases (BLM, 1992). The denial of the right to develop a

valid lease would violate the lessee's contractual rights, as well as result in the loss of federal royalties. Authority for denial can be granted only by Congress (United States Constitution, Article IV, Section 3, Clause 2). The BLM, therefore, can only suspend the lease pursuant to Section 39 of the Mineral Leasing Act pending consultation with the Congress for a grant of authority to preclude drilling and provide required compensation to the lessee.

The selection of the No Action alternative would not allow existing leases to be developed. Implementation of the No Action alternative, as presented in this hypothetical analysis, would preclude all drilling, construction, production, and reclamation activities as planned by the Proposed Action. Selection of the No Action alternative would allow land uses to continue in their presently existing condition. Existing surface management activities, such as surface coal mining, livestock grazing, and wildlife habitat, would continue as they are currently implemented. CBNG development would continue in the general area of the project on other federal, state, and private lands. The No Action alternative is illustrated on a map (Figure 2.2-1).

2.3 ALTERNATIVE B - PROPOSED ACTION

Lance proposes drilling and operating 32 CBNG wells and associated facilities on federal gas leases on federal lands administered by the USFS as part of the TBNG, Douglas Ranger District. The TBNG includes over 553,000 acres of public land intermingled with other ownerships dispersed among plateaus and rolling foothills in northeast Wyoming. The project would occupy portions of noncontiguous TBNG lands and portions of the private lands that lie between them. All of the proposed wells are located on USFS lands within the TBNG; however, the project would require the construction of some new associated facilities on non-USFS lands. Project wells would require the use of roads that cross state-owned surface. The BLM would administer the federally owned minerals. Lance submitted 32 APDs to the BLM, Buffalo Area Field Office, which has forwarded the APDs to the Douglas Ranger District for review and concurrence. The locations of the wells comprise three separate areas known as Thunderhead 1, 2, and 3. Although each area has its own POD, this EA analyzes the effects of developing all three areas. The wells would produce CBNG from the Wyodak-Anderson coal seam and would be drilled on 80-acre spacing to a depth of less than 1,000 feet. Construction operations for the project are expected to require three to six months. The productive life of the wells is expected to be approximately 10 years.

The associated facilities required by the proposed project would include roads, gas and water pipelines, electrical utility (power) lines, buildings that house the central gathering facilities for gas, produced water discharge points, stock tanks, and culverts. Project development would require the construction of approximately 10.6 miles of new roads, approximately 12.4 miles of underground utility corridors, one central gathering facility, and two discharge points on TBNG lands. Project development would require the use of similar existing facilities currently located near the proposed well locations. It would result in the use of roads previously constructed and currently used on State of Wyoming land southeast of Thunderhead 1. The wells and facilities that would be constructed and used for the project are shown on Figure 2.3-1.

Figure 2.2-1 No Action Map

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Figure 2.3-1 Project Map

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Agency officials and Lance personnel conducted onsite inspections on July 18, 19, and 20 in 2001 in preparation for the development of the proposed wells. The purpose of the inspections was to assess the suitability of locations of proposed access roads, project-associated facilities, and utility trenches with respect to site-specific environmental resources. Potential problem areas where environmental mitigation measures may be required were identified. Private land owners were not present at the onsites but were invited and encouraged to attend. They were consulted throughout the planning process to determine how the CBNG produced water may be put to beneficial use. Requests from the landowners resulted in mitigation measures that are incorporated into the Proposed Action.

The following sections summarize the project location and access, the facilities proposed for the three PODs, stipulations that would be applied to project development, the CBNG development process, estimated ground disturbance associated with the Proposed Action, and reclamation procedures. Implementation of the Proposed Action would occur in three primary phases: drilling and construction of facilities; production and maintenance; and decommissioning and reclamation. Detailed procedures for CBNG drilling and production operations are described in the PRB O&G FEIS (BLM, 2003).

2.3.1 Project Location

The proposed project is located approximately three miles southeast of Wright, Wyoming and approximately 40 miles south of Gillette, Wyoming. The wells would be located in southern Campbell County, Wyoming within the Little Thunder Creek watershed in the Powder River Basin. The proposed wells would be located immediately adjacent to property owned by the Thunder Basin Coal Company, the State of Wyoming, and local ranchers. Private, state, and TBNG lands would provide access to the proposed wells.

In the Buffalo Field Office-issued Part I - Basic CBNG APD/POD Guidebook Components of a POD, Part B (BLM, 2003a), BLM guidance is given with respect to the definition of a POD size. The guidelines suggest using lease lines to define POD boundaries. Using this guideline, boundaries surrounding the PODs coincide with federal oil and gas lease boundaries, all within Township 43 North/Range 71 West (T43N/R71W). The POD boundaries include approximately 2,829 acres on TBNG surface:

- Thunderhead 1: All of Section 8 except the NENE quarter, and the SWSW quarter of Section 9;
- Thunderhead 2: The east half of Section 10, the west half of Section 11, the west half of the east half of Section 14; and
- Thunderhead 3: The south half of Section 18, all of Section 20 except the NWNW quarter, and the northwest quarter and west half of the southwest quarter of Section 21.

In addition, the project includes minimal adjacent private lands where linear features, such as roads, connect project wells to existing shared gas and water collection facilities. The existing facilities are located on privately owned surface in NENW Section 14; NESW Section 10; NWNW Section 13; SENE Section 9; SWNW Section 18; SWNE Section 21, all in T43N/R71W; and NESE Section 13 in T43N/R72W. The Proposed Action includes

approximately 23 acres on private surface. Surface ownership affected by the Proposed Action is shown in Figure 2.3-2.

The Project Area, as referenced in this document, refers to the area within the lease boundaries, as described in the preceding paragraphs.

2.3.2 POD Descriptions

Thunderhead 1 would consist of seven wells in Section 8 of T43N/R71W. These wells would be served by a new central gathering facility (sometimes referred to as a header), located in the northeast quarter of Section 8. The wells would be served by approximately 2.3 miles of new roads. One stock tank with a valve would be installed on Section 8, and another valve would be installed along the water line on privately owned surface on Section 9. The north boundary of Section 8 is State Highway (SH) 450.

Thunderhead 2 would consist of four wells in the east half of Section 10, four wells in the west half of Section 11, and two wells in the west half of the eastern half of Section 14 in T43N/R71W. Section 10 wells would be served by a new header in Section 10. Produced water from the wells in Section 10 would be discharged from a proposed discharge point located in Section 10. A previously approved existing header on private land in the northwest quarter of Section 14 would serve the wells in Sections 11 and 14. Produced water from the wells in Sections 11 and 14 would be discharged from an existing discharge point on private land in Section 13. One stock tank with a valve would be installed on Section 10, and another would be installed in Section 11. Thunderhead 2 would utilize approximately 3.5 miles of new roads and 0.3 mile of reconstructed roads.

Thunderhead 3 would consist of 15 wells, eight of which would be in Section 20, four of which would be in the southern half of Section 18, and three of which would be in the western half of Section 21, T43N/R71W. The wells in Section 18 would be served by an existing header on private land to the west of the project. This header serves other previously drilled wells. The wells in Section 20 would be served by a new header located in southwest quarter of that section. The wells in Section 21 would be served by an existing header located in northeast quarter of that section. The Section 21 header also serves other previously drilled wells. A stock tank with a valve would be installed in each of the three sections. Produced water would be discharged to new discharge points in Sections 18, 20, and 21. The wells in Thunderhead 3 would be served by approximately 4.8 miles of new roads and 9.2 miles of existing roads, including 7.8 miles of existing crown and ditch road on private surface.

Figure 2.3-2 Lease and Surface Ownership Map

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2.3.3 Lease Stipulations and Conditions of Approval

The CBNG wells and related facilities would be located on portions of eight federal leases held by Lance. The number of wells that could be drilled on the leased acreage is dictated by spacing rules. The oil and gas leases associated with the proposed wells include approximately 5,090 acres; however, the amount of surface directly affected by the proposed development of the 32 CBNG wells would require disturbance of a small portion of total acreage within the Project Area and an even smaller amount of acreage within the TBNG. The well names, associated leases, and well locations are listed in Table 2.3-1.

Table 2.3-1 Proposed Well Locations and Associated Leases

POD	Well Name	Well Location	Lease	Effective Date of Lease
Thunderhead 1	Federal 21-8-4371	T43N/R71W, Section 8: Lot 03 (NENW)	WYW-36006	4/1/81
	Federal 12-8-4371	T43N/R71W, Section 8: Lot 05 (SWNW)	WYW-36006	4/1/81
	Federal 23-8-4371	T43N/R71W, Section 8: Lot 11 (NESW)	WYW-36006	4/1/81
	Federal 14-8-4371	T43N/R71W, Section 8: Lot 13 (SWSW)	WYW-36006	4/1/81
	Federal 32-8-4371	T43N/R71W, Section 8: Lot 07 (SWNE)	WYW-143686	12/1/97
	Federal 43-8-4371	T43N/R71W, Section 8: Lot 09 (NESE)	WYW-143686	12/1/97
	Federal 34-8-4371	T43N/R71W, Section 8: Lot 15 (SWSE)	WYW-143686	12/1/97
Thunderhead 2	Stuart Federal 41-10-4371	T43N/R71W, Section 10: Lot 01 (NENE)	WYW-95702	12/1/85
	Stuart Federal 32-10-4371	T43N/R71W, Section 10: Lot 07 (SWNE)	WYW-140772	1/1/97
	Stuart Federal 43-10-4371	T43N/R71W, Section 10: Lot 09 (NESE)	WYW-140772	1/1/97
	Stuart Federal 34-10-4371	T43N/R71W, Section 10: Lot 15 (SWSE)	WYW-140772	1/1/97
	Federal 32-14-4371	T43N/R71W, Section 14: Lot 06 (SWNE)	WYW-140772	1/1/97
	Federal 34-14-4371	T43N/R71W, Section 14: Lot 14 (SWSE)	WYW-140772	1/1/97
	Federal 21-11-4371	T43N/R71W, Section 11: Lot 03 (NENW)	WYW-36006	4/1/81
	Federal 12-11-4371	T43N/R71W, Section 11: Lot 05 (SWNW)	WYW-36006	4/1/81
	Federal 23-11-4371	T43N/R71W, Section 11: Lot 11 (NESW)	WYW-36006	4/1/81
	Federal 14-11-4371	T43N/R71W, Section 11: Lot 13 (SWSW)	WYW-36006	4/1/81
Thunderhead 3	Federal 43-18-4371	T43N/R71W, Section 18: Lot 13 (NESE)	WYW-140773	1/1/97
	Federal 14-18-4371	T43N/R71W, Section 18: Lot 17 (SWSW)	WYW-140773	1/1/97

