Appendix H

Required Best Management Practices

APPENDIX H

REQUIRED BEST MANAGEMENT PRACTICES

Consolidated Table

These Best Management Practices (BMPs) will be applied under all alternatives as Conditions of Approval where proposals conflict with identified resources.

Additional mitigation measures are also identified in:

- Appendix K, Applicant Voluntary Committed Measures
- Appendix B, Reclamation Plan,
- Appendix E, Wildlife Monitoring/Protection Plan
- Appendix J, Best Management Practices for Reducing Non-Point Source Pollution

Best Management Practices and mitigation measures are further described in:

- Draft Rawlins Resource Management Plan

- BLM/Forest Service *Surface Operating Standards for Oil & Gas Exploration and Development* ("Gold Book") (http://www.blm.gov/bmp/gold%20book/FinalGoldBook%20-%202006%204th%20Edition.pdf)

- BLM's "Best management Practices Web page: (http://www.blm.gov/bmp/Technical_Information.htm)

- BLM Manual 9113—Roads

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Paleontology Resources		
Paleontology Resources	1) Each proposed facility located in areas with known and/or potential significant paleontological resources (Paleontology Condition 1 and 2 areas and Probable Fossil Yield Class 4 and 5 areas) would be surveyed by a BLM-approved paleontologist prior to surface disturbance. 2) Any significant fossils or localities previously known or discovered during the survey will be avoided by the permitted activity, or fully mitigated prior to allowing the activity to proceed. 3) If paleontological resources are discovered at any time during construction, all construction activities would halt and BLM personnel would be immediately notified. Work would not proceed until paleontological materials are properly evaluated by a qualified paleontologist. In addition, the site would be protected from further damage or looting.	(USDI-BLM 1987, 1990)
Cultural Resources		
Cultural Sites Eligible Under Criterion D–Physical Site Locations - Including Trails	1) Avoidance 2) Data Recovery	Wyoming State Protocol–Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800 Criteria for Eligibility are found in 36 CFR 60.4

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Cultural Resources		
Cultural Sites Where Setting Contributes to Eligibility	1) Collocate roads and pipelines 2) Brush hog rights-of-way where feasible 3) No surface disturbance within a quarter mile of the trails or visual horizon whichever is closer. 4) Use low-profile facilities. 5) Paint all surface facilities a color compatible with local environment 6) Surface all roads with material compatible in color with the local environment.	Wyoming State Protocol–Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800 Criteria for Eligibility are found in 36 CFR 60.4; Special measures are considered within 2 miles either side of the entire trail corridor, since viewsheds of contributing segments may be affected even if a project is located immediately adjacent to a non-contributing portion.
Native American Sensitive Sites/Traditional Cultural Properties (TCP) (Native American Consultation is the first step to identify important mitigation measures to be considered.)	Determined on a case-by-case basis	Numerous laws and directives including: Native American Graves Protection and Repatriation Act of 1990 (NAGPRA); American Indian Religious Freedom Act of 1978 (AIRFA); Executive Order 13007 Native American sensitive sites may or may not be eligible for the National Register. Mitigation measures are considered on a site specific basis.

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Fluid Minerals		
SMAs Water Resources, Visual Resources, Wildlife, Vegetation, Fisheries	1) Require transportation planning map in a GIS compatible format with all operator coordination and input, to minimize duplication of roads, compressor stations, pipelines and other facilities.	
Reducing Impacts from Fluid Mineral Construction, Operation, and Reclamation	1) Directional drilling 2) Drill multiple wells from a single pad 3) Transportation planning (to reduce road density and traffic volumes) 4) Remote well monitoring 5) Pipe produced liquids to centralized tank batteries off-site to reduce traffic to individual wells 6) Submersible pumps 7) Below ground well heads 8) Bus workers to reduce traffic volume 9) Flareless well completions 10) Bury distribution power lines and flowlines in or adjacent to access roads. 11) Design and construction of all new roads to a safe and appropriate standard, “no higher than necessary,” to accommodate their intended use 12) Reuse of old roads or pads 13) Interim reclamation of well locations and access roads soon after well is put into production, as described in the Reclamation Plan, appendix B. 14) Avoid facility placement on steep slopes, ridge tops, and hill tops. 15) All production facilities installed on location that have the potential to leak or spill oil, glycol, produced water, or other fluid, shall be placed within an appropriate containment or diversionary structure. 16) On-site bio-remediation of oil field wastes and spills 17) Remove trash, junk, waste and other materials not in current use. 18) All existing and proposed roads shall be brought up to BLM minimum standards as found in BLM Manual 9113.	BMPs; Reclamation Plan–appendix B

