CHAPTER 2

ALTERNATIVES

MONTANA

CHAPTER 2: ALTERNATIVES

Introduction

The regulations of the Council on Environmental Quality Section 1502.14, Title 40 of the Code of Federal Regulations, require that an EIS "rigorously explore and objectively evaluate all reasonable alternatives. . . ." In this respect, this chapter presents the No Action Alternative (Existing Management) and four other action alternatives in detail for managing oil and gas resources—specifically coal bed methane (CBM) exploration and production—throughout the planning area state-wide, with emphasis in the BLM's Powder River and Billings RMP areas. The BLM and state lands affected by this EIS are those lands open to oil and gas development. Other alternatives were considered but eliminated without detailed analysis; their descriptions and reasons for elimination are provided in the *Alternatives Considered But Not Analyzed in Detail* section.

This chapter is presented in four sections: Alternatives Considered But Not Analyzed in Detail; Alternatives Analyzed in Detail; Management Common to All Alternatives; and, Management Actions Specific to Each Alternative.

Alternatives Considered But Not Analyzed in Detail

The following alternatives were considered for resolving planning questions or issues, but were not analyzed in detail because of technical, legal, or other constraints.

Leasing

BLM oil and gas leasing decisions and lease stipulations, including for CBM, were previously analyzed in the BLM 1992 *Final Oil and Gas RMP/EIS Amendment* (BLM 1992). Those decisions were approved in the project's *Record of Decision* (ROD) published in February 1994. The purpose of this document is to analyze levels of conventional oil and gas development that are greater than those analyzed in the BLM 1992 Final Oil and Gas RMP/EIS Amendment and full scale CBM development. Analyzing new federal lease stipulations as well as decisions such as closing federal areas of oil and gas estate in the Powder River and Billings RMP areas are therefore beyond the scope of this plan.

This plan will analyze the impacts from CBM exploration and development, and identify necessary mitigation measures that would be applied during the permitting process. CBM is part of the oil and gas estate. Existing oil and gas leases include the right to explore and develop CBM. Issuing separate leases for conventional oil and gas and separate leases for CBM would require a regulatory change. The environmental analysis conducted for federal permits can influence where and what level of CBM development can occur.

Bonding

Establishment of bond amounts specifically for CBM development activities that cover the full cost of coal bed methane development. This alternative is not analyzed in detail because the State of Montana and BLM regulations set minimum amounts of bonding required before approving drilling permits. The regulations allow agencies to raise the bond amount required depending upon such factors as the number and type of wells, type and amount of reclamation necessary, and operator history. Bond increases can't exceed the total of estimated costs of plugging and reclamation, the amount of uncollected royalties due and monies owed because of outstanding violations.

Omega Alternative

The Omega alternative to drill a large-diameter well through the coals and from the base of that shaft to directionally drill upwards into the various coal seams in a circular pattern is an experimental technology not yet proven for CBM. If this technology becomes viable for CBM extraction in the future, further consideration would be given to it.

Alternate Sources of Energy

The purpose of this EIS is to analyze CBM and conventional oil and gas development. Considering alternate sources of energy such as wind power and fuel cells is therefore beyond the scope of the EIS.

Re-Injection of Produced Water into the Same Aquifer Alternative

Re-injection of produced formation water is an accepted practice in conventional oil fields but its use

in CBM fields would be counter productive. In conventional oilfields, operators have re-injected produced water since the 1920s to help maintain reservoir energy and to increase ultimate production efficiency, or to move oil preferentially to producing wells. When produced water is re-injected, original reservoir pressures are maintained; this can significantly increase the percentage of original oil in place that is produced before the field's economic limit is reached (Thomas et al. 1987). Re-injection can also sweep oil out of the reservoir toward producing wells in a waterflood, also increasing production efficiency. In these scenarios, water production is neither desired nor absolutely necessary; it's a nuisance that can be minimized with standard engineering practice. In the history of many oilfields, oil is produced water-free for months or even years before water is seen in producing wells.

