United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Butte Field Office
106 North Parkmont
Butte, Montana 59701-9701
www.blm.gov/mt

In Reply Refer To:

1600/3100 (MTB070)

July 18, 2014

Dear Reader:

The Bureau of Land Management (BLM) Butte Field Office prepared an Environmental Assessment (EA) in March to review our decisions concerning two lease parcels nominated for lease in March 2014. The EA was available for a 30-day public comment period that ended on June 18, 2014.

Based on our analysis and review of comments received, the EA has been updated (refer to Chapter 5 of the EA for a summary of public comments). A competitive oil and gas lease sale is scheduled to be held on October 21, 2014. It will be my recommendation to post the oil and gas lease parcels, along with stipulations identified in the proposed action from the updated EA on October 21, 2014.

We anticipate finalizing our decision record after the October oil and gas lease sale, but prior to lease issuance. Upon finalization, the decision record and accompanying finding of no significant impact will be posted at the website listed below.

Please refer to the Montana/Dakotas BLM website at www.blm.gov/mt for availability of the updated EA and the Lease Sale Notice. From this home page, go to the heading titled "Frequently Requested," where you will find a number of links to information about our oil and gas program. Current and updated information about our environmental assessments, Lease Sale notices, and corresponding information can be found on the link titled "Oil and Gas Lease Sales." The BLM's decision to offer lands in the October 21, 2014 is subject a 30-day protest period, which begins on July 23, 2014. Information on the Lease Sale Notice and protest procedures can also be found on the oil and gas website link.

If you have any questions, or would like more information about the updated EA or upcoming oil and gas lease sale, please contact us at 406-533-7600.

Sincerely,

Scott Haight

Scott Haight
Field Manager

United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-MT-B070-2014-0029
July 18, 2014

Project Title: *Oil and Gas Lease EA for 2 parcels in the Butte Field Office*

Location: *T. 4 N, R. 7 E Section 12, NE, N2NW, SENW, E2SE, Gallatin County, MT*
T. 5 N, R. 9 E Section 18, SE, Park County, MT

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Oil and Gas Lease EA for 2 parcels in the Butte Field Office

DOI-BLM-MT-B070-2014-0029-EA

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1.0 PURPOSE AND NEED

1.1 Introduction

It is the policy of the Bureau of Land Management (BLM) to make mineral resources available for use and to encourage development of mineral resources to meet national, regional, and local needs. This policy is based in various laws, including the Mineral Leasing Act of 1920 and the Federal Land Policy and Management Act of 1976. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 Sec. 5102(a)(b)(1)(A) directs the BLM to conduct quarterly oil and gas lease sales in each state whenever eligible lands are available for leasing. The Montana State Office conducts mineral estate lease auctions for lands managed by the federal government, whether the surface is managed by the Department of the Interior (BLM or Bureau of Reclamation), United States Forest Service, or other departments and agencies. In some cases, the BLM holds subsurface mineral rights on split estate lands where the surface estate is owned by another party, other than the federal government. Mineral leases can be sold on such lands as well. The Montana State Office has historically conducted five lease sales per year.

Oil and gas companies file Expressions of Interest (EOI) to nominate parcels for leasing by the BLM. From these EOIs, the Montana State Office provides draft parcel lists to the appropriate field offices for review. BLM field offices then review legal descriptions of nominated parcels to determine: if they are in areas open to leasing; if new information has come to light which might change previous analyses conducted during the land use planning process; if there are special resource conditions of which potential bidders should be made aware; and which stipulations should be identified and included as part of a lease. Ultimately, all of the lands in proposed lease sales (including those covered by this EA) are nominated by the oil and gas industry, and therefore represent areas of high interest.

This environmental assessment (EA) has been prepared to disclose and analyze the environmental consequences of leasing 2 parcels located in the Butte Field Office which would be included as part of a competitive oil and gas lease sale scheduled to occur on October 21, 2014.

