2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

As a result of drilling activities within the original Cave Gulch EIS area following issuance of the Cave Gulch ROD, the Operators have now determined that additional exploration and drilling activity is warranted within a revised project area to fully develop the natural gas resources contained therein. The Operators' Proposed Action for the CGIDP includes the continued development of natural gas resources at increased well densities within a modified project area that includes the Cave Gulch EIS area and an additional 1,920 acres to the southwest of the original EIS project area (see Figure1.1). Additional exploration and development activities within the CGIDP area would begin this spring and continue for approximately 10 years, with the majority of the proposed exploration and development activity expected to occur within the first 5 years following project approval.

Well densities would vary across the CGIDP area, with wells generally being developed on both 40-acre and 20-acre spacing and 10-acre spacing in the core area. Ten-acre spacing (the grouping of closely spaced wells) has been determined to be both viable and necessary for the efficient production of the natural gas resource in the core area (WRMG 2004). Various associated facilities (roads, pipelines, etc.) would also be constructed in conjunction with the continued development of the natural gas resource in the CGIDP area as previously described in the Cave Gulch EIS (BLM 1997a).

2.2 PROPOSED ACTION

2.2.1 Introduction

Under the Proposed Action, the Operators would drill 154 new wells from 110 well pads. They estimate that 87 wells would be drilled at a density of one well per 40 acres, 26 wells would be drilled at a density of one well per 20 acres, and 41 wells would be drilled at a density of one well per 10 acres. The Operators would directionally drill three of the wells proposed at a density of one well per 20 acres and all of the wells proposed at a density of one well per 10 acres. Additional directional drilling will be considered to reduce surface impacts based on continued success of development drilling, the future success of wells drilled at increased depths and/or higher densities, technological advances that allow for the efficient development of marginal reserves, and future economic considerations. The infrastructure to

support these additional wells is largely in place due to the level of exploration and development that has already occurred in the CGIDP area after the Cave Gulch ROD was issued.

The Proposed Action would begin after the BLM issues the DR for the EA. As indicated above, most drilling would occur during the first 5 years, but some drilling activity would probably occur thereafter. Up to four drilling rigs may be active in the CGIDP area at any one time. The Operators expect production from the field to continue for 30 to 40 years.

2.2.2 Preconstruction Planning and Design Measures

Detailed information concerning actions regarding preconstruction planning and design measures that would be implemented by the Operators are presented in Section 2.2.2.11 of the Cave Gulch EIS.

2.2.3 Transportation and Workforce Requirements

Activities and/or requirements associated with transportation and workforce requirements would be similar to those discussed in Section 2.2.2.1 and 2.2.2.5, respectively, of the Cave Gulch EIS.

2.2.4 Access Roads

Primary access to the CGIDP area would be provided by U.S. Highway 20-26, which crosses the southern part of the CGIDP area, and Natrona County Roads 104 and 212, which run north/south through the CGIDP area (see Figure 1.1). Previous exploration and development activities within the CGIDP area have resulted in a road network that should be adequate for access into and within the CGIDP area. Consequently, extensive additional road construction would not be required. However, construction of a collector road system would be required in the 1,920-acre addition where limited exploration and development activity has occurred to date.

New road construction associated with additional exploration and development within the overall project area would average approximately 1,270 ft (0.24 mi) of new road per well location based upon measurements of previous road construction activity within the overall CGIDP area. Road construction associated with 20-acre density wells would be less because these wells would infill existing development where roads have already been constructed in conjunction with wells previously drilled by the Operators on 40-acre well densities. However, a few more new roads would be required for access to those wells proposed on 40-acre

densities, as these wells would be located on the outside of the core area where previous exploration and development activities have been somewhat limited. The 10-acre density wells would be directionally drilled from pre-existing well pads, so no new road construction would be necessary.

Considering a total disturbed ROW width that does not exceed 45 ft, 139,700 ft of new access road construction would result in approximately 145 acres of total (short-term) surface disturbance. As indicated above, no new road construction would be required for wells drilled on 10-acre well densities. Whenever possible, access roads would be designed and constructed to disturb less than the 45-ft ROW, as long as traffic and safety concerns could be satisfied. The existing access roads would be maintained as necessary to accommodate appropriate year-round traffic and to prevent unnecessary erosion.

The types of roads that would be constructed to each well pad would be based on the specific use of the road, relative location to other roads, soil types, and topography. Roads would be constructed in accordance with BLM Manual Section 9113 (BLM 1985b) and/or to the standards outlined in the joint BLM/USFS publication *Surface Operating Standards for Oil and Gas Exploration and Development* (BLM and USFS 1989) and would be designed by a professional engineer as directed by the BLM. Road graveling would be accomplished within 60 days after well completion or as soon as practical. Surfacing and base course materials would be obtained from previously authorized sources within the general area.

2.2.5 Well Pad Design and Construction

The traditional single-well well pad design previously utilized in the Cave Gulch EIS area for drilling operations to the Fort Union/Lance formations would continue to be the predominant pad design used for the Proposed Action (Figure 2.1). Well pads would be constructed from native materials located at the site and would typically occupy a level area of approximately 2.0 acres (350 x 250 ft). With the areas of cut and fill and soil stockpiling, the total area disturbed for well pad construction would average approximately 3.2 acres per well pad, depending upon the severity of the topography at the site. The Operators would utilize a twin (or dual) well pad design in the core area of the CGIDP (Sections 29, 30, 31, and 32 of T37N, R86W). The dual well pad design would be utilized for drilling operations where a second directional well would be drilled from the same well pad along with the initial (vertical) well. Wells pads constructed to accommodate dual wells would occupy a level area of approximately 2.3 acres (400 x 250 ft) or 3.5 acres per well pad once areas of cut, fill, and soil stockpiling are included. Well pads

