CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

2.0 PROPOSED ACTION

Anadarko E&P Company LP (Anadarko) proposes drilling, completing, and operating a maximum of 89 shallow gas wells and related production and water disposal facilities in the Copper Ridge Project Area (CRPA)(Figure 2-1). This analysis assumes that all wells would be drilled and produced although it is possible a lesser number of wells could actually be drilled and produced. If initial drilling attempts are unsuccessful or uneconomical, the possibly exists that Anadarko would abandon the proposal.

Anadarko is proposing to drill 89 shallow gas wells for both technical and economic reasons. Off the 89 wells, 41 would be located on public lands managed by the BLM, 46 would be located on private lands owned by Anadarko, and one well would be located on State of Wyoming lands. The 89 wells were determined by Anadarko to be the minimum number necessary to implement this project to provide; (1) adequate surface area and geological coverage, (2) flexibility in the exploration program due to uncertainty in reservoir characteristics, and (3) an appropriate number of wells to evaluate project viability in a timely fashion. The proposed well count permits an examination of reservoir and geological properties as well as characteristics that allow for production from a depth range of 2,000' to 4,500'. Additionally, 89 wells provides flexibility in repositioning a pod or group of wells in the event that the initial drilling attempts encounter poor quality reservoir or indicate a need to drill future wells on denser spacing. Also, the 89-well proposal provides sufficient wells to effectively dewater the target reservoirs.

The CRPA is located in an existing oil and gas production area, which includes both the Brady Field and the Jackknife Spring Field. Since 1960, a total of 59 producing wells have been drilled and developed, and eight additional, non-producing wells have been plugged, abandoned, and reclaimed within these two existing fields. Natural gas production from these two fields totals approximately 579.4 billion cubic feet since 1978, according to WOGCC records. Wells in the Brady Deep, Brady Shallow, and Jackknife Spring Fields range in depth from approximately 6,000 feet to 17,000 feet, targeting many formations (Almond, Anderson coal, Blair, Dakota, Entrada, Ericson, Frontier, Mesaverde, Muddy, Nugget, Phosphoria, and Weber). The shallow gas wells being proposed with the Copper Ridge project would target sandstone reservoirs and coal seams within the Almond Formation at depths of 2,000 to 4,500 feet. Gas produced would be from both coal seams (coal bed methane or CBM) and adjacent sands.

2.1 PLAN OF OPERATIONS

2.1.1 Preconstruction Planning and Site Layout

Anadarko would follow the procedures outlined below to gain approval for the proposed activity on public lands managed by the BLM within the CRPA. Development activities proposed on private and State of Wyoming surface would be approved by the WOGCC. The WOGCC permitting procedures require filing an APD with the WOGCC and obtaining a ROW from the surface owner.

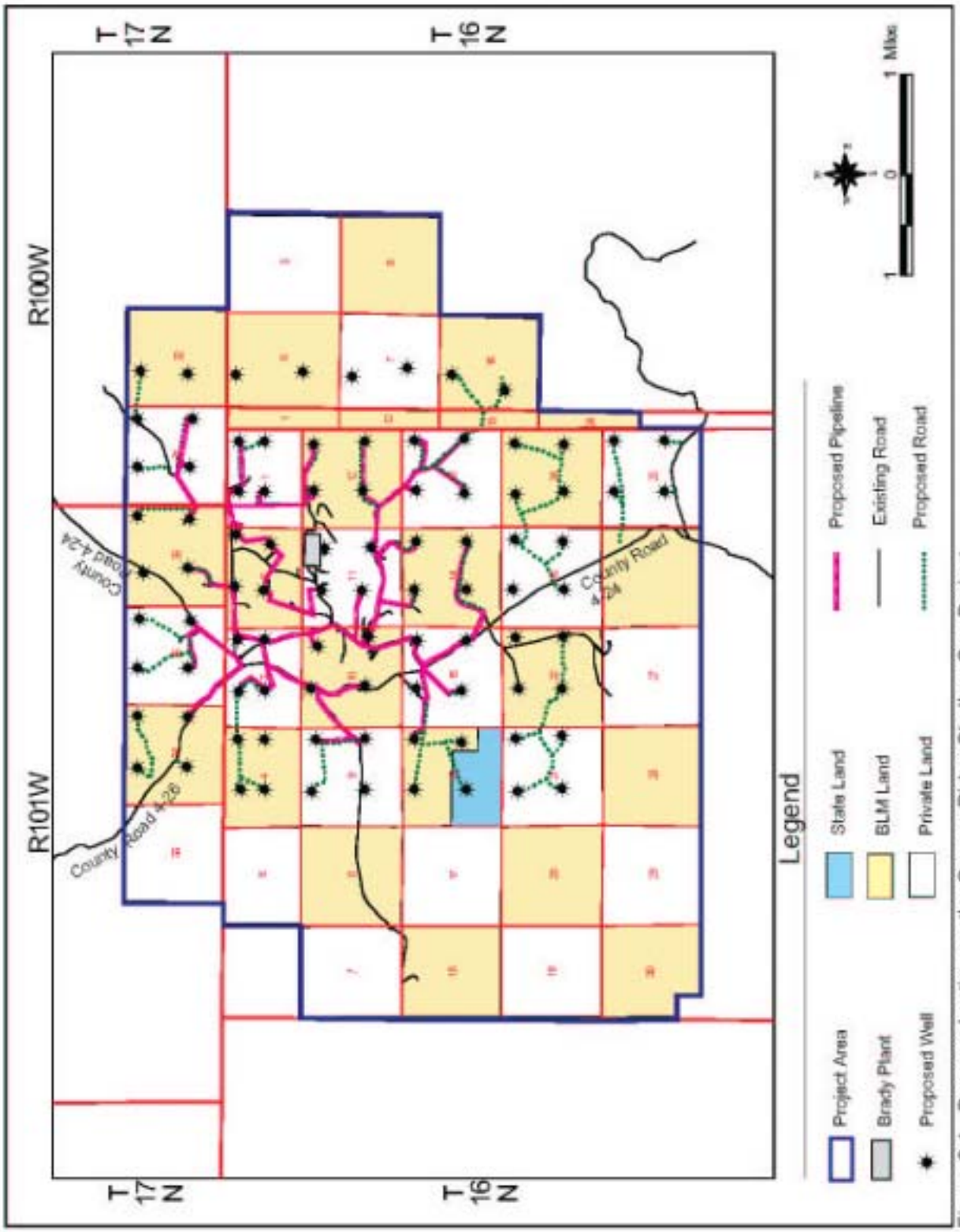


Figure 2-1. Proposed action on the Copper Ridge Shallow Gas Project.

- Prior to the start of construction activities, Anadarko 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. Anadarko, BLM, and the affected surface lessees or owners would conduct an on-site evaluation during which site specific requirements would be identified and discussed. Following the on-site evaluation, Anadarko 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 Anadarko 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, Anadarko 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, Anadarko must have cleared the proposed construction area for cultural values, special status plants and animals, paleontological values, nesting raptors, sage grouse, etc. If any of these resources are found, appropriate mitigation would be applied.

Following is a discussion of proposed construction, drilling, production, and reclamation techniques proposed by Anadarko.

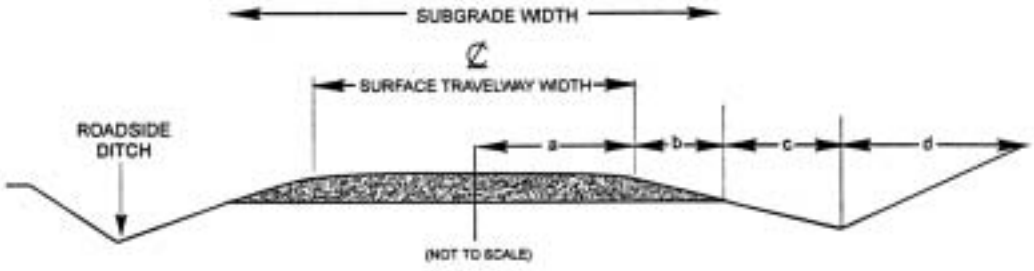
2.1.2 Construction and Drilling Phase

2.1.2.1 Road Construction

Development of the 89 wells would require the construction/reconstruction of approximately 22.25 miles of access roads and approximately 66.75 miles of gas and produced water gathering lines (facilities corridors). An estimated 10.25 mi of new road would be built on federal land and 12.0 miles of road/facilities corridors would be built on private and state land.

