

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

2.0 SUMMARY

The Little Monument Project Area (LMPA) is located in an existing oil and gas production area most recently developed as Little Monument II. Since 1978, a total of 31 producing wells have been drilled and developed in sections 21, 22, 23, 26, 27, and 28, Township 25 North, Range 111 West, 6th Principal Meridian, Sweetwater County, Wyoming. Two additional, non-producing wells have been plugged, abandoned, and reclaimed, and one wellbore has been temporarily abandoned. Burlington proposes to drill a maximum of 31 wells at 8 or more wells per section within the aforementioned sections. The total project area encompasses 3,857 acres, all of which are federal surface and minerals.

The Proposed Action assumes the construction of 31 wells and associated roads and pipelines. The LMPA would have approximately 55.8 acres of new surface disturbance associated with well locations and approximately 35.6 acres of total site disturbance associated with road and pipeline construction. Total new short-term surface disturbance resulting from the Proposed Action would be 91.4 acres (approximately 2.4 percent of the LMPA). During the life-of-project (LOP), 15-20 years, total disturbances would be reduced to approximately 40 acres (31.0 acres associated with 31 wells having 1.0 acre of remaining disturbance per well site, and 9 acres of roads) or approximately 1.0 percent of the 3,857-acre LMPA (Table 2-1).

Table 2-1. Approximate Acreage of Proposed Surface Disturbance, Little Monument Natural Gas Project.

Land Disturbance Summary Little Monument Project Area		
Project Component	Initial Disturbance Acres	Life-of-Project Disturbance Acres
Well Pads	55.8	31.0
Roads and Pipelines	17.8	9.0
Pipelines	17.8	0.0
Total	91.4	40.0

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVE SELECTION PROCESS

2.1.1 Proposed Action

The Proposed Action of drilling and developing approximately 31 natural gas wells in addition to existing drilling and production operations was determined by summarizing drilling plans projected by Burlington over the next three-year planning period. Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur.

Additionally, the Proposed Action of drilling and developing approximately 31 natural gas wells was determined by Burlington as the minimum number of wells needed to properly define the gas resource. The wells are conventional natural gas projected to be drilled to a depth of approximately 9,500 feet. Drilling would take place once appropriate permits are acquired and continue for the subsequent three years, with a life-of-project estimated at 15 to 20 years. The Proposed Action is discussed in detail in Section 2.2 of this EA.

2.1.2 Alternatives to the Proposed Action

2.1.2.1 Alternative A – No Action

For this project, the No Action Alternative is denial of the drilling and development proposal as submitted by Burlington. However, the Department of the Interior's authority to implement an alternative which precludes drilling by denying the project is limited.

The Record of Decision for the Fontenelle Natural Gas Infill Drilling Projects (USDI, BLM 1997) permits 780 wells on BLM administered lands within the Lincoln Road Project Area, which includes the LMPA. To date, 418 wells are producing within the townships overlapping the Lincoln Road Project area. (WOGCC, 2003 <http://wogcc.state.wy.us/FieldMenu.cfm?Skip='Y'&oops=ID13352>). The Fontenelle ROD permits drilling on 80 acre spacing, while Burlington's proposed action requests drilling on less than 80 acre spacing.

The No Action Alternative for this EA would be denial of the proposal in excess of the level of development allowed by the Fontenelle ROD, particularly with regard to well spacing. Transport of natural gas products would be allowed from those wells within the project area that are currently productive.

2.2 PROPOSED ACTION – DRILL AND DEVELOP 31 NATURAL GAS WELLS WITHIN THE LITTLE MONUMENT PROJECT AREA

2.2.1 Preconstruction Planning and Site Layout

Burlington would follow the procedures outlined below to gain approval for the proposed activity on public lands within the LMPA.

- Prior to the start of construction activities, Burlington would submit a Notice of Staking (NOS), APD, or ROW application to the BLM with a map showing the specific location of the proposed activity. Burlington and BLM would conduct an on-site evaluation during which site specific requirements would be identified and discussed. Following the on-

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

site evaluation, Burlington would file the application which would include site-specific construction plans where necessary to describe the proposed development.

- The proposed facility would be staked by Burlington and inspected by representatives of the BLM to ensure consistency with plans in the APD/Sundry Notice/ROW Application.
- Should discrepancies in the application be found, Burlington would revise the application as necessary. The BLM would then grant an authorization with the appropriate Conditions of Approval. The applicant then has one year within which to commence the proposed activity.
- Prior to approval, Burlington must have cleared the proposed construction area for cultural values, special status plants and animals, paleontological values, nesting raptors, greater sage-grouse, etc. If any of these resources are found, appropriate mitigation would be applied.