In CBM production, formation water must be produced before reservoir pressures are sufficiently reduced for the adsorbed methane to be liberated. Water production is unavoidable and pre-requisite to CBM production. As water is produced from the coal seam, the pressure in the seam is reduced. Research by the BLM's Buffalo, Wyoming, Field Office suggests that methane production begins after 20 percent of the virgin reservoir pressure is depleted; significant production does not begin until 40 percent of the pressure is depleted (Crockett and Meyer 2001). Work by Jones et al. (1992) corroborates this relationship. If methane production is directly related to depletion of reservoir pressure, then re-injection of produced water within the confines of the CBM field will directly result in the decrease of methane production. Re-injection of CBM-produced water into the same aquifer cannot, therefore, be considered as a reasonable option for water disposal.

It would be reasonable to inject produced water into non-productive coal seams that were geologically separated from the CBM field. Separation could be the result of faulting or erosion, isolating coals in the injection area even from stratigraphically equivalent productive coal seams in the CBM field. Injection like this would result in preservation of the produced water resource, whether of high or low quality. The permit process could mitigate impact to groundwater so that quality of the injected water is matched to the quality of the formation water in the prospective injection zone. When and if this technology becomes viable, a more detailed analysis would be conducted for further consideration.

Alternatives Analyzed in Detail

Five alternatives have been developed to evaluate the impacts related to the various development scenarios associated with CBM exploration and production. Each alternative represents a different approach for resolving the issues identified during scoping. Alternative A, the No Action Alternative, would continue existing management. Alternative B would allow CBM development while emphasizing the resource protection. Alternative C would emphasize CBM development with minimal environmental restrictions. Alternative D would encourage CBM exploration and development while maintaining existing land uses. Alternative E is the Preferred Alternative and would allow for CBM exploration and development while minimizing the impacts to environmental resources.

The alternatives were formulated in response to the Purpose and Need section as outlined in Chapter 1, which is to amend the BLM's Resource Management Plans for the Powder River and Billings RMP areas in order to address fluid mineral development issues not covered in the current plans. The State of Montana's intention is to comply with the stipulation and settlement agreement for preparing a statewide programmatic supplemental EIS addressing CBM exploration, development, production, reclamation, and closure.

Management Common to All Alternatives

Management common to all alternatives are the management practices for conventional oil and gas operations that will remain the same in each alternative that is analyzed, including the Preferred Alternative.

Bureau of Land Management

The BLM has primary responsibility for managing the federally owned oil and gas estate. After lease issuance, operations may be conducted with an approved permit. Proposed drilling and associated activities must be approved before beginning operations. The operator must file an Application for Permit to Drill (APD) or Sundry Notice (SN) that must be approved according to (1) lease stipulations; (2) onshore oil and gas orders; and (3) regulations and laws. The steps required to obtain approval to

drill and conduct surface operations are summarized in Appendix A of the *1992 Final Oil and Gas RMP/EIS Amendment* and in the *Minerals Appendix* of the *BLM's Big Dry Resource Management Plan/Environmental Impact Statement for the Big Dry Resource Area of the Miles City District (Big Dry RMP/EIS) (1995)*. The process described therein is common to all alternatives.

In addition, under requirements of the Clean Air Act and the Federal Land Policy and Management Act, any activity the BLM authorizes (including oil and gas development) must comply with all applicable air quality laws, regulations, standards, increments and implementation plans. Therefore, land use authorizations will specify that operating conditions (i.e., air pollutant emissions limits, control measures, effective stack heights, etc.) are consistent with the applicable air regulatory agency's requirements.

State of Montana

State agencies that have authority over oil and gas activities include the Department of Natural Resources and Conservation (DNRC), which includes the Montana Board of Oil and Gas Conservation (MBOGC) and the Trust Land Management Division (TLMD); and the Montana Department of Environmental Quality (MDEQ). Each of these agency's roles and responsibilities were discussed in Chapter 1. Current oil and gas development is managed under the guidelines developed in the MBOGC's *Oil and Gas Drilling and Production in Montana: Final Programmatic Environmental Impact Statement* (1989). This document outlines how to incorporate any necessary environmental review into its rules and permitting process in an effort to comply with the Montana Environmental Policy Act (MEPA). In conducting environmental reviews for new permits, MBOGC works with other state agencies that may become involved in the process.