All new access roads within the CRPA would be constructed for the specific purpose of natural gas field development. Roads would be located to minimize disturbances and maximize transportation efficiency. The operators propose to construct access roads across public lands to wells in accordance with BLM Manual 9113 standards. New access roads would be designed and constructed to resource road standards to facilitate reclamation should the well be a dry hole. Roads located on private lands would be constructed in accordance with standards imposed by the private land owner. The number of roads would be limited to decrease potential impacts by accessing wells from short resource roads off the local roads. Roads would be closed and reclaimed by the operators when they are no longer required for production operations, unless otherwise directed by the BLM or private landowners. Roads would be designed to minimize disturbance and would be built and maintained as specified by the BLM to provide safe operating conditions at all times. Surface disturbance would be contained within the road ROW.

Where feasible, gas and water gathering lines would be buried in a single trench adjacent to (with a minimum 5-foot offset) the access road travelway. The average travel surface width for gravel-surfaced resource roads would be 16 feet with turnouts as necessary. Figure 2-2 shows a typical cross section with width specifications. All surface disturbance would be contained



	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbance Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	14	7	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS (PLAN VIEW)

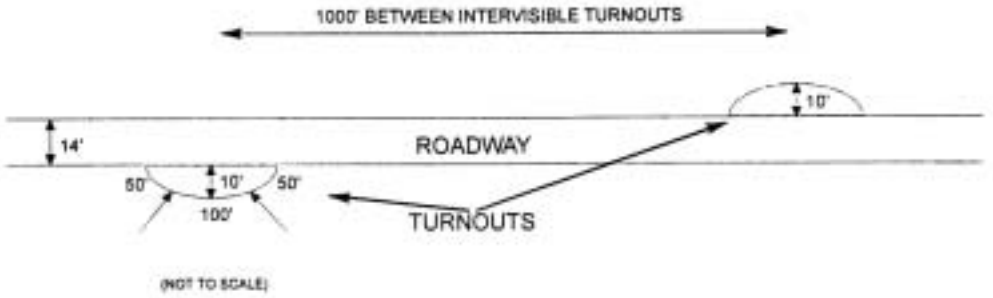


Figure 2-2. Typical Roadway Cross-Section with Width Specifications.

within authorized ROWs. Because roads and gathering lines would be constructed within a single corridor, a corridor 60 feet wide would be disturbed during construction.

Well pad and access road construction would require a maximum of four workers for a period of approximately 4 days per location. These workers would include both heavy equipment operators engaged in road and well pad construction and truck drivers hauling heavy equipment to and from locations. Construction workers would likely be hired locally and contracted by Anadarko or its agents.

Topsoil on new road ROWs would be salvaged, stored in elongated piles within road ROWs, and seeded to prevent erosion as necessary. Available topsoil (up to 12 inches) would be stripped from all road corridors prior to commencement of construction activities, would be stockpiled, and would be redistributed and reseeded on backslope areas of the borrow ditch after completion of road construction activities. Borrow ditches would be reseeded in the first appropriate season after initial disturbance. If a well were determined to be unproductive, the entire road ROW would be recontoured and reclaimed as soon as practical using stockpiled topsoil and appropriate seeding techniques. Any large rocks that occurred on the ROW prior to construction would be scattered over the ROW after reseeding. Disturbance areas associated with the Proposed Action and alternatives are summarized in Table 2-1.

Table 2-1. Types and Approximate Acreage of Surface Disturbance on Federal Land – Proposed Action.

Proposed Action									
	Estimated Life-of-Project (LOP) Disturbance Area (acres)					Estimated Initial Disturbance Area (acres)			
Type of Disturbance	Federal	Private	State	Total		Federal	Private	State	Total
Number of Wells	41	46	2	89		41	46	2	89
Well Pads[1]	41	46	2	89		82	92	4	178
Roads[2]	37.27	41.81	1.8	80.88		74.54	83.62	3.6	161.82
Compressor[5]	0.0	0.9	0.0	0.9		0.0	0.9	0.0	0.9
Pipelines[3,4]	0.0	0.0	0.0	0.0		111.81	125.45	5.45	242.71
Total	**78.27**	**88.71**	**3.8**	**170.78**		**268.35**	**301.97**	**13.05**	**583.37**

[1]Assumes initial disturbance of approximately 2 acres for each well pad and LOP disturbance of 1 acre per well pad.
[2]Assumes an average of 0.25 mi of new roads with parallel gas gathering and water discharge lines (60-ft average disturbance width) for each well. All disturbance except for the estimated 30-ft wide road travelway and adjacent ditches would be reclaimed for the LOP.
[3]Assumes an average of 0.75 mi of new gas gathering and water discharge lines per well of which approximately 0.50 mi will be constructed within existing pipeline corridors.
[4]Assumes an average disturbance width of 30 ft.
[5] The compressor station (about 0.9 acres of disturbance) would be located on private land.

2.1.2.2 Well Pad Design and Construction

Major components of each well pad include a level area for placement/support of the drilling rig and other equipment and an earthen reserve pit to contain drilling fluids. The entire well pad would be cleared of vegetation, and up to 12 inches of topsoil would be removed from all areas of cut, fill, and/or subsoil storage. After topsoil has been removed, the pad would be graded using standard earth-moving equipment (e.g., dozers, scrapers) to prepare a level working surface. Each well location would be designed so that the amount of cut-and-fill material would roughly balance, where feasible, thereby minimizing the need to stockpile excess subsoil adjacent to the well location until site reclamation.

The reserve pit would be excavated using a dozer or other appropriate equipment. Materials excavated from the reserve pit would be stockpiled adjacent to the pit and used to backfill the pit during reclamation. Depending upon the depth to groundwater, the quality of groundwater produced during drilling, and soil permeability, reserve pits may be lined with an impermeable liner as needed to control seepage. (Lining of reserve pits will be determined on a case-by-case basis during the APD process). The reserve pit would be fenced to protect livestock and wildlife until the pit is reclaimed. 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.

The level area of the wellpad required for initial drilling and completion operations would be approximately 360 x 240 ft, including a reserve pit approximately 100 feet by 50 feet and 10 feet deep, so average surface disturbance would be about 2 acres/well. The assumption for this EA is that the well pad disturbance area would be all new, which is the worst case scenario. Should new wells be located on existing well pads, the total disturbance would be less than that analyzed. A typical drill site layout is shown on Figure 2-3.

Erosion control would be implemented, as necessary, at each well location through prompt revegetation of disturbed areas and by constructing surface water drainage controls such as berms, diversion ditches, sediment ponds, and silt fences in accordance with the approved reclamation and Storm Water Pollution Prevention Plans (SWPPPs). All diversion ditches and other surface water and erosion control structures at each location would be shown on maps provided with each APD. SWPPPs would be prepared for all well locations, access roads, and other disturbances of more than 5 acres, as required by the WDEQ.

Following construction of the well pad and access road for a given well, a rotary drilling rig would be transported via truck to the well pad and erected on-site. Approximately 15 days would be required to drill, log, and case each well using a conventional rotary drill rig and associated rig equipment. Wells would be drilled to sandstone reservoirs and coal seams within the Almond Formation at depths of approximately 2,000-4,500 feet. The Almond formation is presently proposed for initial exploration, but other sandstone and coal reservoirs may be explored. Cuttings and all drilling fluids would be contained in the reserve pit, and drilling fluids would be recovered and re-used whenever practical. The reserve pit would be lined as needed to prevent loss of drilling fluids through seepage. If necessary, the reserve pit would first receive a layer of bedding material (e.g., clay, sand) sufficient to prevent contact between the liner and any exposed rocks. The reserve pit would be fenced to protect livestock and wildlife until the pit is reclaimed.