2.2.2 Construction and Drilling Phase

2.2.2.1 Road Construction

Highway access to the LMPA from Rock Springs and Green River is provided by Wyoming State Highway 372 (WYO 372), a two-lane, paved secondary highway which travels 38 miles northwest from I-80 to Fontenelle and another 11 miles west to its intersection with US 189 about 24 miles northeast of Kemmerer. Refer to Figure 3-12 (Chapter 3, Affected Environment) for a road map of the area.

Access to the Project Area from Kemmerer/Diamondville is provided by US 189 and WYO 372. Access from Big Piney/Marbleton is also provided by US 189, a paved, two-lane, primary highway, connecting US Interstate 80 on the south with Hoback Junction to the north, passing through Diamondville, Kemmerer, La Barge, Big Piney, Marbleton and Daniel.

New development would likely require additional access roads to be constructed. Burlington proposes to construct the new roads to meet the standards of BLM Manual Section 9113 as necessary to access the newly developed production facilities. Figure 2-1 shows a typical roadway section as Burlington would construct it.

Burlington estimates that each new well would require an average of approximately 500 feet of new or upgraded road construction, along with an average of 500 feet of flow pipeline. Where possible, flow pipeline would be routed in new roadway ROW's to minimize surface disturbance.

Construction equipment and techniques utilized by Burlington would be standard (e.g., crown-and-ditch method). Surfacing and base course materials would be obtained from local operating gravel pits. Respreading of topsoil and windrowed vegetation to the sideslopes of newly constructed access roads and revegetation would begin the first appropriate season following the well going on production. The access road to an unproductive well site would be reclaimed at the same time the well is abandoned.

Manpower and equipment during road and well pad construction would vary according to conditions encountered, but an average complement would be eight equipment operators with

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

two each dozers, motorgraders (with haul truck), and excavators (with haul truck). Several gravel trucks with operators would be utilized as needed.

2.2.2.2 Well Pad Design and Construction

Burlington proposes to utilize the traditional single-well pad design under the Proposed Action (Figure 2-2). The well pad size is estimated to be approximately 1.8 acres per well. Only those areas necessary to conduct drilling and completion operations would be cleared of vegetation. Total disturbance for the 31 well drilling program proposed would be approximately 55.8 acres.

All available topsoil suitable for reclamation would be stripped from the well pad area and stored on the periphery of the pad. Well pad construction and related facilities would normally take 4 to 6 days to complete, depending on local conditions.

Components of the well pad include construction of a reserve pit to temporarily store drilling fluids, cuttings, and water produced during drilling, and a flare pit for emergency and development flaring. The reserve pit would be approximately 75 feet wide by 125 feet long by 10 feet deep, with a capacity of 8,760 barrels (367,900 gallons). Burlington proposes to use lined reserve pits at all drill site locations. Liners would be of sufficient strength and thickness to withstand normal installation and pit use. Construction details would be utilized to minimize possibility of damage to the liner. All reserve pits would be fenced to minimize the potential loss of wildlife and domestic animals.

Any hydrocarbons floating on the surface of the reserve pit would be removed as soon as possible after drilling operations are complete. Reserve pit fluids would be allowed to dry by evaporation for approximately one year prior to reserve pit closure and drill site reclamation. When the pit is backfilled, cuttings and drilling muds would be covered to a depth of at least three feet.

2.2.2.3 Drilling Operations

Each drilling operation would require transport of approximately 25 truckloads of drilling-related equipment and materials to facilitate the drilling operation. This includes transportation of the drill rig, drill pipe, drilling fluid products, and related support equipment, but does not include the truck traffic required for resupplying the operation (e.g. fuel, drilling fluid additives, etc.). Additional traffic would be variable, depending on the phases of the drilling operation, but should not exceed six or seven vehicles per day per drill site throughout the drilling season. Total rig-up activities and installation of ancillary facilities would take approximately three days to complete.

Because this is a conventional gas project, approximately 10 days would be required to drill, log, and run casing for each well. Approximately nine additional days would be required for completion, including perforating, fracing, and flowback. Drilling depths would vary within the project area between approximately 9,000 feet and 11,000 feet. Water for drilling purposes would be obtained from three existing water source wells located within the Little Monument Unit. Drill water requirements for wells in the LMPA average approximately 3,500 barrels (147,000 gallons or 0.45 acre feet) per well. Dust control water would average approximately 1,000 barrels (42,000 gallons or 0.13 acre feet) per well.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

