MINERALS APPENDIX

COAL

Introduction

This summary is intended to aid in understanding the federal coal management process as it applies to the planning area. The basic requirements of coal management are detailed under the guidance in 43 CFR 3400.

The objectives in managing the federal coal resource in this area are (1) to provide for the development of federal coal in an orderly and timely manner, consistent with the federal coal management program and policies, environmental integrity, and national energy needs; and (2) to identify federal coal that is acceptable for further consideration for leasing. This resource management plan and environmental impact statement provides the basis for tract specific analysis of areas considered for new competitive federal coal leasing, lease modification, exchange, and license issuance.

Coal Planning Process

The planning area is within the Fort Union Coal Region and competitive leasing is subject to oversight by the Regional Coal Team. At this time the region is decertified and not subject to regional coal sales. Individual leases can be sold without a regionwide analysis. However, tract specific analyses are required and the coal team can review the sale and determine that there is enough cumulative regional interest to justify recertifying the coal region. If this decision is made, consideration of the lease sale will become part of a regional analysis.

There are four basic types of coal management actions that can be taken in the planning area: lease by application, lease modification, exchange, and license issuance. Since there is no indication of an immediate request for any of these actions, coal activity is not a major issue in this plan. Coal in the Big Dry Resource Area has low potential for underground mining. Therefore, coal planning is based on surface mining only.

In each of the procedures there is a point at which an environmental impact statement or environmental assessment is prepared. The decision as to what level of study is appropriate hinges on the sensitivity and perceived impact of the action. The environmental study conducted for coal actions will include passing the tract through the four screens identified in 43 CFR 3420.1-4. The screens are: identification of areas with coal development potential, the application of unsuitability criteria identified in 43 CFR 3461.1 (which are primarily on-site concerns), multiple land use decisions, and landowner consultation.

The off-site impacts of coal development will be addressed as needed when identified in the scoping process for specific lease activity planning. This includes concerns about impacts on the agricultural community, area socioeconomics, air quality, and regional transportation.

IDENTIFICATION OF COAL DEVELOPMENT POTENTIAL

The first step in making coal development potential determinations is the gathering of all available geologic data for the study area. The primary data sources are published and unpublished drill hole reports. This includes drilling by the U.S. Geological Survey, the BLM, the Montana Bureau of Mines and Geology, the Bureau of Reclamation, and several coal companies. The government data is available in published reports and publicly accessible files held by the various agencies. The company data is mainly confidential and comes from exploration licenses, mine plan files, and drilling on privately owned coal. The drilling by federal agencies is on federally held coal.

There are several publications on the coal geology of eastern Montana. These provide coal outcrop maps, coal elevations and thicknesses, and identify many areas where coal has been burned in-place. Much information is found in the records of old mines and company interest areas. This often includes coal thicknesses, depths, and quality analyses. Once the coal data has been assembled, the coal beds shown in the drilling records and maps are identified and correlated. Then coal thickness (isopach) and overburden thickness maps are prepared for each coal bed of interest.

The final step preparatory to identifying coal development potential is the comparison of the overburden maps to the coal isopach maps. This results in a stripping ratio (feet of overburden to feet of coal) map. The stripping ratio is the chief parameter in the identification of the development potential of any parcel of land. The classification of development potential falls into four categories:

High - coal at least 5 feet thick, overburden no greater than 150 feet thick, and stripping ratio no more than 10:1.

Moderate - coal at least 5 feet thick, overburden no greater than 200 feet thick, and stripping ratio no more than 20:1.

Low - coal present but does not meet the criteria for high or moderate development potential.

None - no coal present.

It should be noted that a major factor in development potential categorization is the availability of data. As further data becomes available the ranking of any given area can change, usually upwards. This is especially true of areas ranked as having low potential as they might be better classified as "unknown."

The potential for a section is the highest rank of any portion of that section. If any part of the section has high potential, the entire section is ranked high. This is done because a section is the smallest practical unit for classification and study at a scale suitable for the whole planning area. If specific activity planning is done in an area, more detailed investigation will be done at that time.

Fort Union Region coal is ranked as lignite. The lignite heating value ranges from 5,000 to 7,500 British thermal units per pound. Eastern Montana coal typically has high moisture, and low ash and sulfur content (see table 55).

The coal resources identified in the planning area shown in coal development potential maps total 19.276 billion tons (of which 47.5 percent or 9.164 billion tons is federal) (see table 56). The coal bearing Fort Union Formation covers the eastern two-thirds of the planning area. There are doubtless many areas of high and moderate potential coal which have not been identified to date. There are also areas which have been identified but are considered insignificant or inadequately understood and were left out of this study. The acquisition of new data will make for refinements in this estimate.

The remaining three screening steps are applied to the coal areas identified through this first screen.

APPLICATION OF COAL UNSUITABILITY CRITERIA

A total of 263,608 federal coal acres were found unacceptable for further consideration for coal leasing through application of the coal unsuitability screen. This screening is preliminary and will be reviewed and completed when a specific coal tract proposal is made. Those applications that can be made for the unsuitability criteria as follows.

Criterion 1 - Federal Land System: Lands totaling 22,852 federal coal acres were identified as unsuitable as part of the Lewis and Clark National Historic Trail system.

Criterion 2 - Federal Lands Within Rights-of-way or Easements, or Surface Leases for Residential, Commercial, Industrial, or Other Public Purposes: No lands were found unsuitable under this criterion. This criterion will be applied if specific coal activity proposals are made.

Criterion 3 - Buffer Zones Along Road Rights-of-way and Adjacent to Communities, Public Schools, Occupied Dwellings, Churches, Public Parks, and Cemeteries: No lands were found unsuitable under this criterion. This criterion will be applied if specific coal activity proposals are made.

Criterion 4 - Wilderness Study Areas: The Terry Badlands Wilderness Study Area includes 15,630 acres within the Custer Creek coal area. Consequently, 14,166 federal coal acres were found unsuitable for further consideration.

Criterion 5 - Scenic Areas: The Terry Badlands Wilderness Study Area is a Class I visual resource management area. Under this criterion, the same acreage as that identified under Criterion 4 (14,166 federal coal acres) was found unsuitable.

Criterion 6 - Land Used for Scientific Study: There are no federal lands within the coal areas used for scientific study.

Criterion 7 - Historic Lands and Sites: There are no lands within the coal areas that are on the National Register of Historic Places. There are 2,524 federal coal acres overlain by sites considered eligible but not submitted to the register. These coal lands have been declared unsuitable under this criterion.

Criterion 8 - Natural Areas: There are no designated natural areas or national natural landmarks within the coal areas.

Criterion 9 - Federally Designated Critical Habitat for Threatened and Endangered Species: Under Alternative A, there is no identified area for this criterion. Under Alternatives B and C, 853 acres in the Black-footed Ferret Area of Critical Environmental Concern would overlap the Custer Creek coal area and would be designated unsuitable. Under Alternative D, 3,840 acres in the Black-footed Ferret Area of Critical Environmental Concern would overlap the Custer Creek coal area and would be designated unsuitable under this criterion. The 16 acre piping plover site is also designated unsuitable.

TABLE 55
COAL BED DATA
IDENTIFIED HIGH AND MODERATE COAL AREAS

Name	Average Thickness (feet)	Moisture Percent	Ash Percent	Volatile Matter Percent	Fixed Carbon Percent	Sulfur Percent	Btu/lb
CREEK:							
Pust	23.9	38.61	8.02	26.52	26.81	0.72	6,182
CIRCLE:							
Pust	15.0	38.61	8.02	26.52	26.81	0.72	6,182
P	6.0	NA	NA	NA	NA	NA	
Rogers	10.0	NA	6.10	NA	NA	0.40	7,410
R	5.0	NA	NA	NA	NA	NA	NA
Haugins	7.0	33.10	5.30	26.55	35.05	0.45	7,455
S	12.0	26.50	7.50	26.50	34.90	0.27	7,223
CUSTER CREEK:							
R	6.8	NA	NA	NA	NA	NA	NA
U	20.3	25.60	18.80	25.60	30.00	0.30	6,430
L	7.0	NA	NA	NA	NA	NA	NA
GIRARD:							
Prittegurl	7.5	39.85	7.10	25.65	27.40	0.75	6,470
Breugger	5.0	43.20	5.80	29.00	24.00	0.30	5,999
Elvirio	14.0	38.40	6.73	25.67	29.20	0.70	6,667
D	6.7	34.90	7.60	27.10	30.40	0.50	6,790
KNOWLTON:							
Upper Dominy	28.0	38.80	5.72	24.64	30.78	0.39	6,663
Middle Dominy	8.5	37.67	5.60	26.07	30.67	0.43	6,788
Lower Dominy	9.0	36.20	7.72	25.85	30.23	0.41	6,645
LAME JONES CREEK:							
A	6.0	NA	NA	NA	NA	NA	NA
Lame Jones	7.5	38.40	10.46	25.98	25.60	0.61	6,235
PENNEL CREEK:							
A	11.5	32.40	8.90	28.10	30.10	0.51	6,819
B	11.0	NA	NA	NA	NA	NA	NA
SCOBEY:							
E	3.0	NA	NA	NA	NA	NA	NA
D	8.0	29.83	13.67	27.25	29.26	0.64	6,418
C	3.0	NA	NA	NA	NA	NA	NA
WEST GLENDIVE:							
Kolberg Ranch	8.0	NA	NA	NA	NA	NA	NA
Peuse	12.0	35.68	7.44	26.86	29.87	0.32	6,723
Poverty Flats	8.0	NA	NA	NA	NA	NA	NA
Newton Ranch	9.5	30.90	13.45	24.76	30.89	0.37	6,507
WIBAUX-BEACH:							
Harmon	15.0	38.71	9.13	25.30	26.86	0.88	6,079
Hansen	9.0	36.43	11.40	25.00	27.17	1.60	6,077

KEY:Btu/lb. = British thermal unit per pound
NA = not applicable

TABLE 56
HIGH AND MODERATE DEVELOPMENT POTENTIAL TONS AND ACRES FOR IDENTIFIED COAL AREAS
(Federal Ownerships)

Coal Area	Total Tons Recoverable (x1,000,000)	Total Acres	Federal Tons Recoverable (x1,000,000)	Federal Acres
Burns Creek	5,813	267,500	2,595	118,828
Circle	6,238	599,500	2,589	253,617
Custer Creek	459	30,000	342	27,191
Girard	1,534	235,500	1,342	201,924
Knowlton	661	34,000	280	14,176
Lame Jones Creek	299	34,500	120	12,685
Pennel Creek	474	52,000	243	25,923
Scobey	911	132,000	526	74,035
West Glendive	1,903	243,000	799	102,477
Wibaux-Beach	982	46,000	328	16,524
TOTAL	19,276	1,674,500	9,164	847,379

NOTE: Tonnage estimates prepared by BLM.

Criterion 10 - State Listed Threatened and Endangered Species: No areas were listed as unsuitable under this criterion.

Criterion 11 - Bald and Golden Eagle Sites: Four eagle nest sites were identified in the coal areas resulting in 2,040 acres declared unsuitable under this criterion.

Criterion 12 - Bald and Golden Eagle Roost and Concentration Areas: Eagle roosting and concentration areas were identified along the Missouri and Yellowstone rivers in the Girard and Custer Creek coal areas, resulting in 5,503 federal coal acres declared unsuitable under this criterion.

Criterion 13 - Falcon Nesting Sites: Prairie falcon sites were identified in the Burns Creek and Circle coal areas. A total of 4,080 federal coal acres were designated unsuitable under this criterion.

Criterion 14 - Migratory Birds of High Federal Interest: No additional migratory birds of high federal interest (besides eagles) were identified in the coal areas.

Criterion 15 - Habitat for Species of State Interest: A total of 213,098 federal coal acres are unsuitable under this criterion. The habitat consists of critical winter ranges for white-tailed and mule deer, antelope, and grouse leks.

Criterion 16 - 100 Year Floodplains: A total of 6,300 federal coal acres were found within the Burns Creek, Custer Creek, and Girard coal areas and designated unsuitable.

Criterion 17 - Municipal Watersheds: No areas were identified as unsuitable under this criterion. There have been no municipal watersheds designated by the surface management agency within the coal areas.

Criterion 18 - Natural Resource Waters: No areas were identified as unsuitable under this criterion. There are no natural resource waters designated within the coal areas.

Criterion 19 - Alluvial Valley Floors: No areas were identified as unsuitable under this criterion. The state of Montana has the lead in designation of alluvial valley floors. It will make the designation when there is a specific coal action proposal including a mine plan.

Criterion 20 - State Proposed Criteria: The state of Montana has proposed no unsuitability criteria.

MULTIPLE LAND-USE DECISIONS

There are no unsuitability conflicts that necessitate multiple use or mitigative measures.

Coal mining and oil and gas production can conflict. Present management practice is to allow the companies involved the opportunity to negotiate a private settlement. BLM

policy is being drafted for the situation when the coal and oil and gas lease are federal. The proposal is to work on a first-come, first-served basis. The second lease issued will include the stipulation that the lessee must be prepared to hold operations in abeyance or cease permanently in favor of the prior lease.

SURFACE OWNER CONSULTATION

BLM is required by Section 714 of the Surface Mining Control and Reclamation Act to consult with "qualified" surface owners of split estate lands (privately owned surface over federally held coal) where surface mining of the federal coal is under consideration.

"Qualified" surface owners are asked to state their opinion for or against coal mining on their land. In areas of significant surface owner opposition, federal coal is removed from consideration for surface mine leasing. This screen involves only split estate lands remaining after the other three screens have been applied.

Surface owner consultation has not been conducted for this resource management plan and environmental impact statement. At present there are no active proposals for new coal leasing in the planning area. Since landownership and owner qualifications will change through time, this screen will be applied when actual lease proposals are contemplated. This is in order to respond to the current landowner feelings at the moment of lease activity planning.