POD	Well Name	Well Location	Lease	Effective Date of Lease
	Federal 34-18-4371	T43N/R71W, Section 18: Lot 18 (SWSE)	WYW-140773	1/1/97
	Federal 21-21-4371	T43N/R71W, Section 21: Lot 03 (NENW)	WYW-140773	1/1/97
	Federal 12-20-4371	T43N/R71W, Section 20: Lot 05 (SOWN)	WYW-140773	1/1/97
	Federal 14-20-4371	T43N/R71W, Section 20: Lot 13 (SWSW)	WYW-140773	1/1/97
	Federal 23-18-4371	T43N/R71W, Section 18: Lot 15 (NESW)	WYW-141207	3/1/97
	Federal 41-20-4371	T43N/R71W, Section 20: Lot 01 (NENE)	WYW-36006	4/1/81
	Federal 32-20-4371	T43N/R71W, Section 20: Lot 07 (SWNE)	WYW-36006	4/1/81
	Federal 43-20-4371	T43N/R71W, Section 20: Lot 09 (NESE)	WYW-36006	4/1/81
	Federal 34-20-4371	T43N/R71W, Section 20: Lot 15 (SWSE)	WYW-36006	4/1/81
	Federal 12-21	T43N/R71W, Section 21: Lot 05 (SOWN)	WYW-143062	10/1/97
	Federal 14-21	T43N/R71W, Section 21: Lot 13 (SWSW)	WYW-143062	10/1/97
	Federal 21-20	T43N/R71W, Section 20: Lot 03 (NENW)	WYW-143686	12/1/97
	Federal 23-20-4371	T43N/R71W, Section 20: Lot 11 (NESW)	WYW-140939	2/1/97

2.3.4 Drilling and Construction of Facilities

2.3.4.1 Roads and Trenches

Existing roadways would be used where possible, and new roads would be constructed where needed. The project roads have been designed and modified to meet the long-range USFS road management plans for the area, as described in the Final Williams Thunderhead Coalbed Methane Project Roads Analysis (Road Management Plan) (USFS, 2002). Details relating to road construction and usage can be found in the Transportation Plan (Greystone, 2002). The road design for new project roads has been approved by the USFS. Road use by Lance personnel is intended to be light and limited. Vehicle traffic would be confined to established roads at all times. Vehicle use would be restricted if such use could result in rutting. Roads on privately owned surface would be used or constructed only after agreement is reached between Lance and the landowner.

Roadways would typically serve as common routes for vehicle access and rights-of-ways (ROWs) for buried gas, water, and electric lines. Trenches would be excavated, wherever possible, along the access routes to minimize ground disturbance. Single trenches for gas and water pipelines and electric lines would link a header building to its associated producing wells.

USFS short-term roads would be used for access from the headers to the wells. Short-term roads are native surface, two-track roads that may be surfaced with concurrence by the USFS. Initial disturbance for two-track roads would include brush-hogging the route to a width of 25 feet. After construction, actual road width would be approximately 12 feet. Where a two-track road would be paralleled by a utility trench, disturbance would be included in the 25-foot ROW. The area not needed for vehicular travel would be reclaimed following construction. The limited use of these roads would not necessitate further improvement beyond establishment of the track; however, drainage crossings or some spot upgrades may require the application of crushed scoria to harden soft or excessively erosive surfaces. Some areas may require additional blading to maintain the road surface and prevent drive-arounds. Total length of the road segments that require additional blading would be approximately 5,100 feet. Areas where blading up to the 25-foot width of the ROW are identified in the project Transportation Plan (Greystone, 2002) and the site-specific COAs developed during the 2001 onsite. Additional improvements would be addressed on a case-specific basis.

USFS local roads would be used to access the headers. These roads are single lane roads that typically provide primary access to central gathering facilities and may be reclaimed after wells cease to produce. The roads are 12 to 14 feet wide, crowned and ditched (C&D), and may be surfaced with six inches of crushed scoria, drained, and maintained. Disturbance width for local roads is approximately 40 feet, including disturbance for buried utilities, if present.

Access road construction is typically completed over a period of approximately four to six weeks. Construction activities would require use of these roads several times daily; however, after construction, roads would be used once daily until telemetry equipment is installed. After telemetry equipment installation, the PODs would be visited approximately twice weekly, and each well would be visited once per week.

Maintenance on project roads during drilling and construction would be the responsibility of Lance and would be consistent with USFS specifications. During the duration of the project, Lance would monitor the project roads and perform appropriate repairs. Such maintenance may include procedures required to correct excessive soil movement, rutting, and/or braiding around problem areas. Maintenance activities are expected to be infrequent and may require use of a two-ton truck. If Lance personnel were to observe deteriorating road conditions resulting from use by vehicles outside their control, USFS would be notified.

In some cases, new roads would duplicate existing access. Current roads not necessary for other USFS management activities or public needs would be decommissioned. The USFS and Lance would assume the responsibility for obliterating duplicative roadways. Lance would decommission the roads to USFS standards at the time of construction of the new roads.

Table 2.3-2 summarizes the types of existing roads that would be used for project development. These roads would be used in the current condition. There would be no additional surface disturbance associated with the use of roads in their current state.

Table 2.3-2 Existing Roads For Project Use

Road Type	USFS surface			Private Surface		
	feet	miles	disturbed area (acres) ¹	feet	miles	disturbed area (acres) ¹
Existing 2-track roads to be used for Project, to be used as is	5,200	1.0	NA	1,589	0.3	NA
Existing C&D roads to be used for Project, to be used as is	1,923	0.4	NA	41,140	7.8	NA
Total Existing Roads To Be Used	7,123	1.4	NA	42,729	8.1	NA
2-track roads to be decommissioned	47,157	8.9	13.0	0	0	0

Source: Adapted from Greystone, 2003

¹ No additional disturbance is associated with the use of existing roads

Table 2.3-3 summarizes the types, length, surface ownership, and disturbance associated with proposed new roads. Short-term disturbance includes the entire ROW including the part that is reclaimed after road construction (25-foot ROW for 2-track roads and 40-foot ROW for C&D roads). Long-term disturbance was calculated using the amount of road surface used for vehicle access because the remainder of the area within the ROW used for road construction would be reclaimed (12 feet for 2-track roads and 14 feet for C&D roads). Some existing 2-track roads would be upgraded to C&D to allow access for project development. New road construction linking the proposed wells and disturbance resulting from upgrades are illustrated on Figure 2.3-1.

Table 2.3-3 Disturbance Associated Proposed New Roads

Road Type	USFS Surface				Private Surface			
	Feet	Miles	Short-Term Disturbance (acres)	Long-Term Disturbance (acres)	Feet	Miles	Short Term Disturbance (acres)	Long Term Disturbance (acres)
Proposed 2-track roads	48,236	9.2	27.7	13.3	2,553	0.5	1.5	0.7
Proposed C&D roads	5,311	1.0	4.9	1.7	952	0.2	0.8	0.3
2-track roads to be upgraded to C&D for Project ¹	2,159	0.4	1.4	0.1	1,687	0.3	0.6	0.1
Total New Roads	55,706	10.6	34.0	15.1	5,192	1.0	2.9	1.1

Source: Adapted from Greystone, 2003

A total of approximately 11.6 miles would be constructed on both TBNG and private lands, resulting in a short-term disturbance of approximately 34 acres and 2.9 acres, respectively. Under the Proposed Action, approximately 8.9 miles of existing 2-track roads would be

decommissioned on TBNG lands, approximately equivalent to 13 acres. The additional long-term disturbance associated with the upgrading of 2-track roads would amount to approximately 0.1 acre each for both USFS and private surfaces. Total long-term disturbance on both USFS and private surface is approximately 16.2 acres, 15.1 of which lies on USFS surface. Therefore, the amount of USFS land disturbed by the construction of new roads, 15.1 acres, would be offset by the reclamation of 13 acres of roads, resulting in a net new disturbance of only 2.1 acres on TBNG lands over the long term. Approximately 1.1 acres of private land would be affected by road disturbance over the life of the project.

2.3.4.2 Drilling Operations and Well Completion Program

Construction activities at well sites would be kept to a minimum to limit disturbance to vegetation and underlying soils. Because the natural terrain at all the well sites is nearly level, no leveling would be required. Only small amounts of vegetation would be mowed or cleared. Construction, drilling, and completion operations would take place during daylight hours.

The area affected by well site construction would typically be approximately 100 by 100 feet (approximately 0.23 acre) for each well. A temporary mud/reserve pit approximately four to six feet deep, 10 feet wide and up to 20 feet long would be excavated for use during drilling and completion operations. Vehicles at the well site typically include the truck-mounted, shallow water well-type drilling rig, one backhoe, a water truck, and a truck mounted pulling unit that operates the down-hole production equipment. Drilling operations would require about one to three days with a crew of approximately 14 persons. If surface water were to be used for drilling purposes, the required surface water appropriation permit would be obtained from the WSEO.