The Butte Field Office (FO) administrative area is located in mid-western Montana. The Butte FO administers about 307,300 acres of public land surface and 660,819 acres of federal mineral estate in Broadwater, Deer Lodge, Gallatin, Jefferson, Lewis and Clark (southern portion), Silver

Bow, Park, and the northern portion of Beaverhead County. Table 1 identifies BLM-administered acres and total acres within the planning area by county.

Table 1. Lands Within the Butte Planning Area

County	BLM Surface Acres	BLM Mineral Estate	County Acres in Planning Area
Beaverhead	12,660	22,372	31,429
Broadwater	70,679	106,032	792,866
Deer Lodge	5,227	141,648	473,932
Gallatin	7,250	34,656	1,683,558
Jefferson	94,397	124,786	1,061,462
Lewis and Clark	63,510	113,119	895,925
Park	8,365	53,505	1,793,054
Silver Bow	45,221	64,701	460,124
TOTALS	307,309	660,819	7,192,349

1.2 Purpose and Need for the Proposed Action

The purpose of offering parcels for competitive oil and gas leasing is to allow private individuals or companies to explore for and develop oil and gas resources on the BLM-administered lands in mid-western Montana for sale on public markets.

This action is needed to help meet the energy needs of the people of the United States. By conducting lease sales, the BLM provides for the potential increase of energy reserves for the U.S., a steady source of significant income, and at the same time meets the requirement identified in the Energy Policy Act, Sec. 362(2), Federal Oil and Gas Leasing Reform Act of 1987, and the Mineral Leasing Act of 1920, Sec. 17. Oil and gas companies filed Expressions of Interest (EOI) to nominate parcels for leasing by the BLM Montana. The BLM needs to respond to the EOIs by determining whether or not to recommend these lease parcels nominated for competitive oil and gas lease sale and, if so, with any stipulations attached.

The decision to be made is whether to sell oil and gas leases on the parcels in question, and, if so, what stipulations would be identified as required for specific parcels at the time of lease sale. For leased parcels currently under suspension, the decision to be made is whether the conditions under which they have been leased are still valid and in conformance with the land use plan and whether the lease suspensions should be lifted.

1.3 Conformance with Land Use Plan(s)

This EA is tiered to the decisions, information and analysis contained in the Butte RMP (April 2009) and its associated environmental impact statement (EIS). The Butte RMP is the governing land use plan for the Butte FO. A more complete description of activities and impacts related to oil and gas leasing, development, production, etc. can be found in the Butte RMP (USDI BLM 2009: pages 71-74, Appendix H) and in the Proposed Butte RMP/Final EIS (USDI BLM 2008a:

pages 274-276, 330-331, 339, 342-3, 346, 377-8, 388, 407, 410-412, 413, 420-3, 442, 455-8, 503, 504, 509).

The parcels to be offered are within areas open to oil and gas leasing. Site-specific analysis was conducted by Butte Field Office resource specialists who relied on professional knowledge of the areas involved, review of existing databases, and file information to ensure that appropriate stipulations have been attached to specific parcels.

At the time of this review, it is unknown whether a particular parcel will be sold and a lease issued. It is unknown when, where, or if future well sites, roads, and facilities might be proposed. Assessment of projected activities and impacts was based on potential well densities discerned from the reasonably foreseeable development (RFD) scenario developed and documented in conjunction with the Butte RMP. Detailed site-specific analysis of activities associated with any particular parcel would occur when a lease holder submits an application for permit to drill (APD).

The proposed project would not be in conflict with any local, county, or state laws or plans.

Regulations at 43 CFR 1610.5-4 require that resource management plans and supporting components be maintained to reflect minor changes in data and to further refine or document previously approved decisions incorporated in the plan. Plan maintenance does not require formal public or interagency involvement, nor does it require preparation of an environmental assessment or environmental impact statement.

A number of items associated with the Butte RMP require plan maintenance at this time. Under the Butte RMP, the BLM has adopted a number of geographic information system (GIS) coverages created by the Montana Department of Fish, Wildlife and Parks (MFWP) pertaining to specific wildlife species and habitats. Since publication of the approved Butte RMP in 2009, the following base GIS coverages have been updated by MFWP as they pertain to the Butte Field Office: Bighorn Sheep Core Areas, Bighorn Sheep Yearlong Areas, and Big Game Winter/Spring Ranges (Mule Deer, Elk, Antelope and Moose). These updated coverages were used in identifying where pertinent oil and gas leasing stipulations should apply for this project and will be used for BLM management of these habitats until updated further in the future.