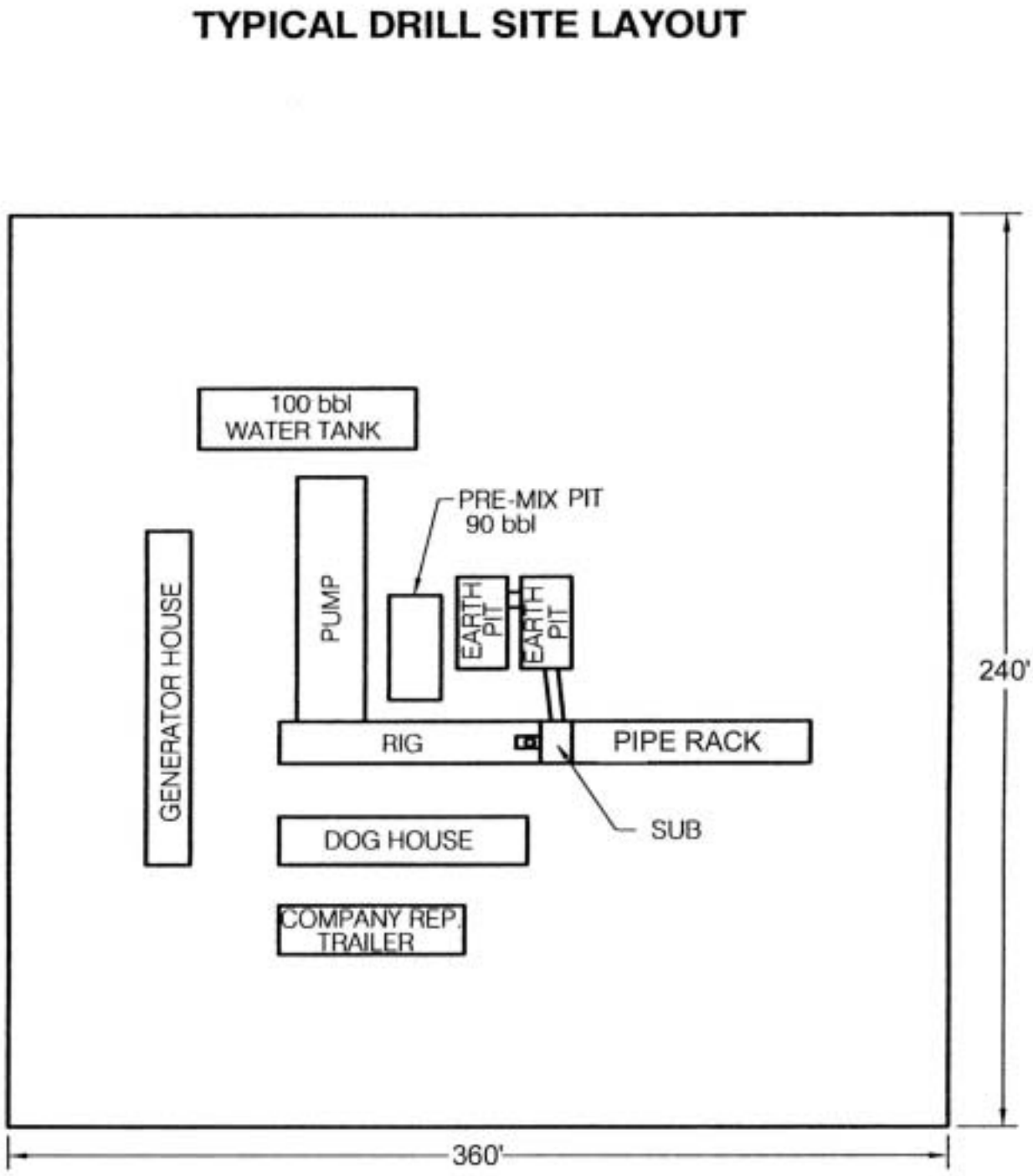


Figure 2-3. Typical Drill Site Layout – Copper Ridge Shallow Gas Project.

2.1.2.3 Drilling Operations

In the event that undesirable materials (e.g., hydrocarbon liquids) are inadvertently discharged to a reserve pit, they would be removed immediately and disposed of in accordance with WDEQ requirements. If any oil in the pit (as evidenced by sheen on the water surface) is not immediately removed, the pit would be protected to prevent waterfowl use as directed by the BLM.

Approximately 6,000 barrels (bbl) (252,000 gallons) of water would be required to drill each well. For the proposed action, a total of 534,000 bbl (22,428,000 gallons) or 68.8 acre-ft would be required for drilling, assuming no re-use of drilling water. This water would be obtained from the water supply well in the NE1/4SE1/4, Section 10 T10N, R101W (Nightingale Well No. 1). Water used to drill one well also may be reused for drilling subsequent wells to conserve water.

No abnormal temperatures, pressures, or hydrogen sulfide levels are anticipated to be encountered during drilling. Any shallow water zones encountered would be reported and adequately protected.

Drilling rigs would be contracted by Anadarko from third parties. The drill rig would be rated at approximately 1,200 horsepower, supplied by on site diesel powered generators. The drill rig contractor would typically employ four workers per 12-hour shift, with one crew on shift and one crew off. These crews would reside at their own homes or other living quarters in nearby towns (e.g., Rock Springs). A number of additional personnel may be required to be on location during various stages of the drilling operation, including a geologist, a mud logger, and other service personnel. In some cases, these individuals would be required to remain on location 24 hours a day during drilling operations, and trailers would be provided on-site for their use.

If any spills of oil, gas, or other noxious fluids occur, Anadarko would immediately contact the BLM and any other regulatory agencies as necessary, and cleanup efforts would be initiated. These actions would occur at any stage of drilling, completion, operation, or abandonment of facilities.

During drilling and subsequent operations, all equipment and vehicles would be confined to access roads, well locations, and other areas specified in approved APDs, except in emergency situations.

Fresh-water aquifers and potentially minable coal blocks would be protected by running casing - steel pipe - into the open borehole and cementing the casing into place. Cementing would also isolate all other formations in the hole and would effectively eliminate the possibility of contamination between hydrocarbon zones and/or water aquifers and other mineral resources.

2.1.3 Completion and Production Testing Phase

In accordance with 43 C.F.R. 3164, a Well Completion Report would be filed with the BLM no later than 30 days after well completion. Following wellbore casing and cementing, potentially productive coal seams and sandstone reservoirs of the Almond Formation would be perforated and tested. During preparation for production testing, the rig used to drill the well would be replaced with a smaller service rig that would operate only during daylight hours. Smaller diameter (2-7/8-inch or 2-3/8-inch) tubing would be placed in the cased hole and pumping equipment set below the perforated intervals. If the completed interval is incapable of flowing

naturally, water would be pumped from the completed zone using sucker rod pumping units, progressive cavity pumps, or submersible pumps, until natural gas flow is established. Each pump would require approximately 20 horsepower, initially to be supplied by on site generation, replaced with utility electric power within one year. This procedure may require 560 days or more of pumping to initiate diagnostic gas flow rates.

Pursuant to WOGCC regulations and/or BLM Notice to Lessee (NTL) 4A, gas flows would be measured at the surface, and noncommercial volumes of gas would be temporarily flared or vented under controlled conditions at the well site. Anadarko expects to flare or vent a maximum of 50 MCF of gas per 5 days for each well. Venting would be conducted in accordance with WOGCC regulations. Once the permitted venting limit is reached, wells would either be put into production or shut-in for later production. Produced water would flow through gathering lines buried below frostlines to the existing water disposal wells. Each well likely would be production tested for an estimated 6 to 18 months to evaluate the commercial feasibility of further development. Routine daily maintenance, including pump changes, would be required during the evaluation period.