Agency Permits

Table 2-1 shows the agencies involved with issuing permits for oil and gas operations on federal, state, and private leases.

TABLE 2-1
APPLICABLE PERMITS FOR OIL AND GAS DEVELOPMENT ACTIVITIES

Agency	Responsibility/Permit/Approval
Bureau of Land Management (BLM)	Approval of APDs and SNs on federal leases. Approval or issuance of rights-of-way on federal surface.
	Communitization Agreements and Federal Unit Agreements
U.S. Army Corps of Engineers (COE)	Section 404 of the Clean Water Act—regulates the discharge of dredged or fill material into waters of the United States; Section 404 permit.
U.S. Fish & Wildlife Service (FWS)	Review under the Endangered Species Act (ESA)/Biological Opinion.

TABLE 2-1
APPLICABLE PERMITS FOR OIL AND GAS DEVELOPMENT ACTIVITIES

Agency	Responsibility/Permit/Approval
U.S. Environmental Protection Agency (EPA)	Regulates Underground Injection Control (UIC) Class V injection program/UIC Permit.
	Regulates all classes of underground injection wells and all point source discharge to streams for any source located in Indian Country.
	ESA review for National Pollutant Discharge Elimination System (NPDES) permits, Total Maximum Daily Loads (TMDL's) and Water Quality Standards (WQS) on state and tribal lands
	Clean Air Act (CAA)—Air quality permitting for major emitting sources on tribal lands
	404 enforcement under the CWA for dredge and fill activities
	401 Discharge certification under the CWA on tribal lands and certain discharges in one state that may affect the quality of water within any other state
	518 under the CWA for approval or disapproval of Tribal Water Quality Standards
	Section 303(d) of the CWA regarding EPA's oversight and partnership role with states to identify streams that do not meet the CWA objectives by establishing TMDLs for such streams
Montana Department of Environmental Quality (MDEQ)	Administers MEPA (75-1-101, MCA).
	Air Quality Permitting—Clean Air Act of Montana (75-2-101 *et seq.*, MCA)(ARM 17.8).
	Resource Conservation and Recovery Act (RCRA) Waste Disposal—Hazardous Waste Management Act (75-10-401, Montana Codes Annotated [MCA]) (Administrative Rules of Montana [ARM] 17.53.101).
	Solid Waste Management Act (75-10-201, MCA) (ARM 17.50.501).
	Water Quality Act (75-5-401 through 405, MCA).
	Montana Surface WQS (ARM 17.30.601 *et seq.*).
	401 Discharge Certification under the CWA.
	Montana Nondegradation Rules (ARM 17.30.701 *et seq.*).
	Montana Pollutant Discharge Elimination System (MPDES) (ARM 17.30.1301 – 1426).
	Certificate of environmental compatibility—Major Facility Siting Act (75-20-101, MCA).
	Montana Groundwater Pollution Control System (MGWPCS) (ARM 17.30.100 *et seq.*)

TABLE 2-1
APPLICABLE PERMITS FOR OIL AND GAS DEVELOPMENT ACTIVITIES

Agency	Responsibility/Permit/Approval
State Historic Preservation Office (SHPO)	Review under the National Historic Preservation Act (NHPA) regarding protection of cultural/historic resources.
County Weed Districts	Review for control and prevention of noxious weed infestations under the Noxious Weed Control Law (7-22-2101, MCA)
Local Conservation District	Montana Natural Streambed and Land Preservation Act (310 Permit)
Montana Department of Natural Resources and Conservation (DNRC)	
Trust Land Management Division (TLMD)	Approval of activities on state trust surface and mineral estate (subsurface) lands; issuing land use licenses, easements, and mineral leases; conducting land exchanges; manages grazing permits.
Minerals Management Bureau (MMB)	Responsible for leasing, permitting, and managing mineral leasing program.
Water Resources Division, Water Rights Bureau	Permit to allow beneficial use of groundwater and surface water. (85-2-310 to 312, MCA)
Montana Board of Oil and Gas Commission (MBOGC)	Approval of state drilling permits on state and private leases (APDs). (ARM 36.22) (82-11-111, MCA)
	Oversee UIC program for Class II wells (ARM 36.22.1401)(82-11-101, MCA)
	RCRA-exempt Solid Waste Disposal (ARM 36.22.1105)
	Surface Restoration (ARM 36.22.1307)