Also in the context of plan maintenance, a number of specific oil and gas leasing stipulation decisions in the Butte RMP require clarification of their original intent and areas of applicability. The No Surface Occupancy (NSO) (within ½-mile) stipulations for "90-100 percent pure" Westslope and Yellowstone cutthroat trout populations (pages 215-216 of Butte RMP) also apply to "conservation populations" as per the interagency conservation agreement for management of these species and their habitats to which the BLM is a party. Objective #2 on page 30 of the

Butte RMP indicates that the BLM will manage habitat for Westslope and Yellowstone cutthroat trout (as well as additional species) as per conservation agreements and recovery plans. Therefore this clarification of these stipulations makes the Butte RMP more clearly consistent with this objective in the RMP. An additional clarification needs to be made to the NSO stipulation for "Wetlands, Floodplains, Riparian Areas, and Water Quality" on page 218 of the Butte RMP. While not explicitly stated in the stipulation in the RMP, the reference to "Riparian Areas" needs to be clarified to indicate "Riparian Management Zones" as described on pages 21-22 of the Butte RMP.

1.4 Public Scoping and Identification of Issues

Public scoping for this project was conducted through a 15-day scoping period advertised on the BLM Montana State Office website and posted on the Butte FO website NEPA notification log. Scoping was initiated March 25, 2014. No comments or concerns were identified during the 15-day scoping period.

The BLM focuses its analysis on issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1(b)). Issues have a relationship with the proposed action; are within the scope of analysis; and are amenable to scientific analysis.

The issues carried forward through analysis in this EA are associated with air resources, greenhouse gas emission and climate change, economic resources, socioeconomics, cultural resources, paleontological resources, water resources, recreation and visual resources, wildlife habitat, Special Status and Sensitive Species, vegetation , livestock grazing management, invasive, non-invasive species and noxious weeds.

Issues Considered But Not Analyzed in Detail

The BLM considered other issues, listed below, but decided not to analyze those in further detail. The aspects of the existing environment that the BLM determined to not be present or not potentially impacted by this project include: grizzly bears, Canada Lynx, lands with wilderness characteristics, cave and karst resources, wilderness study areas, livestock grazing, Special Recreation Management Areas, Special Designations, visual resources, and there are no known threatened or endangered plant species in the project area. Thus, the EA contains no further discussion of these issues.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Alternative A - No Action

For environmental assessments (EAs) on externally initiated proposed actions, the No Action alternative generally means that the Proposed Action would not take place. In the case of a lease sale, this would mean that all expressions of interest to lease (parcel nominations) would be denied or rejected. For lease parcels under suspension, parcels would remain under suspension, and would be subject to cancellation.

The No Action alternative would exclude offering 2 lease parcels in the Butte FO from the upcoming lease sale. Surface management would remain the same and ongoing oil and gas development would continue on surrounding federal, private, and state leases.

2.2 Alternative B - Proposed Action

The Proposed Action would be to offer 2 parcels of federal minerals for oil and gas leasing covering 520 acres administered by the Butte FO. The parcels are located in Park, and Gallatin counties (Map 1). Parcel number, acreage (size) and detailed locations and associated proposed stipulations are provided in Appendix A.

Of the approximately 520 acres of federal mineral estate that are considered in this EA, there are no acres of public surface with federal mineral estate; all 520 acres are split-estate (private surface with federal mineral estate). All parcels would be subject to leasing stipulations as per the oil and gas leasing decisions in the Butte RMP that would protect identified resources or resource uses that otherwise might be impacted by the Proposed Action.

All 520 acres in both parcels are split estate. In these instances, the BLM provided courtesy notification to private landowners that their lands would be included in this analysis. In the event of activity on such split estate parcels, the lessee and/or operator would be responsible for adhering to BLM requirements as well as reaching an agreement with the private surface landowners regarding access, surface disturbance, and reclamation.