Based on the results of this initial production test, the coals and sandstone reservoirs may be further studied by petroleum engineers to determine if gas flow rates may be augmented through hydraulic fracture stimulation ("a frac"). A frac is designed to improve gas or fluid movement from the reservoir to the wellbore ("permeability"). In the course of a frac, fresh water or other water-based fluids are pumped down the wellbore and through the casing perforations under sufficiently high pressure to physically fracture the formation rock. Sand grains or other similar proppants are carried in suspension in fluids into the fractures. Following stimulation, the wellhead is opened at the surface and frac fluid flows back into the wellbore and is discharged at the surface into the reserve pit. Successfully fractured formations will close on the proppants, leaving open channels for gas and liquid to be produced to the wellbore. Excess frac fluid would be evaporated or removed from the site for disposal at an authorized location. Wells may be fractured without proppant.

Within 365 days after termination of drilling and completion activities, the liquid contents of the reserve pit, if any, would be removed and disposed of at an approved waste disposal facility. If adverse weather conditions prevent removal of the fluids from the reserve pit within 365 days, an extension may be granted by the BLM. If necessary, under special circumstances, reserve pit contents would be removed and disposed of at an appropriate facility and in a manner that satisfies all relevant state and federal regulations and stipulations. The reserve pit would be reclaimed by filling it with the spoil removed during initial pit construction, spreading previously stored topsoil, and reseeding according to BLM or surface owner specifications. After reclamation of disturbed areas no longer needed for production, each producing location typically would occupy an area of approximately 1 acre. Reserve pit back-filling and reseeding would not occur until after production testing, since the pit is generally used to hold liquids during such operations.

Production testing would, on average, require two workers for 90-540 days for every 30 wells. Existing Brady Unit personnel would be utilized where possible. Telemetry would be utilized in an effort to minimize the number of visits to and the time spent at the wellsite.

2.1.4 Pipeline Construction

Gas collection lines for in-field gas collection (gathering system) would be installed to bring natural gas from individual well sites to the Central Gathering Facility (CGF) and the interconnect pipeline. Gas collection lines would generally be located adjacent to roads or access road travelways (with a 5-foot minimum offset), where feasible, and all necessary authorizing actions for the lines would be addressed prior to installation. A total of approximately 242.71 mi of gas and water collection lines would be installed within the 60-ft wide facilities corridor.

Sufficient topsoil to facilitate reclamation would be removed from collection line ROWs and stockpiled before construction; however, ROWs that do not require major excavation may be stripped of vegetation to ground level (scalped) by mechanical cutting, leaving topsoil intact and root masses relatively undisturbed. Scalping, coupled with ripping of compacted soils, would facilitate vegetation re-establishment.

A trench approximately 6-feet deep would be excavated with a trencher or backhoe. Up to 12-inch diameter HDPE conduit would be buried at depths of 3.0-4.5 feet, except at major road and railroad crossings, where the depth would be at least 6 feet. Spoil and topsoil would be windrowed separately.

2.1.5 Anadarko Gas Compression

If the pilot project proves successful, a natural gas compression facility may be constructed within the exploration area, located in the NW1/4 NW1/4 of Section 11, Township 16 North, Range 101 West, on private lands. Wellsite compression may also be utilized to move gas. Anadarko plans to install a 600 HP compressor during the pilot portion of the project, and up to 4,800 HP at full development. Approximately 20% of this compression horsepower will be electric utility powered, with the remainder being natural gas engine driven. Natural gas from the exploration area would be delivered to the compressor station via gas gathering lines. Once the natural gas reaches the compressor station, dehydration units would remove residual water from the gas, and this water would be evaporated from the dehydration unit.

2.1.6 Natural Gas Production

Initial natural gas production from individual wells is expected to vary significantly and depend upon the presence or absence of contributing coalbed and sandstone reservoirs. Production is expected to be from coal beds and surrounding sands. To facilitate the removal of water from wells with substantial contribution from coal seams, some well site production facilities would be installed once wells have been completed. In accordance with applicable regulations, a facilities/site security diagram would be filed with the BLM within 30 days of installation. The operator would adhere to all site security regulations as specified in Onshore Oil and Gas Order No. 3.

Rod-type pumping units or submersible pumps (powered by gas-driven engines, propane generators, or gas-powered generators fueled by produced gas) would be used to remove water from any wells incapable of natural flow. In some wells, produced water and gas would be separated at the wellhead. Other wells would not require separators, as the water and gas would separate in the well casing. No uncontained surface discharge is proposed. Water produced during initial production operations would be disposed of in the existing water disposal

wells. Water would be delivered from each well to the water disposal wells. Produced water quality would be monitored in accordance with state and federal regulations. Pumping units may be enclosed by a small shelter to avoid damage from wind, snow, and cold weather.

If the exploration field is economically productive, a centrally located, natural gas-fired compressor (e.g., 600 horsepower [hp] initially, up to 4,800 hp at full production) would be installed on private land. Exploratory wells on adjacent private land have been successful, so gas compression would likely be needed to transport the gas to market. Gas volumes would dictate the amount of compression required. Gas exiting the wellbore would be transported from each well through the natural gas gathering system to the compression station.

Anadarko anticipates production of up to 300 thousand cubic feet of gas per day (mcfgpd) from each well, which may require well site compressors. On-location compressors would be located and muffled to minimize noise and would comply with all applicable WDEQ, Air Quality Division (AQD) permitting requirements, as necessary. Anadarko would evaluate on-location compression needs as the project develops.

Electric-powered compression is proposed as part of the exploration project. Anadarko estimates that 20% of the compression for the project would be powered by electricity from a utility. In addition, wellsite electrical requirements would be supplied by the utility.

All wells would be operated in a safe manner according to standard industry operating procedures. Routine maintenance of the producing wells would be necessary to maximize performance and to detect operational difficulties. Each well site would be monitored daily to ensure operations are proceeding safely and efficiently. This visit would include, but would not be limited to, checking gauges, valves, fittings, and other on-site facilities. Routine on-site equipment maintenance would also be performed as necessary. All roads and well sites would be regularly inspected and maintained (e.g., regraded, resurfaced, watered) to minimize dust and erosion and to assure safe operations.

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.

Producing well workovers are periodically necessary to correct downhole problems in a producing well to return the well to production. Workovers are implemented on an as-needed basis and are undertaken to increase or maintain production from the current downhole producing zone; to recomplete in a new zone; to lower operating costs by reducing water and/or sand production; or to return the well to its production objective by pulling and replacing leaking tubing or pulling and repairing lift equipment. Workovers normally take 1 to 4 days.

Ancillary facilities would include access roads, gas and water gathering lines, a power source, a central gathering/metering facility (CGF), and, if the field proves economically viable, a compressor station. No new power lines are currently proposed. Anadarko proposes to use existing above ground power lines in conjunction with buried electrical distribution lines, as needed.

Each well would require gas and water gathering lines to transport product to a centralized facility to be located on private land and water lines to transport produced water to a central disposal facility and a power source. A trunk line gas gathering system will be constructed

utilizing high-density polyethylene [HDPE]) starting with 4-inch at the wellhead and graduating up to 12-inch at the compressor inlet. A network of water lines (up to 8-inch diameter HDPE) would be required to collect produced water. Water would be conveyed to a water transfer station and on to a salt water disposal facility. Gas and water lines would be installed adjacent to access road ROWs. Temporary power would be supplied by gas-driven engines, propane generators, or gas-powered generators fueled by produced gas until commercial power is made available.

2.1.7 Estimated Employment Requirements.

Existing Anadarko employees would be utilized for gas field development and operation over the LOP. Additional workers would be used for surveying, engineering, maintenance, inspection, and other specialty services. Construction workers would be hired from the local work force when available; otherwise, workers from outside the area would be hired.

2.1.8 Water Supply and Disposal

Water for drilling wells would come from produced water from existing wells. Water used to drill one well would be re-used to drill subsequent wells where practical.