Coal Development Scenario Generic Mine and End-use Facility Description and Impacts

The purpose of this discussion is to present assumptions and impacts for coal development. The uncertainty of the location and size of the mine and end-use facility will limit this to a general discussion. This is not meant to be a substitute for a detailed site-specific analysis and environmental impact statement that may come later in response to an application for the permit to build and operate a mine and end-use facility. Nor will it preclude any federal, state, local, or private decisions concerning actual end-use, facility siting, or end-use restrictions.

The following is based on the detailed analysis presented in the Draft Fort Union Regional Coal Draft Environmental Impact Statement (USDI, BLM 1982c) and related logical mine size tract site-specific analyses and the Draft North Dakota Resource Management Plan and Environmental Impact Statement (USDI, BLM 1986a).

MINE

The generic mine considered is a 5.5 million ton per year surface mine with a 40-year mine life. Mine operation is expected to disturb land at a rate of 340 acres per year or 14,000 acres over 40 years. It would take approximately 10 to 13 years for completion of the full cycle from initial disturbance through mining, reclamation, and bond release for each acre. In full production, the total area out of production in any year would be 3,400 to 4,400 acres. Soils would be continuously replaced on mined-out areas and brought back into production during the life of the mine.

The low energy value and high water content of lignite coal constrains transportation of lignite. Therefore, it is assumed that an end-use facility would be near the mine.

FACILITY

A generic coal-fired electric power generation plant would consist of two 500 megawatt units located near a lignite coal source. The facility has an average operation factor of 0.90 and a load factor of 0.85. It would be capable of delivering a maximum of approximately 900 megawatts to the existing transmission system. The facility would consist of the following units: (l) coal preparation, storage, and handling; (2) power generation; (3) pollution control and waste disposal; and (4) utility and transportation corridors. The total land area dedicated to the facility would be approximately 600 acres.

COAL PREPARATION, STORAGE, AND HANDLING

Lignite coal would be transported from a nearby mine to a 3-day storage pile or a 60-day storage pile. From the 3-day storage pile, the coal would be sent by conveyor to be crushed before being transferred to the plant silos for intermediate storage. Finally, coal would be reconditioned before introduced into the furnace for ignition. A generic plant would burn approximately 800 tons of coal per hour or about 5.5 million tons per year.

POWER GENERATION

The crushed coal is combined with air supplied by forced-draft fans and then ignited and burned in the boiler furnaces. The combustion in the boiler furnace produces heat that creates steam from feed water entering the boiler heat-exchange system. After releasing energy through expan-

sion in the high-pressure section of the turbine, steam is returned to the boiler for reheating. After being reheated, steam is returned to the intermediate section and subsequently to the low-pressure section of the turbine. Spent steam passes through the condenser where waste heat is removed, and the condensed liquid is returned to the boiler feed water system. Combustion gases from the furnace are exhausted to the atmosphere through the pollution control devices. Steam energy is converted to mechanical energy by the turbine and subsequently transformed into electrical energy by the generator. Generated power is routed through the main transformer for voltage step-up and then to a switchyard and transmission line system for distribution.

The water for the power plant systems would come from a nearby river or impounded water source. Demineralization of the filtered water for boiler makeup will be necessary to provide water of the required quality for the steam generation system. The treated water would then be stored for use. There will be several holding ponds included at the facility to store recoverable water.

The cooling system for the electric power facility would be mechanically induced draft wet-type cooling towers. Cooling tower blowdown would be sent to a holding pond to be used for ash sluicing, scrubbers or coal dust suppression.

POLLUTION CONTROL AND WASTE DISPOSAL

Burning lignite in the boiler produces gaseous emissions, fly ash, and bottom ash. The gas from the boiler passes through a fabric filter baghouse and a sulphur dioxide dry scrubber, and is dispersed by a 600-foot stack.

Bottom ash from the main boiler, pyrite rejected from the pulverizer, and ash discharged from the hoppers would be hydraulically conveyed to dewatering bins. The ash would then be loaded into trucks and transported to the adjacent mine for disposal.

The plant would include a dry scrubbing system to absorb sulphur dioxide from the flue gas. The scrubber product would be treated prior to disposal with dry fly ash. The fly-ash and scrubber product would be blended with water for dust control and stabilization. Emission of nitrogen oxides would be controlled by designing the boiler for proper mixing and flame quenching. The quantity of wastes produced by the power facility would be approximately 80 tons per hour of fly-ash and scrubber product and 10 tons per hour of bottom ash.

The air emissions would depend primarily on: (l) the conversion process, the emission control technology used at the facility, and the level of control used; (2) the sulfur, ash, and water content of the lignite; and (3) whether or not the facility produces its own electric power. For this discussion, it is assumed that the facility would produce electric power with coal-fired boilers and steam turbines.

UTILITY AND TRANSPORTATION CORRIDORS

Water would be pumped from the water source to a surge pond. The water pipelines would require a rights-of-way probably consisting of a 100-foot-wide construction easement and a 50-foot-wide permanent easement. The surge pond would have a water surface area of approximately 42 acres and would contain l,050 acre-feet of water. Transportation corridors would be required for roads and a railspur. The transmission line leaving an electric power facility would be a 500 kilovolt line with a right-of-way 150 feet wide connecting with an existing system.

LOCATABLE MINERALS AND MINERAL MATERIALS

Locatable Minerals Disposal Actions

The federal law governing locatable minerals is the Mining Law of 1872, as amended (30 U.S.C. 22-54). This law provides for the exploration, discovery, and mining of metallic and certain nonmetallic minerals on federal lands. The Mining Law of 1872, as amended, has five elements: (1) discovery of a valuable mineral deposit, (2) location of mining claims, (3) recordation of mining claims, (4) maintenance of mining claims, and (5) mineral patenting. BLM manages the last three elements.

DISCOVERY

Federal statutes do not describe what constitutes a valuable mineral deposit. Several judicial and administrative decisions over the years have shaped a definition. A principal part of the definition is the “prudent man rule.” This rule holds that the statutory requirements for a discovery have been met if a person of ordinary prudence will be justified in expending labor and costs to develop a mine. Departmental decisions require a discovery on each claim with physical exposure of the valuable mineral within the claim boundaries, and each 10 acres on a placer claim must be

"mineral in character." Mineral in character is a discovery based on geologic inference, not necessarily on actual exposure.

LOCATION

Any U.S. citizen or corporation organized under state laws can locate a mining claim. A claimant can hold a number of mining claims. A mining claim is located on federal mineral estate with valuable deposits of locatable minerals. There are two types of mining claims (lode and placer); and two types of mineral entries (mill and tunnel sites).

Lode claims include classic vein deposits with well defined boundaries. These include deposits such as gold and silver. There is no known potential for lode claims in the planning area. Placer claims are those not subject to lode claims. These include bedded deposits such as bentonite. Where practical placer claims are located by legal land subdivision. The maximum size of a placer claim is 20 acres per claim.

A mill site is a parcel of public land of a nonmineral character and is used to support mining claim operations. The mill site must include the erection of a mill or reduction works incident to mining. The maximum size of a mill site is five acres. Tunnel sites are plots of land where a tunnel is run to develop a vein. There is no known need for tunnel sites in the planning area.

Claimant rights include: (1) access to the claim across federal surface, (2) use of timber on the claim for the mining operation, (3) construction of fences and gates to protect the area of operations and equipment, and (4) construction of structures for storing equipment and housing employees and testing and processing facilities. Mining claims are real property and interests in them can be bought or inherited.

RECORDATION

Claims and sites must be recorded with both the county and BLM. Location notices contain: (1) the date of location, (2) the locator's name, (3) the name of the claim or site, (4) the type of claim or site, (5) the acreage claimed, and (6) a description of the parcel claimed.

The Federal Land Policy and Management Act of 1976 requires claimants to file a copy of the notice or certificate of location with BLM. Maps and other documents filed under state law must accompany the copy of the official record. Federal regulations (43 CFR 3833) specify the information required. Amendments and transfers of ownership must be filed with the BLM.

MAINTENANCE

To maintain an interest in a claim, the claimant must pay a rental fee of $100 per claim each year. There is a provision for fee exemptions for claimants who qualify by producing between $1,500 and $800,000 under an active notice plan with less than 10 acres disturbance on 10 claims or fewer nationwide.

Exploration and mining activity on BLM-administered lands are subject to the regulations in 43 CFR 3809. These regulations require an operator to prevent unnecessary and undue degradation of the land. Less than 5 acres of disturbance requires the filing of a notice of operations. There is no requirement to notify the BLM of casual use activities (negligible disturbance). This includes activities that involve use of earth moving equipment or blasting.

Activities involving more than five acres of disturbance require the preparation of a plan of operations and a reclamation plan. Special category lands defined in 43 CFR 3809.1-4 always require a plan of operations, regardless of the size of the disturbance area. These include areas of critical environmental concern, wilderness areas, and areas designated as closed to off-road vehicle use. Claim operations, whether casual, under a notice, or by a plan of operations, shall be reclaimed (43 CFR 3809.1-1).

MINERAL PATENTS

A patented mining claim is one for which the federal government has passed its title to the claimant, making it private land. A person can mine and remove minerals from a mining claim without a mineral patent. In most cases a mineral patent gives the owner exclusive title to the locatable minerals and title to the surface and other resources. Patenting requires discovery of a valuable deposit that meets the "prudent man rule" and marketability tests. A federal mineral examiner examines the claim to verify its validity.

The following are legal descriptions for federal locatable minerals and mineral materials in the areas of critical environmental concern proposed in Alternative D.

Mineral Materials Disposal Actions

The planning area has permitted mineral material disposal areas with free use permits and mineral material sales to local governments. There is no specific data on the material from these locations. A pit is typically on a gravel source located by the permittee. A BLM representative is shown the site during an inspection and a Categorical Exclusion Review is prepared. All permitted sites must meet National Environmental Policy Act standards under the land use plans in effect at the time of permit issuance.

A typical permit operation begins with removal of the topsoil and its storage on location. The storage site is selected for the protection and stability needed to maintain the soil over the lifetime of the operation. Backfill will be consolidated to match the original material as much as possible. Natural vegetation will establish some protection from erosion. The pit is excavated by dozers and front-end loaders and the material hauled away with trucks. In operations where large rocks are in the deposit, a portable rock crusher is used to reduce them to usable sizes.

An average pit in the planning area is excavated to 10 feet in depth. At the end of operations, BLM stipulations require reduction of vertical exposures to a slope ratio of 3 to 1 (horizontal to vertical) and the topsoil spread on the surface. A conventional seed mixture is prescribed for reclaiming abandoned material extraction sites.

In a scoria pit operation, if a dozer is unable to rip a massive deposit, some blasting is necessary. In areas where cliffs serve as raptor nesting sites, mitigation measures are stipulated in the reclamation plan and bonding is set accordingly.

NONENERGY LEASABLE MINERALS

Description of Program

The leasing functions of the nonenergy leasable minerals program revolve around three major program activities, namely, prospecting permitting, preference right (noncompetitive) leasing, and competitive leasing.

Prospecting Permitting - Prospecting permits for nonenergy leasable minerals are issued to qualified applicants on public or acquired lands where exploratory work is necessary to determine the existence or workability of deposits of the mineral covered by the permit. The maximum acreage that can be included in a permit varies from 640 to 2,560 acres, depending upon the commodity. Prior to the issuance of the permit, an applicant is required to submit to BLM an exploration plan and a surety or personal bond.

A prospecting permit grants to the permittee the exclusive right to prospect on and explore the lands covered by the permit to determine the existence of a valuable deposit of the mineral(s) covered by the permit. As defined in the regulations at 43 CFR Part 3500, entitled "Leasing of Solid Minerals Other than Coal and Oil Shale," a "valuable deposit" is a mineral occurrence where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of their labor and means, with a reasonable prospect of success in developing a valuable mine. If the permittee makes a discovery of a valuable deposit of the minerals(s) covered by the permit, they are entitled to a preference right lease.

Preference Right Leasing - A prospecting permittee can apply for a preference right lease no later than 60 days after the expiration of the permit. The principle criterion for approval of the application is that there must be a determination by BLM that the permittee has discovered a valuable deposit of the mineral(s) covered by the permit. In preference right lease applications for sodium, potassium, and sulphur, it additionally must be shown that the lands are chiefly valuable for that mineral as opposed to nonmineral disposition of the lands. Prior to issuance of a lease, the applicant is required to furnish a bond. Leases are conditioned upon the payment of a production royalty, which varies in rate depending upon the mineral.

Competitive Leasing - Lands classified as known leasing areas may be leased by competitive sale to the bidder who offers the highest acceptable bid. The highest qualified bidder must meet or exceed fair market value and, prior to lease issuance, must furnish a surety or personal bond for a minimum of $5,000. Like preference right leases, competitive leases are issued for an initial 20-year term and are subject to the same conditions for renewal and readjustment.

OIL AND GAS

Procedures In Oil And Gas Recovery

GEOPHYSICAL EXPLORATION

Oil and gas geophysical exploration activities include data acquisition by use of ground vehicle or aircraft. Data is acquired to determine if a structure exists which might

contain oil or gas. Geophysical exploration does not include core drilling for subsurface geologic information or well drilling for oil and gas. A federal oil and gas lease is not required before conducting geophysical operations.

Information from geophysical exploration can lead oil companies or others to request that lands be offered for lease, or assist in the selection of drill sites on existing leases.

Existing road systems are used where available. Roads may be cleared of vegetation and loose rocks to improve access for trucks if that action is allowed by the permit. Blading and road construction for seismic operations are not usually allowed so that environmental impacts are minimized. In areas with rugged terrain or without access roads, and certain seasons of the year, seismic work is conducted by helicopter or airplane rather than by ground vehicles. Geophysical operations which do not cause additional surface disturbance include remote sensing, gravity prospecting, and aeromagnetic surveying.