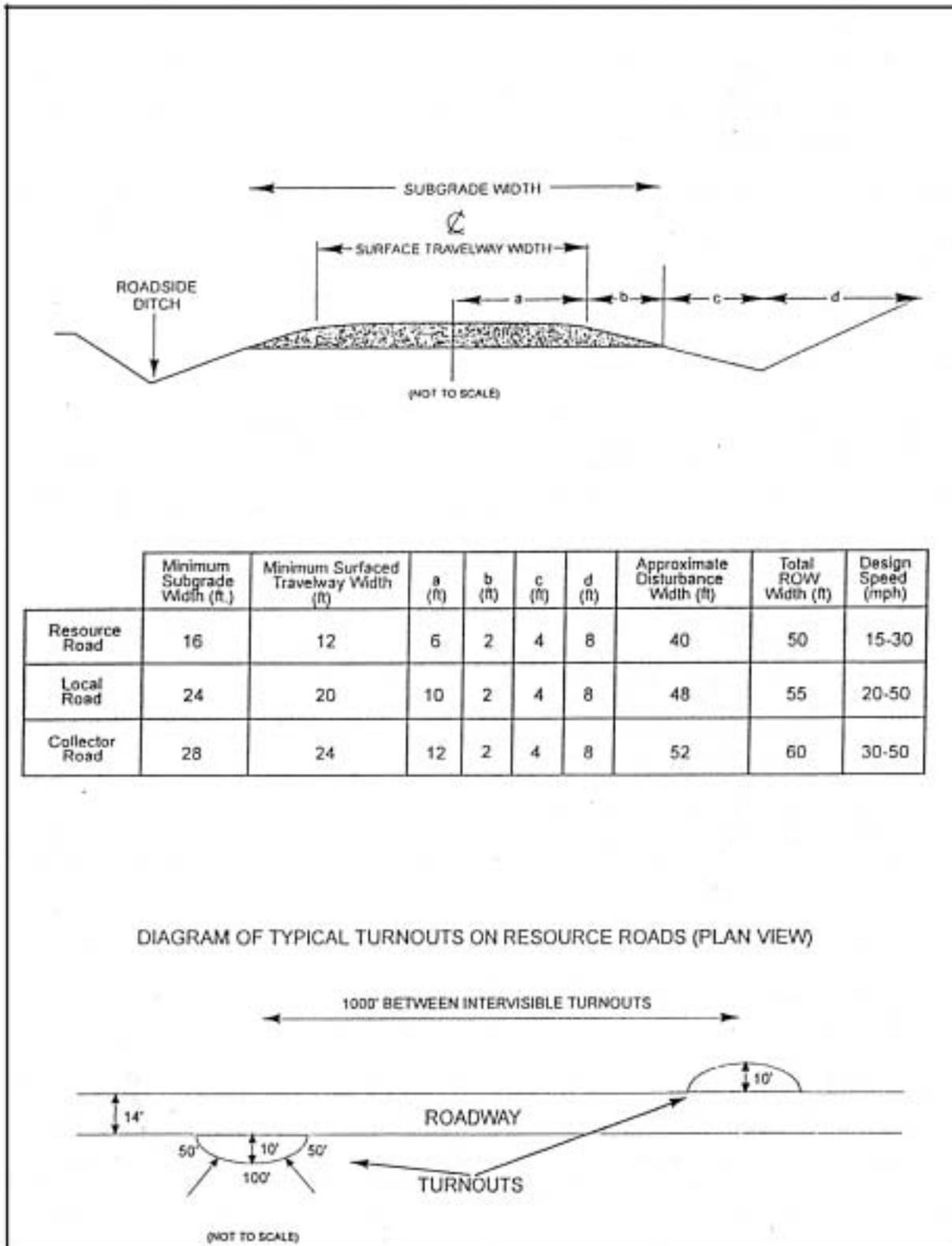


Figure 2-1. Typical Roadway Cross-Section with Width Specifications.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

Each well would be designed with a 4-inch gas discharge line. A separator and dehydrator would be placed at each well location along with metering equipment.

2.2.2.4 Pipeline Construction

Following drilling and completion, flowlines and gathering facilities would be installed for successful wells. Flowlines would be 3.5 inch O.D. or 4.5 inch O.D. steel pipe depending on pressure and volume requirements. Pipelines would be installed underground at a minimum depth of 2.0 feet. A ROW, 50 feet wide, is anticipated for flowlines. However, where possible, flowlines would be combined with access roads or existing pipelines to minimize disturbance. Flowlines would be hydrotested with fresh water during warmer weather to prove integrity. Water would be obtained from the Green River at the one lane bridge below Fontenelle on Lincoln County Road 311.

The gas produced within the LMPA would be transported by both new and existing pipelines and new and existing gathering lines. The operator would parallel existing roads, pipelines and gathering lines whenever feasible.

2.2.2.5 Natural Gas Production

All access roads to productive well sites would be maintained for well servicing activities if drilling is productive. Reclamation would be completed on segments of the well pad and access road ROW no longer needed. Well completion operations consist of the placement and cementing of well casing and perforation, stimulation and testing of potentially productive zones. Perforation, stimulation and testing requires large equipment to be transported and utilized at the well site, and flaring of the initial produced gas.

A typical cased well bore consists of conductor pipe, surface casing, and production casing. Surface casing is set deep enough and cemented to the surface to protect freshwater aquifers. Surface casing is set at the beginning of drilling operations. Setting production casing and cementing it in place is designed to prevent gas, oil, condensate, or water from migrating from formation to formation and to isolate producing zones.