If a well is not put into production, the drill rig would be used to plug the well. If a well were productive, completion operations would commence immediately after drilling is finished. Completion operations stimulate gas production and determine gas and water production characteristics. Completion operations require a mobile completion rig and approximately 15 people for approximately one to three days for each well. After the drilling and completion operations are finished, the reserve pit would be allowed to dry sufficiently long enough for the water in the drilling fluid to evaporate. The liner, if present, would be ripped before being backfilled and covered. Cuttings and mud would be buried approximately three feet. The pit would be backfilled such that no surface depression would remain after the soil has compacted. A telemetry system would then be installed so that Lance could monitor CBNG production remotely. Following well completion, portions of the well site that are not needed for surface production activities would be reclaimed and reseeded in compliance with USFS requirements. Re-vegetation and reclamation of the site would be completed within six months of drilling the well, weather permitting. Long-term disturbance would be less than 0.1 acre at each well site. Surface disturbance associated with well site construction for the project is shown in Table 2.3-4.

Table 2.3-4 Surface Disturbance Associated with Well Site Development

Well Location	Number of Wells	Initial Disturbance (acres)	Disturbance After Interim Reclamation (acres)
Thunderhead 1	7	1.6	0.7
Thunderhead 2	10	2.3	1.0
Thunderhead 3	15	3.5	1.5
Total	32	7.4	3.2

2.3.5 Production and Maintenance

2.3.5.1 Wellhead Facilities

If a well were productive, an electric submersible pump would be installed below ground level, and an insulated wellhead covering would be placed over the wellhead. The submersible pump dewateres the coal seam to reduce pressure in the seam and promote recovery of the CBNG. A ground water appropriation permit would be obtained from the WSEO in order to withdraw water from the producing coal seam during the dewatering phase. The production facilities at the well would consist of the wellhead and an insulated wellhead cover. The wellhead cover would consist of a fiberglass box (approximately four feet by four feet by four feet) placed over the wellhead. A power panel would be placed adjacent to the wellhead cover, and a four-sided pipe fence would surround the cover and panel. The installation and use of telemetry equipment will allow Lance to minimize travel to the wellhead. These facilities would occupy the estimated 0.1 acre for each well after interim reclamation.

2.3.5.2 Water, Gas, and Electric Lines

Produced water and gas from operational wells would be delivered to central gathering facilities through buried water lines and polyethylene gas lines. The water, gas, and electric lines would occupy common trenches adjacent to roads where feasible. Underground electric lines would be installed in trenches to provide electricity from overhead power lines to the headers. There would be two new overhead power lines constructed on private surface in association with the project. Approximately 0.25 mile of overhead line would be located in the southwest quarter of Section 14, T43N/R71W, and approximately one mile of overhead line would be located in Sections 28 and 29. There would be no generators installed for long term use; however, Lance typically uses generators until the well is completed and the electric lines are installed.

Utility trenches that are constructed adjacent to two-track roads and USFS local roads would require four feet of width for construction within the road ROW. Utility trenches that must be constructed independently of roads would require a disturbance width of 14 feet. The larger 12-inch gas lines would require a 50-foot ROW. After pipeline construction, all disturbed areas would be reseeded in accordance with the reclamation procedures described in Sections 2.3.4.1 and 2.3.6. Therefore, there would be no long-term disturbance associated with the construction of pipelines and utility trenches. A summary of short-term disturbance associated with pipeline/utility trench construction is shown in Table 2.3-5.

Table 2.3-5 Short-Term Disturbance Associated with Pipelines/Utility Trenches

Road Type	Trench Status	USFS			Private		
		feet	miles	Short term disturbance (acres)	feet	miles	Short term disturbance (acres)
2-track ¹	Proposed	46,508	8.8	4.3	2,553	0.5	0.2
C&D ¹	Proposed	6,046	1.2	0.5	952	0.2	0.1
None- Stand Alone Pipeline/Utility Trench	Proposed	3,912	0.7	1.3	37,197	7.0	12.0
Possibly none- 12” gas line with or without access or additional pipelines	Proposed	8,811	1.7	10.1	6,742	1.2	7.7
	Total	65,277	12.4	16.2	47,444	8.99	20.0

Source: Adapted from Greystone, 2003

¹ Short-term disturbance for pipelines constructed adjacent to roads would occur within ROW disturbances.

In addition to new pipelines, existing pipelines and overhead electric lines would also be utilized to transport gas and electricity. Approximately 44,285 feet of existing co-located pipelines would be used by project wells, 1,923 feet of which would be located within the TBNG. There would be no new disturbed surface associated with the use of these pipelines or electric lines.

2.3.5.3 Central Gathering Facilities

Produced water and gas from project wells would be transported to six central gathering facilities. Three central gathering facilities would be constructed for this project. Three central gathering facilities exist and are in use by other non-project wells. Gas would be metered at each facility. Each central gathering facility requires approximately 0.25 acre of disturbance. The total amount of new disturbance associated with construction of all the headers would be 0.25 acre on USFS land and 0.5 acre on private land. Details pertaining to the central gathering facilities are shown in Table 2.3-6.

Table 2.3-6 Central Gathering Facilities

POD	Status	Surface Owner	Location	Number of Project Wells Served	New Disturbance (acres)
Thunderhead 1	Proposed	USFS	NE/4 Section 8, T43N/R71W	7	0.25
Thunderhead 2	Proposed	Private	SW/4 Section 10, T43N/R71W	4	0.25
	Existing	Private	NW/4 Section 14, T43N/R71W	6	NA
Thunderhead 3	Existing	USFS	SE/4 Section 13, T43N/R72W	4	NA
	Proposed	Private	SW/4 Section 20, T43N/R71W	8	0.25
	Existing	USFS	NE/4 Section 21, T43N/R71W	3	NA

2.3.5.4 Water Discharge Points

Produced water from project wells would be metered at the wellhead and then piped to six discharge points where produced water would be released into channels. All discharge points have been or would be permitted through the WDEQ-Water Quality Division (WQD) with NPDES permits. Three discharge points exist and are in use. An additional three discharge points are proposed to distribute the water. Two of the proposed new discharge points would be located on TBNG lands, and one would be located on private land. Each discharge point would require approximately 0.25 acre for construction purposes. New discharge points would require approximately 0.5 acre on USFS land and 0.25 acre on private land.

Maximum produced water discharge from the project wells is expected to be 14 gallons per minute (gpm) per well and would result in 448 gpm (1.0 cubic feet per second [cfs]) being discharged into the Little Thunder Creek watershed. Details describing discharge point construction can be found in the Hydrology Report (Greystone, 2002a) developed to support this project.

Existing and proposed discharge points are located on tributaries to Little Thunder Creek rather than the main creek channel to promote evaporation and infiltration. Suggestions were solicited from agencies and landowners during the onsite inspections and during project planning with respect to discharge point locations and improved design. Most discharge points are located in stable, well-defined, low-gradient ephemeral channels away from significant downstream head cuts or other major erosion features. These types of locations minimize the possibility of creating large “boggy” areas. All channels are able to accommodate the water proposed for discharge in addition to precipitation associated with naturally occurring storm events. Table 2.3-7 provides details of the produced water discharge points that would be utilized by project wells.

Table 2.3-7 Produced Water Discharge Points

POD	Status	Surface Owner	Location (T43N/R71W)	Number of Wells Served	Permit Number	New Disturbance (acres)
Thunderhead 1	Existing	Private	NE/4 Section 9	7	WY0037338-001	NA
Thunderhead 2	Proposed	Private	SW/4 Section 10	4	TBD ¹	0.25
	Existing	Private	NW/4 Section 13	6	WY0038211-001	NA
Thunderhead 3	Proposed	USFS	NW/4 Section 20	8	WY0042285-006	0.25
	Existing	Private	NW/4 Section 18	4	WY0042285-007	NA
	Proposed	USFS	NE/4 Section 21	3	WY0042315-003	0.25

¹ To be determined

The existing discharge points were inspected during the July 2001 onsites, are structurally sound, and would adequately manage the anticipated increase in flow. The existing discharge point in Section 9 would service wells in Section 8. This discharge point and associated water lines from

the NENE quarter of Section 8 were constructed after the approval of a separate project. Produced water from proposed wells in Sections 11 and 14 would be piped to the existing discharge point in Section 13. This discharge point and associated water lines, up to the USFS land boundaries, were constructed and approved as part of a separate project. Wells in Section 18 would be discharged to a facility in the northwest quarter of Section 18 on private land. This discharge point and associated water lines, up to the USFS land boundaries, were constructed after approval of a separate project.

New discharge points would be located in Sections 10, 20, and 21. The proposed locations were inspected during the July 2001 onsite inspections and were found to discharge into channels adequate to handle the expected flow. Water from wells in Section 10 would be piped to a discharge point located on private surface in the east half of the southwest quarter of the section. A naturally defined channel does not exist. A channel would be constructed with a ditcher or similar machine to the northwest of the discharge point to provide a flow path to the defined channel in the northwest quarter of the section. Water from wells in Section 20 would be discharged to a permitted location in the northwest quarter of Section 20. Water from wells in Section 21 would be discharged to a permitted location in the northwest quarter of Section 21.

Each discharge point would have a splash pad/water discharge structure installed to bring water to channel grade. The splash pad would consist of a 12-inch polyethylene pipe positioned vertically and armored at ground level by rock surrounding the discharge pipe. Where the discharge structure would be accompanied by a stock tank, the vertical section of polyethylene pipe would be positioned centrally inside the tank, allowing water to fill the tank. The splash pads below produced water discharge points would be armored using up to 10 cubic yards of clinker or gravel in the channel bottom to dissipate energy, covering the channel bottom to a depth of approximately one foot over a distance of 15 feet. The size of the rocks used would vary from three to six inches. Outfall design may include discharge aprons and downstream stabilization of channel side slopes to prevent accelerated erosion.

Erosion control methods would follow the guidelines described in Section 2.3.8. If increased erosion related to the release of produced water were observed in the channel of Little Thunder Creek or its tributaries, engineering measures, such as armoring the channel, would be applied in the impacted areas to prevent further erosion.