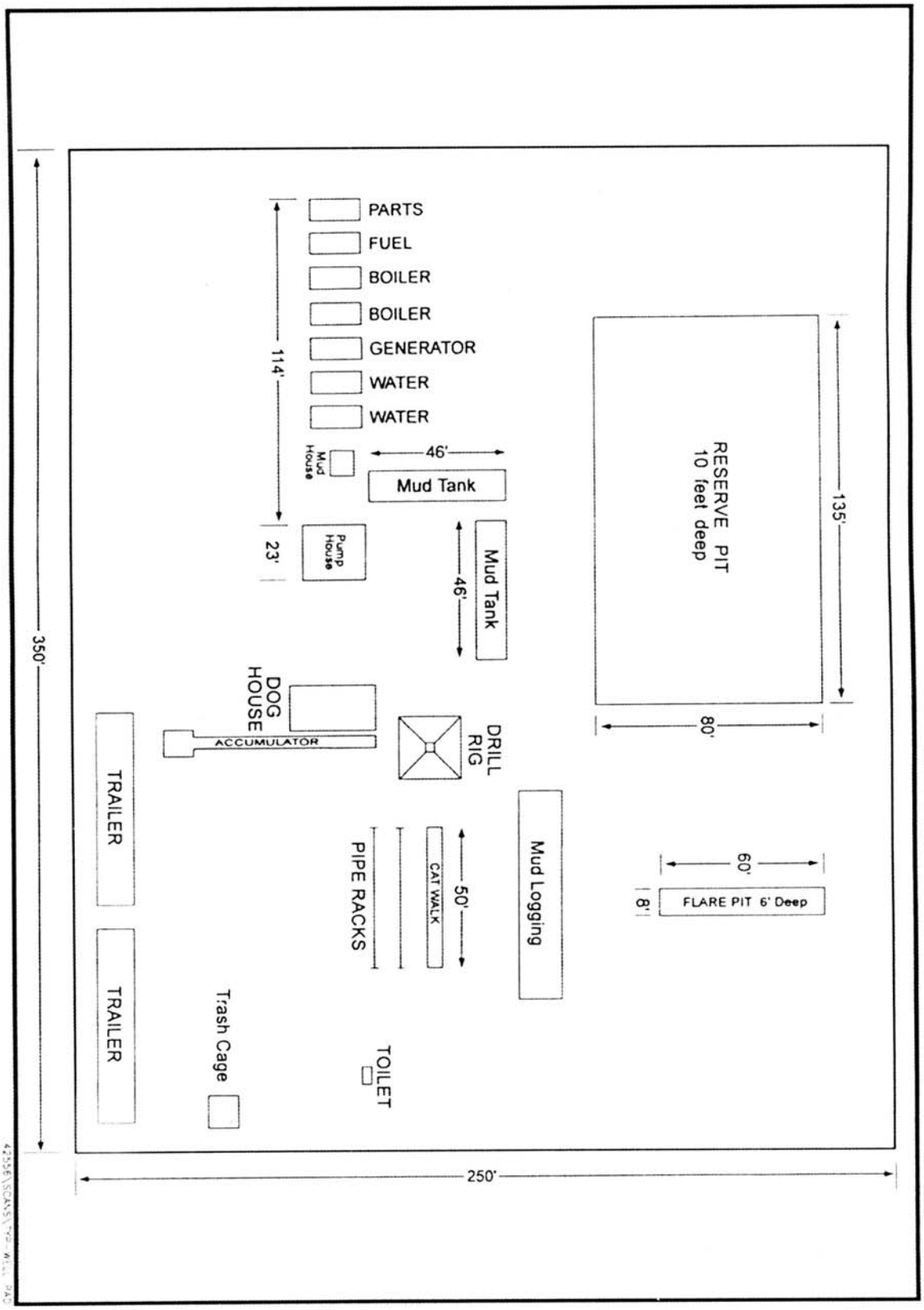

Figure 2.1 Typical Drawing of a Single-well Pad.

constructed to accommodate a single deep well would occupy a level area of approximately 5.7 acres (500 x 500 ft) or 8.7 acres once areas of cut, fill, and soil stockpiling are included. The actual size of these well pads would depend primarily upon the availability of specific drilling rigs at any particular time, terrain limitations at each individual drill site location, and the total depth to which the well would be drilled.

Section 2.2.2.2 of the Cave Gulch EIS contains a description of the major components of each individual single well pad and the techniques to be used in their design and construction. The major components of the twin well pads would be the same as proposed for the single well pads with the possible addition of a second set of production facilities (oil tank, produced water tank, production pack, and meter run) and a second well head assembly located approximately 15 ft from the first (initial) well bore.

2.2.6 Drilling Operations

The Operators plan to have from one to four drilling rigs in service at any given time within the CGIDP area. Please refer to Section 2.2.2.3 of the Cave Gulch EIS for a more detailed description of proposed drilling operations in the CGIDP.

The primary geologic formations to be tested in the CGIDP area include the Lower Fort Union and Lance formations, with productive potential found in certain deeper horizons as well. The drilling depths for gas wells drilled into the Lance Formation is approximately 9,800 ft and would require approximately 20 drilling days for vertical drilling operations barring major drilling complications. The Lower Fort Union Formation, at a depth of approximately 5,000 ft, is considerably shallower than the Lance Formation and would require approximately 7 days for vertical drilling operations. Deeper wells would require more drilling time--estimated at approximately 35 days to penetrate the Mesaverde Formation and approximately 240 days to penetrate the Muddy Formation.