Management Actions Specific to Each Alternative

Each alternative was structured within the varying theme circumstances to stress different development emphasis, such as resource protection, CBM development, and existing land uses.

Alternative A—No Action (Existing Management)

This section describes the current management practices used by the BLM and the state to manage the exploration, development, and operation of CBM wells in Montana.

BLM

The BLM issues oil and gas leases that include the right to explore for and develop CBM. The *Final Oil and Gas RMP/EIS Amendment* allowed for the drilling of test wells and initial small-scale development of CBM. Under Alternative A, the BLM would approve the drilling and testing of CBM wells on federal leases, but would not authorize production of CBM from federal minerals or the installation of production facilities.

The permitting procedures for CBM wells and associated activities would be the same as described in the *Management Common to All Alternatives* section for conventional oil and gas operations, which are detailed in the *Final Oil and Gas RMP/EIS Amendment* and in the *Minerals Appendix* of the *Big Dry RMP/EIS*.

Water produced during the testing phase would remain untreated and be contained at the well site in either a pit or a steel tank, and would not be discharged into state or federal waters. The water would be available for beneficial use by industry (for example, pipelines, dust abatement) and landowners. Wells drilled on federal minerals would be shut-in or plugged after completion of the testing phase.

Coal seams targeted for exploration would be determined by industry and not by the government. Vertical wells producing from a single coal seam would be allowed. Vertical wells producing from multiple coal seams would not be required. Operators would be required, when technologically and economically feasible, to drill several wells from a well pad which may require directional drilling. The placement of wells would not be restricted through the use of buffer zones around active coal mines or Indian reservations. The placement of wells would not be restricted through the use of buffer zones around active coal mines or Indian reservations.

Transportation corridors for vehicles would not be required; however, operators would be encouraged to use existing routes, corridors or previously disturbed areas when feasible or as required by the surface owner. Power lines would be either above ground or buried according to operator plans. Placement of roads and powerlines or other utilities requiring right-of-way (ROW) are subject to environmental review and agency approval. Diesel, electric, or gas-fired engines would power generators used during the testing phase of CBM wells. The number of wells connected to each compressor would be dependent on the operator's development circumstances. Equipment would have to be removed at the end of the testing phase or at the time of abandonment. Areas of surface disturbance associated with lease operations would have to be reclaimed at the completion of activities in accordance with surface owner requirements. Upon abandonment, roads providing legal access to BLM-administered surface would be open to the public.

State

For Alternative A, the state would manage CBM based on the Stipulation and Settlement Agreement reached in the First Judicial District Court, Lewis and Clark County, between the MBOGC and the Northern Plains Resource Council, Inc., on June 19, 2000. In this agreement, the MBOGC may, upon proper application by the operator, issue 200 CBM exploration permits for water quality, quantity and/or perform suitability tests on coals. An additional restriction limits the number of wells per pod to nine and pods per township to one, and prohibits the discharge of any water into the waters of Montana or the United States. In addition to these exploration wells, the agreement specifies that Redstone Gas Partners could apply to the MBOGC for up to 90 additional wells for its CX Field Pilot Project in southeastern Big Horn County. The total producing wells in the CX Pilot Field cannot exceed 250. In addition to these, Redstone can drill another 75 exploration wells for a total of 325 wells. Discharge of production water would be arranged through the state DEQ, via a MPDES permit. The MPDES permit would allow for 1,600 gallons per minute discharge into the Upper Tongue River from up to 11 discharge points.