Production operations would occur year-round, requiring the use of access roads in the project area on a year-round basis. Access roads would be maintained as necessary by gravelling in spring or fall and plowing snow during winter months.

Cut and fill slopes associated with each production well site would be reclaimed as prescribed in the APD. Each producing well would be serviced by its own production facility, unless consolidation of production facilities for closely spaced wells is technically and economically feasible.

2.2.2.6 Estimated Employment Requirements

The estimated numbers of persons employed in various phases of the pre-drilling, construction, drilling, completion/testing, and producing well services including pipeline construction are shown in Table 2-2. It should be noted that many of the personnel employed on different phases of the well development are not full-time employees, but short term skilled or craft workers. In most cases, the length of time for each activity is indicated in addition to the

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

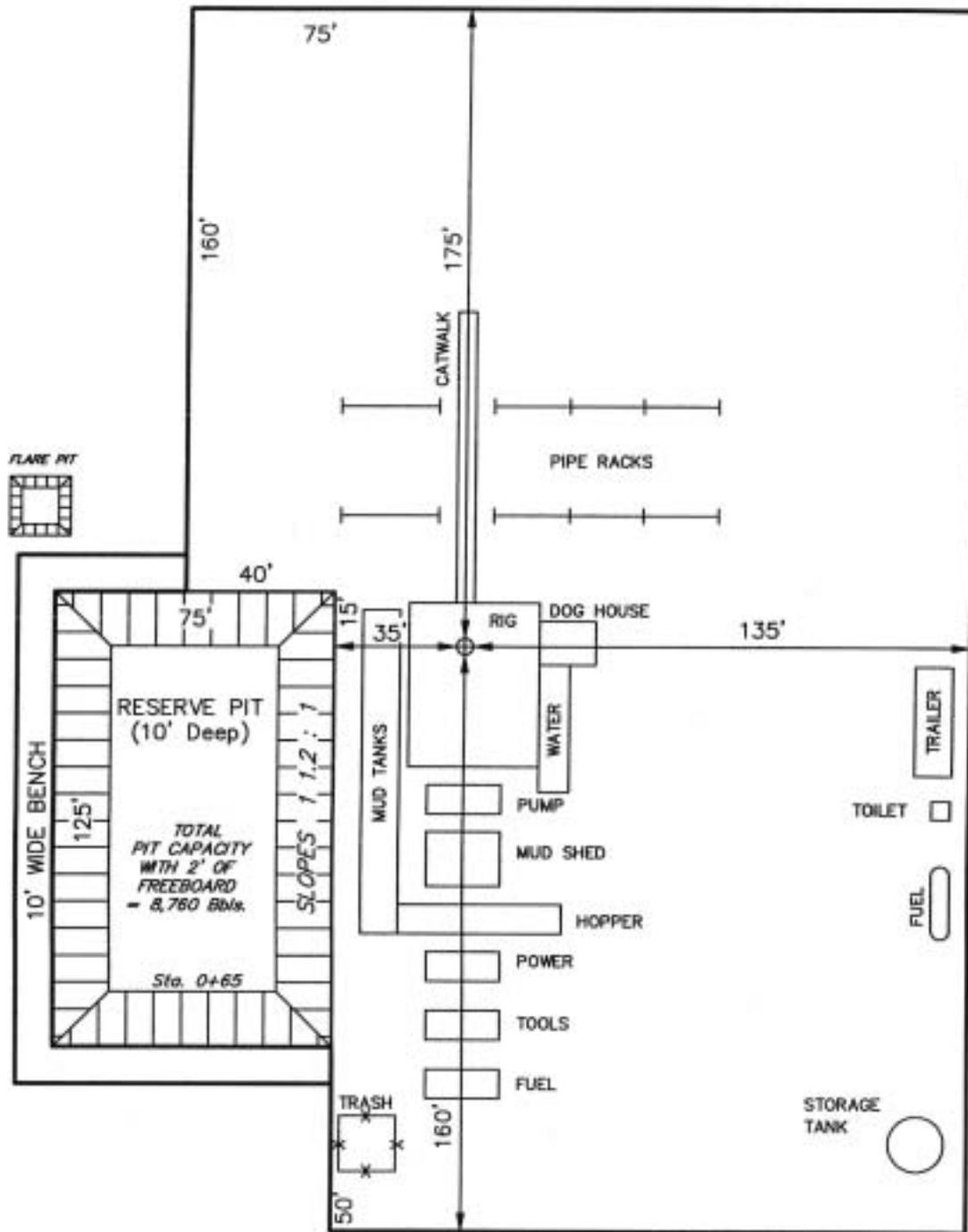


Figure 2-2. Typical Drill Rig Layout

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

expected time on site for the different activities involved in field development. In addition, Table 2-3 shows trip estimates for well development activities.