Standard lease terms, conditions, and operating procedures, as well as additional stipulations as listed in Appendix A would apply to these parcels. Standard operating procedures in oil and gas fields include measures to protect the environment and resources including groundwater, air, wildlife, historical and pre-historical concerns, and others as mentioned in the Butte RMP (Pages 71-74).

Standard operating procedures, best management practices and required conditions of approval and the application of lease stipulations change over time to meet overall RMP objectives. In

some cases new lease stipulations may need to be developed and these types of changes may require an RMP amendment. There is no relief from meeting RMP objectives if local conditions were to become drier and hotter during the life of the RMP. In this situation, management practices might need to be modified to continue meeting overall RMP management objectives. An example of a climate related modification is the imposition of additional conditions of approval to reduce surface disturbance and implement more aggressive dust treatment measures. Both actions reduce fugitive dust, which would otherwise be exacerbated by the increasingly arid conditions that could be associated with climate change.

Oil and gas leases would be issued for a 10-year period and would continue for as long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, ownership of the minerals leased would revert back to the federal government, and the lease could be resold.

Drilling of wells on a lease would not be permitted until the lease owner or operator secures approval of a drilling permit and a surface use plan as specified at 43 CFR 3162.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the affected existing environment (i.e., the physical, biological, social, and economic values and resources) that could be affected by implementation of the alternatives described in Chapter 2. Much more detail on the Affected Environment can be found in Chapter 3 of the Butte Proposed RMP/Final EIS (USDI BLM 2008a) (Butte RMP/FEIS).

3.2 General Setting

3.2.1 Geology

The Butte FO generally occupies an area known as the Montana Overthrust Belt, a complex structural zone where older rocks have been thrust eastward over younger rock units. The area includes lands in both the craton, as well as overthrust blocks to the west of the cratonic terrain. The cratonic rocks are a complex series of Archean (older Precambrian) crystalline metamorphic and igneous rocks. The overthrust rocks to the west include a series of younger Precambrian to Tertiary-aged sedimentary rocks. In some areas, cratonic rocks may also have a veneer of younger Paleozoic sedimentary rocks. During the Larimide Orogeny (60 million years BP), there were numerous episodes of igneous activity. It was this igneous activity associated with the thrusting and faulting that led to the complex geologic settings for this area as well as some of the areas mineral deposits.

The mountains in southwest Montana range in elevation from 4,000 to 11,000 feet. Valley fill reaches depths of several thousands of feet. These mountain and valley systems were predominately formed by large scale north-south striking block faulting and thrusting from the west (moved from above) as well as intrusions of granitic igneous rocks including the Boulder Batholith which occupies much of the area from Butte north to Helena.

Important fault bounded, thrust-faulted and predominantly sedimentary rock mountain ranges of the northern portion of the Rocky Mountain Physiographic Province include, from approximately north to south: the Garnet, Big Belt, Little Belt, Boulder, Tobacco Root, Bridger, Gallatin, Madison, Pioneer, and Beaverhead ranges. The Big and Little Belt Mountains are both broad, flat-crested, anticlinal uplift mountain ranges. The Crazy Mountains consist of sedimentary rocks domed by the emplacement of intrusive stocks and sills (laccolithic mountains). The Elkhorn Mountains are a volcanic range.

Much of Montana was glaciated during the Pleistocene Epoch (2.5 million to 10,000 years ago) as evidenced by the presence of many glacial cirques and sharp rugged erosional remnants of the highest mountain (arêtes and cols).

3.2.2 Soils

The Butte FO is characterized by rugged mountains and broad valleys, with average annual precipitation ranging from 9 inches in the lowlands to about 40 inches in the mountains. Principal soils in the Butte Field Office have developed from three major geologic units--older Precambrian Belt Series sedimentary rocks, Boulder batholith granite and related rocks, and younger Paleozoic sedimentary rocks and Tertiary volcanic rocks. In addition, mountain glaciations helped shape and carve the mountain topography. Eroded bedrock from the mountains was deposited in the adjacent valleys.