2.3.5.5 Culverts

All stream crossings would be handled by drainage structures incorporating culverts and drainage dips. Five new culverts and three existing culverts would be utilized to facilitate the flow of discharged water produced from project wells. Existing culverts were found to be in good condition during the July 2001 inspections. New culverts would be located at existing crossings of perennial channels or channels anticipated to have flows from produced water discharges. New culverts would be constructed in accordance with USFS guidelines and as detailed in the BLM and USFS Gold Book (BLM and USFS, 1989). Normal drainage is currently being accommodated by the use of 18-inch, 24-inch, and 36-inch culverts that are sufficiently sized to allow flood flow without degradation to roads or adjacent channel slopes. Similarly sized culverts have been installed under area roads and have sufficiently

accommodated anticipated flows. Each culvert would discharge produced water from its outfall across a galvanized steel, concrete, or rock splash pad to the channel bottom. More detail with respect to culverts can be found in the Hydrology Report (Greystone, 2002a).

Lance would minimize surface disturbance at stream crossings during construction to prevent erosion and sediment movement. Culverts would be covered with scoria over fill. A road dip would be constructed at the culvert, resulting in a combination of low water crossing and culvert drainage. The road dip would facilitate storm water drainage and would also minimize surface disturbance during construction. Native vegetation would remain undisturbed to the extent possible to help stabilize slopes and soils. Filled areas would be re-seeded in the spring or fall during the first growing season following development.

Retrofitting to upgrade existing culverts would be completed prior to project construction. Culverts or fords that require remedial work would follow the guidelines described in this section and in Section 2.3.8. The locations of the proposed new culverts are shown on Figure 2.3-1. No fords, drainage dips, or low water crossings are planned for this project.

2.3.5.6 Gates and Cattle Guards

In general, a cattle guard and metal gate would be installed where access to USFS lands crosses a fence line, between private and public lands, or between different grazing allotments. In one case, however, the gate between the north and south halves of Section 18 would not be installed at the request of a surface owner. Approximately six new gates and six new cattle guards would be installed for range management. The locations for the currently identified proposed gates and cattle guards are shown on Figure 2.3-1.

2.3.5.7 Stock Tanks

Facilities that would enable the CBNG produced water to be used for beneficial use include flow-through and valved stock tanks. Site-specific designs that employ best management practices were developed to accommodate livestock access to water, control erosion, and limit sedimentation. Several valved stock tanks would be constructed to allow “at-will” access to water by the leaseholder for stock watering.

Six stock tanks would be installed during project development. Plans for flow-through stock tanks were reviewed during the July 2001 onsite inspections. The last four tanks in the list below have been requested by surface lessees or private landowners:

- A tank would be located near the Federal 23-11-4371 in Section 11 on TBNG surface.
- A tank would be located near the Federal 21-21-4371 in Section 21 on TBNG surface.
- A tire tank would be located at the Federal 23-8-4371 well in Section 8 on TBNG surface. The tank would be a closed-system stock tank with pressure flow and shutoff valves.
- A closed-system tank with pressure flow and shutoff valves would be installed at the fence line just northwest of the Stuart Federal 34-10-4371 well site in Section 10 on TBNG surface. This would be a flow-through system with the water line ending on the

west side of the fence on private property. A trench would be dug pass through the natural swale, then to an established watercourse in the SWNW of Section 10.

- A closed-system stock tank would be located near the discharge point for Thunderhead 3 in Section 18 on privately owned surface, located above a small reservoir just southwest of the previously approved Federal 12-18-4371 well site.
- A closed-system stock tank would be located at the playa east of the Federal 34-20-4371 well in Section 20 on TBNG surface.

To meet a lessee's request, a closed-system stock tank would be used to receive produced waters from project wells in Section 8 at a privately owned reservoir in the SWSWNW of Section 9, T43N/R71W. The reservoir is on a tributary to Rochelle Lake, which is a playa and defined as a closed basin. A valved connection on a lateral line would provide water to this private reservoir. The locations for the proposed stock tanks are shown on Figure 2.3-1.

2.3.6 Reclamation

Surface disturbance associated with the removal of well site facilities would be reclaimed in accordance with the APD COAs, Special Use Permits, or the SUPO. All disturbed areas would be reseeded in order to re-establish native vegetation.

Depleted well bores would be plugged and abandoned in accordance with Onshore Oil and Gas Order No. 2. A pipe monument including the location, lease number, operator, and well name would be required unless waived by the BLM or USFS. If waived, the casing may be cut off and capped below ground level. All other surface facilities associated with a well would be removed. The well site would be scarified to a depth of six inches. Disturbed surfaces would be returned to the original contours of the land prior to reseeded.

A seed drill would be used to plant a seed mix of perennial species to allow their establishment and the encroachment of other native species. Access would be restricted to reseeded areas to ensure a successful reclamation effort. The seed mix will be approved by the USFS at the time of reclamation.

If the well were assigned, all rights and responsibilities, including reclamation would pass to the USFS unless otherwise specified. The USFS would then permit the well for beneficial use according to WSEO procedures and policies.

The Road Management Plan (USFS, May 2002) for the project would determine which project roads would be reclaimed and which roads would be incorporated into the existing roads network. The two-track roads from the production facilities to the well sites would be scarified to a depth of six inches. Scoria and drainage culverts would be removed prior to reseeded. Disturbed surfaces would be returned to the original contours of the land.

Buried pipelines and utilities would be left in place. The pipelines would be flushed with water at post-production and prior to abandonment. Surface disturbance associated with their removal would be reclaimed in accordance with the APD COAs, Special Use Permits, or the SUPO.

2.3.7 Surface Disturbance Summary

Implementation of the Proposed Action would result in short and long-term new disturbances to the surface. These disturbances represent construction upon previously undeveloped land. Long-term disturbance consists of roads, well sites, water discharge points, and central collection facilities and would be present for the life of the project. Short-term disturbance associated with underground utility corridors and portions of the road ROWs would occur during a portion of the project life and would be reclaimed immediately following construction, typically prior to establishment of vegetation associated with interim reclamation.

Approximately 77 acres would be initially disturbed with the implementation of the Proposed Action, including 54 acres on TBNG lands and 23 acres on private lands. After interim reclamation, a large part of each well site and the surface where utility trenches were constructed would be returned to their natural states after the native vegetation has had time to re-establish. Some roads would be decommissioned and reclaimed in association with project development. Approximately 13 acres of roads would be decommissioned by Lance and the USFS. Long-term disturbance would, therefore, consist of well sites after interim reclamation, travel surfaces of new roads, central gathering facilities, and discharge points. This amount would be reduced by the acreage corresponding to the decommissioned roads. The residual long-term disturbance would consist of the difference between the acreage initially disturbed and the acreage revegetated during interim reclamation plus the acreage corresponding to decommissioned roads. Therefore, long-term disturbance would consist of approximately eight acres, including approximately six acres on TBNG lands and two acres on private lands. This amount represents approximately 0.28 percent of the Project Area and 0.001 percent of the acreage in the TBNG.

A summary of short- and long-term disturbance associated with the project is indicated in Table 2.3-8. The disturbance figures shown for utility trenches include both stand-alone trenches and the incremental amount of disturbance incurred when trenches would be installed adjacent to roads.

Table 2.3-8 Disturbance Associated with the Proposed Action; Thunderhead 1, 2, and 3¹

Facility	Short-Term Maximum Disturbance (Acres)			Long-Term Maximum Disturbance (Acres)		
	USFS	Private	Total	USFS	Private	Total
Surface Ownership						
Well Sites	7.3	0	7.3	3.2	0	3.2
Central Gathering Facilities	0.25	0.5	0.75	0.25	0.5	0.75
Discharge Points	0.5	0.25	0.75	0.5	0.25	0.75
Roads	33.9	2.9	36.9	15.1	1.1	16.2
Pipelines/Utility (stand alone)	11.4	19.7	31.1	0	0	0
Sub-Total	53.4	23.4	76.8	19.0	1.8	20.9
Decommissioned Roads	-	-	-	13.0	0	13.0
Total Disturbance	53.4	23.4	76.8	6.0	1.8	7.9

¹ Minor discrepancies in totals due to rounding

In addition to disturbance associated with construction and project development, the Proposed Action would also utilize existing facilities, such as roads, pipelines, and central gathering facilities.

2.3.8 Conditions of Approval and Mitigation Measures

Project development and operation would be subject to the CBNG COAs implemented by the TBNG and site-specific mitigation measures developed during the July 2001 onsite inspections conducted by representatives of Lance, the USFS, and the BLM. A complete listing of the TBNG CBNG COAs is included in Appendix D. These and other measures have been incorporated by Lance into the Proposed Action, and their legal bases are indicated in Table 2.3-9.