Procedures and Regulations

Notification Process - Geophysical operations on public lands are reviewed by the BLM. Exploration on public lands requires review and approval following the procedures in 43 CFR 3150 and 3151 (1990). In the Miles City District the Area Manager is authorized to act for the District Manager to approve geophysical operations. The responsibilities of the geophysical operator and the Area Manager during geophysical operations are described below.

Geophysical Operator - The operator is required to file a Notice of Intent to Conduct Oil and Gas Exploration Operations (form 3150-4) for operations on public lands administered by the BLM. Maps (preferably 1:24,000 scale topographic maps) showing the location of the proposed lines and access routes must accompany the Notice of Intent.

When the Notice of Intent is filed, the authorized officer may request a prework conference or field inspection. Special requirements or procedures that are identified by the authorized officer are included in the Terms and Conditions for Notice of Intent to Conduct Geophysical Exploration (form 3150-4a and a copy of the state requirements). Any changes in the original Notice of Intent must be submitted in writing to the authorized officer. Written approval must be secured before activities proceed.

Bonding of the operator is required. A copy of proof of satisfactory bonding shall accompany the Notice of Intent. Proper bonding may include a nationwide or statewide oil and gas bond, with a rider for geophysical exploration, or a $5,000 individual bond filed with the authorized officer.

The operator is required to comply with applicable federal, state, and local laws such as Federal Land Policy and Management Act of 1976, the National Historic Preservation Act of 1966, and the Endangered Species Act of 1973, as amended. Operators may be required to submit an archeological evaluation if dirt work is contemplated, or if there is reason to believe that significant cultural resources may be adversely affected.

When geophysical operations have been completed, the operator is required to file a Notice of Completion (form 3150-5) including certification that all terms and conditions of the approved Notice of Intent have been fulfilled. The operator must also submit a map which shows the actual line location, access route, and other survey details.

BLM Area Managers (authorized officers) - The authorized officer is required to contact the operator within five working days after receiving the Notice of Intent to explain the terms of the notice, including the "Terms and Conditions for Notice of Intent to Conduct Geophysical Exploration," current laws, and BLM-administrative requirements. At the time of the prework conference or field inspection, written instructions or orders are given to the operator. The authorized officer is responsible for the examination of resource values to determine appropriate surface protection and reclamation measures.

The authorized officer is required to make a final inspection following filing of the Notice of Completion. When reclamation is approved, obligation against the operator's bond is released. The BLM has 30 days after receipt of the Notice of Completion to notify the operator whether the reclamation is satisfactory or if additional reclamation work is needed. Bonding liability will automatically terminate within 90 days after receipt of the Notice of Completion unless the authorized officer notifies the operator of the need for additional reclamation work.

State Standards - Geophysical operators register with the state through the County Clerk and Recorder's office. State regulations include requirements for shothole locations, drilling techniques, plugging techniques, and reclamation.

Mitigation - When a geophysical Notice of Intent is received, restrictions may be placed on the application to protect resource values or to mitigate impacts. Some of these requirements may be the same as oil and gas lease stipulations. Other less restrictive measures may be used when impacts to resource values will be less severe. This is due in part to the temporary nature of geophysical exploration. The decisions concerning the level of protection

required are made on a case-by-case basis when an Notice of Intent is received.

LEASING PROCESS

Federal oil and gas leasing authority is found in the 1920 Mineral Leasing Act, as amended, for public lands and the 1947 Acquired Lands Leasing Act, as amended, for acquired lands. Leasing of federal oil and gas is affected by other acts such as National Environmental Policy Act of 1969, the Wilderness Act of 1964, National Historic Preservation Act of 1966, the Endangered Species Act of 1973, Federal Land Policy and Management Act of 1976, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. Regulations governing federal oil and gas leasing are contained in 43 CFR 3100 with additional requirements and clarification found in Onshore Operating Orders and Washington office manuals and instruction memorandums.

The lease grants the right to explore, extract, remove, and dispose of oil and gas deposits that may be found in the leased lands. The lessee may exercise the rights conveyed by the lease subject to the following lease terms.

Lease rights may be subject to lease stipulations and permit approval requirements. Stipulations and permit requirements describe how lease rights are modified. Lease constraints or requirements may also be applied to new use authorizations on existing leases provided the constraints or requirements are within the authority reserved by the terms and conditions of the lease. The stipulations and conditions of approval must be in accordance with laws, regulations, and lease terms. The lease stipulations and permit conditions of approval allow for management of federal oil and gas resources in concert with other resources and land uses.

The BLM planning process is the mechanism used to evaluate and determine where and how federal oil and gas resources will be made available for leasing. In areas where oil and gas development will conflict with other land uses or resources, even with mitigation measures, the area is closed to leasing. Areas where oil and gas development could coexist with other land uses or resources will be open to leasing. Leases in these areas will be issued with or without stipulations based upon decisions in the land use document. Stipulations are a part of the lease only when environmental and planning records demonstrate the necessity for the stipulations (modifications of the lease).

Currently, leases are issued as either competitive leases or over-the-counter leases with 10-year terms. The competitive leases will be sold to the highest qualified bidder at an oral auction. After the sale, tracts that received no bid during the auction will be issued over-the-counter to the first qualified applicant. Rental payments for these leases will be $1.50 per acre for the first 5 years and $2 per acre thereafter until production is established. Leases will be issued with a fixed 12.5 percent royalty rate.

Future interest leases are also available. An entire mineral estate, or fractional interest therein, of all or certain minerals may revert to federal ownership after being reserved for a specified period of time in the deed. A party who owns all, or substantially all (at least 50 percent), may file an offer with the BLM to lease the mineral rights prior to the date of vesting ownership with the United States. A noncompetitive future interest lease may be issued to the applicant, effective on the date the mineral rights revert to federal ownership.

Plan Maintenance

Changes in the data inventory are a result of new information. New use areas and resource locations may be identified or use areas and resource locations which are no longer valid may be identified. These resources usually cover small areas requiring the same protection or mitigation as identified in this plan. Identification of new areas or removal of old areas which no longer have those resource values will result in the use of the same lease stipulation identified in this plan. These areas will be added to the existing data inventory without a plan amendment. In cases where the changes constitute a change in resource allocation outside the scope of this plan, a plan amendment would be required.

Lease Stipulations

Certain resources in the planning area require protection from impacts associated with oil and gas activities. The specific resource and the method of protection are contained in lease stipulations. Lease stipulations are usually no surface occupancy, controlled surface use, or timing limitation. A notice may be included with a lease to provide guidance regarding resources or land uses. While the actual wording of the stipulations may be adjusted at the time of leasing, the protection standards described will be maintained. The following lease stipulations and notices will be included with leases issued in the planning area.

Controlled Surface Use

Use or occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. Controlled surface use is used for operating guidance, not as a substitute for the no surface occupancy or timing stipulations.

RESOURCE: Soils.
STIPULATION: Prior to surface disturbance on slopes over 30 percent, an engineering and reclamation plan must be approved by the authorized officer. The plan must demonstrate how the following will be accomplished:
- site productivity restored.
- surface runoff adequately controlled.
- off-site areas protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- water quality and quantity in conformance with state and federal water quality laws.
- surface-disturbing activities prohibited during extended wet periods.
- construction not allowed when soils are frozen.

OBJECTIVE: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.
EXCEPTION: None.
MODIFICATION: The area affected by this stipulation can be modified by the authorized officer if it is determined that portions of the area do not include slopes over 30 percent.
WAIVER: This stipulation can be waived by the authorized officer if it is determined that none of the leasehold includes slopes over 30 percent.

RESOURCE: Visual Resource Management Class II.
STIPULATION: All surface-disturbing activities, semi-permanent and permanent facilities in visual resource management Class II areas may require special design, including location, painting, and camouflage, to blend with the natural surroundings and meet the visual quality objectives for the area.
OBJECTIVE: To control the visual impacts of activities and facilities within acceptable levels.
EXCEPTION: None.
MODIFICATION: None.
WAIVER: None.

NOTE: This stipulation will not prevent surface access. There are no Waivers, Exceptions, or Modifications because a land use plan amendment would be needed to change the classification of lands. In order to maintain the visual qualities of Class II lands the operations plan for the well must meet the objectives for that class.

RESOURCE: Makoshika State Park and surrounding area of management concern.
STIPULATION: Surface use is prohibited within Makoshika State Park and the surrounding area of management concern except on designated sites identified in the 1989 Memorandum of Understanding between BLM, Montana Department of Fish, Wildlife and Parks, and Dawson County.
OBJECTIVE: To maintain the recreational, scenic, and other values for which Makoshika State Park was established.
EXCEPTION, MODIFICATION, AND WAIVER: This stipulation can be excepted, modified, or waived only through changes to the 1989 Memorandum of Understanding. A land-use plan amendment can also be required.

RESOURCE: Prairie dog towns within potential black-footed ferret reintroduction areas that have been determined to be essential for black-footed ferret recovery.
STIPULATION: The Draft Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed ferret Recovery (USDI, USFWS 1990) will be used as appropriate to develop site-specific conditions of approval to protect black-footed ferret reintroduction and recovery. Specific conditions of approval will depend on type and duration of proposed activity, proximity to occupied black-footed ferret habitat, and other site-specific conditions.
OBJECTIVE: To maintain the integrity of designated black-footed ferret reintroduction area habitat for reintroduction and recovery of black-footed ferrets.
EXCEPTION: May be granted by the authorized officer for activities that are determined, through coordination with the Montana Black-Footed Ferret Coordination Committee to have no adverse impacts on reintroduction and recovery of black-footed ferrets.
MODIFICATION: The boundaries of the stipulated area may be modified if the authorized officer, in coordination with the Montana Black-Footed Ferret Coordination Committee, determines that portions of the area are no longer essential for black-footed ferret reintroduction and recovery.
WAIVER: The stipulation may be waived if the authorized officer, in coordination with the Montana Black-Footed Ferret Coordination Committee, determines that the entire leasehold no longer contains habitat essential for the reintroduction and recovery of the black-footed ferret or if the black-footed ferret is removed from protection under the Endangered Species Act.

RESOURCE: Potential black-footed ferret habitat (prairie dog colonies and complexes 80 acres or more in size that are not designated as black-footed ferret reintroduction sites).
STIPULATION: Prior to surface disturbance, prairie dog colonies and complexes 80 acres or more in size will be examined to determine the absence or presence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy that would be in violation of the Endangered Species Act of 1973.

The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-

footed ferrets are present, or if the proposed activity would have an adverse effect, or if the area can be cleared. This examination must be done by or under the supervision of a qualified resource specialist approved by the Surface Management Agency. An acceptable report must be provided to the Surface Management Agency documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities.
OBJECTIVE: To assure compliance with the Endangered Species Act by locating and protecting black-footed ferrets and their habitat.
EXCEPTION: An exception may be granted by the authorized officer for surface-disturbing activities determined to have no adverse effect on black-footed ferrets and ferret habitat.
MODIFICATION: The boundaries of the stipulated area may be modified by the authorized officer if portions of the leasehold are cleared, based on current and/or past black-footed ferret surveys.
WAIVER: This stipulation may be waived if the entire leasehold is block cleared, or permanently cleared based on current and/or past black-footed ferret surveys, or if the black-footed ferret is declared recovered and no longer subject to the Endangered Species Act.

No Surface Occupancy

Use or occupancy of the land surface for fluid mineral exploration or development is prohibited in order to protect identified resource values. The no surface occupancy stipulation includes stipulations which may have been worded as "No Surface Use and Occupancy," "No Surface Disturbance," "Conditional No Surface Occupancy," and "Surface Disturbance or Occupancy Restriction (by location)."

RESOURCE: Terry Badlands Limber Pine.
STIPULATION: Surface occupancy and use is prohibited within identified Terry Badlands limber pine areas.
OBJECTIVE: To protect a unique stand of limber pine (*Pinus flexilis*) in the Terry Badlands. This stand is at the edge of the species' range and is found at a lower elevation than the typical occurrence.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified by the authorized officer if the boundaries of the identified limber pine are changed as a result of a land use plan amendment.
WAIVER: This stipulation can be waived by the authorized officer if all identified limber pine areas within the leasehold are allocated to other uses as a result of a land use plan amendment.

RESOURCE: Riparian and Hydrology.
STIPULATION: Surface occupancy and use is prohibited within riparian areas, 100-year floodplains of major rivers, and on water bodies and streams.
OBJECTIVE: To protect the unique biological and hydrological features associated with riparian areas, 100-year floodplains of major rivers, and water bodies and streams.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The area affected by this stipulation can be modified by the authorized officer if it is determined that portions of the area do not include riparian areas, floodplains, or water bodies.
WAIVER: This stipulation can be waived by the authorized officer if it is determined that the entire leasehold does not include riparian areas, flood plains, or water bodies.

RESOURCE: Coal.
STIPULATION: Surface occupancy and use is prohibited within existing coal leases with approved mining plans.
OBJECTIVE: To protect existing coal leases with approved mining plans.
EXCEPTION: An exception can be granted by the authorized officer if the operator submits a plan of operation which is compatible with existing or planned coal mining operations and is approved by all affected parties.
MODIFICATION: The area affected by this stipulation can be modified by the authorized officer if it is determined that portions of the area are not needed for existing or planned mining operations, or where mining operations have been completed, and the modification is approved by all affected parties.
WAIVER: This stipulation can be waived by the authorized officer if it is determined that all coal lease operations within the leasehold have been completed, or if the lease is terminated, canceled, or relinquished.