2.2.6.1 Water-Based Drilling Fluids System

The Operators would utilize the same basic drilling fluids system identified in the Cave Gulch EIS. Average water requirements would equal approximately 462,000 gallons (1.3 acre-ft) per well, or approximately 200 acre-ft for the 154 wells. Fresh water would be obtained from one of several commercial water wells in the area:

- a commercial water well and reservoir owned by Mel's Water Service and located in the NE¼NE¼ of Section 30, T36N, R86W (State of Wyoming Permit #UW-47628);

- a commercial water well and reservoir owned by Mike/Pat Grose and located in the NW¼NW¼ of Section 19, T36N, R86W (State of Wyoming Permit #UW-107014); and
- a commercial water well and reservoir owned by Andy and Glenda VanPatten and located in the NE¼SW¼ of Section 30, T36N, R86W (State of Wyoming Permit #UW-104817).

Water used in drilling operations would be contained in an earthen reserve pit constructed on each location and would serve as the base medium for the drilling mud system. The reserve pit would be fenced on the three non-working sides during drilling, with the fourth side of the pit fenced to protect wildlife and livestock immediately following removal of the drilling rig. Fencing would be installed in accordance with guidelines contained in *Surface Operating Standards for Oil and Gas Exploration and Development* (BLM and USFS 1989) and would be maintained until the reserve pit has been backfilled. Netting (1-inch mesh) would be placed over reserve pits containing hydrocarbons or other substances potentially toxic to wildlife in compliance with *BLM Information Bulletin Number WY-93-054*.

No water would be diverted from the North Platte River or any of its tributaries for use in construction, drilling, cementing, completion, hydrostatic testing, or dust abatement operations within the CGIDP area.

2.2.6.2 Oil-Based Drilling Fluids System

Drilling operations currently proposed by Pogo Producing Company (POGO) in Section 23, T36N, R87W, would utilize an oil-based mud system for drilling operations from the base of the surface casing (≈1,000 ft) to total depth. The oil-based mud system would consist primarily of no. 2 diesel fuel, which would reduce the potential for hole sloughing while drilling through water-sensitive formations. The oil-based mud and drilled cuttings would be circulated out of the hole during drilling operations and centrifuged to remove excess fluids. The semi-dry cuttings would then be placed in a separate lined pit for treatment and disposal upon completion of drilling operations. Drilling fluids utilized in the oil-based mud system would be contained on location in steel tanks specifically designed for that purpose. These fluids would be recycled during drilling operations by separating the drilled cuttings from the oil-based fluids. The cuttings would be deposited in a separate lined cuttings (reserve) pit for treatment, and the fluids would be recycled into the mud system (steel tanks) for use in drilling operations. A plastic/vinyl liner would be placed underneath all steel tanks designed for the storage and/or mixing of the oil-based drilling fluid system.

Upon cessation of drilling and completion operations, POGO would utilize the solidification technique developed and marketed by Soli-Bond, Inc. for processing and disposing of the oil-contaminated drill cuttings. The Soli-Bond processing technique would render the drill cuttings into an inert solid mass that would be buried in the cuttings pit and covered with a minimum of 3 ft of overburden.

The other Operators may also elect to utilize an oil-invert mud system in certain circumstances and would utilize similar solidification techniques for cuttings treatment and pit closure. While the solidification techniques utilized may not be those specifically developed and marketed by Soli-Bond, Inc., the end result would be the same.

2.2.6.3 Casing and Cementing Operations

Surface casing equal to 10% of the total vertical depth of the well would typically be set and cemented back to the surface on each proposed well to isolate all near-surface fresh water aquifers. Upon reaching total depth, the well would be evaluated and production casing would be set and cemented as warranted by electric logs and/or hydrocarbon shows. Cement would be circulated to a minimum of 300 ft above the top of the shallower geologic horizons of the Fort Union Formation, thereby effectively isolating all geologic formations encountered downhole in compliance with BLM *Onshore Oil and Gas Order Number 2* (43 C.F.R. 3160). This cementing procedure would eliminate any possibility for fluid communication between potential hydrocarbon-bearing zones and any near-surface fresh water aquifers that may be encountered downhole.

2.2.7 Well Completion and Testing Operations

Once a well has been drilled and cased, a workover unit would be moved on-site and completion operations would begin. Completion operations would typically require an average of 3 to 5 days per well location and would include cleaning out the well bore with water containing a 3% solution of potassium chloride (KCl), pressure testing, and perforating the potentially productive formations downhole to allow the flow of hydrocarbons to the surface.

After the casing has been perforated, production tubing would be run and specific zones within the targeted formation would be fractured. A normal “frac” of each potentially productive zone would include a mixture of approximately 1,500 barrels (bbl) of fresh water (mixed with KCl to obtain an overall 3% solution) and 100,000 to 150,000 pounds (lbs) of sand that is pumped down the casing under extreme pressure and forced

through the perforations into the formation. As the formation is fractured, the resultant spaces are filled with sand to prop them open, which facilitates the flow of gas into the well bore and subsequently to the surface.

Upon completion of the frac job, the well would be flowed back to the surface in an attempt to recover as much of the frac fluid as possible and to clean excess sand from the perforations prior to setting production equipment and placing the well on line. All fluids utilized in the completion procedure would be captured either in the reserve pit or in test tanks on the well location and ultimately disposed of in strict accordance with Wyoming Department of Environmental Quality (WDEQ) rules and regulations. Gases produced in association with completion and testing would be diverted to the flare pit. Approximately 30 days of well testing are typically required to recover frac fluids, to clean out the perforations, and to obtain an accurate flow test of the well. Completion operations typically take 3 to 4 weeks for shallow wells (Fort Union/Lance Formation) and 8 to 9 weeks for deeper wells (Mesaverde/Muddy Formation).