Table 2.3-9 Mitigation Measures Incorporated Within the Proposed Action

Federal Requirements	
Drilling and Construction	
General	
The disposal of trash, sewage, and other waste materials would be mitigated through defined procedures.	Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4(b)(7); Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology
Noise and odor would be minimized by the use of effective muffling of equipment engines and regular engine maintenance.	Noise Control Act of 1972 (42 USC 4901 et seq., as amended)
If previously undiscovered cultural resources were found, Lance would notify the USFS or BLM, as appropriate, and cease operations at the site pending agency evaluation.	Archeological Resources Protection Act of 1979 (16 USC 470), FSM 2361.21
Lance would instruct its employees and contractors in procedures to be followed in the event of discovery of human remains as required by applicable regulations. Lance has conducted a Class III cultural resource survey of the Project Area and has prepared a monitoring and mitigation plan.	Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001, 43 CFR 10)
Roads	
Most new roads to well sites would be roughed in as two-track roads to minimize disturbance.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology

<p>If the well were completed, the access road would be maintained as necessary to prevent soil erosion and accommodate year-round use.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>Lance would prohibit off-road travel by its employees or contractors except in emergency situations.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>No road construction is expected to occur on slopes greater than 8% and no surface disturbance or occupancy would occur on slopes in excess of 25%.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>Gravel or scoria may be applied to soft, rut-prone areas. Travel on two-track roads would be rescheduled or postponed during infrequent periods of wet weather when vehicular traffic could cause rutting. Only if necessary, access would be via four-wheel all terrain vehicles or on foot.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>Completion</p>	
<p>Surface casing would be installed to protect fresh water aquifers.</p>	<p>Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases,, III.G.4.(a)(2); Onshore Order No. 2 Drilling III.B</p>
<p>When a well is completed, all disturbed areas that are not needed for production facilities would be restored as soon as practical and typically within six months.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>Well Sites</p>	
<p>Construction activities at well sites would be kept to a minimum to limit disturbance of vegetation and underlying soils, significant wildlife habitat, recreational value, wetlands, or riparian areas. Surface disturbance within 100 feet of ephemeral drainages would be avoided.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; Executive Order 11990</p>
<p>Lance would employ the following mitigation measures in relation to wetlands:</p> <p>Wetland and flood-prone areas would be crossed only during dry conditions. Winter construction activities would occur only when soils are not frozen.</p> <p>As soon as possible following construction, wetland or drainage channels would be reclaimed as closely</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>

<p>as feasible to pre-construction conditions. Where impermeable soils contributed to wetland formation, soil compaction would be used to reduce permeability.</p> <p>Streams and ephemeral drainages would be crossed perpendicular to flow direction, wherever practical. Wetland topsoil would be selectively handled.</p> <p>Recontouring and UFSF-approved native species would be used for revegetation and soil stabilization.</p>	
Pipelines	
<p>Gas and produced water gathering pipelines would be placed together in the same trench/ditch wherever possible to minimize surface disturbance.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>All pipelines would be installed in ROWs along access roads or in utility corridors wherever possible to minimize disturbance.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
Produced Water	
<p>Produced water outfall points would be stabilized with concrete, rock, or other appropriate materials to reduce discharge velocities and minimize splash and erosion between the outfalls and the channels.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore No. 7 Disposal of Produced Water III.G</p>
Electrical Power Utilities	
<p>Secondary electric power lines would usually be co-located in common trenches with gathering and produced water pipelines, eliminating additional surface disturbance.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
Construction Resource Requirements	
<p>Construction water would be obtained from approved local sources, typically from a nearby producing CBNG well.</p>	<p>Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(b)(2)</p>
Production and Maintenance Operations	
General	
<p>A field-wide Spill Prevention Control and Countermeasures Plan (SPCCP) would be developed, if necessary, to mitigate unplanned spills.</p>	<p>40 CFR 112.1(b), 112.1(d), 112.1(f), 112.3(a) through 112.3(c), 112.3(f), and 112.4</p>
<p>Automated well telemetry equipment would remotely monitor project wells, eliminating the need for daily routine inspections by lease operators and reducing the amount of field traffic.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; Forest Service Handbook 7709.55 – Transportation Handbook</p>
Roads	
<p>The maintenance program would be consistent with standard maintenance operations in the area and would include postponing travel on two-track roads</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore</p>

during and immediately after wet weather when rutting could occur.	Federal and Indian Oil and Gas Leases, III.G.4.(b)(2); FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Noxious weeds along roads would be subject to control measures.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; Executive Order 13112-Invasive Species
Herbicides would not be stored within 500 feet of any special status plant species.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; Executive Order 13112-Invasive Species
Decommissioning and Reclamation	
General	
Lance would follow agency procedures or surface owner specifications designed to reclaim disturbed areas as close to pre-development conditions as feasible.	43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.C., V.; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Lance would plug and abandon each well according to BLM and USFS requirements.	43 CFR 3162.3-4; Onshore Oil and Gas Order No. 2, Section III.G; Onshore Order No. 1, Section V; Mineral Leasing Act of 1920
Roads	
Reclaimed roads on federal lands would be reseeded with a seed mixture approved by the appropriate agency.	43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.C., V.; BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Pipelines and Electric Utilities	
Underground pipelines would be cleaned, disconnected, and abandoned to avoid unnecessary surface disturbance.	43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.C., V.; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Underground electric lines would be disconnected and abandoned in place to avoid unnecessary surface disturbance.	43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.C., V.; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
State Requirements	
General	
Lance would adhere to applicable national ambient air quality standards (NAAQS) and Wyoming ambient air quality standards (WAAQS) as required by WDEQ.	WDEQ, Air Quality, Chapter 3, Section 2(f); Clean Air Act, 42 USC 7401 et seq.
Noise and odor would be minimized by the use of effective muffling of equipment engines and regular engine maintenance.	WDEQ, Air Quality, Chapter 2, Section 11(a)(ii) Ambient Standards; EPA environmental noise guidelines

Drilling and Construction	
Pipelines	
Pipelines would cross streams according to the requirements of permitting under Section 404 of the Clean Water Act.	WDEQ, Water Quality, Chapter II, Sections 1 and 2(a); Clean Water Act, 33 USC 1251 et seq.
At least 30 days prior to construction, Lance would prepare a Stormwater Pollution Prevention Plan and file a Notice of Intent with the WDEQ.	WDEQ, Water Quality, Chapter II, Sections 9(c), 10(a)(6), and 12(b) through (d); Clean Water Act, 33 USC 1251 et seq.
Produced Water	
The produced water outfall points would be discharged on the surface for beneficial use. Lance would monitor discharge points in accordance with WDEQ NPDES permit requirements.	WDEQ, Water Quality, Chapter II, Section 3(a)(1) and (2); Clean Water Act, 33 USC 1251 et seq.
Lance has committed to a sampling and analysis program as well production results in produced water discharges. Details of the sampling program are contained in the Hydrology Report (Greystone, 2002a, p. 10).	WDEQ, Water Quality, Chapter II, Section 3(a)(1) and (2); Clean Water Act, 33 USC 1251 et seq.
Decommissioning and Reclamation	
Lance would plug and abandon each well according to WOGCC requirements.	WOGCC regulations, Chapter 3, Section 14
Applicant-Committed Mitigation Measures	
Drilling and Construction	
General	
Onsite inspections of USFS portions of the Proposed Action have been conducted by representatives of the USFS, BLM, and Lance, and resultant mitigation measures have been incorporated into this EA	NEPA, 42 USC 4321 et seq; 40 CFR Parts 1500-1508; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.C., III.G.5
Lance has offered a water well agreement to nearby landowners to ensure that water wells would be protected all from unintentional effects of CBNG development associated with the proposed project. The agreement would apply to all wells that lie within 0.5 mile of the wells proposed for the Thunderhead 1, 2, and 3 PODs. A list of all water wells that are located within those limits is included in the Hydrology Report (Greystone, 2002a). A typical water well agreement is included in Appendix E.	Onshore Oil and Gas Order No. 1 - Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, III.G.4.(a)(2); Onshore Order No. 2 Drilling III.B.; Safe Water Drinking Act 42 USC 300 et seq; WDEQ, Water Quality, Chapter II, Section 3(a)(1) and (2); Clean Water Act, 33 USC 1251 et seq.
Lance would require staff and contractors to safely operate motor vehicles to minimize the risk of collisions with wildlife, would acquaint staff and contractors with applicable wildlife laws, and would discipline workers violating such policies and laws.	Occupational Safety and Health Act, OSHA, 20 USC 651 et seq.

Lance would use watering or other dust control techniques to reduce fugitive dust emissions from traffic on unpaved roads.	WDEQ, Air Quality, Chapter 3, Section 2(f)); Clean Air Act, 42 USC 7401 et seq.
Lance would prohibit staff and contractors from illegal collection or destruction of cultural resources and would discipline workers violating such policies and laws.	Company policy
Firearms and dogs would not be allowed within the Project Area and Lance drug, alcohol, and firearms policies would be rigorously enforced.	Company policy
Lance would implement hiring policies that would encourage the employment of area residents and, to the extent feasible, would purchase equipment and materials from local area merchants.	Company policy
Lance would monitor and remove carrion along roads to minimize the attraction of scavenging raptors.	Company policy
Paleontological Resources	
Lance has conducted a pedestrian paleontological survey of portions of the Project Area with high potential for discovery of vertebrate fossils and has prepared a monitoring and mitigation plan.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Roads	
Lance submitted a Transportation Plan that assists the USFS in the completion a Roads Analysis Plan for efficient transportation management.	Forest Service Handbook 7709.55 – Transportation Handbook; 30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Order #1, III.G.4.(b)(2); BLM Gold Book; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Lance will limit access from public to private lands at the request of private landowners.	Company policy
Produced Water	
Prior to the discharge of any proponent produced CBNG water, Lance will fill the holes behind the Little Thunder Dam spillway walls with compatible materials located on site or a bentonite mixture.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore No. 7 Disposal of Produced Water III.G
Prior to the discharge of any proponent produced CBNG water, Lance will submit plans to armor the area between the embankment and the spillway on Little Thunder Reservoir, and after the plans are approved by the Forest Service official, implement the armoring.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore No. 7 Disposal of Produced Water III.G

Production Facilities	
A metal fence or rail may be placed around well houses and electrical panels to protect them from livestock or big game animals.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983). VII.; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Well houses would be painted in a color specified by the USFS and/or BLM to minimize visual impact. The facilities would be painted within six months after being installed. Any facility requiring safety colors to meet the Wyoming Occupation Health and Safety (WOSH) Standards would be painted to meet WOSH standards.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; WY OSHA Development Plan, 40CFR 1910 and 1926
Pipelines	
Lance would prohibit construction or routine maintenance activities during periods when soil is too wet to adequately support construction equipment. Pipe would be buried and open trenches closed as soon as practical.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Construction of pipelines would be planned to minimize impact to public use of existing roads and trails, or inhibit wildlife or livestock movement.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Trees would be avoided during construction. Disturbance to areas of heavy sagebrush cover would be avoided as planned in on-site inspections. Soils would be left undisturbed over most of the construction work area.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f)
Reclamation would begin immediately after the pipeline is buried, weather permitting.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983). VII.; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology
Production and Maintenance Operations	
General	
Lance routinely performs monitoring and treatment of weed infestations on its properties. Identified populations of weeds will be brought to the attention of the Forest Service and corrective actions will be determined and performed.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; FSM 2100 Environmental Management and FSM 2800 Minerals and Geology; Executive Order 13112-Invasive Species
Lance would repair/replace required fences as necessary in order to prevent cattle access to project facilities.	Company policy
Produced Water	
Produced water would be beneficially used for stock and livestock watering where possible.	WDEQ, Water Quality, Chapter II, Section 3(a)(1) and (2); WDEQ, Water Quality, Chapter II, Section 3(a)(1) and (2); Clean Water Act, 33 USC 1251 et seq.; 43 CFR 3162.3-1(f)