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Reclamation Plan		
Appendix B–Reclamation Plan (Control and minimize surface runoff, erosion, and sedimentation; invasive weed control; native vegetation and habitat protection/restoration; visual resource management.)	1) See appendix B, Reclamation Plan, for complete, specific reclamation guidance	
Vegetation Resources		
Aspen, Juniper Woodland, Serviceberry, Mountain Mahogany, Silver Sagebrush/Bitterbrush Vegetation Communities.	1) Avoidance areas. Plans should be submitted and approved by BLM for surface disturbance in these areas. Only those areas that cannot be avoided could be approved.	Plant communities which failed to meet Rangeland Health Standard #3 in 2001 assessment. These communities are high value, low occurrence, and present reclamation difficulties
Control of Invasive Weeds	1) Weeds shall be controlled on project disturbed areas and native areas infested as a direct result of the project. The control methods shall be in accordance with guidelines established by the USEPA, BLM, state and local authorities. Prior to the use of pesticides, the operator will obtain written approval from the BLM Authorized Officer (meaning an approved pesticide use proposal form).	Wyoming Weed and Pest Control Act, 1973 & Wyoming Weed and Pest Special Management Program, Title 11, Chapter 5. Executive Order 13112
Protection of Study Areas	1) Avoid any disturbance to monitoring sites.	Rangeland Health Standards, 43 CFR 4180.1

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Visual Resource Management		
VRM Management Class III Areas Visible from State, County and BLM Roads in Viewshed	1) Gravel of road surfacing shall be similar color to adjacent dominant soil colors. 2) Avoid locating pads in areas visible from primary roads. 3) Avoid locating facilities on or near ridgelines - use subsurface or low-profile facilities to prevent protrusion above horizon line when viewed from any primary road. 4) Avoid routing well access roads directly from state, county, or BLM roads. 5) Co-locate wells when possible. 6) Locate facilities far enough from the cut and fill slopes to facilitate re-contouring for interim reclamation. 7) Do not locate wells adjacent to prominent features such as rock outcrops. 8) Repeat elements of form, line, color, and texture to blend facilities and access roads with the surrounding landscape 9) Complete annual transportation plan for entire area before beginning construction - make layout that will minimize disturbance and visual impact. 10) Design and construct all new roads to a safe and appropriate standard, “no higher than necessary” to accommodate their intended use. 11) Locate roads far enough off the back of ridgelines so they aren't visible from state, county or BLM roads. 12) Use remote monitoring to reduce traffic and road requirements. 13) Remove unused equipment, trash and junk immediately. 14) Reclaim unnecessary access roads as soon as possible. 15) All above-ground structures, production equipment, tanks, transformers, insulators, not subject to safety requirements shall be painted to blend with the natural color of the landscape. The paint used shall be a non-reflective “Standard Environmental Color” approved by the BLM VRM specialist.	VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Visual Resource Management		
Slopes < 5% in VRM Management Class III Areas Visible from State, County and BLM Roads (Minimizing road construction methods will reduce visual impacts by reducing vegetative removal and soil exposure.)	1) Do not create unnecessary cut and fill. Design and construct all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use.	VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1
Water and Soil Management		
Avoidance Areas	1) Avoidance areas for surface disturbing and disruptive activities and linear crossings include: • Identified 100-year flood plains; • Areas within 500-feet from perennial waters, springs, wells and wetland riparian areas, and • Areas 100-feet from the inner gorge of ephemeral channels.	Wyoming Standard Mitigation Guidelines and Planning Decisions
Non-Point Source Pollution	See appendix J, Best Management Practices for Non-Point Source Pollution	Clean Water Act Section 303(e) and 40 CFR 130.5

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Water Management Plan as Part of the Annual Work Plan Submittal in April	1) The Atlantic Rim operator responsible for new development around existing pods will submit a Water Management Plan as part of the Annual Work Plan submittal in April. This plan will have the following information: • 12-digit HUC number and name • All digital and other information required by the Annual Workplan • Surface water assessment of current road network in the area including future plans for maintenance. • Average daily water production per well at current pod wells. • Average daily injection volumes of current injection wells, by well. • Unused injection well capacity • Estimated water production from proposed wells • Location, name and estimated capacity of new injection wells • Special Protection Measure for each well location, if applicable • Any water quality sampling results • Anticipated permit requirements, and copies of existing permits for water related activities required from ACOE, other federal agencies and/or the State of Wyoming.	Monitoring, planning and compliance for the success of the project
Surface Disturbance on Slopes >25% as Identified from the 30 meter DEM Data.	1) Plans should be submitted and approved by BLM for surface disturbance in these areas. Only those areas that cannot be avoided could be approved.	Wyoming Standard Mitigation Guidelines