After production facilities are installed, reclamation would be initiated as soon as practicable on those portions of the well location not needed for production. Reclamation would occur on the unneeded (non-working) areas of existing well pads and access road/pipeline ROWs. Approximately 30 to 40% of the original well pad would be required for ongoing production operations, whereas the remaining 60 to 70% would be reclaimed by backfilling, recontouring, and reseeding as specified in the approved Application for Permit to Drill (APD) and Appendix A. Reclamation of the well location would be accomplished within a maximum of 2 years following the termination of drilling and completion operations (in the case of productive wells) or well abandonment (in the case of newly drilled dry holes). Approximately 38% of the disturbance associated with road building would be reclaimed shortly after disturbance.

Reclamation of the reserve pit would be accomplished when the pit is no longer required for completion and/or testing operations. Prior to backfilling the pit, all free-standing water would be allowed to evaporate through natural means to the greatest extent possible; however, in some instances the pit contents may be mixed with suitable solid materials and the pit backfilled, as approved by the either the BLM or WOGCC. Prior to the mixing of reserve pit contents with approved stabilizing materials, the contents of the reserve pit would be tested for total petroleum hydrocarbons (TPH) and toxicity characteristics leaching procedure (TCLP) constituents, and appropriate closure permits would be obtained from the WOGCC and/or WDEQ. If necessary, reserve pit contents would be removed and disposed of at an approved disposal facility in a manner commensurate with all relevant county, state, and federal regulations and stipulations.

2.2.8 Production Operations

CGIDP wells would be expected to produce varying quantities of natural gas and oil (condensate) with minor quantities of water. Production equipment at each well would generally include a "Christmas tree" (valve assembly) at the well head, a separator where entrained liquid hydrocarbons (condensate or oil) would be separated from the gas stream, and tanks for the storage of both produced water and liquid hydrocarbons. Once the liquids have been separated from the gas stream, the "dry" gas would be metered on location for allocation purposes prior to being released to the gas gathering system for delivery to existing compressor facilities within the CGIDP area. The Operators do not anticipate the need for any additional compression beyond the levels originally analyzed in the Cave Gulch EIS.

Production operations would occur on a year-round basis. Routine maintenance operations on project-related roads would typically occur during the late spring, summer, and early fall. Winter maintenance generally would be limited to snow removal necessary to facilitate access to producing wells and associated facilities.

All aboveground structures on a well location for 6 months or longer, such as pumping units and tank batteries, would be painted one of the standard environmental colors recommended by the Rocky Mountain Five-State Interagency Committee, as specified in the approved APD. Environmental colors will be chosen that best mitigate visual impacts. The color specified for aboveground structures may vary in different geographic portions of the project area. The only exception to this would be for structures subject to safety considerations, which would be painted the color specified by regulation. The Operators would submit a schematic diagram showing the proposed production facility layout to the BLM for approval prior to commencing installation operations on lands subject to federal jurisdiction. A typical production facility layout is presented in Figure 2.2.

2.2.9 Gas Gathering System

Gas gathering system "corridors" have already been established in the CGIDP area and should be sufficient for the transportation of additional natural gas produced in conjunction with the Proposed Action. Buried pipelines would be installed to facilitate the collection and transportation of natural gas from each individual producing well to a connection with the existing gas gathering system, and these pipelines would be buried to a depth of approximately 6 ft below the natural ground surface. Pipeline diameters would range from 3 to 10 inches based primarily on gas production rates at each respective well.