<p>A project Water Management Plan (Hydrology Report, Greystone, 2002a) was developed and submitted to the USFS to anticipate produced water volumes and effectively manage its disposition.</p>	<p>Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project; 43 CFR 3162.3-1(f); Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology</p>
<p>At the request of local landowners or surface lessees, Lance would install stock tanks to receive produced water. The stock tanks will be designed site-specifically, using best management practices, to accommodate livestock access to water, control erosion, and limit sedimentation. Plans for flow-through stock tanks were reviewed during the onsite inspection.</p>	<p>Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983). VII</p>
<p>Lance would monitor each discharge point on a monthly basis during the first year of operation. Inspectors would note the condition of the discharge point, check for evidence of accelerated erosion due to continuous discharge of produced water, and schedule any remedial work if required. After the first year of operation, inspections would only occur annually, unless specific sites have required remedial action. Monthly monitoring of sites requiring remedial action would continue until no further remedial action involving the redesign of the discharge point has been required for a period of one year.</p> <p>Dam outlets (spillways and pipes) and culvert outlets would be checked quarterly or after major storm events for the first year of operation.</p> <p>Erosion stabilization measures (headcuts, etc.) would be inspected for signs of erosion or structural failure. Inspectors would note condition and schedule any remedial work if required. Downstream channel (below the well(s)/project) would be inspected for signs of accelerated erosion due to the continuous flow of produced water. After the first year of operation, inspections would occur annually unless specific sites have required remedial action.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore No. 7 Disposal of Produced Water III.G</p>
<p>If increased erosion is observed in the channel of Little Thunder Creek or its tributaries related to the discharge of CBNG produced water, engineering measures would be applied in the impacted areas to prevent further erosion</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); 43 CFR 3162.5-1; Onshore No. 7 Disposal of Produced Water III.G</p>
<p>Decommissioning and Reclamation</p>	
<p>General</p>	
<p>Lance would follow agency procedures or surface owner specifications designed to reclaim disturbed areas as close to pre-development conditions as possible.</p>	<p>30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology</p>

Roads	
Unneeded constructed roads would be blocked, re-contoured, reclaimed, and revegetated consistent with the requirements of the BLM, USFS, and the State of Wyoming.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Order #1, III.G.4.(b)(2); Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983); Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology
Two-track roads scheduled for decommissioning would be reclaimed by ripping or plowing and drill seeding if deemed necessary by the USFS.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Order #1, III.G.4.(b)(2); Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983). VII.; Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology
Well Sites	
Well sites would be re-contoured, plowed, and seeded consistent with the procedures described in the APD SUPO or COAs.	30 USC Section 226(g), Mineral Leasing Act of 1920; 43 CFR 3162.3-1(f); Onshore Oil and Gas Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases 48 FR 48916 (1983). VII.; Forest Service Manual (FSM) 2100 Environmental Management and FSM 2800 Minerals and Geology

The actions described in Alternative B are consistent with the oil and gas lease standards and guidelines, stipulations described in the TBNG LRMP, and standard COAs for CBNG wells on USFS lands, as detailed in the 1994 ROD for the TBNG LRMP/FEIS. Most of the leases were issued prior to the finalization of the TBNG LRMP, and lease stipulations reflect management policies in practice when the 1987 *Medicine Bow National Forest Land and Resource Management Plan* was effective; however, at the behest of the USFS, Lance agreed that all operations performed in association with the Proposed Action would be subject to standards and guidelines described in the TBNG LRMP. Standard COAs for CBNG wells on the TBNG would also apply and are listed in Appendix D of this EA. In addition, site-specific COAs were developed by the TBNG for each of the proposed wells. Site-specific COAs are listed in Appendix D.

Most of the TBNG LRMP standards and guidelines that would affect the Proposed Action are biological in nature and are more extensive than those contained in the leases. Other lease stipulations include the requirements for conducting surveys for cultural and paleontological surveys prior to undertaking any surface disturbing activities. The TBNG LRMP biological standards and guidelines are summarized in Table 2.3-10.

Table 2.3-10 TBNG LRMP Biological Oil and Gas Standards and Guidelines

Timing Limitations (TL)	Start	End	TBNG LRMP	Waivers and Exceptions
Ferruginous and Swainson's hawk nests	3/1	7/31	0.5-mile radius (LOS)	No nesting activity past 7 years
Golden eagle nests	2/1	7/31	0.5-mile radius(LOS)	No nesting activity past 7 years
Merlin nests	4/1	8/15	0.5-mile radius(LOS)	No nesting activity past 7 years
Sharp-tailed grouse leks	3/1	6/15	1.0-mile radius(LOS)	No display activity past 2 years or no current activity by May 1
Sage grouse leks	3/1	6/15	2.0-mile radius(LOS)	No display activity past 5 years or no current activity by May 2, max noise 49 dBA
Mountain Plover nest areas	3/15	7/31	0.25-mile radius(LOS)	No nests or no active nesting by 6/10
Black-footed Ferret habitat	3/1	8/31	0.125-mile radius of prairie dog colonies potentially inhabited by BFF(LOS)	Survey clearances
Swift fox dens	3/1	8/31	0.25 mile radius(LOS)	No dens or demonstration of acceptable impacts
Controlled Surface Use (CSU)	TBNG LRMP			Waivers and Exceptions
Black-footed Ferret habitat	80-ac spacing, lost habitat replace 1 yr, minimize new roads, daylight operations			Unlikely
Mt. Plover habitat	80-ac spacing, lost habitat replace 1 yr, minimize new roads, 9am-5pm operations			Unlikely
No Surface Occupancy (NSO)	TBNG LRMP			Waivers and Exceptions
Mountain Plover nests and nest areas	0.25-mile known nests			Unlikely
Bald Eagle nests	1.0-mile known nests(LOS)			Demonstration of non-occupation last 7 years
Bald Eagle winter roosts	1.0-mile known roosts(LOS)			Roost no longer active or acceptable impact
Golden eagle, burrowing owl, merlin, Ferruginous hawk, Swainson's hawk nests	0.25-mile known nests(LOS)			Demonstration of non-occupation last 7 years
Sharp-tailed and Sage grouse leks	0.25-mile active leks(LOS)			Demonstration of non-activity last 2 seasons (sharp-tailed) or 5 seasons (sage), or acceptable impacts

LOS - Line of Sight

2.4 ALTERNATIVE C - MODIFIED DEVELOPMENT SCENARIO

Alternative C is nearly identical to Alternative B, the Proposed Action. Alternative C was developed in response an issue identified during the scoping process:

Adverse impacts to sage grouse and ferruginous hawks could result from the connecting routes and well sites for the wells 14-8 and 23-8 in Thunderhead POD 1 and 21-11 and 12-11 in Thunderhead POD 2, Township 43 North, Range 71 West.

Alternative C was developed to eliminate proposed wells and the roads that could possibly adversely impact sage grouse leks and ferruginous hawk nests. One or more ferruginous hawk nests in Section 11 were reported as active within the last seven years. During the biological surveys conducted in association with the proposed project, the exact location and current status of the nest(s) could not be verified. Alternative C was developed, in part, to avoid possible disturbance to ferruginous hawk habitat. The two well locations removed from Alternative C could not be moved outside of the ¼-mile (line-of-sight) buffer of the two most recently identified nest sites. The Stuart II sage grouse lek is located in Section 8 within ¼-mile of the proposed Federal 14-8-4371 and Federal 23-8-4371 wells. Although activity has not been reported on this lek since 1992 (Greystone, 2002, page 13), these wells were omitted in this alternative.

Under Alternative C, Lance would drill and operate 28 CBNG wells within Thunderhead 1, 2, and 3. Four of the wells proposed under Alternative B would not be drilled, and the routes that would connect them would not be constructed. All of the omitted wells and roads would have been located on TBNG surface. Additional infrastructure not included under Alternative B but present in this alternative includes the construction of a two-track access road, designated as W0811 in the Transportation Plan (Greystone, 2002). This road would be constructed in Thunderhead 1 and would be approximately 1,668 feet in length, or approximately 0.32 mile long. The road would connect wells Federal 34-8-4371 and Federal 43-8-4371 in the SE quarter of Section 8. Major facilities that would be constructed under Alternative C are shown in Figure 2.4-1. A summary of short and long-term disturbance associated with the 28 wells considered in Alternative C is indicated in Table 2.4-1.

Table 2.4-1 Disturbance Associated with the Alternative C; Thunderhead 1, 2, and 3¹

Facility		Short-Term Maximum Disturbance (Acres)			Long-Term Maximum Disturbance (Acres)		
		USFS	Private	Total	USFS	Private	Total
Well Sites	28	6.4	0	6.4	2.8	0	2.8
Central Gathering Facilities	3	0.25	0.5	0.75	0.25	0.5	0.75
Discharge Points	3	0.5	0.25	0.75	0.5	0.25	0.75
Roads	10.5 miles	30.7	2.9	33.6	13.5	1.1	14.6

Facility		Short-Term Maximum Disturbance (Acres)			Long-Term Maximum Disturbance (Acres)		
		USFS	Private	Total	USFS	Private	Total
Pipelines/Utility	10.7 miles	11.4	19.7	31.1	0	0	0
Sub-Total	-	49.3	23.4	72.6	17.1	1.8	18.9
Reclaimed roads	8.9 miles	-	-	-	13.0	0	13.0
Total	-	49.3	23.4	72.6	4.1	1.8	5.9

Adapted from Greystone, 2003

¹ Minor discrepancies in totals due to rounding

Facilities, including wells and roads, included under the Proposed Action that would not be developed or constructed under this alternative are shown in Table 2.4-2.