2.2.2.7 Ancillary Facilities

Burlington would construct ancillary facilities as necessary to meet production needs. Such facilities may include, but not be limited to: (1) individual well site liquids recovery units, (2) gas metering stations, (3) pipeline pigging facilities, (4) field storage buildings, and (5) cathodic protection facilities. The number and location of such ancillary facilities is unknown at this time, but most would be installed within the boundaries of existing disturbances.

Additional compression may be required to transport some of the new production, but Burlington is not anticipating any for this Proposed Action. If any compression is required, it would be analyzed with an action for pipeline or other transportation system.

2.2.2.8 Site Restoration and Abandonment

Burlington proposes to completely reclaim all disturbed areas not needed for production activities including pipeline ROW's, portion of road ROW's not needed in the function of the road, and the portion of the drill pad not needed during production. In addition, Burlington would reclaim unneeded and illegal "short-cut" roads in the LMPA once the new access roads are complete. Drill pads are reclaimed such that an estimated one acre of disturbance remains per pad. Reclamation would generally include: (1) cleanup of the disturbed areas; (2) restoration of the disturbed areas approximately to the original grade; (3) ripping the disturbed area to a depth of 12 to 18 inches; (4) replacement of topsoil over all disturbed areas; (5) seeding of reclaimed areas with the seed mixture prescribed in by the BLM; and (6) fertilizing and mulching, if considered necessary by the BLM's authorized officer (AO).

The final set of reclamation measures to be applied would be developed in the APD or ROW grant by the operator in consultation with the BLM and would be specific to each site.

2.2.2.9 Applicant-committed Practices

2.2.2.9.1 Cultural Resources

Class III surveys would be completed on areas proposed for surface disturbance prior to initiation of the disturbance, and reports would be submitted to the BLM, RSFO. Burlington and contractors would inform their employees about relevant federal regulations protecting cultural resources. If any cultural remains, monument sites, objects, or antiquities, subject to the *Antiquities Act of June 8, 1906* or the *Archaeological Resources Protection Act of 1979*, are discovered during construction, activities shall immediately cease and the responsible AO would be notified.

2.2.2.9.2 Paleontological Resources

Literature and records review and field check did not lead to the identification of scientifically significant fossil resources within the project area. The Green River Formation (Laney Member), which underlies the project area in its entirety, is recognized by the BLM as a sensitive formation (Class 5 formation) known to contain scientifically significant fossil resources elsewhere in Wyoming, including not far from the project area boundaries. As a result of the

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

apparent absence of significant fossil resources in the project area, monitoring of surface disturbance is not recommended, however provision for the accidental discovery of such resources is recommended. If paleontological resources are uncovered during construction activities, Burlington or their contractors would suspend all operations to prevent further disturbance of such materials and would immediately contact the BLM's AO, who would arrange for a determination of significance and, if necessary, recommend a recovery or avoidance plan. Mitigation of paleontological resources would occur on a case-by-case basis, and Burlington would be responsible for the associated costs.

Table 2-2. Little Monument Project Employment Estimates, Per Well.

Pre-Approval & Permitting	Crew Size	Man-Days
Company Personnel	1	1
Permitting Contractor	1	1
Surveyors	2	2
Archeologist	2	1
Access Road/Well Pad Construction		
Operator Crew	8	16
Gravel Truck	1	2
Drilling		
Rig Move	5	10
Rig Supervisor	1	13
Rig Crews	10	130
Mud Logging	1	5
Mud Engineer	1	2
Mud Truck	1	2
Open Hole Logger	4	4
Fuel Trucks	1	11
Rig Mechanics	1	3
Completion		
Pulling Unit	4	16
Flowback Specialist	4	12
Consultant	1	9
Wireline	2	2
Fracturing	20	20
Drilling/Completion Total	71	262
Gathering System/ Water Line/Power Line Construction	10	50
Total Drilling and Field Development	81	312
Daily Average		10
Peak Day		21

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

Table 2-3. Little Monument Project Trip Estimates, Per Well.

Pre-Approval & Permitting	Total One-Way Trips
Company Personnel	2
BLM Personnel	2
Permitting Contractor	2
Surveyors	2
Archeologist	2
Access Road/Well Pad Construction	
Dozer Haul Truck	4
Grader Haul Truck	4
Backhoe Haul Truck	4
Crew Truck	4
Gravel Trucks	4
Drilling	
Rig Move	30
Rig Supervisor	26
Rig Crews	52
Open Hole Logger	2
Mud Engineer	4
Mud Trucks	4
Wire Line	6
Fuel Trucks	20
Rig Mechanics	6
Completion	
Pulling Unit	12
Flowback Specialist	16
Wireline	2
Consultant	18
Fracturing	20
Total Drilling	248
Gathering System/ Water Line Construction	42
Total Drilling and Field Development	290
Average Daily	10
Peak Daily	25

2.2.2.9.3 Air Quality/Noise

Burlington would not burn garbage or refuse at the drill sites or other facilities. All vehicles and construction equipment would be maintained to minimize exhaust emissions and would be properly muffled to minimize noise. Disturbed areas would be watered as necessary to suppress dust. Burlington employees and contractors would observe speed limits.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

In any area of operations (drill site, construction areas, etc.) where noise levels may exceed federal OSHA safe limits, Burlington Resources and its contractors would provide and require the use of proper personnel protective equipment by employees.