Testing of CBM wells that have been previously drilled under previously issued permits would continue provided no water is discharged to the waters of Montana or the United States. No commercial production of methane would occur from any of the wells. For each landowner where tests wells are drilled, the operator conducting the drilling would enter into a water well mitigation agreement. All wells drilled under the terms of the settlement agreement would be required to comply with the MBOGC's regulations. After test wells are completed, such wells would be abandoned or plugged according to the MBOGC's regulations.

The development of CBM wells also would be subject to the same regulatory requirements outlined in the *Management Common to All Alternatives* section for conventional oil and gas. The exception to these rules that pertain to CBM would be the Stipulation and Settlement Agreement that would govern the number of well permits and require the completion of a statewide, programmatic, supplemental EIS. The stipulation and settlement agreement would remain in effect until a Record of Decision (ROD) is formulated and signed for this EIS.

Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife and Cultural Resources

This alternative would allow CBM development while emphasizing the protection of natural and cultural resources.

All generators and compressors would be required to be powered by natural gas-fired engines. The number of wells connected to each compressor would be

maximized to reduce the overall number of field compressors.

To the extent agency authority allows, buffer zones would be established around Indian lands and active coal mines. Until a reservation approves production of CBM on their lands, a 2-mile buffer would be enforced around reservations in Montana. A 1-mile buffer would be enforced around active coal mines where no CBM production would be permitted.

Water from exploration wells would be stored in tanks, or other approved non-discharging storage facilities. Water from producing wells would be injected into a different aquifer with the same or lesser quality water. Class V permits for injection of produced water with less than 3,000 milligrams per liter (mg/l) total dissolved solids (TDS) would need to be obtained from the EPA Region VIII. If the produced water has dissolved solids in excess of 10,000 mg/l, it would need to be disposed of via the Class II UIC program maintained by the MBOGC. Produced water between 3,000 and 10,000 ppm TDS can be disposed of in a Class II well permitted by MBOGC with concurrence from EPA. Regardless of the water quality or class of well, the produced water would not be injected into the same coal seam that the methane was being extracted from unless there was some form of geological separation to prevent migration of the injected water into the area of methane production.

Co-location of single-seam development wells on the same well pad would be required. Multiple seam completions in a single well bore would be encouraged to the extent technology permits. CBM production could occur simultaneously from multiple seams or staggered over time from separate seams. Directional drilling would be required for deeper coal seams to avoid excess surface use or disturbance.

Roads to wells and compressor sites would be limited to single lane width with turnouts. Exploration wells would not have permanent gravel access roads. Utilities would be placed along the road routes, using the transportation network as utility corridors. Power lines would be buried in the utility corridors; no overhead lines would be permitted. Produced water flowlines and gas flowlines would be buried in the same trench when feasible. When the well had reached the end of its useful life, new access roads on BLM and state surface would be rehabilitated and closed.

Alternative C—Emphasize CBM Development

This alternative would emphasize CBM exploration and development with minimal restrictions.

Operators could use diesel engines with Best Available Control Technology (BACT) to reduce emissions. Agencies would not require a minimum number of CBM wells be connected to a field compressor nor limit the number of field compressors delivering gas to a sales compressor.

Roads and utility corridors would be positioned to use existing disturbances as much as possible. Corridors would not be required. Power lines would be aboveground or buried per operator's plans. Gas and water lines would be buried. Upon abandonment, new BLM and state surface oil and gas roads would be rehabilitated and closed.

Operators would not be required to drill directional or horizontal CBM wells. Wells would be located by the operator and agencies would not require multiple wells to be located on the same well pad.

Water management would be based on a combination of beneficial use and surface discharge. Beneficial uses would include stock water, industrial needs, dust control, and agricultural reuse. Surface discharge would be subject to MDEQ permit requirements Montana Pollutant Discharge Elimination System (MPDES) and limitations established for discharge into identified watersheds. Water discharge via a transportation pipeline into a drainage system would not be required. The operator must obtain 401 Certification from the State if the disposal action needs BLM approval. Injection of produced CBM water would not be required.

A CBM production buffer zone would not be imposed around Indian reservations or coal mines.

Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses

This alternative would encourage CBM development while maintaining existing land uses and protecting downstream water consumers.

The number of wells connected to each compressor would be maximized to reduce the overall number of field compressors required. Natural gas engines with

electric booster would be required for all compression operations.

Operators would be required, when technologically and economically feasible, to drill several wells from a well pad which may require directional drilling. Multiple seam completions in a single well bore would be encouraged. The transportation network also would serve as a utility corridor. Roads and utilities would be constructed with one way in and out. All power lines and water and gas flowlines would be buried. Upon abandonment, new oil and gas roads on BLM and state surface would be rehabilitated if closed. Roads would remain open or closed at the surface owner's discretion.

If agency jurisdiction permits, buffer zones for production would be established around Indian lands (2 miles) and active coal mines (1 mile). The buffer zone around Indian lands would remain in effect until the Tribe approves production on its own lands.

All produced water (depending upon water quality) would be treated prior to surface discharge or pumping into holding facilities such as impoundments, pits, and ponds. Transportation of treated water for discharge would be via a constructed drainage system or pipeline to the nearest perennial watercourse if possible. The method of treatment is unrestricted, provided the effluent meets standards established by the MDEQ for down-stream use. Beneficial use of produced water would be allowed and treatment would vary based on industrial, municipal, or agricultural uses such as power plant cooling water, coal slurry pipeline, field irrigation, livestock or wildlife watering, or municipal power turbines. The operator must obtain 401 Certification from the State if the disposal action needs BLM approval. Surface storage of produced waters would also require an MPDES permit issued by MDEQ.

Alternative E—Preferred Alternative

Alternative E would provide management options to facilitate CBM exploration and development while sustaining resource and social values, and existing land uses.

Exploration and development of CBM resources on BLM, state and/or fee minerals are allowed subject to agency decisions, lease stipulations, permit requirements and surface owner agreements. Under this alternative, operators would be required to submit a Project Plan outlining the proposed development of an area when requesting CBM well densities greater than 1 well per 640 acres. The project plan would be developed in consultation with the affected surface owner(s) and other involved permitting agencies. All shallow coal seams would have vertical wells installed; for deeper coal seams, the operator would drill directionally or demonstrate in the project plan for agency consideration why directional drilling is not needed or feasible. Operators would develop single or multiple coal seams per their plans, however, there would be only one well bore per coal seam per designated spacing restriction. Operators would also be required to demonstrate in their project plan how impacts to surface resources, such as wildlife, would be minimized or mitigated.

The Preferred Alternative combines management options so that there would be no unnecessary or undue degradation of water quality allowed in any watershed. The preferred water management options of water produced with CBM is for beneficial use. Other produced water management options include, but are not limited to, injection, treatment, impoundment, and discharge. The operator must obtain 401 Certification from the State if the disposal action needs BLM approval. A Water Management Plan would be required for exploratory wells and for each Project Plan. Produced water management plans or permits would be approved by the appropriate agency in consultation with affected surface owners. Surface storage of produced waters would also require an MPDES permit issued by MDEQ. Impoundments proposed as part of the Water Management Plan would be designed and located to minimize or mitigate impacts to soil, water, vegetation, and channel stability. There would be no discharge of produced water (treated or untreated) into the watershed unless the operator has an approved MPDES permit and can demonstrate in the Water Management Plan how discharge could occur in accordance with water quality laws without damaging the watershed.

With regards to air quality, the objectives of this alternative are the same as Alternative B (the number of wells connected to each compressor would be maximized and natural gas-fired engines for compressors and generators would be required), except in areas with sensitive resources, including people, where noise is an issue. In those areas, the decibel level would be required to be no greater than 50 decibels measured at a distance of one-quarter mile from the compressor. This may require the installation of an electrical booster at these locations.