Table 2.4-2 Facilities Not Included in Alternative C

POD	Facility Name	Location	Well Site Disturbance (acres)		Road Length and Disturbance			
			Short Term	Long Term	Feet	Miles	Short Term ¹ (acres)	Long Term (acres)
Thunderhead 1	Federal 23-8-4371	T43N/R71W, Section 8: Lot 11 (NESW)	0.23	0.1	-	-		
	Federal 14-8-4371	T43N/R71W, Section 8: Lot 13 (SWSW)	0.23	0.1	-	-		
	Roads 932A6 (2T); 932A6A ² (2T) and adjacent pipeline	T43N/R71W, SW and NE quarter of Section 8			3,649	0.7	2.1	1.0
	Tire tank	Federal 23-8-4371 well in Section 8	NA	NA	-	-		
Thunderhead 2	Federal 21-11-4371	T43N/R71W, Section 11: Lot 03 (NENW)	0.23	0.1	-	-		
	Federal 12-11-4371	T43N/R71W, Section 11: Lot 05 (SWNW)	0.23	0.1	-	-		
	Road W1112 (2T) and adjacent pipeline	T43N/R71W, W half of Section 11			3,688	0.7	2.1	1.0
Total ³			0.9	0.4	7,337	1.4	4.2	2.0

Source: Adapted from Greystone, 2002 and 2003

¹ Includes road and pipeline disturbance

² Transportation Plan designations (Greystone, 2002)

³ Minor discrepancies in totals due to rounding

If Alternative C were implemented, total short-term disturbance would be approximately 73 acres, including 49 acres on TBNG lands, or approximately 4 acres fewer than the short term disturbance associated with Alternative B. After interim reclamation, the total long-term disturbance would be approximately six acres, four acres of which would be on TBNG land. Alternative C would result in two fewer acres of long-term disturbance than that associated with Alternative B.

Figure 2.4-1 Modified Development Scenario Map

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All COAs and mitigation measures that would be applied to the 32 wells described in the Proposed Action would also apply to the development of the 28 wells in Alternative C. The actions included in this alternative are consistent with the lease stipulations, the TBNG COAs, and the standards and guidelines in the TBNG LRMP.

2.5 IMPACT AND MITIGATION MONITORING AND REPORTING

The Mitigation and Monitoring Plan is considered "strategic" for purposes of the Project's monitoring and evaluation effort. It is strategic in that it provides a conceptual framework within which specific monitoring and evaluation criteria can be built. The plan is intended to be a flexible component that could change as new methodologies and techniques are developed throughout the life of this project. This section does not display all of the specific monitoring and evaluation criteria for any particular resource. Other criteria are found throughout this EA, in the COAs, the SUPO, the APDs, and the TBNG LRMP. The measures outlined below are not exclusive of other measures but are detailed to provide guidance to those persons who are obligated to carry out this task and produce the required documentation.

Lance, in cooperation with the USFS, will develop a specific monitoring program to:

- Verify implementation of mitigation measures adopted in the Decision Notice;
- Measure the success of implemented mitigation measures;
- Modify measures as needed based on observed performance;
- Allow for peer review of measures effectiveness; and
- Provide feedback to interested public.

The following resources are of particular concern; however, this plan may be amended, as determined by the authorized officer, at any time when it is warranted.

- Air Quality
- Wildlife, including raptors
- Water – groundwater, surface water, wetlands, and riparian areas
- Aquatics
- Surface disturbance/revegetation/noxious weed spread.

The following table will be utilized and added to or otherwise amended to meet specific requirements as analyzed in the EA. The USFS will require a buy-off on the program, the tasks to be implemented and monitored, and the acceptance of a final plan prior to commencement of activity on the part of the operator.

Table 2.5-1 Mitigation and Monitoring Plan for the Thunderhead PODs

Resource to be Monitored	Person or position Responsible for accomplishment	Frequency/timing	Reason for Monitoring	Notes
Air quality	Operator will maintain contact with and abide by all regulations imposed by EPA and WYDEQ.	Prior to construction activities and during routine operations.	To ensure air quality remains within state specified air quality constraints.	Operator will maintain documentation of all required permits and notifications.
Raptor nest locations	USFS Wildlife Biologist will review all new site locations and concur or not.	During or after survey/staking and prior to activity commencing.	To protect individuals, or their habitat from encroachment or disturbance.	Operator will maintain close contact with Project Manager and /or Biologist to determine schedule.
Raptor protection or perch inhibitors on power lines	USFS Surface Protection Specialist or Lands Officer will verify installation.	During or after installation of all inhibitors or protections.	To protect individuals from electrocution or prevent them from utilizing power lines as hunting perches.	Operator will report installation of power lines to USFS Project Manager for field review and sign-off.
Water quality - groundwater	Operator will offer a water well agreement to nearby landowners to ensure that water wells would be protected all from unintentional effects of CBNG development associated with the proposed project. The agreement would apply to all wells that lie within 0.5 mile of the wells proposed for the Thunderhead 1, 2, and 3 PODs.	Prior to initiating construction activities.	To ensure nearby landowners with water wells have legal safeguards with respect to the water quality of their wells.	Operator will maintain documentation of all water well agreements, subsequent associated correspondence/documents if they/as they occur, and will submit documentation to the USFS upon request.
Water quality – surface water	Operator will monitor each discharge point. Inspectors would note the condition of the discharge point, check for evidence of accelerated erosion due to continuous discharge of produced water, and schedule any remedial work if required.	Monthly during the first year after produced water is initially discharged to the surface. After the first year of operation, inspections would only occur annually, unless specific sites have required remedial action. Monthly monitoring of sites requiring remedial action would	To maintain surface water quality.	Operator will maintain documentation of all inspection forms, will inform the USFS if remedial action is necessary, and will submit documentation to the USFS upon request.

Resource to be Monitored	Person or position Responsible for accomplishment	Frequency/timing	Reason for Monitoring	Notes
		continue until no further remedial action involving the redesign of the discharge point has been required for a period of one year. WDEQ NPDES monitoring requirements will also be met.		
	As long as Operator produced CBNG water from the project is reaching Little Thunder Reservoir, Operator will monitor seepage downstream of the Little Thunder Reservoir dam to (a) determine if seepage is increasing and/or whether seepage water is cloudy and/or carrying suspended solids and (b) check for sandboils and/or the formation of sinkholes on the embankment slopes/crest, for whirlpools in the reservoir and for instability on the slopes.	Every three years and after significant (>10 year) storm events and be conducted by personnel familiar with dam inspections.	To maintain surface water quality and ensure reservoir integrity.	Monitoring results will be submitted to the USFS within 30 days after each inspection or within 2 days if problems are noted.
	Operator will check dam (spillways and pipes) and culvert outlets.	Quarterly, or after major storm events for the first year of operation.		Operator will maintain documentation of all inspection forms , will inform the USFS if remedial action is necessary, and will submit documentation to the USFS upon request.
	Operator will inspect erosion stabilization measures (headcuts, etc.) for signs of erosion or structural failure. Inspectors will note condition and schedule any	Monthly during the first year after produced water is initially discharged to the surface. After the first year of operation, inspections would only occur annually,	To maintain surface water quality.	Operator will maintain documentation of all inspection forms, will inform the USFS if remedial action is necessary, and will submit documentation

Resource to be Monitored	Person or position Responsible for accomplishment	Frequency/timing	Reason for Monitoring	Notes
	<p>remedial work if required. Downstream channels (below the well(s)/project) will be inspected for signs of accelerated erosion due to the continuous flow of produced water.</p> <p>If increased erosion is observed in the channel of Little Thunder Creek or its tributaries related to the discharge of CBNG produced water, engineering measures would be applied in the impacted areas to prevent further erosion. Operator will submit plans to armor the area between the embankment and the spillway on Little Thunder Reservoir, and after the plans are approved by the Forest Service official, implement the monitoring.</p>	<p>unless specific sites have required remedial action. Monthly monitoring of sites requiring remedial action would continue until no further remedial action involving the redesign of the discharge point has been required for a period of one year.</p>		<p>to the USFS upon request.</p>
	<p>Operator will commit to a sampling and analysis program as well production results in produced water discharges.</p>	<p>As specified in NPDES discharge permit requirements.</p>	<p>To ensure that surface water quality is not compromised with the discharge of CBNG produced water discharge.</p>	<p>Details of the sampling program are contained in the Hydrology Report (Greystone, 2002a, p. 10).</p>
<p>Noxious weed control</p>	<p>Operator will routinely perform monitoring and treatment of weed infestations on its properties. Identified populations of weeds will be brought to the attention of the Forest Service and corrective actions will be</p>	<p>Annually.</p>	<p>To prevent the spread of noxious vegetation.</p>	<p>Operator will submit receipts for all herbicides, document their application and submit annually to USFS Project Manager.</p>

Resource to be Monitored	Person or position Responsible for accomplishment	Frequency/timing	Reason for Monitoring	Notes
	determined and performed.			
Road and disturbed surface reclamation	Unneeded constructed roads will be blocked, re-contoured, reclaimed, and revegetated by the Operator consistent with the requirements of the BLM, USFS, and the State of Wyoming.	Subsequent to interim and final reclamation of any disturbed area.	To ensure that the landscape is returned to its original condition as much as possible.	Operator will submit receipts for all seed mix to verify “weed free” mixes are being used, and verify appropriate application rate for seed
Road use and Maintenance	The “maintenance program” will be submitted to the USFS by the Operator.	Prior to Project initiation.	To ensure that the construction and maintenance of roads will be performed to USFS standards.	Operator will submit a Transportation Plan to the USFS and secure its approval prior to construction.
Paleontological resources	Operator has conducted a pedestrian paleontological survey of portions of the Project Area with high potential for discovery of vertebrate fossils and will prepare a monitoring and mitigation plan.	Prior to Project initiation.	To protect paleontological resources from disturbance or destruction.	Operator will submit a Paleontological Monitoring Plan to the USFS and secure its approval prior to construction.
Cultural Resources	Operator will instruct its employees and contractors in procedures to be followed in the event of discovery of human remains as required by applicable regulations. Operator has conducted a Class III cultural resource survey of the Project Area and has prepared a monitoring and mitigation plan.	Prior to Project initiation.	To protect cultural resources, including human remains, from disturbance or destruction.	Operator will submit a Cultural Resource Monitoring Plan to the USFS and secure its approval prior to construction.