Because of geological factors, gas may be contained in both sandstone and coalbed reservoirs within the Almond Formation. Completion of gas-charged sandstone reservoirs is expected to result in the immediate production of natural gas. In contrast to coalbed methane performance, conventional wells are anticipated to flow under their own energy and would not require artificial lift equipment. Conventional production of natural gas is driven by the creation of a pressure drop between the reservoir and the wellbore which initiates and maintains the flow of gas. Expected initial gas and water flow rates from wells of this type are 500 Mcfd and 5 Bwpd respectively.

In the case of methane within coal beds, more than 90% of methane stored in coal is adsorbed onto coal surfaces or absorbed within the coal (Jones and DeBruin 1990). The Cretaceous coals of the western Washakie Basin are water-bearing, and desorption of methane gas occurs when the formation hydrostatic pressure is reduced by pumping water out of the coalbed through a wellbore. As hydrostatic pressure drops, the physical bond between carbon (coal) and methane molecules is broken, and methane bubbles form and flow in a water solution towards the zone of lower pressure at the wellbore. Therefore, to create favorable conditions for the release of methane gas, water must be produced prior to and during methane extraction, especially during initial coalbed dewatering. Anadarko would file for the appropriation of the water rights for all produced waters, and dewatering permits would be obtained from the Wyoming State Engineers Office.

Based on limited data from the seven of the nine wells completed on private land, the maximum initial water discharge rate from each well would be about 500 barrels per day (bpd) The water discharge rate per well is expected to decrease to about 75 bpd during the first 18 months of pumping. Actual discharge values may be greater or less depending on geologic conditions, pumping equipment limitations, interference of adjacent wells, and reservoir enhancement methods.

Pumping equipment used for the dewatering phase of the proposed project would be the same type generally used by the petroleum industry to lift oil and/or water (i.e., rod-type pumping units

and/or electric submersible [downhole] pumps). Anadarko would likely use downhole progressive cavity (pc) pumps, which employ a mechanical drivehead, sucker rods inside a tubing string, and an engine powered by an electric generator, diesel, propane, or produced natural gas. These units would be selectively employed within the CRPA and likely would be gasoline- or propane-powered during the early phases of development.

A 20 hp progressive cavity (pc) type pumping unit will most likely be used, which is capable of pumping a daily maximum rate of about 600 bpd (25,200 gal/day). The pc-type pumps may be replaced by submersible or beam pumps at some well sites as water production rates decline.

Produced water would be disposed of in existing WDEQ/WQD approved permitted water disposal wells after transport through buried water pipelines. Produced water pipelines generally would be located between natural gas pipelines and roads within the 60-ft wide facilities corridor. No produced water would be stored or discharged in open surface facilities such as ponds, impoundments, or streams at any time during development or production.

2.1.9 Ancillary Facilities

Anadarko would construct ancillary facilities as necessary to meet production needs. Such facilities may include, but not be limited to (1) produced water disposal equipment, (2) individual well site compression, (3) individual well site liquids recovery units, (4) electrical power lines, (5) gas metering stations, (6) pipeline pigging facilities, (7) field storage buildings, and (8) 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.

2.1.10 Site Restoration and Abandonment

Reclamation would be conducted on all disturbed public lands in compliance with the BLM Wyoming Policy on Reclamation (BLM 1990b). The short-term goal of the reclamation program is to stabilize disturbed areas as soon as possible after disturbance to protect sites and adjacent undisturbed areas from degradation. The long-term goal is to return the land to conditions approximating those that existed prior to disturbance.

Reclamation would occur during two phases of the proposed project. Initially, well pads and facilities corridors would be partially reclaimed after well testing and production/ancillary facilities are installed. This initial reclamation would reduce the amount of disturbed area to only that necessary for production operations. Final reclamation at the end of the LOP would involve reclamation of all remaining disturbed areas. In addition, all unproductive well sites and the ROWS to these sites would be reclaimed as soon as practical during the LOP.

2.1.10.1 Initial Reclamation

After installation of production equipment, the well pad needed for a producing well would be reduced from approximately 2 acres to approximately 1 acre. Drilling and other fluids contained in reserve pits would be evaporated and covered in place as authorized by the BLM and/or WOGCC. If necessary, the material would be removed from pits and disposed of at an authorized location outside of the CRPA (e.g., existing lined evaporation ponds or injector wells). The unused portion of the pad would be recontoured and reseeded within 1 year.

The following procedures are proposed by Anadarko to assure that all disturbed areas are stabilized and that revegetation efforts are enhanced so that significant impacts do not occur (BLM-RSFO 1997, BLM-PFO 1999b).

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

Seedbed Preparation. Appropriate seed bed preparation is critical for seed establishment. Seedbed preparation would be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement and moisture retention. Seedbed preparation would also be performed to break up surface crusts and to eliminate weeds that 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 would be specified on a site-specific basis and their selection would 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 2-1 were developed from observation of successful revegetation projects in the Green River Basin region and observation of dominant species in the project area. 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 would coordinate with WGFD to insure that the correct shrub species are incorporated into seed mixtures on public lands. Native species to be considered include bluebunch wheatgrass, streambank wheatgrass, bottlebrush squirreltail, needle-and-thread grass and Wyoming big sagebrush.

Fall seeding would 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 would be completed by May 30 or as directed by the BLM. Seed would be used within 12 months of testing.

Seeding Method. Drill seeding would 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 would ensure optimum seed placement. The seed would be separated by boxes to prevent seed from separating due to size and weight. Rice hulls or other appropriate material would be added to the seed as necessary to prevent separation. The drill would be properly calibrated so that seed is distributed according to the rates specified for each seed mix.

Table 2-2. Bureau of Land Management Recommended Seed Mixes for Disturbed Surface Land Areas in the RSFO Management Area (USDI-PFO 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
Alkali sacaton		1.0
Inland saltgrass		1.0
Scarlet globemallow		1.0
Gardner saltbush		2.0
Shadscale		2.0
TOTAL		**17.0**
WETLAND/HIGH WATER SOILS		
Tufted hairgrass		2.0
Basin wildrye		5.0
Slough grass		6.0
Bluejoint reedgrass		3.0
Alkali sacaton		1.0
TOTAL		**17.0**
UPLAND SOILS		
Thickspike wheatgrass	'Critana'	4.0
Western wheatgrass	'Rosanna'	4.0
Indian ricegrass		4.0
Shadscale		1.0
Scarlet globemallow		1.0
Winterfat		2.0
Gardner saltbush		1.0
Sandberg bluegrass		2.0
TOTAL		**19.0**

[A] Pounds/acre Pure Live Seed.

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

2.1.10.2 Final Reclamation/Abandonment

During final reclamation and abandonment, Anadarko would obtain necessary authorizations from the appropriate regulatory agencies or private landowners to abandon facilities. Wells would be permanently or temporarily plugged or shut-in until decisions are reached regarding future production options. Pipelines would be purged of all combustible products and retired in place or removed, based on authorizing agency or landowner specifications. All aboveground facilities would be removed, and all unsalvageable materials would be disposed of at authorized sites. Roads would be reclaimed or left in place based on authorizing agency or landowner preference. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is reclaimed. Regrading, topsoiling, and revegetation of disturbed lands would be completed. Abandoned ROWs would revert to the private landowner or appropriate agency control. Compacted areas would be thoroughly ripped to a depth of 12-18 inches before topsoil is replaced. A seed mix approved by the BLM or private landowner would be broadcast or drill seeded on these affected lands. The types and approximate acreage of surface disturbance on federal land for the Proposed Action and No Action alternative are summarized in Table 2-2.

2.1.11 Applicant-committed Practices

2.1.11.1 Project-Wide Mitigation Measures and Procedures

Anadarko proposes to implement the following mitigation measures, procedures, and management requirements on public lands administered by the BLM to avoid or mitigate resource or other land use impacts. On lands owned by Anadarko, the company would determine which measures would be applied, to what degree, and where. Anadarko would coordinate with the State of Wyoming as to application of mitigation on state-owned lands. An exception to a mitigation measure and/or design feature may be approved on public land on a case-by-case basis when deemed appropriate by the BLM. An exception would be approved only after a thorough, site-specific analysis determined that the resource or land use for which the measure was put in place is not present or would not be significantly impacted.