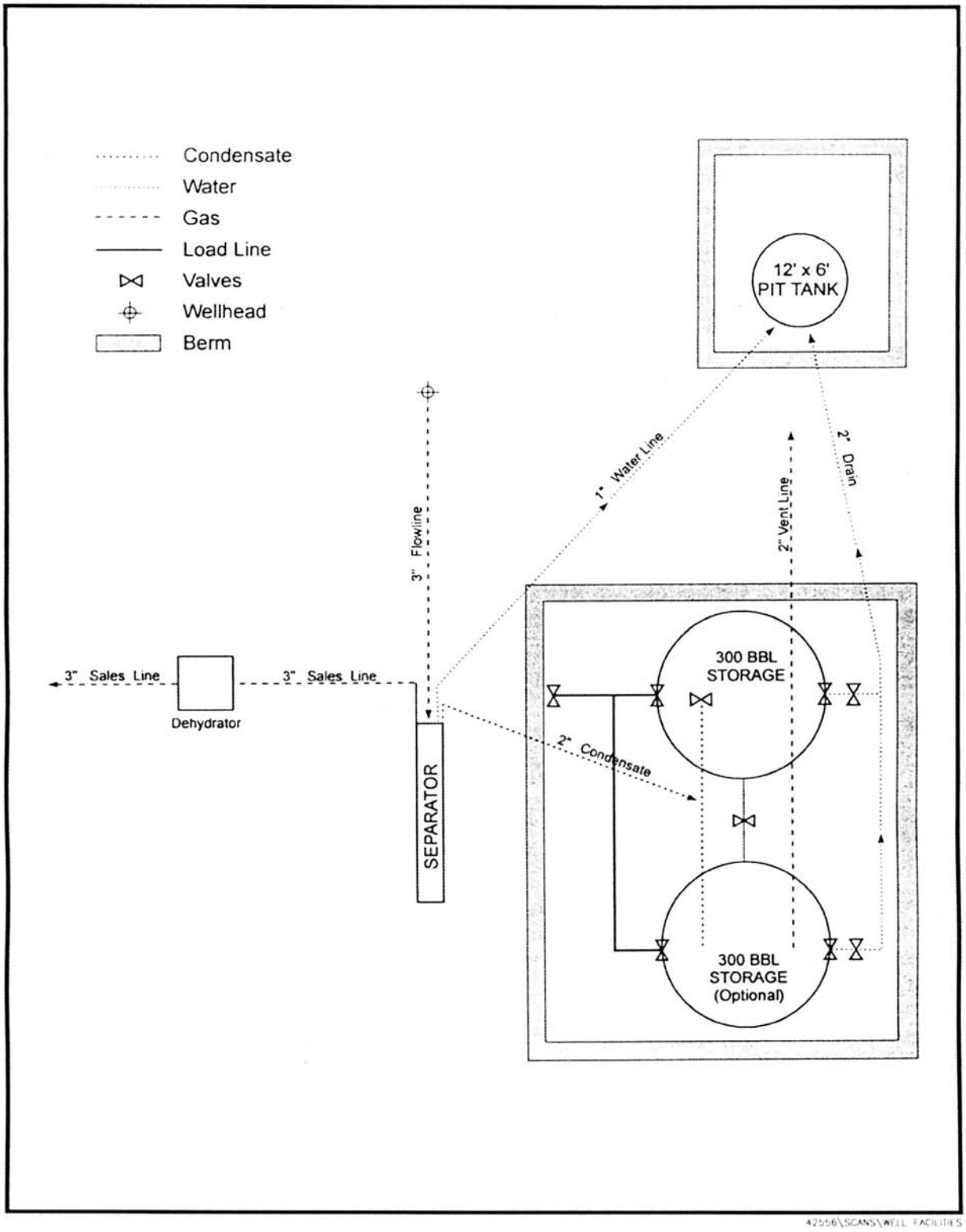

Figure 2.2 Typical Production Layout for a Single-well Pad.

Development activities at a 20-acre well density would require significantly less pipeline construction than would development at a 40-acre well density because most of these infill wells would be located in areas where an existing gas gathering system already exists. Pipelines would be installed directly adjacent to existing access roads within the CGIDP area to the extent practicable and would require a disturbed ROW width of 30 ft. Where installation is adjacent to an existing road, the Operators would use the existing access road as a staging area for pipe assembly and installation.

Fresh water for use in hydrostatic testing of pipelines would be obtained from those local sources identified in Section 2.2.6.1. Upon completion of hydrostatic testing activities, the water would be pumped into tanks and transported over existing roads to drilling locations within the CGIDP area for use in ongoing drilling operations. Should the recovered water not be needed for use in drilling operations, it would be discharged to the surface on undisturbed lands having vegetative cover or into an established drainage channel in a manner that would not cause accelerated erosion. Any surface discharge of hydrostatic test water would be conducted in full compliance with WDEQ rules and regulations.

Please refer to Section 2.2.2.4 of the Cave Gulch EIS for a more detailed discussion of pipeline construction and testing techniques.

2.2.10 Produced Water Disposal

As is the current practice, methods used for the future disposal of water produced in association with the natural gas and separated from the gas at the well location would be accomplished though a combination of discharge to the surface under existing/proposed National Pollutant Discharge Elimination System (NPDES) permits issued by the WDEQ and by underground injection under existing/proposed Underground Injection Control (UIC) Permits issued by the WOGCC. Produced water that does not meet the water quality criteria for surface discharge established by the WDEQ would be routed through buried pipelines to existing and proposed injection wells for subsurface disposal. The necessary permits for existing disposal facilities in the CGIDP area have been obtained from the appropriate regulatory agencies. Permits for any new discharge/disposal facilities proposed herein would be acquired as necessary prior to construction and use. Depending on the quantity and quality of produced water available at any given time, some of the produced water could be used in conjunction with drilling, completion, and hydrostatic testing operations within the CGIDP area.

2.2.10.1 Additional Water Injection Wells

There are currently three permitted water injection wells within the CGIDP area:

- South Branch Federal #1: NW¼NW¼ (Lot 7) of Section 5, T36N, R86W, operated by Bill Barrett Corporation;
- South Branch Federal #2-5 SWDW: NE¼SE¼ (Lot 10) of Section 5, T36N, R86W, operated by Bill Barrett Corporation; and
- Waltman Unit #15: SW¼SW¼ of Section 7, T36N, R86W, operated by Chevron USA Inc.

Due to the limited capacity of these existing injection wells and considering the distance of both the 1,920-acre extension and the southern portions of the Waltman Field from the core area of the CGIDP area, as well as varied nature of the oil/gas operators involved in the Proposed Action, it is possible that additional water injection wells and water disposal/treatment facilities may be required in these areas. There are no plans for the installation of additional injection wells or water treatment/disposal facilities outside of the core area of the CGIDP; however, provision has been made below for additional water injection wells/disposal facilities should they be required at some point within the foreseeable future. In this regard, up to four additional produced water injection wells and associated pipelines could be required for the disposal of the additional produced water that would be generated by the additional wells under the Proposed Action.

These injection wells would be similar in design to those currently operating within the CGIDP area. To the extent possible or practical, the Operators would attempt to use existing well bores (either existing wells [non-commercial] or previously plugged and abandoned wells) for conversion to injection wells. The ability of the Operators to utilize pre-existing well bores for conversion to injection wells would depend upon the proximity of the existing well bore to the produced water source, the depth of the well, the condition of the existing casing downhole, and the characteristics of the target formation including its ability to meet the UIC requirements for disposal operations therein. Installation, abandonment, and reclamation procedures for these injection wells would be similar to those included in the Cave Gulch ROD and are included in this EA by reference. The Operators would comply with applicant-committed practices, mitigation measures, and monitoring activities as specified in Appendix A, Section III, of the Cave Gulch ROD.