RESOURCE: Recreation.
STIPULATION: Surface occupancy and use is prohibited within developed recreation areas and undeveloped recreation areas receiving concentrated public use.
OBJECTIVE: To protect developed recreation areas and undeveloped recreation areas receiving concentrated public use.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified by the authorized officer if the recreation

area boundaries are changed.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold no longer contains developed recreation areas or undeveloped recreation areas receiving concentrated public use.

RESOURCE: Visual Resource Management Class I.
STIPULATION: Surface occupancy and use is prohibited in visual resource management Class I areas (for example, wilderness, wild and scenic rivers).
OBJECTIVE: To preserve the existing character of the landscape.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified by the authorized officer if the boundaries of the visual resource management Class I area are changed.
WAIVER: This stipulation can be waived by the authorized officer if all visual resource management Class I areas within the leasehold are reduced to a lower visual resource management class. Areas reduced to a lower visual resource management class will be subject to the controlled surface use stipulation for visual resources.

RESOURCE : Least Tern.
STIPULATION: Surface occupancy and use is prohibited within 1/4 mile of wetlands identified as least tern habitat.
OBJECTIVE: To protect the habitat of the least tern, an endangered species under the Endangered Species Act.
EXCEPTIONS: An exception can be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the least tern or its habitat. If the authorized officer determines that the action can affect the least tern or its habitat, consultation with the U.S. Fish and Wildlife Service will be required prior to final determination on the exception.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that portions of the area are no longer essential to the least tern.
WAIVER: The stipulation can be waived if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that the entire leasehold no longer contains habitat essential to the least tern, or if the least tern is declared recovered and is no longer protected under the Endangered Species Act of 1973.

RESOURCE: Wildlife - Peregrine Falcon
STIPULATION: Surface occupancy and use is prohibited within 1 mile of identified peregrine falcon nesting sites.
OBJECTIVE: To protect the habitat of the peregrine falcon, an endangered species under the Endangered Species Act of 1973.
EXCEPTION: An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the peregrine falcon or its habitat. If the authorized officer determines that the action may or will have an adverse effect, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM in consultation with the U.S. Fish and Wildlife Service.
MODIFICATION: The boundaries of the stipulated area may be modified if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that portions of the area no longer are critical to the peregrine falcon.
WAIVER: The stipulation maybe waived if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that the entire leasehold no longer contains habitat critical to the peregrine falcon, or if the peregrine falcon is declared recovered and is no longer protected under the Endangered Species Act of 1973.

RESOURCE: Piping Plover.
STIPULATION: Surface occupancy and use is prohibited within 1/4 mile of wetlands identified as piping plover habitat.
OBJECTIVE: To protect the habitat of the piping plover, a threatened species under the Endangered Species Act of 1973.
EXCEPTION: An exception can be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the piping plover or its habitat. If the authorized officer determines that the action can affect the piping plover or its habitat, consultation with the U.S. Fish and Wildlife Service will be required prior to final determination on the exception.
MODIFICATION: The boundaries of the stipulated area may be modified if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that portions of the area are no longer essential to the piping plover.
WAIVER: The stipulation can be waived if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that the entire leasehold no longer contains habitat essential to the piping plover, or if the piping plover is declared recovered and is no longer protected under the Endangered Species Act of 1973.

RESOURCE: Bald Eagle Nest Sites and Nesting Habitat.
STIPULATION: Surface occupancy and use is prohibited within 1/2 mile of known bald eagle nest sites which have been active within the past 7 years, and within bald eagle nesting habitat in riparian areas.
OBJECTIVE: To protect bald eagle nesting sites and/or nesting habitat in accordance with the Endangered Species Act and the Montana Bald Eagle Management Plan (USDI, BLM 1986c).
EXCEPTION: An exception can be granted by the autho-

rized officer if the operator submits a plan which demonstrates that the proposed action will not affect the bald eagle or its habitat. If the authorized officer determines that the action can affect the bald eagle or its habitat, consultation with the FWS will be required prior to final determination on the exception.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that portions of the area can be occupied without adversely affecting bald eagle nest sites or nesting habitat.
WAIVER: This stipulation can be waived if the authorized officer, in consultation with U.S. Fish and Wildlife Service, determines that the entire leasehold can be occupied without adversely affecting bald eagle nest sites or nesting habitat, or if the bald eagle is declared recovered and is no longer protected under the Endangered Species Act of 1973.

RESOURCE: Ferruginous Hawk.
STIPULATIONS: Surface occupancy and use is prohibited within 1/2 mile of known ferruginous hawk nest sites which have been active within the past 2 years.
OBJECTIVE: To maintain the production potential of ferruginous hawk nest sites. Ferruginous hawks are sensitive to disturbance and have been identified as a category 2 species under the Endangered Species Act.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that the impacts from the proposed action will not adversely affect the ferruginous hawk or its habitat. Seasonal exceptions can be allowed from August 1 to March 1 (the nonbreeding season) if the authorized officer determines that the proposed activity will not disturb the production potential of ferruginous hawk nest sites.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the production potential of ferruginous hawk nest sites.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold can be occupied without adversely affecting the production potential of ferruginous hawk nest sites or if the ferruginous hawk is downgraded from any protective category.

RESOURCE: Grouse Leks.
STIPULATION: Surface occupancy and use is prohibited within 1/4 mile of grouse leks.
OBJECTIVE: To protect sharp-tailed and sage grouse lek sites necessary for the long-term maintenance of grouse populations in the area.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting grouse lek sites.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold can be occupied without adversely affecting grouse lek sites, or if grouse lek sites within 1/4 mile of the leasehold have not been used for 5 consecutive years.

RESOURCE: Reservoirs with Fisheries.
STIPULATION: Surface occupancy and use is prohibited within 1/4 mile of designated reservoirs with fisheries.
OBJECTIVE: This stipulation is intended to protect the fisheries and recreational values of reservoirs.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the fisheries and recreational values of the reservoir.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold can be occupied without adversely affecting the fisheries and recreational values of the reservoir.

RESOURCE: Cultural Resources.
STIPULATION: Surface occupancy and use is prohibited within sites or areas designated for conservation use, public use, or sociocultural use.
OBJECTIVE: To protect those cultural properties including Rosebud and Reynolds Battlefields, identified for conservation use, public use, and sociocultural use (see definitions for use categories within BLM Manual 8111).
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the lessee or operator submits a plan which demonstrates that the cultural resource values which formed the basis for designation are not affected, or if adverse impacts are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the designated site or area can be occupied without adversely affecting the cultural resource values for which the site or area was designated.
WAIVER: This stipulation can be waived if the authorized officer determines that all designated sites or areas within the leasehold can be occupied without adversely affecting the cultural resource values for which such sites or areas were designated, or if all designated sites or areas within the leasehold are allocated for other uses.

NOTE: Compliance with Section 106 of the National Historic Preservation Act is required for all actions which can affect cultural properties eligible for the National Register of Historic Places.

RESOURCE: Paleontological Resources.
STIPULATION: Surface occupancy and use is prohibited within designated paleontological localities.
OBJECTIVE: To protect significant paleontological localities.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the lessee or operator submits a plan which demonstrates that the paleontological resource values which formed the basis for designation are not affected, or if adverse impacts are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the designated locality can be occupied without adversely affecting the paleontological resource values for which the locality was designated, or if the boundaries of the designated locality are changed.
WAIVER: This stipulation can be waived if the authorized officer determines that all designated localities within the leasehold can be occupied without adversely affecting the paleontological resource values for which the localities were designated, or if all designated localities within the leasehold are allocated for other uses.

Timing Limitation (Seasonal Restriction)

Prohibits surface use during specified time periods to protect identified resource values. This stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

RESOURCE: Raptor Nests.
STIPULATION: Surface use is prohibited from March 1 to August 1, within 1/2 mile of raptor nest sites which have been active within the past 2 years. This stipulation does not apply to the operation and maintenance of production facilities.
OBJECTIVE: To protect nest sites of raptors which have been identified as species of special concern in Montana, North or South Dakota.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area no longer are within 1/2 mile of raptor nest sites which have been active within the past 2 years. The dates for the timing restrictions can be modified if new information indicates that the March 1 to August 1 dates are not valid for the leasehold.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold no longer is within 1/2 mile of raptor nest sites which have been active within the past 2 years.

RESOURCE: Grouse Nesting Zone.
STIPULATION: Surface use is prohibited from March 1 to June 15 in grouse nesting habitat within 2 miles of a lek. This stipulation does not apply to the operation and maintenance of production facilities.
OBJECTIVE: To protect sharp-tailed and sage grouse nesting habitat from disturbance during spring and early summer in order to maximize annual production of young, and to protect nesting activities adjacent to nesting sites for the long-term maintenance of sharp-tailed and sage grouse populations in the area.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area no longer contain sharp-tail or sage grouse nesting habitat within 2 miles of a lek. The dates for the timing restriction can be modified if new information indicates that the March 1 to June 15 dates are not valid for the leasehold.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold no longer contains sharp-tailed or sage grouse nesting habitat within 2 miles of lek.

RESOURCE: Crucial Winter Range.
STIPULATION: Surface use is prohibited from December 1 to March 31 within crucial winter range for wildlife. This stipulation does not apply to the operation and maintenance of production facilities.
OBJECTIVE: To protect white-tailed deer, mule deer, elk, antelope, moose, bighorn sheep, and sage grouse crucial winter range from disturbance during the winter use season, and to facilitate long-term maintenance of wildlife populations.
EXCEPTION: An exception to this stipulation can be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area can be modified if the authorized officer determines that portions of the area no longer contain crucial winter range for wildlife. The dates for the timing restriction can be modified if new wildlife use information indicates that the December 1 to March 31 dates are not valid for the lease-

hold.
WAIVER: This stipulation can be waived if the authorized officer determines that the entire leasehold no longer contains crucial winter range for wildlife.

RESOURCE: Elk Spring Calving Range
STIPULATION: Surface use is prohibited from April 1 to June 15 within established spring calving range for elk. This stipulation does not apply to the operation and maintenance of production facilities.
OBJECTIVE: To protect elk spring calving range from disturbance during the spring use season, and to facilitate long-term maintenance of wildlife populations.
EXCEPTION: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.
MODIFICATION: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area no longer contain spring calving range for elk. The dates for the timing restriction may be modified if new elk use information indicates that the April 1 to June 15 dates are not valid for the leasehold.
WAIVER: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer contains spring calving range for elk.

Lease Notices

CULTURAL RESOURCES: The surface management agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in the Notice to Lessee (Montana State Office [MSO]-85-1).
OBJECTIVE: This notice would be consistent with the present Montana guidance for cultural resource protection related to oil and gas operations.

RESOURCE: Land Use Authorizations
MANAGEMENT DECISION: Land use authorizations incorporate specific surface land uses allowed on BLM-administered lands by authorized officers and those surface uses acquired by BLM on lands administered by other entities. These BLM authorizations include rights-of-way, leases, permits, conservation easements, and recreation and public purposes leases and patents.

The rights acquired, reserved, or withdrawn by BLM for specified purposes include non-oil and gas lease, conservation easements, archaeological easements, road and fence easements, and administrative site withdrawals. The existence of such land use authorizations shall not preclude the leasing of the oil and gas. The locations of land use authorizations are noted on the oil and gas plats and in Automated Lands and Minerals Record System/On-line Recordation and Case Access. The plats are a visual source noting location; On-line Recordation and Case Access provides location by legal description through the geographic cross reference program.

The specifically authorized acreage for land use should be avoided by oil and gas exploration and development activities. All authorized surface land uses are valid claims to prior existing rights unless the authorization states otherwise.

The rights of the Secretary to issue future land use authorizations on an oil and gas lease is reserved by provision of Section 29 of the 1982 Mineral Leasing Act, 30 U.S.C. § 186 {Interior Board of Land Appeals (IBLA) 88-258, vol. 110 pg 89}.

All Federal Land Policy and Management Act of 1976 {Section 701(b)} authorizations are subject to valid existing rights.

Land uses are authorized in accordance to the law which applies to that specific use at the time of issuance.

AUTHORITIES:
Federal Land Policy Management Act of 1976.
Mineral Leasing Act of 1921, as amended.
Recreation and Public Purposes Act of 1926, as amended.
Pre-Federal Land Policy Management Act
    Revised Statute 2477
    Taylor Grazing Act of 1934
Mining Law of 1872, as amended.
Acquired Mineral Leasing Act of 1947.
Executive Orders.

PERMITTING

The lessee may conduct lease operations after lease issuance. Before beginning construction or drilling a well, the lessee must have an approved Application for Permit to Drill, including requirements for surface and subsurface operations. Other lease operations, including surface and subsurface, must be approved by a Sundry Notice. When a well is no longer useful, the well is plugged and the surface reclaimed. Well plugging and reclamation operations are approved by a Sundry Notice, although verbal approval for plugging may be given for a well that was drilled but not completed for production. The period of bond liability is terminated after all wells covered by the bond are properly plugged and the surface reclaimed. The lands may become available for future leasing.

Proposed drilling and associated activities must be approved before beginning operations. The operator must file an Application for Permit to Drill with the BLM District Office. A copy of the application will be posted in the District Office, and if applicable, in the office of the Surface Management Agency for a minimum of 30 days for review by the public. After 30 days, the application can be approved in accordance with (a) lease stipulations, (b) Onshore Oil and Gas Orders, and (c) Onshore Oil and Gas regulations (43 CFR 3160) if it is administratively and technically complete.

Evidence of bond coverage for lease operations must be submitted with the application. Bond amount must not be less than a $10,000 lease bond, a $25,000 statewide bond or a $150,000 nationwide bond.

On-site inspections usually are required for all exploratory wells. On-site inspections of proposed development or infill well locations may not be required if an appropriate environmental assessment has been completed for the field that includes the proposed location. The inspection makes possible selection of the most feasible well site and access road from environmental, geological, and engineering points of view. Surface use and reclamation requirements are developed during the on-site inspection which is usually conducted within 15 days after receipt of the Notice of Staking or Application for Permit to Drill.