Transportation corridors would not be required; however, proposed roads, flowline routes and utility line routes would be located to follow existing routes or areas of previous surface disturbance when possible. The operator will also address in the Project Plan how the surface owner was consulted for input into the location of roads, pipeline and utility line routes. Concerning powerlines, the operator will demonstrate in the Project Plan how the proposal for power distribution would mitigate or minimize impacts to affected wildlife. For example, the operator may propose that all or a portion of the powerlines be buried and any above-ground lines be designed following raptor-safe specifications or designed to safely eliminate use by raptors in sage grouse habitat. When wells are abandoned, the associated oil and gas roads would remain open or be closed at the surface owner's discretion. If the roads were requested to be closed they would be rehabilitated. This includes leaving BLM and State surface roads open if access is desirable.

As with current management, there would be no buffer zone for CBM production around active coal mines (MSO IM 2000).

To determine potential impacts to groundwater on the Crow and Northern Cheyenne reservations, monitoring wells would be required to be installed during the exploration phase on all BLM-administered oil and gas leases that are within two miles of reservation boundaries in Montana. Any development projects that propose CBM well densities greater than 1 well per 640 acres would need monitoring wells when the closest edge of the field is within 5 miles of reservation boundaries. If monitoring indicates drawdown would occur on the reservation, mitigation such as the operator providing a hydrologic barrier, communitization agreement, or spacing that would protect the Indian minerals from drainage, would be required.

Comparison of Alternatives

The differences between alternatives by development theme are depicted in Table 2-2. The variations for development by theme are compared for the five alternatives carried forward for detail analysis.

A range of potential issues affecting development has been analyzed in the context of the themes described for each alternative. The comparison focuses on the various techniques typically used to develop CBM fields. The variations between alternatives reflect the different potential drilling technologies, water disposal methods, transportation corridor construction, compressor engines, socioeconomic issues, etc. These alternatives represent the majority of development techniques commonly used with CBM operations. There are general and specific assumptions as to percentages of use per theme within each alternative. These assumptions are presented in Chapter 4, *Environmental Consequences*.

TABLE 2-2

ALTERNATIVE MANAGEMENT FOR CBM

Theme	Alternative A—No Action (Existing Management)	Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife and Cultural Resources	Alternative C—Emphasize CBM Development	Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses	Alternative E—Preferred Alternative
Air	The number of wells connected to each compressor would be per the operator's plans.	The number of wells connected to each compressor would be maximized.	Same as Alternative A.	Same as Alternative B.	Same as Alternative B.
	Compressors and generators would be powered by diesel, electric, or gas-fired engines.	Gas-fired engines for compressors and generators would be required.	Same as Alternative A.	Gas engines for compressors and generators with electric boosters would be required.	Same as Alternative B, except in areas with sensitive resources, including people, where noise is an issue. In those areas, the decibel level would be required to be no greater than 50 decibels measured at a distance of 0.25 miles from the compressor. This may require an electrical booster.
Coal	There would be no buffer zone for CBM production around active coal mines.	There would be a 1 mile buffer area around active coal mines where no CBM production would be allowed.	Same as Alternative A.	Same as Alternative B.	Same as Alternative A.
CBM	Limited CBM exploration would be allowed on BLM-administered minerals. No CBM production wells would be permitted on BLM-administered minerals.	CBM exploration and production would be allowed by BLM and the state.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B, except the operator would be required to submit a Project Plan outlining the proposed development for an area when requesting a different spacing from the State.
	The state would permit up to 200 CBM exploration wells. The CX Ranch Field would be allowed to have up to 250 production wells and 75 exploration wells.				The Project Plan would be developed in consultation with the surface owner.

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ALTERNATIVE MANAGEMENT FOR CBM