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Drainage Crossings	1) Culverts or low-water crossings would be installed for all ephemeral and intermittent drainage crossings. All drainage crossing structures and culverts would be designed to pass at a minimum the 25-year discharge events, or as otherwise directed by the BLM. Downstream armoring will be installed when necessary. 2) The design of channel crossings will minimize changes in channel geometry and subsequent changes in flow hydraulics. Disturbed channel beds will be regraded to the original geometric configuration with the same or very similar bed material. Downstream armoring will be installed when necessary. 3) Construction of drainage crossings will be limited to no-flow periods or low-flow periods. 4) Channel crossings for buried pipelines will be constructed using trenching techniques such that the pipe is buried a minimum of four feet below the channel bottom. To stabilize stream banks, appropriate size riprap will be placed from the channel bottom to the top of the normal high water line at all stream crossings. When excavating the crossing separate the top one-foot of stream bottom substrate from deeper soil layers and reconstruct the original layers by replacing deeper substrate first.	Wyoming Standard Mitigation Guidelines

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Reducing Surface Runoff and Erosion	1) Adequate drainage control devices and measures would be included in the road design and maintenance (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipaters) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid concentrated flows. 2) Locations for these features will be proposed in Annual APD approval master plans submitted by the operator and will be identified specifically in construction plans after BLM on-sites. 3) Erosion control devices would also be used in conjunction with the surface runoff and drainage control devices, such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. A revegetation program would be implemented as soon as possible to re-establish the soil protection afforded by a vegetal cover. 4) When an existing road, improved for travel, will reduce environmental impacts compared with a new route, it will be used and identified during annual planning and onsite inspections.	Wyoming Standard Mitigation Guidelines
Road and Pad Drainage and Erosion Mitigation	1) Culverts should be installed in road crossings for small ephemeral channels. All drainage and erosion mitigation should be designed for at least the 25 year discharge events, and use at minimum 18 inch culverts (with armored entrances and exits as necessary). Waterbars, waddles or haybales, and silt fences can be used as needed to reduce surface runoff velocity and deposit sediment in the uplands to protect riparian areas, wetlands and surface waters.	(USDI-BLM and USDA 2006)
Well Inventories Water developments Associated with Groundwater	1) All potentially affected landowners having properly permitted water wells with the Wyoming State Engineer's Office within each proposed well's circle of influence (1/2 mile radius) were offered a Water Well Agreement; and if a water well agreement is not reached with the landowner, the responsible Atlantic Rim Operator will mitigate the impacts in accordance with State of Wyoming water laws. Some examples of mitigation would be drilling an additional supply well or provide CBNG water as an offset.	Potential Impact Mitigation– Note that this is situation is very unlikely to occur, but important to address if it does occur.

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Interim Reclamation of Unused Areas.	1) Completely reclaim all disturbed areas not needed for production activities including: • Pipeline ROW, • Portion of road ROW not needed in the function of the road, and • The portion of the drill pad not needed during production. Reclamation would generally include: • complete cleanup of the disturbed areas; • The topography would be restored to contours that existed prior to construction; • Ripping of disturbed areas to a depth of 12 to 18 inches; • Topsoil or suitable plant growth material would be replaced over all disturbed surfaces; • Seeding of reclaimed areas with the seed mixture prescribed in the Surface Use Plan or Plan of Development for the proposed Action, and • Mulching or soil amendments, if considered necessary by the BLM officer.	Reduce long-term disturbance by improving reclamation success.