2.2.2.9.4 Vegetation and Wetlands

Vegetation

- Removal and disturbance of vegetation would be kept at a minimum through construction site management (e.g., using previously disturbed areas and existing easements, limiting equipment/material, storage yard and staging area size, etc.).
- Well locations and associated roads and pipelines would be located to avoid or minimize impacts in areas of high value (e.g., sensitive species' habitats, wetland/riparian areas).
- Proper erosion and sediment control structures and techniques would be incorporated by Burlington into the design of well pads, roads, pipelines, and other facilities. Revegetation using a BLM-approved, locally adapted seed mixture containing native grasses, forbs, and shrubs would begin in the first appropriate season following disturbance.

Watershed and Water Resources

- Crossing of ephemeral, intermittent, and perennial streams associated with road and utility line construction would generally be restricted until after spring runoff and normal flows are established.
- Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 feet below the channel bottom.
- Channel crossings by roads and pipelines would be constructed perpendicular to flow. Streams would be crossed perpendicular to flow, where possible, and all stream crossing structures would be designed to carry the 25-year discharge event or other capacities as directed by the BLM.
- Disturbed channel beds would be shaped to their approximate original configuration.
- Operators would avoid disturbance within 500 feet of wetland/riparian areas and open water area and within 100 feet of ephemeral/intermittent drainages, where possible. This includes fueling, servicing, and staging of vehicles.
- Any disturbances to wetlands and/or waters of the U.S. would be coordinated with the U.S. Army Corps of Engineers (COE), and 404 permits would be secured as necessary prior to disturbance.
- Burlington would evaluate all project facility sites for occurrence of waters of the U.S., special aquatic sites, and wetlands, per COE requirements. All project activities would be located outside of these sensitive areas, where practical.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

- Where disturbance of wetlands, riparian areas, streams, and ephemeral/intermittent stream channels cannot be avoided, COE Section 404 permits would be obtained by Burlington as necessary.

2.2.2.9.5 Wildlife

Burlington would comply with the following guidelines concerning avoidance of raptor nests and greater sage-grouse leks and nesting areas.

Raptors

Where feasible, pipeline ROW's would be selected and designed to avoid disturbance to raptor nests. If construction activities are to occur between February 1 and July 31, surveys for raptor nests within 0.5 to 1.0 mile of the proposed surface disturbances would be conducted to determine nest occupancy. All construction activities would be restricted between February 1 and July 31 within a 0.5-mile radius of all occupied raptor nests except ferruginous hawk and bald eagle nests, for which the seasonal buffer would be 1.0 mile. Surface structures requiring repeated human presence would not be constructed within 825 feet (1,970 feet for eagles) of active raptor nests, where practical. An active raptor nest is defined as a nest that has been occupied within the past three years.

Greater Sage-grouse

Surface disturbance within 0.25 mile of any sage-grouse lek would be avoided. If construction activities are planned in potential sage-grouse nesting habitat (i.e., areas within 2.0 miles of an active lek) between February 1 and July 31, BLM wildlife biologists would conduct field evaluations to identify active nests. If an active sage-grouse nest is identified in an area proposed for disturbance, construction activities would be delayed until nesting is completed and the young are fledged.

Sensitive Animals and Plants

The BLM would conduct FWS consultation and coordination as necessary for all mitigation activities relating to listed, or proposed for listing, threatened and endangered species and their habitats. In areas that have not been previously surveyed or cleared for these species, a qualified biologist/botanist would conduct surveys for these species in areas of potential habitat prior to disturbance, and if found, consultation with the FWS would be initiated, as necessary, and construction activities would be curtailed until the BLM, FWS, and Burlington concur on which activities can be authorized.

2.2.2.9.6 Health and Safety

Construction sites would be maintained in a sanitary condition at all times. Waste materials (human waste, trash, garbage, refuse, etc.) would be disposed of promptly at an appropriate waste disposal site. A litter policing program, approved by the AO, would be implemented by Burlington to cover all roads and other sites associated with the LMPA.

During construction and upon commencement of production operations, Burlington would have a chemical or hazardous substance inventory for all such items that may be at the site. Burlington would institute a Hazard Communication Program for its employees and would

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

require subcontractor programs in accordance with OSHA CFR 1910.1200. All employees would receive the proper training in storage, handling, and disposal of hazardous substances.

Spill Prevention Control and Countermeasure (SPCC) Plans would be written and implemented as necessary in accordance with 40 CFR Part 112 to prevent discharge into navigable waters of the United States.