2.1.11.1.1 Preconstruction Planning and Design Measures

- Anadarko and the BLM would make on-site interdisciplinary (ID) team inspections of each proposed and staked facility site (e.g., well sites), new access road, access road reconstruction, and pipeline alignment projects so that site-specific recommendations and mitigation measures can be developed.

- New road construction and maintenance of existing roads in the CRPA would be accomplished in accordance with BLM Manual 9113 standards unless private landowners or the State of Wyoming specify otherwise.

- Anadarko would prepare and submit an APD for each drill site on federal leases to the BLM for approval prior to initiation of construction and would be subject to additional environmental review. Also, prior to construction, Anadarko or its contractors would submit Sundry Notices and/or ROW applications for pipelines and access road segments on federal leases. The APD would include a Surface Use Plan that would show the layout of the drill pad over the existing topography, dimensions of the pad, volumes and cross sections of cut and fill (when required), location and dimensions of reserve pit(s), and access road egress and ingress. The APD, Sundry Notice, and/or ROW application plan would also itemize project administration, time frame, and responsible parties.

- Anadarko would slope-stake construction activities when required by the BLM (e.g., steep and/or unstable slopes) and receive approval from the BLM prior to start of construction.

2.1.11.2 Resource-Specific Requirements

Anadarko proposes to implement the following resource-specific mitigation measures, procedures, and management requirements on public lands managed by the BLM.

2.1.11.2.1 Range Resources/Other Land Uses/Invasive/Noxious Weed Monitoring and Management

- Anadarko will coordinate with the affected livestock operators to ensure that livestock control structures remain functional during drilling and production operations.

- Incorporate best known weed prevention measures as outlined in Appendix 4 of Partners *Against Weeds: An Action Plan for the Bureau of Land Management*.

- Incorporate invasive/noxious weed management strategies into the preconstruction planning and design process for all surface disturbance activities including road, pipeline, well pad and ancillary facility construction.

- Inventory and remove existing invasive/noxious weed seed sources that could be transported into relatively weed-free areas by passing vehicles.

- Clean muddy off-road equipment before moving into relatively weed-free areas.

- Minimize removal of native vegetation during construction of roads, pipelines, well pads and ancillary facilities.

- Stabilize disturbed areas and reestablish vegetation on all bare ground using mixtures and treatment guidelines prescribed in the approved APD/ROW as soon as practical to minimize weed spread.

- Store gravel, top soil and fill in relatively weed-free areas.

- Where possible, limit access to all disturbed sites that are not yet re-vegetated.

- Monitor disturbed and re-vegetated sites to ensure that desired species are thriving and invasive/noxious weeds are not present. Treat, reseed and fertilize as necessary.

- Monitor roads and other disturbed areas throughout the life of the project and for three years after reclamation to insure that invasive/noxious weeds are identified and eradicated.

- Ensure that all invasive/noxious weed control measures adhere to standards in the Decision Record for the Rock Springs District Noxious Weed Control EA or applicable updated guidance.

- Cooperate with the Sweetwater County Weed and Pest District to identify appropriate methods of weed control.

- Before treatment of invasive/noxious weeds, submit Pesticide Use Proposal (PUP) to the BLM for approval, ensure that all pesticides intended for use are on the BLM's approved label list for use on public lands (the label list is updated each year). The PUP(s) s must be approved prior to any spraying. PUP's can be approved for up to a three year period.

- Ensure that pesticide applicators are certified with an up to date Pesticide Applicator's License before performing spraying work.

- Submit Pesticide Application Records to the BLM RSFO each year. Ensure that treatments comply with all federal and state regulations regarding use of pesticides, including those outlined in the following:

    - BLM Information Bulletin No. WY-98-106, *Weed Management Guidance*;
    - Instruction Memorandum No. WY-99-29, *Executive Order #13112 : Invasive Species*;
    - Washington Information Bulletin No. 99-110; *Submission of Pesticide Use Report*;
    - Information Bulletin No. WY-2000-25: *Annual Pesticide Use Report.*

Mitigation requirements listed under Soils, Vegetation and Wetlands, and Wildlife also apply to Range Resources and Other Land Uses.

2.1.11.2. 2 Air Quality

- All BLM conducted or authorized activities (including natural gas development alternatives) must comply with applicable local, state, tribal and Federal air quality regulations and standards. Anadarko would adhere to all applicable ambient air quality standards, permit requirements (including preconstruction, testing, and operating permits), motorized equipment and other regulations, as required by the State of Wyoming, Department of Environmental Quality, Air Quality Division (WDEQ-AQD).

- Anadarko would not allow burning garbage or refuse at well locations or other facilities. Any other open burning would be conducted under the permitting provisions of Chapter 10, Section 2 of the Wyoming Air Quality Standards and Regulations (WDEQ-AQD).

- On Federal land, Anadarko would initiate immediate abatement of fugitive dust (by application of water, chemical dust suppressants, or other measures) when air quality,

soil loss, or safety concerns are identified by the BLM or the WDEQ-AQD. These concerns include, but are not limited to, potential exceedances of applicable air quality standards. The BLM would approve the control measure, location, and application rates. If watering is the approved control measure, the operator must obtain the water from state-approved source(s).

- Anadarko would seed appropriate permits and/or follow state protocol for approval of all on-site temporary or permanent equipment used in association with this project from the Wyoming Department of Environmental Quality, Air Quality Division.

2.1.11.2.3 Transportation

- Existing roads should be used as collectors and local roads whenever possible. Standards for road design should be consistent with BLM Road Standards Manual Section 9113.

- Roads not required for routine operation and maintenance of producing wells and ancillary facilities would be permanently blocked, reclaimed, and revegetated.

- Areas with important resource values, steep slopes and fragile soils should be avoided where possible in planning for new roads.

2.1.11.2.4 Minerals/Paleontology

Mitigation measures presented in the Soils and Water Resources sections would avoid or minimize many of the potential impacts to the surface mineral resources. Protection of subsurface mineral resources from adverse impacts would be provided by the BLM casing and cementing policy.

Impacts to fossil resources can be reduced by the implementation of paleontologic resource mitigation measures. These measures include the following:

Field Survey. Detailed preconstruction field surveys should be conducted within the CRPA in area where construction would disturb surface exposures or subsurface bedrock of the Green River, Wasatch, and Fort Union. Field survey would involve a visual examination of the formation by a BLM-approved paleontologist in areas of exposure and would recommend additional mitigation. A report of findings, including recommendations for further mitigation or negative findings must be filed by the BLM-approved paleontologist and approved by the BLM before work can be authorized. After review of the paleontologist's report, the BLM will determine the need for additional mitigation measures. These could include collection of specimens and monitoring of excavation.

Worker Instruction. Construction personnel would be instructed about the types of fossils they could encounter and the steps to take if they uncover fossils during construction. Workers would be informed that destruction, collection or excavation of vertebrate or other scientifically-significant invertebrate or plant fossil materials from federal land without a federal permit is illegal and they and their company could face charges if they knowingly destroy or remove fossils.

Discovery Contingency. Should fossil resources be uncovered during surface disturbance

associated with the Proposed Action, authorized personnel should immediately notify the BLM and work should cease immediately in the area of the discovery until authorized by the BLM AO. A BLM-approved paleontologist may be needed to evaluate the fossil material. If fossil remains of significance are identified then additional mitigation measures may be required. Additional mitigation could include avoidance, collection, identification, and monitoring and may delay resumption of work.

If field survey does not reveal significant fossils, no additional work for paleontology may be recommended in the areas surveyed.

2.1.11.2.5 Soils

- Reduce the area of disturbance to the absolute minimum necessary for construction and production operations while providing for the safety of the operation.