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Water Used for Construction, Maintenance, and Drilling Activities	1) All water used for drilling, completion and testing activities will come from existing CBNG wells or re-used from other drilling sites, subject to state permitting. 2) All water used for construction, dust abatement or hydrostatic testing will come from existing CBNG wells or sources with sufficient quantities and through appropriation permits approved by the State of Wyoming. Surface water and shallow groundwater sources would only be located in the Colorado River Basin and has been consulted on with the Fish and Wildlife Service (See appendix G, Biological Assessment). Under no circumstances are these methods to be used for water disposal, only volumes appropriate for the use would be approved. 3) Hydrostatic test water will be discharged in a controlled manner onto an energy dissipater and within existing ROWs. The water is to be discharged onto undisturbed land that has vegetative cover and with energy dissipation such as using a rock armored apron or gated pipe. Prior to discharge, water should be tested and treated or filtered if necessary to reduce pollutant levels or to settle out suspended particles if necessary. Coordinate all discharge to test water with the SEO, WDEQ and the BLM.	CBNG water is generally of good enough water quality in this area to be used for these purposes. Waters from the producing coal seams has been shown to be geographically isolated from most water sources (See section 4.4). These are proper beneficial uses with the State's approval that would not change impacts if used in volumes commiserate with the water needs. These methods are not intended to help with water disposal needs for the project, since they are generally of such low volumes
Range Management		
Range Improvements	1) Employ prevention measures to avoid damaging fences, gates, and cattleguards. 2) Report and correct any damage that occurs to rangeland improvement projects. 3) Prior to drilling, upgrade cattleguards and gates width and load bearing requirements to meet BLM Road Standards (BLM Manual 9113).	Protect function and value of range improvements
Reduce Danger to Livestock from Potential Hazardous Wastes	1) For the protection of livestock, all pits and open cellars shall be fenced. Fencing shall be in accordance with BLM specifications.	

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Appendix F Wildlife Monitoring/Protection Plan Wildlife Monitoring/Protection	For complete list of wildlife protection measures (See appendix E)	
Big Game Crucial Winter Range	1) Directional drilling 2) Drill multiple wells from a single pad 3) Remote well monitoring 4) Transportation planning (to reduce road density and traffic volumes) 5) Cluster development 6) Compensation mitigation 7) Seasonal restriction of public vehicular access.	BMP's
Greater Sage-Grouse and Columbian Sharp-Tailed Grouse Habitat	1) Directional drilling 2) Drilling of multiple wells from a single pad 3) Seasonal restriction of public vehicular access 4) Noise reduction techniques and designs 5) Use of low profile well facilities and tanks 6) Burying of power lines to avoid use of poles and other tall structures 7) Transportation planning to align roads out of sight and sound of leks, and to schedule traffic to avoid greater sage-grouse and Columbian sharp-tailed grouse activity periods 8) Design of roads to minimum safe standard for intended use 9) Partial reclamation of resource roads needed for project construction to lower standards necessary for maintenance operations	BMP's
Wildlife Habitat	1) Seasonal restriction of public vehicular access 2) Implementation of the Wyoming Bird Conservation Plan from Wyoming Partners in Flight.	BMP's

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Potential Hazards to Wildlife	1) For the protection of wildlife, all pits and open cellars shall be fenced. Fencing shall be in accordance with BLM specifications. Netting shall be placed over all open production pits to eliminate any hazard to migratory birds or other wildlife. Netting is also required over reserve pits which have been identified as containing oil or hazardous substances (CERCLA Section 101(14)) as determined by visual observation or testing. The mesh diameter shall be no larger than one inch. 2) Cover vent pipes to prevent bats or small birds from being trapped.	
Atlantic Rim Mule Deer Study, Game & Fish Data Disruption of Mule Deer Migration Corridors.	1) NSO narrow migration corridor (to be determined following data collection and analysis from Mule Deer Study). 2) Avoid surface disturbance within identified migration corridors.	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)
Reduce Incidental Loss of Wildlife	1) Inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment. 2) Require that regular drivers undergo training describing the types of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that can be employed to minimize them.	
Disturbance of Severe Winter Relief Habitats for Greater Sage-Grouse and Columbian Sharp-Tailed Grouse.	1) Avoidance	Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse (HWA 2004)

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Human presence	1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 2) Remote monitoring of well locations would be required where feasible.	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA. Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.

Notes:
ACOE – U.S. Army Corps of Engineers
APD – Application for Permit to Drill
AIRFA – American Indian Religious Freedom Act of 1978
BLM – Bureau of Land Management
BMP – Best Management Practices
CBNG – coal bed natural gas
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
DEM – digital elevation model
GIS – geographic information system
HUC – hydrologic unit code
HWA – Hayden-Wing Associates
NAGPRA – Native American Graves Protection and Repatriation Act of 1990
NHPA – National Historic Preservation Act
ROW – right-of-way
SEO – State Engineer's Office
SMA – Special Management Area
TCP – Traditional Cultural Properties
USDA – United States Department of Agriculture
USDI-BLM – United States Department of the Interior-Bureau of Land Management

USEPA – United States Environmental Protection Agency
VRM – Visual Resource Management
WDEQ – Wyoming Department of Environmental Quality
WGFD – Wyoming Game and Fish Department

References Cited

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WGFD 2004. *Minimum Programmatic Standards Recommended by the Wyoming Game and Fish Department to Sustain Wildlife Habitats Affected by Oil and Gas Development.* Cheyenne, Wyoming: Wyoming Game and Fish Department.