2.2.2.9.7 Existing Utilities

Burlington would secure an ROW on public lands from the BLM prior to construction and would notify other authorized ROW users of any pipeline crossings or overlaps. Any associated building or zoning on river, creek, or utility crossing permits would be secured from the appropriate regulatory agency or private entity prior to construction.

2.2.2.9.8 Visual Resources

Burlington would restore the disturbed areas to as near its original contour as possible as soon as the work allows. The disturbed areas would be planted with the seed mixture(s) recommended by Burlington and approved by the BLM. All aboveground facilities would be painted with Carlsbad Canyon 2.5Y 6/2 or a similar color determined by the AO to blend with the surrounding landscape, except for structures that require safety coloration in accordance with OSHA requirements.

2.2.2.9.9 Recreation

Burlington would minimize conflicts between project vehicles and equipment and recreation traffic by posting appropriate warning signs, implementing operator safety training, and requiring project vehicles to adhere to low speed limits.

2.2.2.9.10 Water Resources

Burlington would minimize impacts to surface waters by design and construction of interception ditches, sediment traps, silt fences, water bars and revegetation, and soil stabilization measures as needed.

Burlington would case wells during drilling, and case and cement all wells in accordance with Onshore Order No. 2 to protect accessible high quality water aquifers. Well casing and weldments would be of sufficient integrity to contain all fluids under high pressure during drilling and completion. Further, wells would adhere to the appropriate BLM cementing policy.

Reserve pits would be constructed to prevent seepage of fluids, utilizing drilling mud gel or poly liners. The liner would be impermeable and chemically compatible with all substances which may be put in the pit. Burlington would maintain two feet of freeboard on the reserve pits at all times to avoid the overflow danger.

Burlington would implement a pollution prevention plan (PPP) for storm water runoff at drill sites as required by the Wyoming Department of Environmental Quality (WDEQ) storm water NPDES permit requirements. The WDEQ requires operators to obtain a field permit for fields of 20 wells or more.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

Burlington would coordinate all crossings or encroachments of waters of the U.S. with the COE.

2.2.2.9.11 Soils

Burlington would minimize areas of disturbance to the minimum required for safely accomplishing their objectives. Where feasible, pipelines would be located adjacent to roads to minimize disturbance. Burlington would install runoff and erosion control measures such as water bars, berms, and interceptor ditches as needed. Culverts for ephemeral and intermittent drainage crossings would be installed.

Burlington would include adequate drainage control devices and measures in road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosive, concentrated flows. In conjunction with surface runoff or drainage control measures, Burlington would use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers.

Upon completion of construction activities, Burlington would restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites. Re-seeding would be performed pursuant to APD/ROW stipulations. The following procedures are recommended to assure that all disturbed areas are stabilized and that revegetation efforts are enhanced so that adverse impacts do not occur (USDI-BLM 1997, USDI-BLM 1999b).

Scarification. Prior to revegetation, all compacted areas will be scarified by ripping or chiseling to loosen compacted soils. Scarification promotes water infiltration, better soil aeration and root penetration. Scarification will be done when soils are dry to promote shattering of compacted soil layers.

Seedbed Preparation. Proper seedbed preparation is critical for seed establishment. Seedbed preparation will be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement and moisture retention. Seedbed preparation will also be performed to break up surface crusts and to eliminate weeds, which may have developed between final grading and seeding. In most cases, chiseling is sufficient because it leaves a surface smooth enough to accommodate a tractor-drawn drill seeder and rough enough to catch broadcast seed and trap moisture and runoff. In low to moderate saline soils, a firm, weed-free seedbed is recommended. With high salinity levels, particularly when a high water table is involved, a fallow condition may not provide the best seedbed. If existing vegetation and weeds are chemically eradicated, the remaining dessicated roots and stems improve moisture infiltration and percolation, reduces evaporation from the soil surface, and protects emerging seedlings (Majerus 1996).

Seed Mixtures. Seed mixtures will be specified on a site-specific basis and their selection will be justified in terms of local vegetation and soil conditions. Livestock palatability and wildlife habitat needs would be given consideration in seed mix formulation. The recommended general seed mixtures shown in Table 2-4 were developed from observation of successful revegetation in the Green River Basin region and observation of dominant species in the project area. These mixtures comply with Executive Order 13112 (Invasive Species). EO 13112 also specifies that use of any introduced plant species must have prior BLM approval for federal lands.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

BLM guidance for native seed use is BLM Manual 1745 (Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants). The WGFD recommends that BLM consider shrub species in seed mixtures. BLM will coordinate with WGFD to insure that the correct shrub species are incorporated into seed mixtures on federal lands. Native species that will be considered include bluebunch wheatgrass, streambank wheatgrass, needle-and-thread grass and Wyoming big sagebrush. Fall seeding will occur from about September 15 until ground freeze or snow pack prevents critical seed soil coverage. The optimum time to seed a forage or cover crop in saline-alkaline soils is late fall (mid-October to December) or during a snow-free period during the winter (Majerus 1996). Ideally, in saline-alkaline soils, the seed should be in the ground before the spring season so that it can take advantage of the diluting effects of early spring moisture. Spring seeding will be completed by May 30 or as directed by the BLM. Seed will be used within 12 months of testing.