Soils in the Tertiary valley-fill can be highly variable in physical and chemical properties due to the inherent variability of the source rock. Soils support native communities of grasslands, shrubs, and forest land, punctuated by wetlands and riparian communities along streams. Generally, soils in the lease parcels are clayey residuum weathered from sandstone and shale.

3.2.3 Water Resources

The Butte FO generally consists of headwaters of the Missouri River (Big Hole River, Jefferson River, Madison River, and Gallatin River) and to a lesser extent, the Yellowstone River and Clark Fork River.

Topography varies from steep rugged mountains of the Madison, Gallatin, Bridger, Crazy, and Absaroka ranges to broad grassy valleys around the towns of Bozeman, Butte, and Helena. Elevations range from 11,200 feet in the Absaroka Range to 3,400 feet along the Missouri River below Holter Lake.

Precipitation patterns are affected primarily by local terrain. Mountain ranges cause rain shadow and other orographic effects, resulting in variations in annual precipitation from 10 to 15 inches in the valleys to 30 to 60 inches in the mountains (Western Regional Climate Center 2004). May and June are the wettest months; however, moisture from mountain snowpack typically sustains the major streams and rivers all year.

3.2.4 Climate

The climate of the region is modified northern Pacific Coast-type with continental components. The Rocky Mountains exert the main influence on climate. Winter days are marked by cold temperatures and cloudy days. Winter Chinook winds blow frequently from 25 to 50 miles per hour and can create warm, windy days east of the Continental Divide, while temperatures remain steadier in the mountain valleys west of the Continental Divide. In the summer, the heat and dry conditions are somewhat modified by mountainous terrain west of the Divide.

3.2.5 Vegetation

Vegetation in the Butte FO is predominantly grasslands, shrublands, and subalpine conifer forests. Grasslands and shrublands occupy valley floors and lower slopes, while subalpine conifer communities are present at higher elevations in mountains. The smaller areas of

transitional vegetation, dry foothills/woodlands, and cool moist conifer forests reflect a relatively steep elevation gradient. This results in relatively narrow zones that support vegetation intermediate in ecological requirements of grassland and shrublands and higher elevation conifer forest. Vegetation on land in the Butte Field Office is grassland (45 percent), shrubland (7 percent), and conifer forests and woodlands (45 percent).

3.2.6 Wildlife

The BLM coordinates with Montana Fish, Wildlife, and Parks (MFWP), and the U.S. Fish and Wildlife Service (FWS) to manage wildlife. While the BLM manages habitat on BLM lands, MFWP is responsible for managing all wildlife species populations. The FWS also manages some wildlife populations but only those federal trust species managed under mandates such as the Endangered Species Act, Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

Wildlife management is factored into project planning at multiple scales and should begin early in the planning process. Evaluating wildlife values at the landscape scale is the first step to understanding potential impacts of a project. Wildlife values, including terrestrial conservation species, richness, and game quality, and aquatic conservation connectivity, conservation species, and game species, have been mapped at the landscape level for Montana by MFWP through their Crucial Areas Planning System (CAPS: http://fwp.mt.gov/gis/Maps/caps/). The oil and gas lease parcels were reviewed in the CAPS GIS (geographic information system) website as an overlay to potential aquatic, terrestrial, and habitat values. This course-scale landscape analysis of wildlife resources provides one tool for understanding the context of the wildlife values at a large scale. Fine-scaled tools, data, and resource information based on inventory and monitoring data, as well as local knowledge from BLM and MFWP employees, are used to further examine resource issues at the site-specific level for the specific resources contained in the lease parcels considered in this EA.

Important wildlife habitats include wetlands and riparian areas, coniferous forests, shrublands, grasslands, snags (standing dead trees), cliffs and rocky outcrops, and caves and abandoned mines. Seasonally important habitats include big game winter ranges, calving and fawning areas, raptor nest sites, bat breeding and hibernation sites, waterfowl nesting areas, greater sage-grouse and sharptail grouse courtship (leks) and nesting areas, wolf denning and rendezvous sites, and grizzly bear habitat. The Butte FO includes lands that are part of an important wildlife linkage area that connects the Yellowstone Ecosystem, the Continental Divide, the Gravelly Mountains, the Tobacco Root Mountains, the Belt Mountains, and the Northern Continental Divide Ecosystem allowing the potential for movement and genetic exchange among geographically dispersed wildlife populations.