Assuming that pre-existing well bores would be used for conversion to injection, approximately 1.12 acres of LOP surface disturbance would be associated with each individual water injection well. Surface disturbance associated with well re-entry and completion activities would be calculated based upon a single well pad design as defined in Section 2.2.5. In most cases these injection wells would be located at the periphery of the existing well field and would typically require the construction/ reconstruction of approximately 7,920 ft (1.5 mi) of access road per well. Using the disturbance parameters outlined in Sections 2.2.4 and 2.2.9, installation of approximately 31,680 ft (6.0 mi) of access road and produced water pipeline to these four injection wells would result in total surface disturbance of approximately 55 acres (33 acres and 22 acres respectively). The produced water pipelines would be installed in a common corridor with the access road to each proposed injection well. LOP surface disturbance associated with access road construction would be approximately 21 acres. Water disposal pipelines within the well field would be installed adjacent to existing access roads and would not result in any additional LOP surface disturbance.

2.2.10.2 Produced Water Gathering System

The Operators propose to install a produced water gathering system within the CGIDP area for the transportation of water produced primarily from wells in the core area to the Cave Gulch Unit (CGU) #4 water treatment and disposal facility (WTDF). The proposed water gathering system would consist of a main "trunk" pipeline designed to gather the combined water produced from wells in/adjacent to the core area and to transport the produced water to the CGU #4 WTDF. Lateral lines would be installed from individual wells (or groups of wells) and would tie into the main trunk line. The trunk line would consist of 10- to 12-inch polyethylene pipe, and the lateral lines would consist of 3- to 6-inch polyethylene pipe. These lines would be buried at a maximum depth of 6 ft to prevent freezing and would parallel existing/proposed roads and/or natural gas pipelines within the field to the greatest extent possible. In the case of new wells drilled and completed within the CGIDP area, water disposal lines would be buried in the same ROW that is required for installation of the gas gathering system. In the case of existing wells, the water lines would be installed in existing ROW corridors (access road and/or pipeline) to minimize surface disturbance. Although these lines would be installed in existing previously disturbed ROWs, it is assumed that these existing ROWs have already been reclaimed to some extent and that the installation of these lines would be considered as surface disturbance for the purposes of this analysis. Therefore, the installation of approximately 86,360 ft (16.4 mi) of water gathering line (including both main trunk and lateral lines) connecting approximately 68 existing wells to the CGU #4 WTDF would result in approximately 60 acres of surface disturbance. The installation of water gathering lines for the 154 wells

in the Proposed Action would not result in any additional surface disturbance because the produced water lines would be installed in common ROWs with the gas gathering lines.

2.2.10.3 Proposed Cave Gulch Unit #4 Water Treatment and Disposal Facility

The Operators propose installation of a replacement WTDF adjacent to the CGU #4 well location (SW¼SW¼ of Section 29, T37N, R86W) for treatment and disposal of water produced from both existing and proposed wells in the core area of the CGIDP area. The CGU #4 WTDF would replace an existing facility located on the Bullfrog Unit #1-6-36-86 abandoned well location (NE¼NW¼ of Section 6, T36N, R86W). The existing Bullfrog facility would continue to be used for the treatment and disposal of water produced from wells within the core area of the CGIDP area until such time as the proposed CGU #4 WTDF has been installed and is operational. At that time, the facilities on the Bullfrog Unit #1-6-36-86 well location would be dismantled and the existing well location would be reclaimed in accordance with reclamation guidelines presented in Appendix A of this EA.

The CGU #4 water treatment and disposal facility would require approximately 3 acres and would generally consist of the following components:

- a 60 x 30 ft building housing pumps and filters for the transfer of water from the tank battery to subsurface disposal;
- a tank battery consisting of approximately fifteen 400-bbl tanks designed to hold both water and skimmed oil (condensate); and
- an unlined evaporation pond constructed for the surface discharge of produced water.

The existing water transfer and treatment facility located on the Cave Gulch Unit #4 would be dismantled and the disturbed area reclaimed in accordance with reclamation guidelines presented in Appendix A of this EA and Appendix A of the Cave Gulch ROD. The new facility would be constructed directly adjacent to the CGU #4 well location and would be operational within 12 to 18 months following BLM approval.

The proposed tank battery would occupy an area approximately 86 x 54 ft and would be surrounded by a concrete containment dike. Water received by the facility would initially be routed through “skim” tanks designed to remove any remaining liquid hydrocarbons prior to disposal. The liquid hydrocarbons skimmed from the produced water would be routed to separate oil storage tanks for sales, and the water would be routed to water storage tanks for disposal. Disposal methods would be determined by water

quality, which varies throughout the CGIDP area. Water that meets the quality criteria established by the WDEQ in the approved NPDES permit would be discharged to the surface though a wetland to be constructed adjacent to the CGU #4 WTDF. Any produced water that does not meet the NPDES criteria for discharge would be injected into the subsurface in accordance with an approved UIC permit issued by the WOGCC.

The evaporation pond (constructed wetland) would be installed downstream/downslope from the proposed CGU #4 WTDF and would involve the construction of an earthen evaporation/percolation pond (wetland) approximately 200 x 75 ft. To facilitate the development of a constructed wetland, the pit would not be lined but would be fenced "sheep-tight" to preclude livestock use according to standard BLM fencing guidelines. Water would be piped from the evaporation pond (constructed wetland) into a livestock/wildlife watering tank to be installed below the constructed wetland and thence to Cave Gulch Draw (or an ephemeral tributary thereof) for discharge.

As part of the CGU #4 WTDF, BBC would install a three-phase power line to allow for the incorporation of a control system that would monitor the quality of water being collected and allow it to be discharged to either the proposed evaporation pond (constructed wetland) or re-injected as appropriate. The proposed power line would tie into an existing power supply at an as-yet-undetermined location and would follow existing ROW corridors from the proposed tie-in point to the CGU #4 WTDF. The proposed power line would be constructed in accordance with *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996* (Avian Power Line Interaction Committee 1996) and would result in a minimal amount of additional surface disturbance.