Conditions of approval implement the lease stipulations and are part of the permit when environmental and field reviews demonstrate the necessity for operating constraints or requirements. A surface restoration plan is part of an approved permit, either an Application for Permit to Drill or Sundry Notice that includes surface-disturbing activities.

The authorized officer will act on the application in one of two ways:

Approves the application (a) as submitted or (b) with appropriate modifications or conditions of approval; or

Returns the application and (a) advises the lessee or operator of the reasons for disapproval or (b) advises the lessee or operator of the reason why final action has been delayed and the date such final action is expected.

For drilling operations on lands with state or private mineral ownership, the lessee must meet the requirements of the mineral owner and the state regulatory agency. The BLM does not have jurisdiction over nonfederal minerals; however, the BLM has surface management responsibility in situations of BLM surface over nonfederal mineral ownership.

APPLICATION FOR PERMIT TO DRILL

Applications for Permit to Drill are approved for the Miles City District by the Assistant District Manager, Division of Mineral Resources. The approved Application for Permit to Drill includes Conditions of Approval, and Informational Notices which cite the regulatory requirements from the Code of Federal Regulations, Onshore Operating Orders and other guidance.

Conditions of Approval

Conditions of approval are mitigative measures which implement lease restrictions to site specific conditions. General guidance for conditions of approval is found in the BLM and U.S. Forest Service brochure entitled “Surface Operating Standards for Oil and Gas Exploration and Development” (USDI, BLM 1989c) and BLM Manual 9113 entitled “Roads”.

The following mitigative measures may be applied to approved permits as conditions of approval. The listing is not all inclusive, but presents the most often used conditions of approval in the planning area. The wording of the condition of approval may be modified or additional conditions of approval may be developed to address specific conditions.

A. Access Road

1. Prior to construction, a minimum of 4 inches of topsoil must be removed from the area necessary for road and ditch construction, including backslopes. Topsoil must be stored for use in reclamation.

2. For drilling and production operations, the access road must be flat-bladed, but sloped to provide

drainage off of the road. The access road width must not exceed 16 feet.

3. For drilling and production operations, the access road must be crowned and ditched. The access road width must not exceed 16 feet. Ditches must have flat or rounded bottoms.

4. The access road must be surfaced with and maintained at a minimum 3 inch layer of gravel.

5. Minimum 18-inch diameter culvert(s) must be installed in the designated drainage(s). The culvert(s) must be installed on undisturbed ground and extend a minimum of 1 foot beyond the toe of the fill slopes. Riprap material must be place at the inlet and outlet ends of the culvert(s).

6. A cattleguard must be installed at the designated fence crossing(s).

7. A low-water crossing must be constructed at the designated drainage(s). A minimum 6-inch layer of gravel must be placed on the road in the crossing.

8. The access road and associated structures must be maintained in a safe condition. Off-road vehicle travel is not authorized.

B. Well Pad

1. Prior to construction, a minimum of 4 inches of topsoil must be removed from the area necessary for pad construction, including to the toe of the cut and fill slopes. Topsoil must be stockpiled separately from all other material.

2. The reserve pit must be lined with an impervious plastic liner with a minimum 140 pounds per square inch burst strength and 30 pounds tear strength. The liner must be installed over material that will not puncture or tear the liner.

3. The reserve pit must be fenced on three sides during drilling operations and the fourth side after completion of drilling operations. Netting may be required over the reserve pit.

4. All storage tanks must be located on the well pad. Storage tanks must be surrounded with a dike or trench sloped to the reserve pit.

5. All trash must be stored in an enclosed container and disposed of in an approved disposal facility. Trash or debris is not allowed in the reserve pit.

6. Erosion control measures must be constructed or installed as prescribed.

C. Production Facilities

1. Storage tanks and treater must be located on the cut portion of the well pad.

2. The storage tanks and treater or the entire well pad must be surrounded by an earthen dike. The dike must be of sufficient size to contain 110 percent of the volume of the largest single tank in use.

3. Production facilities such as storage tanks, treater and pump unit must be painted a specified color from the Munsell Soil Color Chart.

4. Fluid storage pits must be permitted, constructed and maintained in accordance with State requirements.

5. The well site and production facility site must be maintained in a safe and orderly manner. All trash and debris must be stored in an enclosed container and disposed of at an approved disposal facility. All unused equipment must be stored in an orderly manner or removed. All containers must be installed and maintained in accordance with the manufacturer's and Occupational Safety and Health Act requirements.

D. Reclamation

1. Pit reclamation:

   a. The pit must be closed properly to assure protection of soil, water and vegetation.

   b. The pit may not be cut or trenched.

   c. Prior to pit closure, free fluids must be removed and disposed of properly.

   d. Pit mud and sludge material may be buried onsite after the material has been tested and has met the following criteria:
      *range of pH: 6 to 9
      *moisture content: <50 percent by weight
      *oil and grease content: <3 percent by weight
      *electrical conductivity: <12 mmhos (unit of measure of conductivity) per centimeter
      *unconfined compressive strength: >20 pounds per square inch

*total metals content must not exceed Environmental Protect Agency limits

e. The liner may be cut off above the pit material or pushed over the pit material.

f. The pit material must be covered with a minimum of 5 feet of native soil.

2. Site reclamation:

a. For production, the unused portion of the pad must be recontoured with slopes not steeper than 3:1. Proper drainage must be established. Erosion control measures may be required.

b. For final abandonment, the site must be cleaned up of all equipment, material and debris. All surfacing material must be removed.

c. For final abandonment, the site must be recontoured to blend in with the adjacent terrain.

d. Specific erosion control measures will be prescribed as necessary.

e. For production or abandonment, recontoured areas must be scarified, mulched and seeded. After scarification to a depth of 12 inches, topsoil must be spread evenly over the recontoured area. Weed-free straw mulch must then be applied evenly over the recontoured area at a rate of 1 ton per acre. The mulch must be crimped into the soil. The recontoured area must then be seeded with a prescribed seed mixture. Seed must be drilled on the contour at 6 inch drill row spacing at a depth of 1/2 to 3/4 inch.

The most commonly prescribed grass species include:

*western wheatgrass
*slender wheatgrass
*intermediate wheatgrass
*thickspike wheatgrass
*green needlegrass
*dryland alfalfa
*yellow sweetclover

f. After seeding, the site must be fenced with four strands of barbed wire, metal line posts and wood corner and brace posts. The fence must be maintained to keep out livestock until reclamation work has been approved.

g. For final abandonment on privately owned surface, reclamation must be completed in accordance with the surface owner's requirements, unless the surface owner defers to BLM requirements.

h. The reclamation work will be considered successful when the seeded area is stabilized, potential water erosion is effectively controlled and the vegetative stand is established with at least a 60 percent cover of the prescribed grass species.

i. An interim reclamation plan may be required if the site has been constructed but no other work has been accomplished within 6 months after permit approval.

3. Road reclamation:

a. For final abandonment, the surfacing material and structures (culverts, cattleguards) must be removed.

b. For final abandonment, the road and ditches must be recontoured. Erosion control measures may be required.

c. For final abandonment, the recontoured area must be scarified, mulched and seeded in the same manner as well sites.

d. For final abandonment, drainages must be restored to a free-flowing condition and the reclaimed area protected to prevent eroding and scouring.

e. For final abandonment on privately owned surface, reclamation must be completed in accordance with the surface owner's requirements, unless the surface owner defers to BLM requirements.

f. The reclamation work will be considered successful when the seeded area is stabilized, potential water erosion is effectively controlled and the vegetative stand is established with at least 60 percent cover of the prescribed grass species.

4. Pipeline reclamation:

a. The pipeline must be tested for leaks prior to backfilling the trench.

b. The trench must be backfilled immediately after completion of pipeline leak testing procedures. The fill material must be compacted.

c. Topsoil must be spread evenly over the disturbed area.

d. Erosion control measures must be installed as prescribed.

e. Drainages must be restored to a free-flowing condition and the reclaimed area protected to prevent eroding and scouring.

f. The disturbed area must be seeded in the same manner as well sites.

Site specific operating requirements (conditions of approval) are based on analysis of the proposed location for the wellsite. Operating requirements may affect the drilling program, access road, production facilities, water supply, waste disposal, well site layout, and surface restoration.

The following conditions of approval in addition to any site specific conditions are included with each approved application for Permit to Drill.

Verbal notifications will be made to the BLM, Miles City District Office, 406-232-4331, or after business hours to the appropriate individual's home phone.

- notify this office verbally at least 48 hours prior to beginning construction.

- notify this office verbally at least 12 hours prior to spudding the well. (To be followed up in writing within 5 days.)

- notify this office verbally (follow up in writing within 5 days) at least 12 hours prior to running any casing or blow-out preventer tests.

- notify this office verbally at least 24 hours prior to plugging the well to receive verbal plugging orders.

- notify this office verbally at least 24 hours prior to removal of fluids from the reserve pit.

- failure to comply within specified notification time frames may incur an assessment under 43 CFR 3163.1 and civil penalties under 43 CFR 3163.2.

A complete copy of the approved Application for Permit to Drill, including conditions, stipulations, and the hydrogen sulfide contingency plan (if required) shall be available for reference at the well site during the construction and drilling phases.

This drilling permit is valid for either 1 year from the approval date or until lease expiration, whichever occurs first.

Construction of access roads and well pads, and installation of cattleguards, culverts, fences, and other structures shall be in accordance with the BLM and Forest Service brochure entitled "Surface Operating Standards for Oil and Gas Exploration and Development" (USDI, BLM 1989c) which is available in the Miles City District Office.

The operator is responsible for informing all persons in the area who are associated with this project that they will be subject to prosecution for knowingly disturbing historic or archaeological sites. If historic or archaeological materials are uncovered during construction, the operator is to immediately stop work that might further disturb such materials, and contact the authorized officer. Within 5 working days the authorized officer will inform the operator as to:

- whether the materials appear eligible for the National Register of Historic Places;

- the mitigation measures the operator will likely have to undertake before the site can be used (assuming site preservation is not necessary); and,

- a time frame for the authorized officer to complete an expedited review under 36 CFR 800.11 to confirm, through the State Historic Preservation Officer, that the findings of the authorized officer are correct and that mitigation is appropriate.

If the operator wishes, at any time, to relocate activities to avoid the expense of mitigation and/or the delays associated with this process, the authorized officer will assume responsibility for whatever recordation and stabilization of the exposed materials may be required. Otherwise, the operator will be responsible for mitigation costs. The authorized officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the authorized officer that the required mitigation has been completed, the operator will then be allowed to resume construction.

It is the responsibility of the operator to control noxious weeds on lands disturbed in association with oil and gas lease operations. Lease associated weed control strategies, when required by the BLM, are to be coordinated with any involved surface owners and local weed control boards. A pesticide-use proposal must be prepared, and then be reviewed and approved by the BLM, prior to any herbicide

application on lands disturbed by federal oil and gas lease operations. A pesticide application record must be completed within 24 hours after completion of application of herbicides.

The abandonment marker shall exhibit the same information required for the well sign and must be installed when the well is plugged.

- A steel pipe (minimum 4-inch diameter, capped, minimum 4 feet above ground) set in cement.

- A steel plate welded to surface casing at the recontoured ground level.

- A steel plate welded to surface casing below ground level.

Additional requirements may be imposed if changes in operational and/or environmental conditions dictate.

These conditions of approval are subject to the State Director review and appeals provisions of 43 CFR 3165.3 and 3165.4.

Informational Notice

The following items are from the Federal Oil and Gas regulations (43 CFR 3160, Onshore Orders 1 and 2, Notice to Lessees, and other guidance). This is not a complete list of requirements, but is an abstract of some major requirements.

General Requirements

The lessee or designated operator shall comply with applicable laws and regulations; with the lease terms, Onshore Oil and Gas Orders, Notice to Lessees; and with other orders and instructions of the authorized officer. Any deviation from the terms of the approved Application for Permit to Drill requires prior approval from BLM (43 CFR 3162.1(a))

If at any time the facilities located on public lands authorized by the terms of the lease are no longer included in the lease (due to a contraction in the unit or other lease or unit boundary change) the BLM will process a change in authorization to the appropriate statute. The authorization will be subject to appropriate rental or other financial obligations determined by the authorized officer.

Drilling Operations (Onshore Order 2)

Onshore Order 2 requires surface casing shall have centralizers on at least every fourth joint starting with the shoe joint.

If drill stem tests are run, the Miles City District office shall be notified at least 6 hours prior to testing. All applicable safety precautions outlined in Onshore Order 2 shall be observed.

All indications of usable water (10,000 parts per million or less total dissolved solids) shall be reported to Miles City District office prior to running the next string of casing or before plugging orders are requested, whichever occurs first.

Well Abandonment (43 CFR 3162.3-4,
Onshore Order 1-Sec. V)

Approval for abandonment shall be obtained prior to beginning plugging operations. Initial approval for plugging operations may be verbal, but shall be followed up in writing within 30 days. Subsequent and final abandonment notifications are required and shall be submitted on Sundry Notice and Reports on Wells (form 3160-5), in triplicate.

Reports and Notifications (43 CFR 3162.4-1, 3162.4-3)

Within 30 days of completion of the well as a dry hole or producer, a copy of all logs, core descriptions, core analyses, well-test data, geologic summaries, sample descriptions or data obtained and compiled during the drilling, workover, and/or completion operations shall be submitted with Well Completion or Recompletion Report and Log (form 3160-4), in duplicate.

In accordance with 43 CFR 3162.4-3 this well shall be reported on Minerals Management Service form 3160, Monthly Report of Operations, starting with the month in which drilling operations commence, and continuing each month until the well is physically plugged and abandoned.