Theme	Alternative A—No Action (Existing Management)	Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife and Cultural Resources	Alternative C—Emphasize CBM Development	Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses	Alternative E—Preferred Alternative
	Operators would drill vertical CBM wells. Directional drilling for deeper coal seams would not be required.	Directional drilling for deeper coal seams would be required.	Same as Alternative A.	Same as Alternative B.	Operators would drill vertical wells for shallow coal seams. For deeper coal seams, the operator would demonstrate in the Project Plan for agency consideration why directional drilling is not needed or feasible.
	There would be one well bore per coal seam developed.	There would be multiple completions in a single well bore.	Same as Alternative A.	Same as Alternative B.	Same as Alternative A.
	Operators would develop coal seams per their plans.	Company would be required to develop all coal seams at the same time.	Same as Alternative A.	Same as Alternative B.	Same as Alternative A, except operator would need to demonstrate in project plan how impacts to wildlife and other surface resources would be minimized or mitigated.
Hydrology	Untreated water from CBM exploration would be placed in holding facilities such as pits, and tanks. The water would be available for beneficial use by industry (pipelines, dust abatement, etc.) and landowners. No discharge to waters of the U.S. would be allowed for BLM-authorized wells. The state would permit discharge for the CX Ranch field up to 1,600 gallons per minute (gpm).	Untreated water from CBM exploration would be placed in tanks.	Discharge of untreated water onto the surface would be allowed by BLM and the state in the planning area. General dispersal adjacent to the well pad and/or into ephemeral drainage's would be allowable. The water would be available for beneficial use by industry and landowners.	Water would be treated prior to discharge onto the surface. All discharge water would be transported to the nearest perennial body of water via a pipeline or constructed drainage system. Treated water would be used for industrial (power plants, hydro, coal slurry pipeline, municipal, power turbines) and landowner's beneficial use.	No degradation of a watershed would be allowed. A Water Management Plan would be required for every exploration Application for Permit to Drill. First priority for discharged water would be for beneficial use.

TABLE 2-2

ALTERNATIVE MANAGEMENT FOR CBM

Theme	Alternative A—No Action (Existing Management)	Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife and Cultural Resources	Alternative C—Emphasize CBM Development	Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses	Alternative E—Preferred Alternative
	Injection of produced CBM water would not be required.	Water from CBM production would be injected into a different aquifer with water of same/lesser quality.	Same as Alternative A.	Same as Alternative A.	Water from production would be managed per a site-specific Water Management Plan submitted by the operator as part of the Project Plan. First priority for discharged water would be for beneficial use. Impoundments proposed as part of the Water Management Plan would be designed and located to minimize or mitigate impacts to soil, water and vegetation. There would be no discharge of produced water into the watershed unless the operator can demonstrate in the Water Management Plan how discharge could occur without damaging the watershed in accordance with water quality laws. Injection of produced CBM water would be an option.
Realty	There would be no transportation corridors required. Existing disturbances would be used where possible.	Transportation corridors would be required. Roads would be designed to have one way in and out.	Same as Alternative A.	Same as Alternative B.	Same as Alternative A, except the operator will also address in the project plan how the surface owner was consulted for input into the location of ROWs.

TABLE 2-2

ALTERNATIVE MANAGEMENT FOR CBM

Theme	Alternative A—No Action (Existing Management)	Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife and Cultural Resources	Alternative C—Emphasize CBM Development	Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses	Alternative E—Preferred Alternative
	Powerlines would be aboveground or buried.	All powerlines would be buried.	Same as Alternative A.	Same as Alternative B.	In the Project Plan, the operator would demonstrate how their proposal for powerlines would mitigate or minimize impacts to affected wildlife, for example, propose that the powerlines be buried. All above-ground proposals would have raptor-safe specifications.
	Upon abandonment, roads providing legal access to BLM-administered surface would be open to the public.	Upon abandonment, new oil and gas roads would be rehabilitated and closed.	Same as Alternative B.	Upon abandonment, new oil and gas roads would be rehabilitated if closed. Roads would remain open or closed at surface owner's discretion.	Same as Alternative D.
Indian Trust Resources	There would be no CBM production buffer around the reservations	A 2-mile CBM development buffer would be established around reservation borders in Montana. The buffer zone would remain in effect until the Tribe approves production on its own lands.	Same as Alternative A.	Same as Alternative B.	There would be no CBM production buffer around the reservations. Monitoring wells would be required on BLM-administered oil and gas that abuts the reservation boundaries during the exploration phase. If monitoring indicates drawdown would occur on the reservation, mitigation such as the operator providing a hydrologic barrier, communitization agreement, or spacing which would protect the Indian minerals from drainage would be required.