Populations and distribution of fish and wildlife in the area have been influenced by past management activities that have altered habitat or caused disturbance, including agricultural

activities (including livestock grazing), mining, timber management, exclusion of fire (colonization by conifers into grasslands and shrublands), recreation, urban and suburban expansion, and highway and road construction.

3.2.7 Cultural Resources

As of 2009 in the Butte FO there are 1,174 historic properties. Of these, 538 are prehistoric sites, 506 are historic sites, eight contain both prehistoric and historic components, and 130 sites on private land were recorded due to the effects of federal projects. In addition, 63 sites have been determined to be eligible for listing on the National Register of Historic Places, and 65 sites have been determined not to be eligible for listing. The Butte FO has two historic properties listed on the National Register: the Crow Creek Ditch-and-Flume System and the McCormick Feed and Livery sign. The Butte FO boundaries host segments of two national trail systems: the Lewis and Clark National Historic Trail and the Continental Divide National Scenic Trail.

Prehistoric sites from each of the cultural periods identified for the Northwestern Plains region have been documented in southwest Montana. The oldest occupations in the planning area come from the Paleo-Indian period, about 12,000 to 8,000 years ago.

Mining-related sites are the most common historic sites in the field office. These sites span the period from the early 1860s to after World War II, and many retain evidence of more recent development. Sites range from individual prospect pits and test trenches to concentrations of adits, shafts, waste-rock dumps, and remains of industrial structures such as mills. Placer mining sites also exist in the field office and are almost universally identified by accumulation of placer tailing (man- or machine-made piles of gravel) along a creek or river.

3.2.8 Social and Economic Conditions

3.18.1 Social and Environmental Justice

Introduction

Certain existing demographic and economic features influence and define the nature of local economic and social activity. Long-held customs, social cohesion, and history of an area provide valuable insight into how events or changes to the area may affect the livelihood and quality of life of the residents. Nominated parcels for leasing in the October 2014 lease sale occur in Gallatin and Park counties, Montana. While linkages exist across various social environments, given the location of the nominated parcels the affected social environment consists of Gallatin and Park counties, Montana.

Affected Environment

Gallatin and Park counties are located in the south-west portion of Montana and are both recreation destination areas. These counties provide entrances into Yellowstone National Park, ski resorts, and access to mountain recreational opportunities.

Gallatin County had an estimated populations in 2012 of 92,614 and Park County was estimated at 15,567 (US Census 2013a). The county seats are Bozeman for Gallatin County and Livingston

for Park County. Their estimated 2012 populations were 38,695 residents (Bozeman) and 7,053 residents (Livingston) (US Census 2013b). Bozeman plays an important role as a commercial, education, and medical services center for this region.

Historically, natural resource use, such as mining, agriculture, and logging, has help shape the social atmosphere of these counties. In terms of agriculture, in 2012 Gallatin County had 1,163 farms with 702,713 acres of land in farms (NASS 2014). Park County had fewer farms (564) but more land in farms (774,057 acres) in 2012 (NASS 2014). Along with the mountains, rivers, and ski resorts, agriculture still remains on the landscape and contributes to the social culture of the area.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" (Executive Order 12989).

Minority populations as defined by Council on Environmental Quality (CEQ) guidance under the National Environmental Policy Act (CEQ 1997) include individuals in the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is identified where "(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater…" (CEQ 1997). Additionally, "[a] minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds" (CEQ 1997). Low-income populations are determined by the U.S. Census Bureau based upon poverty thresholds developed every year.

U.S. Census data is used to determine whether the populations residing in the study area constitute an "environmental justice population" through meeting either of the following criteria:

- At least one-half of the population is of minority or low-income status; or
- The percentage of population that is of minority or low-income status is at least 10 percentage points higher than for the entire State of Montana.