- Where feasible, locate pipelines immediately adjacent to roads to avoid creating separate areas of disturbance and in order to reduce the total area of disturbance.

- Avoid using frozen or saturated soils as construction material.

- Minimize construction activities in areas of steep slopes.

- Design cutslopes in a manner that would allow retention of topsoil, surface treatment such as mulch, and subsequent revegetation.

- Selectively strip and salvage topsoil or the best suitable medium for plant growth from all disturbed areas to a minimum depth of 6 inches on all well pads.

- Where possible, minimize disturbance to vegetated cuts and fills on existing roads that are improved.

- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches if needed.

- Install culverts for ephemeral and intermittent drainage crossings. Design all drainage crossing structures to carry the 25- to 50-year discharge event, or as otherwise directed by the BLM.

- Implement minor routing variations during access road layout to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. Disturbance will not encroach within 500 feet of perennial surface water and 100 feet of the thalweg in ephemeral channels. (See item 3 in Section 2.1.11.2.6 below).

- Include adequate drainage control devices and measures in the 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, use erosion control devices and measures such as temporary barriers, ditch blocks, erosion

stops, mattes, mulches, and vegetative covers. Implement a revegetation program as soon as possible to re-establish the soil protection afforded by a vegetal cover.

- Upon completion of construction activities, restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites; replace up to 6 inches of topsoil or suitable plant growth material over all disturbed surfaces; apply fertilizer as required; seed; and mulch.

2.1.11.2.6 Water Resources

Other mitigation measures listed in the Soils, and Vegetation and Wetlands sections would also apply to Water Resources.

- Limit construction of drainage crossings to no-flow periods or low-flow periods.

- Minimize the area of disturbance within perennial, ephemeral and intermittent drainage channel environments.

- Prohibit construction of well sites, access roads, and pipelines within 500 feet of surface water and/or riparian areas, and 100 feet from the thalweg of ephemeral channels. Possible exceptions to this would be granted by the BLM based on an environmental analysis and site-specific mitigation plans.

- Design channel crossings to minimize changes in channel geometry and subsequent changes in flow hydraulics.

- Maintain vegetation barriers occurring between construction activities and perennial, ephemeral and intermittent flows or channels, with the exception of approved right angle linear feature crossings, which, with the exception of the active travel path of a roadway, should be reclaimed.

- Design and construct interception ditches, sediment traps/silt fences, water bars, silt fences and revegetation and soil stabilization measures if needed.

- Construct channel crossings by pipelines such that the pipe is buried a minimum of four feet below the channel bottom.

- Regrade disturbed channel beds to the original geometric configuration and the same or very similar bed material replaced.

- Case wells during drilling, and case and cement all wells in accordance with Onshore Order No. 2 to protect all high quality water aquifers. High quality water aquifers are aquifers with known water quality of 10,000 TDS or less. Include well casing and welding of sufficient integrity to contain all fluids under high pressure during drilling and well completion. Further, wells would adhere to the appropriate BLM cementing policy.

- Construct the reserve pits in cut rather than fill materials or compact and stabilize fill. Inspect the subsoil material of the pit to be constructed in order to assess soil stability and permeability and whether reinforcement and/or lining are required. If lining is

required, as specified in the GRRA RMP ROD (50 feet or less to ground water and permeability grater than 10^{-7} cm/hour), line the reserve pit with a reinforced synthetic liner at least 12 mils in thickness and a bursting strength of 175 x 175 pounds per inch (ASTMD 75179). Reserve Pit lining requirements will be handled on a case-by-case basis during the APD process taking into consideration water quality, soil permeability, and depth to groundwater.

- Maintain two feet of freeboard on all reserve pits to ensure the reserve pits are not in danger of overflowing. Shut down drilling operations until the problem is corrected if leakage is found outside the pit.

- Extract hydrostatic test water used in conjunction with pipeline testing and all water used during construction activities from sources with sufficient quantities and through appropriation permits approved by the State of Wyoming.

- Discharge hydrostatic test water in a controlled manner onto an energy dissipator. The water is to be discharged onto undisturbed land that has vegetative cover, if possible, or into an established drainage channel. Prior to discharge, treat or filter the water to reduce pollutant levels or to settle out suspended particles if necessary. If discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to safely convey the increased flow, and the hydrostatic test water quality would be equal to or better than the receiving waters. Coordinate all discharge of test water with the Wyoming State Engineer's Office (SEO), Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), and the BLM.

- Discharge all concentrated water flows within access road ROWs onto or through an energy dissipator structure (e.g., riprapped aprons and discharge points) and discharge into undisturbed vegetation.

- Develop and implement a pollution prevention plan (PPP) for storm water runoff at drill sites as required per Wyoming Department of Environmental Quality (WDEQ) storm water National Pollution Discharge Elimination System (NPDES) permit requirements. The WDEQ requires operators to obtain a field permit for fields of 20 wells or more.

- Exercise stringent precautions against pipeline breaks and other potential accidental discharges of toxic chemicals into adjacent streams. If liquid petroleum products are stored on-site in sufficient quantities (per criteria contained in 40 CFR Part 112), a Spill Prevention Control and Countermeasures (SPCC) plan would be developed in accordance with 40 CFR Part 112, dated December 1973.

- Coordinate all crossings or encroachments of waters of the U.S. with the U.S. Army Corps of Engineers (COE).

- Discharge all water produced from the gas bearing formation(s) into tanks, pumps, pipelines, and existing injection wells to preclude contamination of surface waters with high mineral content formation water.

2.1.11.2.7 Fisheries

- No fisheries mitigation is needed beyond that indicated under Water Resources and Special Status Species Fish.

2.1.11.2.8 Vegetation and Wetlands

Other mitigation measures under Soils and Water Resources would also apply to vegetation and wetlands.

- File noxious weed monitoring forms with the BLM and implement, if necessary, a weed control and eradication program.

- Evaluate all project facility sites for occurrence and distribution of waters of the U.S., special aquatic sites, and jurisdictional wetlands. All project facilities would be located out of these sensitive areas. If complete avoidance is not possible, minimize impacts through modification and minor relocations. Coordinate activities that involve dredge or fill into wetlands with the COE.

2.1.11.2.9 Wildlife

- During reclamation, establish a variety of forage species that are useful to resident herbivores.

- Prohibit unnecessary off-site activities of operational personnel in the vicinity of the drill sites. Inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment.

- Limit construction activities as per BLM authorizations within big game crucial winter range from November 15 to April 30.

- Complete a raptor survey of the CRPA prior to construction to ensure that well sites are located away from potential conflict areas.

- Survey and clear well sites within one mile of raptor nests identified in the raptor survey prior to the commencement of drilling and construction during the raptor nesting period (February 1 through July 31).

- When an `active' raptor nest is within one mile (Ferruginous Hawk) or ½ mile (all other raptors) of a proposed well site, restrict construction during the critical nesting season for that species.

- Do not perform construction activities within 0.25 mile of existing sage grouse leks at any time except as authorized in writing by exception, including documented supporting analysis, by the Authorizing Official. All surface disturbances would abide by sage-grouse stipulations as detailed in the GRRA RMP ROD and supporting documents.

Provide for sage grouse lek protection during the breeding, egg-laying and incubation period (March 1 - June 30) by restricting construction activities within a two-mile radius of active sage grouse leks. Exceptions may be granted if the activity would occur in unsuitable nesting habitat.

2.1.11.2.10 Special Status Species

Special Status Plants

- Employ site-specific recommendations developed by the BLM IDT for staked facilities.
- Minimize impacts due to clearing and soil handling.
- Monitor and control noxious weeds.
- Comply with Section 404(b) (1) guidelines of the federal Clean Water Act (CWA).

Perform clearance surveys for plant species of concern.