2.2.11 Ancillary Facilities

Section 2.2.8 of the Cave Gulch EIS contains information concerning the need for ancillary facilities within the overall project area. Many of the major ancillary facilities (liquids plant, centralized compressor facility, etc.) discussed in the Cave Gulch EIS have since been installed. Therefore, there is no need for the installation of additional major ancillary facilities in the CGIDP area. Production equipment required on-site for the routine production of individual wells is discussed in Section 2.2.8 of this document. Additional facilities that may be required in conjunction with the Proposed Action that are not discussed elsewhere in this document would include, but are not limited to: 1) gas metering stations, 2) pipeline pigging facilities, and 3) cathodic protection facilities. The number and exact location of such

ancillary facilities are not known at this time, but most would be installed within the boundaries of existing disturbance.

2.2.12 Abandonment and Reclamation

The Operator would obtain the necessary authorization(s) from the appropriate regulatory agencies (BLM and/or WOGCC) to plug and abandon the well as it becomes commercially non-productive (estimated 20- to 40-year production life). All aboveground facilities would be removed from the location, the well bore would be physically plugged with cement, and both the abandoned access road and well location would be reclaimed as described in Appendix A. Pipelines would be purged of combustible materials, any aboveground features would be removed, and the line would be retired in place.

2.2.13 Summary of Surface Disturbance Within the CGIDP Area

Based upon information presented in Section 2.2.5, total surface disturbance associated with single Lower Fort Union/Lance Formation well pads would average approximately 3.2 acres per well and total surface disturbance associated with dual well pads would average approximately 3.5 acres per well. These disturbance figures may fluctuate slightly based upon a combination of topography, operator preferences, specific well requirements, etc., and are presented solely as averages for the purpose of estimating overall surface disturbance in the CGIDP area. As indicated above, the Operators propose to drill 87 wells on a 40-acre well density. Assuming that approximately 80 of these wells will be drilled to the shallower Lower Fort Union/Lance/Mesaverde Formation using the 3.2-acre single well pad design, and up to seven of the wells would be drilled to the deeper Muddy Formation using the 8.7-acre well pad design. The remaining 23 well pads would be constructed utilizing the 3.5-acre twin or dual well pad design. A total of approximately 398 acres of surface disturbance would occur from construction of the 110 well pads.

As indicated in Table 2.2, 147,312 ft (27.9 mi) of access road have been constructed to the 116 existing well locations, for an average of 1,270 ft of road per well. Assuming a similar ratio of average new road construction per well pad for the CGIDP, approximately 139,700 ft (26.5 mi) of new road construction would be expected in association with additional exploration and development activities in the CGIDP area. Considering a total disturbed ROW width of 45 ft, construction of the 139,700 ft of new access road would result in an additional 144 acres of short-term surface disturbance, 90 acres of which would be LOP disturbance.

An additional 139,700 ft (26.5 mi) of gas/water pipelines would be installed in a common ROW in conjunction with the 110 well pads. Based on a total disturbed ROW width of 30 ft, this pipeline construction would disturb an additional 96 acres, all of which would be reclaimed shortly after disturbance.

Installation of a produced water gathering system to service the 68 existing well pads within the core area of the CGIDP would result in the short-term disturbance of an additional 60 acres. The 86,360 ft (16.4 mi) of produced water gathering line would be installed in existing (previously disturbed) ROW corridors, many of which have been reclaimed since initial disturbance.

Table 2.1 provides a compilation of the projected total and LOP surface disturbance associated with the Proposed Action.

Measurements of existing surface disturbance within the CGIDP area using Global Positioning System (GPS) technology were obtained by the Operators in 2003 and subsequently transferred into a Geographic Information System (GIS) database for interpretation. Table 2.2 provides the results of the disturbance inventory and analysis.

Table 2.1 Projected Surface Disturbance Associated with the CGIDP.

Facility	Measurement		Disturbance (acres)	
	Basis	Number	Total	LOP[1]
Single Well Pads [2]	3.2 acres/pad	84	269	95
Dual Well Pads	3.5 acres/pad	23	81	29
Deep Well Pads	8.7 acres/pad	7	61	22
Access Roads [3]	45-ft ROW	171,380	177	110
Gas/Water Pipelines [4]	30-ft ROW	171,380	118	0
Water Gathering System	30-ft ROW	86,360	60	0
Total			766	256

[1] LOP disturbance was calculated based upon the assumption that 65% of those areas disturbed during construction of the 114 well pads (including the four injection wells) would be reclaimed for production, 38% of those areas disturbed during road construction would be reclaimed for production, and all pipeline ROWs would be reclaimed after pipe installation. These assumptions are consistent with the data presented in Table 2.2.

[2] Includes the four proposed water injection wells.

[3] Includes the 31,680 ft (6 mi) of projected access road to service the four proposed water injection wells based upon a 45 ft total disturbed ROW width.

[4] Includes the 31,680 ft (6 mi) of projected water pipeline based upon a 30 ft total disturbed ROW width.

The information presented in Table 2.2 represents existing surface disturbance within the CGIDP area as of January 1, 2004, and provides baseline information concerning surface disturbance associated with oil/gas exploration and development activity within the project area from August 1997 through December 2003. It also includes approximately 115 acres of long-term disturbance that existed before the Cave Gulch ROD was issued in 1997. The Cave Gulch EIS predicted 789 acres of total disturbance, and 394 acres of LOP disturbance. Based on the GPS/GIS measurement data, the Cave Gulch EIS accurately predicted total surface disturbance (at 788.3 acres) but over-predicted LOP disturbance by approximately 283 acres.