Notify this office within 5 business days of production start-up if either of the following two conditions occur:

The well is placed on production. “Placed on production” means shipment or sales of hydrocarbons from temporary tanks, production into permanent facilities or measurement through permanent facilities.

The well resumes production after being off production for more than 90 days.

Notification may be written or verbal with written follow-up within 15 days, and must include the following information:

Operator name, address, and telephone number.

Well name and number, county and state.

Well location, "1/4-1/4, Section, Township, Range, P.M."

Date well begins or resumes production.

The nature of the well's production; that is, crude oil, or crude oil casing gas, or natural gas and entrained liquid hydrocarbons.

The Federal or Indian lease number.

As appropriate, the unit agreement name, number and participating area name.

As appropriate, the Communitization Agreement number.

Environmental Obligations and Disposition of Production (43 CFR 3162.5-1, 3162.7-1 and 40 CFR 302.4)

With BLM approval, water produced from newly completed wells may be temporarily disposed of into unlined pits up to 90 days. During this initial period, application for the permanent disposal method shall be made to this office in accordance with NTL-2B. If underground injection is proposed, an Environmental Protection Agency or State Permit shall also be obtained.

Spills, accidents, fires, injuries, blowouts and other undesirable events must be reported to this office within the time frames in NTL-3A.

Gas may be vented or flared during emergencies, well evaluation, or initial production tests for a time period of up to 30 days or the production of 50 million cubic feet of gas, whichever occurs first. After this period, approval from this office shall be obtained to flare or vent gas in accordance with NTL-4A.

Well Identification (43 CFR 3162.6)

Each drilling, producing, or abandoned well shall be identified with the operator's name, the lease serial number, the well number, and the surveyed description of the well (either footages or the quarter-quarter section, the section, township and range). The Indian allottee lessor's name may be required. Markings shall be legible and in a conspicuous place.

Site Security (43 CFR 3162.7.5)

Oil storage facilities shall be clearly identified with a sign, and tanks must be individually identified (43 CFR 3162.6 (c)).

Site security plans shall be completed within 60 days of production startup (43 CFR 3162.7-5(c)).

Site facility diagrams shall be filed in this office within 60 days after facilities are installed or modified (43 CFR 3162.7-5(d)(1)).

Confidentiality (43 CFR 3162.8)

Submitted information not marked "CONFIDENTIAL INFORMATION" will be available for public inspection upon request.

District Office Address and Contacts

The approval letter concludes with the complete address, phone number, and business hours for the Miles City District office. A list of staff members, their job titles, and home phone numbers is provided for the company to use when the office is closed.

CONSTRUCTION

Construction of the access road and the well site is necessary before drilling operations begin. The extent of surface disturbance necessary for construction depends on the terrain, depth of the well, drill rig size, circulating system, and safety standards.

The depth of the drill test determines the size of the work area necessary, the need for all-weather roads, water requirements, and other needs. The terrain influences the construction problems and the amount of surface area to be disturbed. Reserve pit size may vary because of well depth, drill rig size, or circulating system.

Access roads to well sites in the planning area usually consist of running surfaces 14 to 18 feet wide that are ditched on one or both sides. Many of the roads constructed will follow existing roads or trails. New roads might be necessary because existing roads are not at an acceptable standard. For example, a road may be too steep so that realignment is necessary.

Roads can be permanent or temporary, depending on the success of the well. The initial construction can be for a temporary road; however, it is designed so that it can become permanent if the well produces. Not all temporary roads constructed are rehabilitated when the drilling stops. A temporary road is often used as access to other drill sites. The main roads and temporary roads, require graveling to be maintained as all-weather roads. This is especially important in the spring. Access roads may be required to cross public lands to a well site located on private or state

lands. The portion of the access road on public land would require a BLM right-of-way.

Approximately 1 to 4 acres are impacted by well site construction. The area is cleared of large vegetation, boulders, or debris. Then the topsoil is removed and saved for reclamation. A level area from 1 to 4 acres is then constructed for the well site, which includes the reserve pit.

The well pad is constructed by bulldozers and motor scrapers. The well pad is flat (to accommodate the drill rig and support equipment) and large enough to store all the equipment and supplies without restricting safe work areas. The drill rig must be placed on "cut" material rather than on "fill" material to provide a stable foundation for the rig. The degree of cutting and filling depends on terrain; that is, the flatter the site, the less dirt work is required.

Hillside locations are common, and the amount of dirt work varies with the steepness. A typical well pad will require a cut 10 feet deep against the hill and a fill 8 feet high on the outside. It is normal to have more cut than fill to allow for compaction, and any excess material is then stockpiled. Eventually, when the well is plugged and abandoned, excavated material is put back in its original place.

Reserve pits are normally constructed on the well pad. Usually the reserve pit is excavated in "cut" material on the well pad. The reserve pit is designed to hold drill cuttings and used drilling fluids. The size and number of pits depends on the depth of the well, circulating system and anticipated down hole problems, such as excess water flows.

The reserve pit can be lined with a synthetic liner to contain pit contents and reduce pit seepage. Not all reserve pits are lined; however, BLM can require a synthetic liner based upon factors such as soils, pit locations, ground water and drilling mud constituents. The operator can elect to line the reserve pit without that requirement.

An adequate supply of water is required for drilling operations and other uses. The sources of water can be a water well at the drill site or remote sources such as streams, ponds, or wells. The water is transported to the site by truck or pipeline. Pipelines are normally small diameter surface lines. The operator must file for and obtain all necessary permits for water from the state of Montana. On public lands an operator must have the BLM's permission before surface water can be used.

DRILLING OPERATIONS

As drilling progresses for a vertical well, the hole is drilled, pipe is placed in the hole to maintain the integrity of the hole. The first string of pipe is the conductor pipe which stabilizes the hole near the surface. The second string of pipe placed in the hole is for surface casing which is set deep enough to reach an impervious layer of clay below the deepest usable freshwater aquifer.

The surface casing is set and cemented in the hole by pumping cement between the casing and the hole wall. Surface casing acts as a safety device to protect freshwater zones from drilling fluid contamination. To prevent the well from "blowing-out" in the event the drill bit hits a high pressure zone, blowout preventers are mounted on top of the surface casing. If high pressure zones are encountered that cannot be controlled with mud additives, the blowout preventers can be closed to effectively seal the well.

After the surface casing is set, a smaller drill bit that fits inside the surface casing is installed and drilling resumes. Depending on well conditions, additional strings of casing called intermediate casing may be installed and cemented into place. Conditions resulting in the need for intermediate casing include freshwater zones and sloughing formation zones. Casing prevents the flow of freshwater into the wellbore, and conversely prevents drilling fluids from infiltrating porous formations with low internal pressures. Casing also prevents mixing of waters from different formations (interformational mixing) where water within the formations are of differing quality.

All cementing operation plans are reviewed to assure cement is placed at the appropriate depths and a sufficient quantity is utilized to effectively seal all freshwater-bearing formations from contamination by interformational mixing or migration of fluids.

If no oil or gas is encountered, the well is plugged with cement and abandoned in accordance with state and federal requirements. If the well is a producer, casing is set and cemented in place.

Directional drilling may be used where the drill site cannot be located directly over the drilling target. There are limits to both the degree that the wellbore can be deviated from the vertical and the horizontal distance the well can be drilled away from the well site.

Horizontal wells are drilled similarly to directional wells, except that the bottomhole location of the well is not a single point, but rather a lateral horizontal section. They are drilled to increase the recovery oil and gas reserves from vertically fractured reservoirs, or reservoirs with directional permeability. In the Cedar Creek Anticline, operators have drilled horizontal wells to access oil reserves which might normally remain undeveloped.

PRODUCTION AND DEVELOPMENT

Production

Production begins when a well yields oil or gas in commercial quantities. If formation pressure is sufficient to raise oil to the surface, the well is completed as a flowing well. A pumping unit is installed if the formation pressure is not sufficient to bring the oil to the surface.

When the well is completed as a free-flowing well, an assembly of valves and special connections known as a "Christmas tree" (so called because of its many branch-like fittings) is installed on top of the casing to regulate the flow of the well. Later, when the natural pressure declines, the Christmas tree can give way to a simple wellhead arrangement of valves and a pumping unit to lift the oil artificially. Most pumping units in the planning area are "beam" style pumps which are powered by electric or gasoline engines.

The majority of gas wells produce by natural flow and do not require pumping. Surface use at a flowing well is usually a small area containing a gas well Christmas tree, a dehydrator, a produced water pit, and a meter house. Separators, condensate tanks, and compressors may be included. Some gas wells require continuous water pumping as water entering the well chokes off the gas flow.

Development

Development can take years and include from one or two wells to more than a hundred wells per field. Roads to producing wells are upgraded to all-weather roads as necessary. Pipelines, electrical transmission lines, separators, dehydrators, sump pits, and compressor stations soon follow. Sometimes oil and gas processing facilities are built in or adjacent to the field.

Further Seismic Testing

More detailed seismic work can be done to achieve better definition of the petroleum reservoir. Diagonal seismic lines can be required to tie the previous seismic work to the discovery well. The discovery well can be used to conduct studies to correct the previous seismic work and provide more accurate subsurface data.

Spacing Requirements

A well spacing pattern must be established before development drilling begins. Information considered in establishment of a spacing pattern includes data from the discovery well on porosity, permeability, pressure, composition, and depth of formations in the reservoir; well production rates and type (predominantly oil or gas); and the economic effect of the proposed spacing on recovery. The state of Montana establishes well spacing patterns for both exploratory and development wells. The state specifies the minimum distance from lease lines or government survey lines for bottom hole location of the wellbore depending upon depth of the oil well and specifies a minimum distance for gas wells. The spacing regulations determine the acres assigned to each well.

Spacing unit size is established to provide for the most efficient and economic recovery of oil or gas from a reservoir. Well spacing ranges from 40 acres to 640 acres. Wells below 11,000 feet can be no closer than 1,650 feet to other producing wells below 11,000 feet. Only one producing well per formation in each 40, 80, 160, 320, and 640 acre unit. Figures 13 and 14 show the different spacing patterns for oil and gas wells and the minimum distance from spacing unit boundaries to the well.

Drilling of Development Wells

The procedures used in drilling development wells are the same as those used for wildcat wells, but usually with less subsurface sampling, testing, and evaluation. The rate at which development wells are drilled in a field depends on factors such as whether the field is developed on a lease basis or unitized basis, the probability of profitable production, the availability of drilling equipment, lease requirements, and the degree to which limits of the field are known.

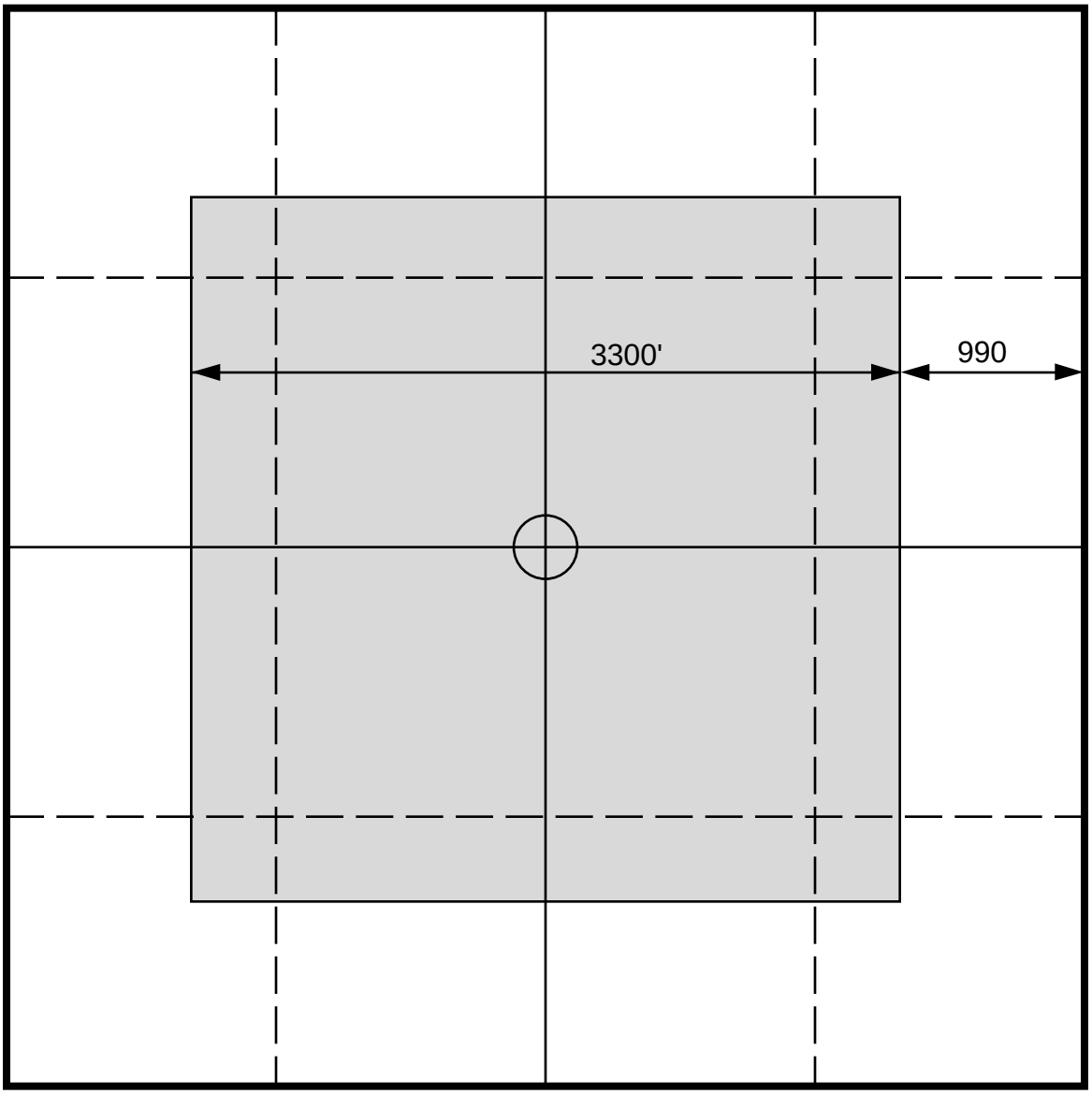
Some fields go through several development phases, the first resulting from the original discovery and others from later discovery. A field can be considered fully developed and produce for several years, and then a well may be drilled to a deeper or shallower pay zone. Discovery of a new pay zone in an existing field is a "pool" discovery (as distinguished from a new field discovery). A pool discovery may lead to the drilling of additional wells, often from the same drilling pad as existing wells.