Where the Operator (Lance) is obliged to submit a monthly report, it will be assembled within the last week of each month and submitted within the first week of the next month. Where the Operator is obliged to submit an annual report, it will be assembled within the last week of the year and submitted within the first week of the next year.

2.6 COMPARISON OF ALTERNATIVES

Table 2.6-1 displays a quantitative comparison of the proposed new facilities among the alternatives. The quantitative comparison necessarily reflects the differences in the projected amounts of surface disturbance. A summary of the more substantial differences, as related to each alternative, is included in the column labeled “Comments.” Qualitative and quantitative descriptions of the impacts to environmental resources under each alternative are discussed in detail in Chapter 3 under distinct resource area sections.

Existing facilities in and around the CBNG wells proposed for this project would continue to be used in their current capacity under all alternatives. Their use might be expanded as a result of ongoing hydrocarbon development and coal mining in the region. Five new culverts, six stock tanks, six gates, and six cattle guards would be installed as part of the Proposed Action; however, their installation would not result in additional surface disturbance. Only five new stock tanks would be installed under Alternative C.

2.7 ALTERNATIVES CONSIDERED BUT NOT ANALYZED

Some of the issues originating from the scoping process suggested potential alternatives to the Proposed Action. Proposed alternatives are required to be technically and economically feasible and to provide the opportunity to achieve the Proposed Project (CEQ, Forty Questions, 2a). Alternatives considered but not analyzed in detail and the rationale for their exclusion in this document are described below.

Issue:

Restrict activities within one mile of any species habitat ranked by WYNDD G1-G3 or S1-S2, species ranked NSS or SSC 1, 2, or 3 by WG&F, black-footed ferret habitat, prairie dog communities, mountain plover nests, northern sage grouse leks and other types of habitats, raptor nests, permanent bodies of water and riparian area, wetlands, and area with special biological values.

Response:

Alternative C incorporates No Surface Occupancy (NSO) areas and timing limitations (TLs) as specified in the TBNG LRMP for sage grouse and ferruginous hawks. The USFS has incorporated other TBNG LRMP standards and guidelines for sensitive, threatened and endangered (T&E), and management indicator species in both alternatives.

Table 2.6-1 Comparison of New, Long-Term Disturbance among the Alternatives

Project Component	Alternative A No Action		Alternative B Proposed Action		Alternative C Modified Development		Comments
	number	acres	number	acres	number	acres	
Well Sites	0	0	32 wells	3.2	28 wells	2.8	Although no wells would be drilled under the No Action alternative, existing wells in the vicinity would continue to be produced and new wells would almost certainly be drilled on nearby non-federal and possibly federal leases.
Central Gathering Facilities	0	0	3	0.75	3	0.75	Three existing headers would also be used by the project and would continue to be used in their current capacity.
Discharge Points	0	0	3	0.75	3	0.75	Two existing discharge points would also be used by the project and would continue to be used in their current capacity.
New Roads	0	0	11.6 miles	16.2	10.5 miles	14.4	Under the No Action alternative, 16.7 miles of existing roads in the Project Area would continue to be used in their current capacity. Under Alternatives B and C, approximately 9.5 miles of existing roads would be used for project operations and 0.4 mile of existing road would be upgraded. Under Alternatives B and C, 8.9 miles of roads would be decommissioned.
Pipelines/Utility	0	0	0	0	0	0	Immediate reclamation of the utility and pipeline trenches after their construction would result in no long term surface disturbance.
Sub-Total	-	0	-	20.9	-	18.9	
Decommissioned Roads	0	0	8.9 miles	13.0	8.9 miles	13.0	
Total ¹	0	0	2.6 miles	7.9	1.5 miles	5.9	Amount of acreage disturbed after interim reclamation and road decommissioning

¹ Minor discrepancies in totals due to rounding

Issue:

No ground disturbing activities within big game winter range, parturition areas, and migration routes.

Response:

Restriction of ground disturbing activities in these areas would be enabled through the designation of NSO areas. Designation of an NSO area on the surface of a previously leased parcel would violate an operator's legal right to develop its leases, in accordance with its contractual agreement with the federal government. An oil and gas lease grants the lessee the "right to drill for, extract, remove, and dispose of all oil and gas deposits" from the leased lands, subject to the terms and conditions of the respective leases (BLM, 1992). The denial of the right to develop a valid lease would also result in the loss of federal royalties. The TBNG LRMP does not designate NSO areas for big game winter range in the Project Area.

Issue:

Mandate that all produced water from coalbed methane wells be re-injected.

Response:

Injection has been found to be technically and economically unfeasible for most CBNG production (BLM, 2003, pp. 2-65 through 2-67). Project Area produced water lacks appropriate receiving formations, would cause additional surface disturbance, and would result in water volumes sufficient to be adequately managed by discharge on to the surface.

Injection of produced water was eliminated from detailed analysis because a lack of suitable receiving formations. Produced water can only be injected into an aquifer that does not contain fresh and potable water (BLM, 1999, p. 5-16). Water quality of potential receiving aquifers has been determined to be too fresh. Injection into the producing coal seam would eliminate gas production since the coal needs to be de-watered to reduce formation pressure sufficiently to allow gas to flow to the surface. Potential deep aquifers examined for possible injection in the Project Area have been determined to be sufficiently saturated and of such low permeability that the anticipated volumes of produced water were insufficient to be economically and technologically handled. In addition, the receiving aquifer must be at least partially depleted to avoid over-pressuring the receiving aquifer (BLM 2003, pp. 3-54 through 3-55). Injection into deep formations, if it were technically feasible, would also remove good quality water from beneficial use on the surface.

Other considerations include the creation of additional surface disturbance and the lack of adverse effects resulting from the discharge of the projected volumes of water. Additional surface disturbance would be generated in order to develop the injection wells and associated pipelines and pumping facilities. The volumes of produced water associated with the project are small compared to those from episodic storm events and would be lost to conveyance within a relatively short distance from the discharge points. Lance has committed to mitigation measures designed to reduce erosion effects. Detailed discussion of the effects of discharging produced water to surface water quality and quantity are included in Section 3.4.2.

A detailed discussion of the potential for re-injecting produced water in the Powder River Basin is contained in the PRB O&G FEIS (BLM, 2003).

Issue:

Consider alternative routes into Thunderhead Plans of Development 2 and 3 that avoid or minimize crossing Forest Service lands.

Response:

Routes were developed for Thunderhead 2 and 3 PODs that would minimize the amount of road building/improvement needed on USFS land. The USFS July 2001 inspection of the 32 proposed routes determined that the routes chosen for the Proposed Action, Alternative B, were the least disruptive to USFS lands. Lance submitted a detailed roads plan (Greystone, 2002) to the USFS, which approved the plan.

Issue:

Consider the use of helicopters to provide transportation of personnel and equipment to construct and maintain header facilities.

Response:

The dominant Management Area Prescription allocations for the Project Area are 6.1 Rangeland with Broad Resource Emphasis and 8.4 Mineral Production and Development. Development of the project would be in compliance with the directives contained in Management Area Prescription 8.4. The description of the desired conditions includes: “Mineral operations of all types are emphasized to effectively and efficiently remove available commercial mineral resources, concurrent with other ongoing resource uses and activities.....Restrictions on public use occur to ensure public safety and to avoid unreasonable interference with mineral operations. Visitors can experience frequent encounters with people, heavy equipment, and noise (TBNG LRMP p.3-26).”

The area is currently extensively developed for oil and gas exploration and production. The use of helicopters to transport personnel to and from headers would place unnecessary economic hardship on the operator for no reasonable cause.

Issue:

Require the use of directional drilling technologies by drilling only in areas with existing and maintained roads.

Response:

Requiring the operator to drill in areas accessible only by existing and maintained roads would require the operator to be able to access the leased minerals from directional well bores. Directional and horizontal drilling was eliminated from detailed analysis in this EA because of the shallow depth of the proposed wells (less than 1,000 feet). Any amount of offset from the vertical to that depth would require drilling a directional or horizontal well bore. These types of well bores can discourage or prevent efficient gas production by preventing the installation of well bore casing and disallowing efficient de-watering. The lower grade coals found in the Powder River Basin may not be competent enough to keep the well bore from collapsing in the

horizontal or deviated portion of the hole. Despite efforts to develop high capacity down hole pumps to de-water the coal seam, pumps have not been developed to operate in a horizontal well bore. Submersible pumps are limited in their placement in deviated well bores. Placement of pumps in nearly vertical sections of the well bore results in hydrostatic pressures that would reduce gas recovery.

Directional and horizontal drilling was also eliminated from detailed analysis due to the increased drilling costs, which could more than double total development costs from the mandatory use of specialized equipment and specially trained personnel.

Issue:

Designate new Research Natural Areas.

Response:

The designation of RNAs is a forest planning issue. RNAs are designated during revisions of forest plans. The revised TBNG LRMP is the appropriate level of analysis for RNA designation. RNAs were analyzed during the revision of the TBNG LRMP. No new RNAs were selected in the vicinity of the Project Area. Re-consideration of RNA designation is outside the scope of this analysis.

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