2.2.14 Applicant-Committed Environmental Protection Measures

The Operators would implement the project-wide mitigation measures (applicant-committed practices) presented in Section 2.2.2.12 of the Cave Gulch EIS as appropriate to the current proposal in order to minimize impacts to the environment. However, the exclusion area around active raptor nests would be 0.50 mi rather than 0.25 mi. An exception to a particular mitigation measure and/or design feature may be approved by BLM on those lands subject to federal jurisdiction on a case-by-case basis as deemed appropriate. The exception would only be approved after a thorough, site-specific analysis has determined that the resource or land use for which the measure was intended is not present or would not be impacted significantly.

Table 2.2 Existing Surface Disturbance in the CGIDP Area as of January 1, 2004[1]

Disturbance Type	Number	Short-Term Disturbance		Long-Term Disturbance	
		Acres	Acres/Well	Acres	Acres/Well
Well Pads	116	488	4.2	154	1.3
Roads [2]	27.9 mi	255	2.1	65	0.5
Pipelines [3]	23.2 mi	162	1.4	0	0.0
Total		904	7.7	219	1.8

[1] Based on GPS/GIS data provided to BLM by the Operators. Includes 115 acres of long-term disturbance that occurred prior to the issuance of the Cave Gulch ROD.
[2] Road areas also include gas collection pipelines and water disposal pipelines located adjacent to road corridors.
[3] Gas production pipelines not associated with roads and common corridors.

2.3 NO ACTION ALTERNATIVE

CEQ regulations for implementing NEPA require that a No Action Alternative must be considered "even if the agency is under a court order or legislative command to act" (46 *Federal Register* 18026, March 23, 1981). The No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of environmental effects of the action alternatives. Under the No Action Alternative, the BLM would deny further natural gas development on federal lands in the CGIDP area as currently proposed by the Operators while continuing existing management and allowing existing land use.

The U.S. Court of Appeals for the District of Columbia in *Sierra Club vs. Peterson* (230 U.S. App. D.C. 352; 717 F.2d 1409, 1411-1414 [D.C. Cir. 1983]) found that "on land leased without a No Surface Occupancy stipulation, the Department cannot deny the permit to drill. ... [O]nce the land is leased the Department no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. The Department can only impose 'mitigation' measures upon a lessee who pursues surface disturbing exploration and/or drilling activities." The court goes on to say "Notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the Department made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building" (Sierra Club 717 F.2nd at 1414-1415).

For the purpose of analysis in this EA, the No Action Alternative means that the Proposed Action would not be implemented. Existing land uses would continue within the CGIDP area, including drilling additional wells previously authorized by the BLM under the Cave Gulch EIS (BLM 1997a, 1997b, 1997c).

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The Proposed Action as presented in the Cave Gulch EIS was BLM's preferred alternative in the Cave Gulch ROD. In addition to the No Action Alternative, the Cave Gulch EIS included two other action alternatives, both of which provided for additional raptor management. Neither of those two alternatives was selected as the preferred alternative by BLM in the subsequent Cave Gulch ROD. Three other alternatives were considered in the Cave Gulch EIS but were eliminated from detailed study. These three alternatives included the following:

- designation of the Cave Gulch EIS area as an Area of Critical Environmental Concern, with no, or limited additional mineral development;

- development of gas resources without applying seasonal raptor management restrictions; and
- transportation of liquid hydrocarbons to a processing plant outside the project area.

All of these alternatives, as well as the No Action Alternative, are discussed in Chapter 2 of the Cave Gulch EIS. Based on conditions currently existing in the Cave Gulch EIS area, there is no reason for any of these previously rejected alternatives to be reconsidered in this EA. Therefore, two alternatives were evaluated in detail in this EA--the Proposed Action and the No Action Alternative. The Proposed Action is discussed in Section 2.2 and the No Action Alternative is discussed in Section 2.3. In accordance with 40 C.F.R. 1502.14, other alternatives that were considered but eliminated from detailed analysis are discussed in Sections 2.4.1 and 2.4.2.

2.4.1 Fewer Wells

The Operators considered drilling fewer wells but concluded that the number of wells in the Proposed Action was the smallest number that could reasonably be drilled to recover the known gas reserves in the CGIDP area. If fewer wells were drilled, it is likely that some natural gas reserves would not be recovered, and this would result in the loss/waste of federal resources and would not meet the purpose and need of the project. Therefore, this alternative was eliminated from further consideration.

2.4.2 Increased Directional Drilling

Under this alternative, the Operators would increase the number of multiple (dual) well pads and would decrease the number of single-well well pads as compared to the Proposed Action. This would require a commitment from the Operators to increase the number of wells that would be directionally drilled. Under the Proposed Action, the Operators have committed to directionally drilling 44 wells, including all of the wells proposed to be drilled at a 10 acre per well density and three wells proposed to be drilled at a 20 acres per well density.

Directional drilling is geologically feasible only where required downhole well locations are close enough together to be drilled from a common well pad and where other geologic conditions do not preclude the more technically challenging aspects of the directional drilling operation. Based on previous drilling operations conducted by the Operators within the Cave Gulch EIS area, it is possible to directionally drill wells when the required bottom hole locations are at a density of one well per 10 acres. The Operators

have committed to drilling all forty-one 10-acre density wells using directional drilling methods. Due to the presence of steeply dipping strata, highly fractured rock, and rock formations prone to caving, directionally drilling wells where downhole densities are less than one well per 10 acres is not generally technically feasible. Nonetheless, three directional wells have been proposed at a lower well density within the CGIDP area in the event that the adverse conditions described are not present throughout the project area and in the further event that directional drilling technology should improve. While the amount of directional drilling as currently proposed is considered to be technically feasible, it would not be technically/geologically feasible to increase the number of directional wells beyond the number currently proposed. As a result, this alternative was determined to be technically infeasible and was eliminated from further consideration.