SECONDARY RECOVERY

Oil cannot be produced unless the reservoir pressure is great enough to drive the oil into the wellbore. Oil production declines as the formation's natural pressure declines. Secondary recovery is initiated to increase reservoir pressures artificially and to maintain the oil recovery factor. This is done by injecting water (water flooding), gas, air, or polymerized liquid into the formation.

FIGURE 13
GAS WELL SPACING
SECTION PLAT

640 Acre Spacing

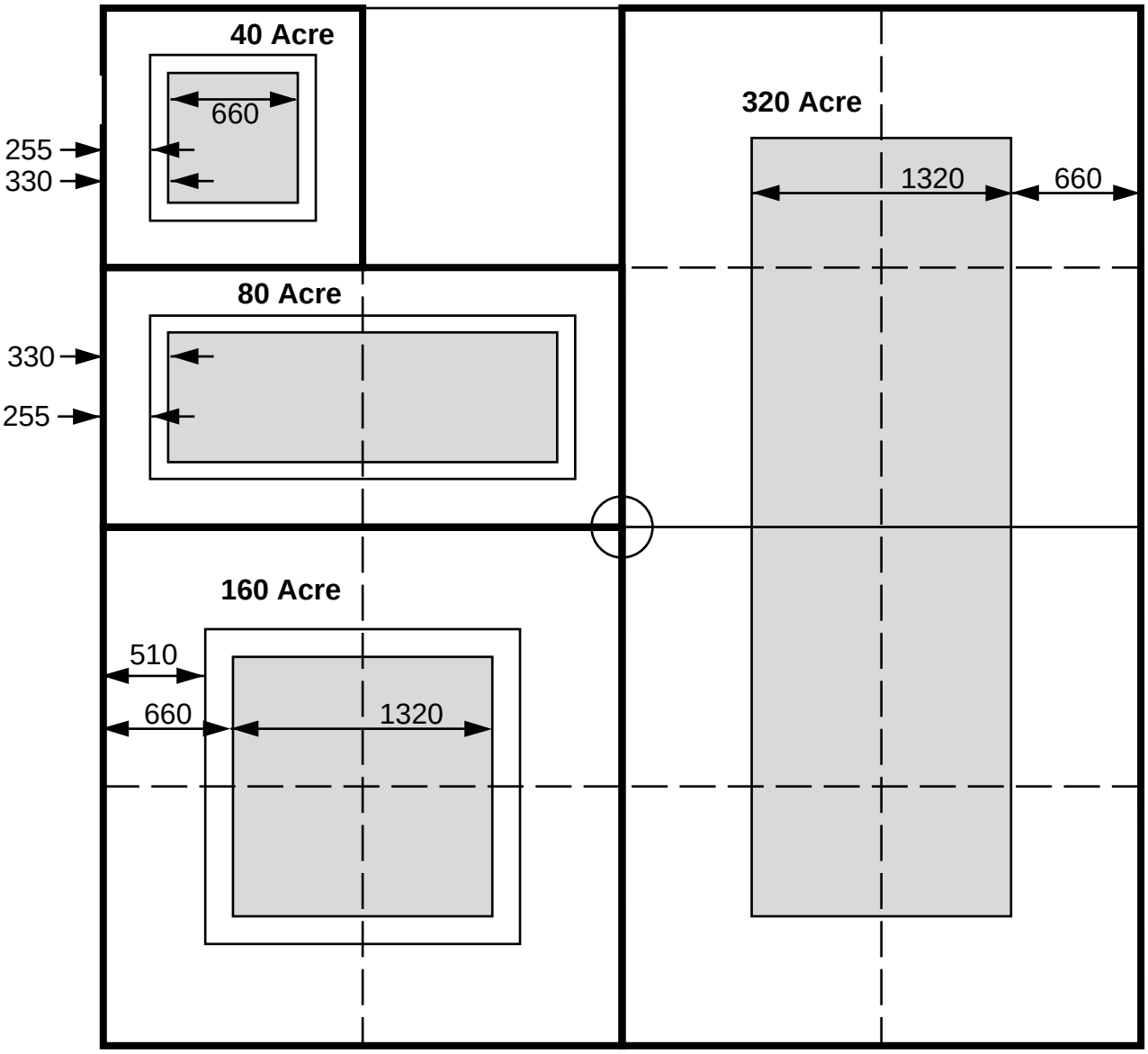


SOURCE: Montana Oil & Gas Commission

Area in which well should be drilled

Well Depth (feet)	Minimum Well Distance (feet)
0>	990

FIGURE 14
OIL WELL SPACING
SECTION PLAT



SOURCE: Montana Oil & Gas Commission

Area in which well should be drilled

Well Depth (feet)	Spacing (acre)	Nearest Boundary (feet)	Topographic Tolerance (feet)	Minimum Well Distance (feet)
0 - 6,000	40 &80	330	75	255
6,001 - 11,000	160	660	150	510
11,001 - >	320	660	none	none

For the 320 acre spacing (1,650 well tolerance) and the 80 acre spacing the drilling unit will be delineated either N-S or E-W.

Inspections

Geophysical operations and lease operations are inspected to determine compliance with approved permits, to resolve conflicts or correct problems and to determine effectiveness and need of lease stipulations. All inspections are documented. Operators are required to correct problems or violations. Lease stipulations and permit conditions may be changed or eliminated as a result of an inspection.

Surface Requirements

Field development activities that cause surface disturbance include access roads, well sites, production facility sites, flow line and utility line routes and waste disposal sites.

Surface uses in a gas field will be less than in an oil field, because gas wells are usually drilled on larger spacing units. The spacing pattern of 640 acres per well, which is common in gas fields, will require only one well per section and might require only 1/2 mile of access roads and pipelines.

Production facilities include separation and storage equipment. Separation equipment is required when production includes a combination of oil, gas or water and storage equipment is required for holding liquids prior to sales.

Flow Lines

Oil and gas are transferred from the well to storage facilities through small diameter (<6 inches) flow lines. Flow lines can be on the surface, buried or elevated. Produced water, gas or polymerized liquid is transferred from storage facilities to injection wells for secondary recovery.

Separating, Treating, and Storage

Any water or gas associated with produced oil is separated from the oil before it is placed in storage tanks. The treating facilities are located at a storage tank battery. Low-pressure petroleum that must be pumped from the well is treated in a single separation. High-pressure, flowing petroleum can require several stages or separation, with a pressure reduction accompanying each stage.

Produced gas is sold when there is sufficient volume, necessary transportation, a market, and it is economical. Generally, if the volume of produced gas is too low for sales, it is used as fuel for well pump engines and heating fuel for the treaters. If the volume of produced gas exceeds fuel requirements on the lease but gas sales are not possible, the gas can be flared or vented into the atmosphere when authorized by permit in accordance with state and federal regulations.

When water is produced with the hydrocarbons, it is separated before the gas is removed. In primary operations, where natural pressures or gravity cause the petroleum in the reservoir to flow to the wellbores, the degree of mixing is high enough to require chemical and heat treatment to separate the oil and water. In secondary production, where water injection or other methods are used to force additional petroleum to the wellbore, the oil and water often are not highly emulsified. In this case, the oil and water can be separated by gravity in a tall settling tank. Produced water can be disposed of by injection into the subsurface, surface evaporation or beneficial purposes such as water for livestock or irrigation.

Produced water from oil and gas operations is normally disposed of by subsurface injection or in surface pits. Regardless of the method of disposal, it must be acceptable to the BLM, in accordance with the requirements of Onshore Oil and Gas Order No. 7, titled “Disposal of Produced Water.” Disposal of produced water by injection wells requires permits from the Environmental Protection Agency. When produced water is disposed underground, it is introduced or injected under pressure into a subsurface horizon containing water of equal or poorer quality. In the oil and gas producing areas of the planning area, this disposal horizon is usually found within the Dakota Group Formation or in the Judith River Formation, although other formations have been used within the area. Produced water may be injected into the producing zone from which it originated to stimulate oil production. Oil and gas units within the planning area utilize this method of reinjection. Dry holes or depleted wells are commonly converted for saltwater disposal and occasionally new wells are drilled for this purpose.

The Environmental Protection Agency requires that all injection wells be permitted under the Underground Injection Control program. Under the Underground Injection Control approval process, the disposal well must be pressure tested to ensure the integrity of the casing. The disposal zone must also be isolated by use of tubing and mechanical plug called a packer. The packer seals off the inside of the casing and only allows the injected water to enter the disposal zone. The tubing and packer are also pressure tested to ensure their integrity. These pressure tests confirm isolation of the disposal zone from possible usable water zones. The tests are repeated on a schedule basis set by the Environmental Protection Agency.

The oil is transported to storage tanks through flow lines after separation from any water or gas. Storage tanks are usually located on the lease either at the producing well or at a central production facility. The number and size of tanks are dependent upon the type and amount of production on the lease.

ABANDONMENT

When drilling wells are unsuccessful or production wells are no longer useful, the well is plugged, equipment is removed from the well site or production facility site, and the site is abandoned. The well bore is secured by placing cement plugs to isolate hydrocarbon producing formations from contaminating other mineral or water bearing formations. The site and roads are then restored as near as possible to original contours. Topsoil is replaced and the recontoured areas are seeded. Reclamation of access roads and well sites on privately owned surface is completed according to the surface owner's requirements.

Rehabilitation requirements generally are made a part of the Application for Permit to Drill. Upon completion of abandonment and rehabilitation operations, the lessee or operator notifies the BLM district that the location is ready for inspection. Final abandonment will not be approved until the required surface reclamation work has been completed to the satisfaction of the BLM or surface owner. The period of bond liability for the well site is terminated after approval of final abandonment.

Reclamation of the reserve pit is part of the well site reclamation process. Reserve pit reclamation includes removal of fluids to a disposal well or commercial pit and burial of solids in the pit. Solids should not be buried until dry and then covered with a minimum of 6 feet of native soil. Any pit liner may be buried in place. Methods such as solidification or dewatering may be used to help dry the solids.

Regulations, Laws, and Special Procedures

UNIT AND COMMUNITIZATION AGREEMENTS

Unit and *communitization* agreements can be formed in the interest of conservation and to allow for the orderly development of oil and gas reserves.

A unit agreement provides for the recovery of oil and gas from the lands as a single consolidated entity without regard to separate lease ownerships. An exploratory unit is used for the discovery and development of the field in an orderly and efficient manner. Paying and nonpaying well determinations are made for each well drilled. If the well is nonpaying as defined by the agreement, the production is allocated on a lease basis. If the well is a paying unit well, a participating area is formed and the production is allocated to all interest owners in the participating area on the basis of surface area.

A secondary unit is formed after the field has been defined and enhanced recovery techniques are being utilized. Secondary recovery techniques include water injection, natural gas injection, or carbon dioxide injection. Injection is initiated to maintain the reservoir pressure to maintain oil production. The agreement provides for the allocation of production among all the interest owners.

A communitization agreement combines two or more leases that otherwise could not be independently developed in conformity with established well spacing patterns. The leases within the spacing unit share in the costs and benefits of the well drilled in the spacing unit. Therefore, unit and communitization agreements can lessen the amount of damage to the environment and save dollars by eliminating unnecessary wells, roads, pipelines, and lease equipment.

DRAINAGE PROVISIONS

Federal oil and gas leases include a clause that the lessee must protect the leased area from drainage by off-lease wells. If the BLM determines that federal oil or gas is being drained (physically removed) by an off-lease well, the federal lessee will be notified. The lessee has the option of drilling a protective well on lease or paying compensatory royalty for the lost oil or gas. The lessee also has the options of submitting data showing that drainage is not occurring or relinquish the portion of the lease subject to drainage after payment of compensatory royalty for drainage which did occur.

The objective of the drainage program is to prevent the loss of federal oil and gas due to drainage by requiring the drilling of protective wells and, where appropriate, to assess compensatory royalty for such losses.