Special Status Animals

- Implement measures discussed in Chapter 4 (Section 4.8) in compliance with the Endangered Species Act (ESA),

2.1.11.2.11 Visual Resources

- Utilize existing topography, vegetation, and color that mimic the existing environment to screen roads, pipeline corridors, drill rigs, well heads, and production facilities from view.
- Paint well and central facilities site structures with flat colors (e.g., Carlsbad Canyon or Desert Brown) that blend with the adjacent surrounding undisturbed terrain, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements.

2.1.11.2.12 Noise

- Muffle and maintain all motorized equipment according to manufacturers' specifications.

2.1.11.2.13 Recreation

Measures under Wildlife, Transportation, Soils, Health and Safety, and Water Resources apply to Recreation.

- 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.
- Monitor recreational use of roads, especially during hunting seasons.

2.1.11.2.14 Socioeconomics

- Implement hiring policies that would encourage the use of local or regional workers who would not have to relocate to the area.

- Coordinate project activities with ranching operations to minimize conflicts involving livestock movement or other ranch operations. This would include scheduling of project activities to minimize potential disturbance of large-scale livestock movements. Establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.

- Anadarko and its subcontractors would obtain Sweetwater County sales and use tax licenses for purchases made in conjunction with the project so that project-related sales and use tax revenues would be distributed to Sweetwater County.

2.1.11.2.15 Cultural Resources

- Conduct a Class III inventory prior to any ground disturbing activities and identify sites considered eligible for, or already on the NRHP.

- If a site is considered eligible for, or is already on the National Register of Historic Places (NRHP), avoidance is the preferred method for mitigating adverse effects to that property.

- Mitigation of adverse effects to cultural/historical properties that cannot be avoided would be accomplished by the preparation of a cultural resources mitigation plan.

- If unanticipated or previously unknown cultural resources are discovered at any time during construction, all construction activities would halt and the BLM Authorized Officer (AO) would be immediately notified. Work would not resume until a Notice to Proceed is issued by the BLM AO.

2.1.11.2.16 Health and Safety

Measures listed under Air Quality and Water Quality also apply to Health and Safety.

- Sanitation facilities installed on the drill sites and any resident camp site locations would be approved by the WDEQ.

- To minimize undue exposure to hazardous situations, require measures that would preclude the public from entering hazardous areas and place warning signs alerting the public of truck traffic.

- Haul all garbage and rubbish from the drill site to a State-approved sanitary landfill for disposal. Collect and store any garbage or refuse materials on location prior to transport in containers approved by the BLM.

- During construction and upon commencement of production operations, Anadarko would have a chemical or hazardous substance inventory for all such items that may be at the site. Anadarko would institute a Hazard Communication Program for its employees and would require subcontractor programs in accordance with OSHA 29 CFR 1910.1200. These programs are designed to educate and protect the employees and subcontractors with respect to any chemicals or hazardous substances that may be present in the work place. It would be required that as every chemical or hazardous material is brought on location, a Material Safety Data Sheet (MSDS) would accompany that material and would become part of the file kept at the field office as required by 29 CFR 1910.1200. All employees would receive the proper training in storage, handling, and disposal of hazardous substances.

- Spill Prevention Control and Countermeasure 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.

- Chemical and hazardous materials would be inventoried and reported in accordance with the Superfund Amendments and Reauthorization Act (SARA) Title III. 40 CFR Part 335, if quantities exceeding 10,000 pounds or the threshold planning quantity (TPQ) are to be produced or stored in association with the Proposed Action. The appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.

- Any hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

- Anadarko plans to design operations to severely limit or eliminate the need for Extremely Hazardous substances. Anadarko also plans to avoid the creation of hazardous wastes as defined by RCRA wherever possible.

2.2 ALTERNATIVE A - NO ACTION

Section 1502.14(d) of the National Environmental Policy Act (NEPA) requires that the alternatives analysis "include the alternative of no action". "No Action" implies that on-going natural gas production activities would be allowed to continue by the BLM in the CRPA, but the proposed field development program (Proposed Action) would be denied. Additional APDs and ROW actions would be considered by the BLM for federal land on a case-by-case basis consistent with the scope of existing environmental analysis. Transport of natural gas products would be allowed from those wells within the CRPA that are currently productive. Additional gas development could occur on private lands within the project area under APDs approved by the WOGCC.

Because the project lies within the checkerboard where Anadarko owns the private surface/minerals, and access already approved to most of the area by BLM through rights-of-way actions, the No Action Alternative would entail continued drilling on private lands (and potentially could lead to additional drilling on public lands to resolve drainage issues). Thus, for purposes of this analysis, the No Action Alternative acknowledges continued development on

the private estate, but assumes no further drilling on public lands beyond that already authorized with approved APD's.

Assuming that no new federal wells would be permitted, Anadarko estimates that 48 wells and associated infrastructure would be developed under the No Action Alternative, as shown in Figure 2-1. Table 2-3 shows surface disturbances anticipated for the No Action Alternative.

Table 2-3. Types and Approximate Acreage of Surface Disturbance on Federal Land - No Action Alternative.

No Action Alternative									
	Estimated Life-of-Project (LOP) Disturbance Area (acres)					Estimated Initial Disturbance Area (acres)			
Type of Disturbance	Federal	Private	State	Total		Federal	Private	State	Total
Number of Wells	0	46	2	48		0	46	2	48
Well Pads[1]	0.0	46	2	48		0.0	92	24	96
Roads[2]	16.36	41.81	1.8	59.97		32.72	83.62	3.6	119.94
Compressor[5]	0.0	0.9	0.0	0.9		0.0	0.9	0.0	0.9
Pipelines[3,4]	0.0	0.0	0.0	0.0		49.09	125.45	5.45	179.99
Total	**16.36**	**88.71**	**3.8**	**108.87**		**81.81**	**301.97**	**33.05**	**396.83**

[1]Assumes initial disturbance of approximately 2 acres for each well pad and LOP disturbance of 1 acre per well pad.
[2]Assumes an average of 0.25 mi of new roads with parallel gas gathering and water discharge lines (60-ft average disturbance width) for each well. All disturbance except for the estimated 30-ft wide road travelway and adjacent ditches would be reclaimed for the LOP.
[3]Assumes an average of 0.75 mi of new gas gathering and water discharge lines per well of which approximately 0.50 mi will be constructed within existing pipeline corridors.
[4]Assumes an average disturbance width of 30 ft.
[5] The compressor station (about 0.9 acres of disturbance) would be located on private land.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Based on technical information provided by Anadarko, the BLM examined utilization of horizontal or directional drilling to minimize surface disturbance. Use of such drilling methods would allow the clustering of surface facilities. This alternative is not given further consideration for the following reasons:

- Economics – horizontally drilled wells are estimated to cost 5 to 10 times as much as similar vertically drilled wells with no commensurate increase in production. This is due to the requirement to drill many laterals (up to 24) to develop the gas resource in a formation with up to 24 coal seams. In addition, horizontal laterals would not be economical in thin seams as the cost of each lateral would exceed the return on ultimate gas recovery. In conventional drilling, these seams would contribute to overall production, therefore maximizing recovery of the gas resource.
- Reservoir issues – the science of CBM wells and the Copper Ridge formation in

particular (targeted interspersed coal and sands), does not warrant horizontal wells for the purpose of intersecting naturally occurring vertical fractures, which is one reason to horizontally drill. The coals of the Almond Coal formation are made up of three subgroups of coals, with 8 to 12 seams ranging in thickness from 1 to 10 feet. Some Almond coal seams correlated between wells over long distances, but there are still a high number of seams or riders that do not correlate from well to well. Thin or discontinuous target zones are poor prospects for horizontal drilling. In addition, horizontal drilling technology requires precise control of target locations in three dimensions. Even the thickest coal seams 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 coal seam locations, directional drilling would not produce the desired results.

- Surface disturbance – Typical vertical well requires approximately 1 acre or less of rig footprint. Horizontal laterals would require a larger rig. Larger rigs are currently using 2 acre or larger footprint depending on the depth of the well and the length of the horizontal. A horizontal well would need to take the place of more than four conventional vertical wells before experiencing net loss in well site surface disturbance.