Table 2-4. BLM-Recommended Seed Mixes for Disturbed Surface Land Areas in the RSFO Management Area (USDI-BLM 1999 and Glennon 2003).

Plant Species	Variety (if applicable)	Recommended Drill Seeding Rate (lbs/ac PLS) ^A
SALINE/SODIC SOILS		
Western wheatgrass	'Rosanna'	4.0
Sandberg bluegrass		2.0
Indian ricegrass		3.0
Bottlebrush squirreltail		1.0
Scarlet globemallow		1.0
Gardner saltbush		2.0
Shadscale		2.0
TOTAL		15.0
WETLAND/HIGH WATER SOILS		
Tufted hairgrass		2.0
Basin wildrye		5.0
Slough grass		6.0
Bluejoint reedgrass		3.0
TOTAL		16.0
UPLAND SOILS		
Thickspike wheatgrass	'Critana'	4.0
Western wheatgrass	'Rosanna'	4.0
Indian ricegrass		4.0
Scarlet globemallow		1.0
Winterfat		2.0
Fourwing saltbush or shadscale		1.0
TOTAL		16.0

^A Pounds/acre Pure Live Seed.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

Seeding Method. Drill seeding will be used where the terrain is accessible by equipment. The planting depth for most forage species is 1/4 to 1/2 inch (5-10 mm). A double disk drill equipped with depth bands will ensure optimum seed placement. The seed will be separated by boxes to prevent seed from separating due to size and weight. Rice hulls or other appropriate material will be added to the seed as necessary to prevent separation. The drill will be properly calibrated so that seed is distributed according to the rates specified for each seed mix.

Although not anticipated to be common in the project area, areas too steep for drill seeding or where approved by the BLM, broadcast seeding may also be used. Broadcasted seed should occur onto a rough seedbed and then should be lightly harrowed, chained or raked to cover the seed. The seeding rate should be doubled for the recommended mixtures because the mixtures were developed for drill seeding. The method used to cover the seed should be selected so that the seed is lightly covered but maintains the surface in rough condition. The broadcast seeder should be properly calibrated or the seeding should occur over a calculated known area so that the proper seeding rate is applied.

Mulching. Where mulching is deemed necessary, a certified weed-free straw or hay mulch will be crimped into the soil at an application rate of two to four tons per acre. Mulches will be applied by blowers, spreaders or by hand. The mulch will not be finely shredded during application and mulch strand lengths will be long enough to be anchored by crimping. The mulch will be spread uniformly over the area so that 75 percent or more of the ground surface is covered. Mulch will be crimped to a depth of two to three inches.

In addition, Burlington would reclaim illegal access roads and other disturbances in the LMPA which are not being utilized by current Burlington operations.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

2.3.1 Fewer Well Sites

Burlington briefly examined developing fewer wells, but concluded that the number of wells in the Proposed Action was the fewest justifiable to rigorously define the gas resource in the LMPA.

2.3.2 Directional Drilling from Fewer Well Sites

Burlington examined utilization of horizontal or directional drilling to minimize surface disturbance. This alternative is not evaluated further for the following reasons:

- Economics – horizontally drilled wells are estimated to cost up to 300% as much as similar vertically drilled wells with no commensurate increase in production. (EIA 1993) The Vermillion Basin EA DR/FONSI, Appendix D (USDI, 2002) estimates directional drilling costs at 140% of vertically drilled wells. This resource extraction method is a process driven by subsurface geologic criteria.
- Reservoir issues – The Frontier Formation (the target pay zone for the LMPA) is fairly deep (greater than 9,000 feet below the surface) and of limited porosity. Fracture stimulation is key to the development of an economic gas well in this type of formation. Horizontal or directional drilled wells can exhibit more severe problems than vertical

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

wells due to collapse of the formation into the wellbore during fracture stimulation. In addition, horizontal drilling technology requires precise control of target locations in three dimensions. Even the thickest gas producing zones in the project area are below the vertical resolution of current seismic technology and yield no target control for lateral drilling. Thus, without the knowledge of gas seam locations, directional drilling would not produce the desired results.

- Surface disturbance – the LMPA is a mature gas producing area with 31 existing gas wells in the LMPA since 1978. The townships overlapping the Lincoln Road Project area, which includes the LMPA, contain 418 producing wells. Burlington is proposing to drill another 31 wells which would disturb approximately 94 acres. Utilizing horizontal or directional drills could decrease this disturbance, but not significantly.