DRILLING ACCESS WITH NO SURFACE OCCUPANCY STIPULATIONS ON OIL LEASES

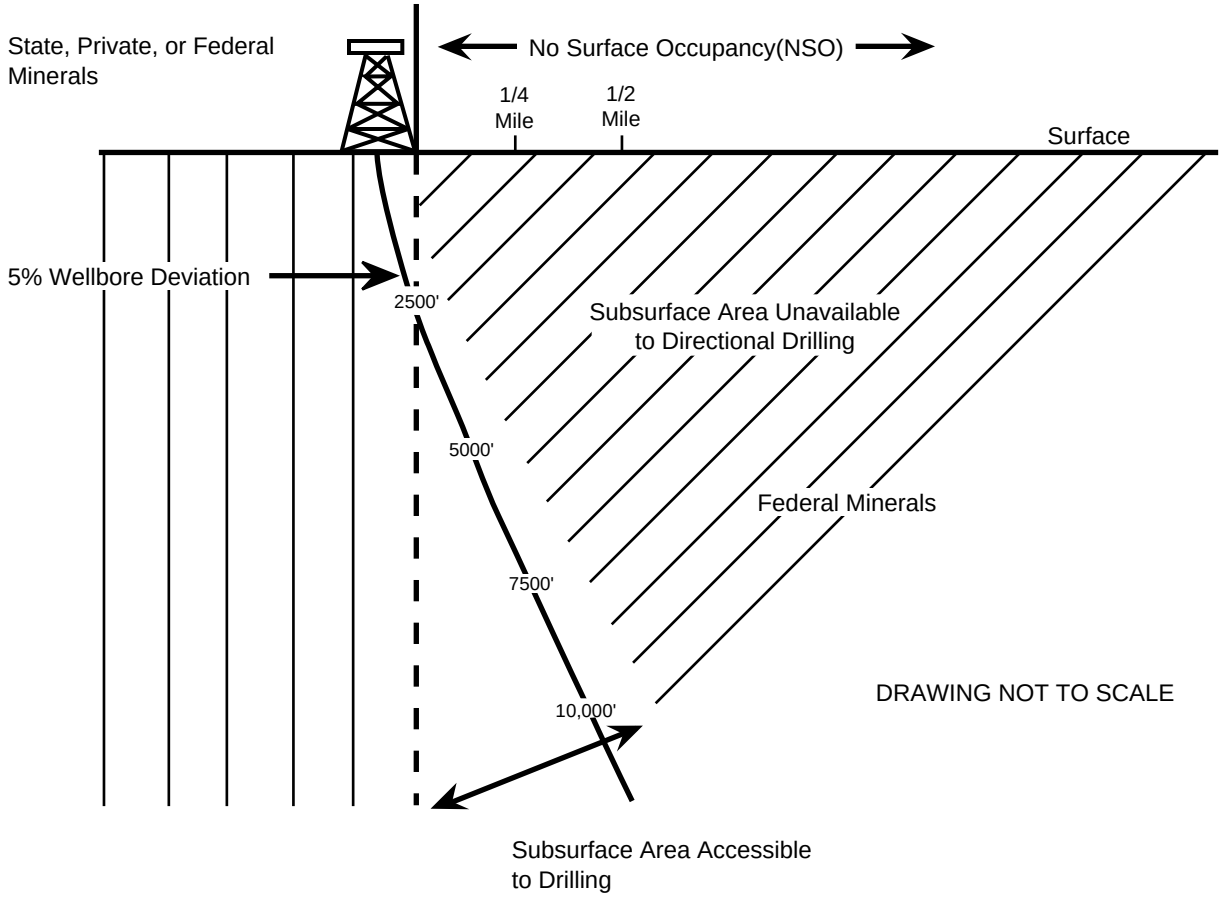
The no surface occupancy stipulations can restrict the development potential of a federal oil and gas lease. The no surface occupancy stipulations can limit the area that can be

developed by restricting the amount of surface acreage available for occupancy. No surface occupancy restrictions often do not affect access to oil and gas resources unless there are blocks of contiguous land with no surface occupancy stipulation or the drilling depth is presumed to be shallow. The drilling access area is that area under a no surface occupancy lease or lease parcel that can be accessed by the well bore from a surface location outside of the areas (see figure 15).

Lands near the outer boundary of a lease affected by a no surface occupancy stipulation can theoretically be developed by directional drilling. The BLM cannot assume that a prudent operator would use new technology such as horizontal drilling to access an entire lease area. Although the technology might allow exploration, the expense might make the venture uneconomical. However, BLM can assume that an operator might be willing to directionally drill wells using equipment and drilling techniques that make the venture economical. For a directionally drilled well, a maximum deviation of approximately five degrees is a commonly used rule of thumb for how much a vertical hole can be economically deviated using a standard drilling rig. The BLM has estimated typical oil well depths for various parts of the District based on drilling history and geologic data. Gas wells in this planning area probably cannot and will not be deviated for technical and economic reasons.

A "directional drilling accessibility" concept has been developed for leases affected by no surface occupancy stipulations. Shallow wells in Montana, less than 6,000 feet deep, can be deviated up to 1/8 mile and have the angle of deviation remain reasonably close to five degrees. This will place the bottom hole location in the center of a 40-acre tract. Because these wells are commonly spaced on a 40-acre basis, all spacing units within 1/4 mile of the outer boundary of the lease can be tested. Wells between 6,000 and 11,000 feet deep can also be deviated up to 1/4 mile. This will place the bottom hole location of the well the maximum allowable distance from the lease line for a well

FIGURE 15
DIRECTIONAL DRILLING ACCESSIBILITY CONCEPT



of this depth. Because these wells are spaced on a 160-acre basis, all spacing units within 1/2 mile of the exterior boundary of the lease can be tested.

The oil wells in Montana, with a total depth greater than 11,000 feet are normally spaced on a 320-acre basis. These wells can be deviated up to 1/4 mile using the above criteria. Using this distance, all spacing units within 1/2 mile of the outer boundaries of an affected lease can be tested.

Using the "directional drilling accessibility" concept and associated work maps, the planning area was analyzed for the potential loss in production due to the impact of no surface occupancy stipulations. The area was examined for the occurrence of one or more no surface occupancy stipulations, and the no surface occupancy area made inaccessible due to the "directional drilling accessibility" concept was calculated. No surface occupancy has more effect in areas of blocked ownership than in scattered tracts due to inaccessibility from off-lease well locations to much of the blocked area. Usually four-blocked sections with no surface occupancy stipulations result in an inaccessible area of 640 acres. The area around the 640 acres would be accessible by directional drilling.

These areas were categorized to permit calculation of wells foregone and the resultant potential loss in production according to the data compiled by the Miles City District. For example, in an area where shallow gas wells are typical, there will be no buffer or offset that will permit access to a shallow production zone within standard deviation limits. The angle of approach will result in a bottom hole location below the production horizon. Deeper production horizons would be accessible to directional drilling because of the well bore deviation concept.

Directional drilling will not allow all of the acreage covered by a no surface occupancy stipulation to be properly tested under the above conditions. In many cases, the most favorable location in a spacing unit will not be available for testing because it will not be economically or technologically possible to directionally drill to it from outside the lease. The best way to economically test a spacing unit is to allow surface occupancy to provide opportunities for vertical well bores. Because it will be more expensive to explore a tract covered by no surface occupancy stipulations, some companies may not offer to lease these lands. This represents an unquantifiable loss in lease revenue.

SPLIT ESTATE

Much of the area included in the planning area contains lands known as split estate lands. These are lands where the surface ownership is different from the mineral ownership. Management of federal oil and gas resources on these lands is somewhat different from management on lands where both surface and mineral ownership is federal. On split estate lands where the surface ownership is private, the BLM places necessary restrictions and requirements on its leases and permit approvals and works in cooperation with the surface owner. BLM has established policies for the management of federal oil and gas resources in accordance with federal laws and regulations.

The BLM does not have the legal authority to regulate how private surface is managed. BLM does have the statutory authority to require measures by lessees to avoid or minimize adverse impacts that may result from federally authorized mineral lease activities. These measures, in the form of lease stipulations or permit conditions of approval, are intended to protect or preserve the privately owned resources and prevent adverse impacts to adjoining lands, not to dictate management to the surface owner.

The term split estate can also refer to lands where the surface ownership is federal and the mineral ownership is private. In this situation, BLM is the surface owner, and works in cooperation with the proponent and the state regulatory agency that approves private mineral applications. BLM has responsibilities in this situation under the previously mentioned statutes; however, BLM does not have the authority to approve or disapprove the mineral owner's actions. The mineral estate owner usually has the right to enter the land and use the surface that is necessary and reasonable for mineral development through either a reserved or an outstanding right contained in the deed.

SUMATRA AREA

Introduction

This narrative discusses the Sumatra oil and gas development potential area. It includes portions of Garfield and Rosebud counties and is considered to be in the Montana Plains province. The principal structural feature is the Sumatra anticline. The majority of this area is covered by Cretaceous exposures, ranging from Hell Creek Formation downward into the Colorado Group.

In the past 15 years, 783 wells have been drilled in the 23-township area of the Tyler Formation play on, or near, the Sumatra anticline. An additional 50 exploratory wells can be expected throughout the area over the next 15 years.

Occurrence Potential

There is a high occurrence potential nearly throughout the area.

The type log used for this map is from the Madison Limestone Test Well 3 (T. 2 N., R. 27 E., sec. 35, NW1/4SE1/4), Yellowstone County. This well was drilled to 7,190 feet into the Precambrian. It illustrates the permeability of potential reservoir beds in the lower Cretaceous, Pennsylvanian, Mississippian, Devonian, Ordovician, and Cambrian formations through drill stem tests which flowed water to the surface. The well was not completed for hydrocarbon production.

Discussion of Development Potential

The 23-township area along the Sumatra anticline has high development potential. It contains 28 oil fields ranging in size from one producing well, such as Howard Coulee, to 68 producing wells in the Sumatra complex. Most of the wells are completed in the Tyler sands; however, Big Wall and Sumatra fields also produce from the Amsden. The Tyler sands are Pennsylvanian in age and are deposited in fluvial beds that fill channels eroded into Mississippian Chester age marine shales and limestone. The resulting oil traps are abruptly discontinuous. Smaller tributary channels will continue to be targets for Tyler drilling but at a reduced rate of perhaps one well per township per year. The remaining lands in this area have moderate development potential. During the next 15 years, 5 new wells are anticipated in this area.

CEDAR CREEK AREA

Introduction

The Cedar Creek oil and gas development potential area includes portions of Dawson, Fallon, Prairie, and Wibaux counties. The Williston basin crosses the northeast corner of this area. The Cedar Creek anticline is the major producing structure in the map area and separates the Williston basin from the Powder River basin.

Occurrence Potential

All of the Cedar Creek area is classified high oil & gas occurrence potential. Regional geologic mapping (Mallory 1972) indicates the area contains sedimentary rock in excess of 5,000 feet thick. The type log for the map, taken from the Marathon 1 State well (T. 2 N., R. 61 E., sec. 16, NW1/4SW1/4), logged 10,262 feet of sedimentary rock before drilling into the preCambrian. The source rocks and reservoirs are proven by the number of producing oil and gas wells in this area.

This area has been a target for oil and gas exploration for over 60 years (Tonnsen 1985). The source rocks and proven reserves will cause this area to experience drilling activity in the next 15 years (similar to the past 15 years), despite the present depressed conditions in the domestic oil industry.

Discussion of Development Potential Ratings

All active producing townships have been rated as high oil and gas development potential in the Cedar Creek area. Along the Cedar Creek anticline, primary targets have been the Cretaceous Eagle gas sands and the oil-bearing Ordovician Red River Formation.

Because exploration and development typically centers around traditional producing areas, these townships can expect a high amount of development activity over the next 15 years. Based on this analysis, anywhere from 1 to 45 additional wells could be drilled in each of these townships, with numerous producers expected in the next fifteen years.

The remainder of the Cedar Creek area is classified moderate development potential because the sedimentary rocks are just as thick as adjacent producing areas of the Williston basin. Wildcatting and limited development will occur in these townships in the next 15 years. This will involve anywhere from one to three wildcat wells being drilled per township.

POPLAR-GLENDIVE AREA

Introduction

This report discusses the Poplar-Glendive oil and gas development potential area outside of the Fort Peck Indian Reservation. The Fort Peck Reservation is not being classified for the purposes of this study. This is the most active oil and gas drilling area in the BLM Miles City District.

Drilling is expected to be just as active over the next 15 years as it has been the last 15 years. It includes portions of Dawson, McCone, Prairie, Sheridan, Wibaux, and all of Roosevelt and Richland Counties. The east half of the area is in the Williston basin. The north extent of the Cedar Creek anticline and Sheep Mountain Syncline occurs in the southwest corner of the area.

Occurrence Potential

All of the Poplar-Glendive area is classified as high oil and gas occurrence potential. Regional geologic mapping (Mallory 1972) indicates the area contains more than 5,000 feet of sedimentary rocks. The type log for the county, taken

from the Dome Petroleum 3 Panasuk (T. 29 N., R. 59 E., sec. 28, SW1/4NW1/4), Ordovician Red River Formation. The source rocks and reservoirs are proven by the number of producing oil and gas wells in this area.

This area has been a target for oil and gas exploration for over 30 years (Billings Geological Society 1951). Since then, over 100 oil and gas fields have been developed in this area (Tonnsen 1985). With the successful introduction of horizontal drilling in the Williston basin in the last two years, many unproductive townships and sections will likely experience significant drilling activity and production in the next 15 years.

Discussion of Development Potential Ratings

All of the active producing townships, outside the Fort Peck Indian Reservation, have been rated as high oil and gas development potential in the Poplar-Glendive area. There are multiple producing horizons in these townships. The following horizons are productive throughout the area: (1) the Mississippian Mission Canyon Formation, (2) the Mississippian/ Devonian Bakken Formation, (3) the Devonian Nisku Formation, (4) the Devonian Duperow Formation, (5) the Devonian Winnipegosis Formation, (6) the Ordovician Gunton Formation, and (7) the Ordovician Red River Formation. It is this multiple pay potential that gives this area of Montana such high development potential despite the depth of most of these wells and the current depressed oil prices.

Because exploration and development typically centers around traditional producing areas, these townships can expect a high amount of development activity over the next fifteen years. Based on this analysis, anywhere from 8 to 95 additional wells could be drilled in each of these townships, with numerous producers and new fields expected in the next fifteen years.

The rest of the Poplar-Glendive area is classified moderate development potential because: (1) the numerous wells that have encountered shows throughout the formations mentioned above, (2) the thickness of the sedimentary rocks, and (3) the number of wells that have been drilled in these townships in the last fifteen years (0-7). Wildcatting and limited development may occur in these townships in the next 15 years. This will involve anywhere from one to seven wildcat wells being drilled per township. Should a discovery be found in any of these townships, that particular township will experience additional drilling activity.