CEQ guidance does not provide specific criteria for determining low-income populations as it does for minority populations so for this planning effort we will use the criteria for minority populations, which are discussed above, as the criteria for low-income populations. We identify low-income and minority population percentages that are "meaningfully greater" as at least 10 percentage points higher than for the entire State of Montana.

Data for the identification of low-income is from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE). The SAIPE program produces yearly single year poverty estimates for states, counties, and school districts and is considered the most accurate for these geographic scales, especially for areas with populations of 65,000 or less. Minority populations

are identified using the U.S. Census Population Estimates program which provides estimates for the resident population by age, sex, race, and Hispanic origin at the national, state and county scales. Estimates from SAIPE and the Population Estimates program are used in federal funding allocations. The analysis was conducted at the county level due to the availability of the most current data.

Table 13 presents percentages of: a) individuals in poverty and b) the population's race and ethnicity for the State of Montana, Gallatin County and Park County. Table 13 indicates that Gallatin and Park counties do not have environmental justice populations since neither of the counties meets the above criteria. Therefore no additional analysis is needed for this EA.

Table 2. Demographics

	Percent of Population (All Ages)								
	In Poverty[1]	Race[2]						Ethnicity[2]	Aggregated Minority[2,3]
		White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Two or more races	Hispanic	
Montana	15.6	89.7	0.6	6.5	0.7	0.1	2.5	3.1	12.8
Gallatin County	13.3	95.5	0.4	1.0	1.3	0.1	1.7	2.9	7.0
Park County	12.9	96.5	0.2	1.1	0.4	0.1	1.7	2.5	5.6

[1]Source: U.S. Census. 2013. 2012 Poverty and Median Household Income Estimates. Small Area Income and Poverty Estimates (SAIPE) Program. Release date: December 2013.
[2]Source: U.S. Census. 2013. Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States, States, and Counties. Population Division. Release date: June 2013.
[3] The term "aggregated minority" refers to that part of the total population which is not classified as Non-Hispanic White Only by the U.S. Census Bureau. By using this definition of aggregated minority, the percentage is inclusive of Hispanics, other minority single race categories and multiple race categories that include a minority race category. This definition is most inclusive of populations that may be considered as a minority population under EO 12898.

3.3 Resource Issues Brought Forward for Analysis

3.3.1 Air Resources

Air quality and climate are the components of air resources, which include applications, activities, and management of the air resource. Therefore, the BLM must consider and analyze the potential effects of BLM-authorized activities on air resources as part of the planning and decision making process.

The Environmental Protection Agency (USEPA) has the primary responsibility for regulating air quality, including seven nationally regulated ambient air pollutants. Regulation of air quality is also delegated to some states. Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology and terrain, and also includes applications of noise, smoke management, and visibility. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years.

Air Quality

Project area air quality is very good. The USEPA air quality index (AQI) is used for reporting daily air quality. It tells how clean or polluted an area's air is and whether associated health effects might be a concern. The AQI focuses on the potential health effects a person may experience within a few hours or days after breathing polluted air. The USEPA calculates the AQI for the five major criteria air pollutants regulated by the Clean Air Act (CAA): ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, USEPA has established national air quality standards to protect public health. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level USEPA has set to protect public health. The following terms help interpret the AQI information:

- **Good** - The AQI value is between 0 and 50. Air quality is considered satisfactory and air pollution poses little or no risk.
- **Moderate** - The AQI is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- **Unhealthy for Sensitive Groups** - When AQI values are between 101 and 150, members of "sensitive groups" may experience health effects. These groups are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- **Unhealthy** – The AQI is between 151 and 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.

- **Very Unhealthy** – The AQI is between 201 and 300. This index level would trigger a health alert signifying that everyone may experience more serious health effects.

AQI data show that there is little risk to the general public from air quality in the analysis area (Table 3). Based on available 2010–2012 data for Gallatin County, 79 percent of the days were rated "good" and the three-year median daily AQI was 29. All portions of Gallatin and Park counties attain the NAAQS.

Table 3. USEPA Air Data Air Quality Index Report (2010–2012)

County	# Days in Period	# Days Rated Good or No Data	Percent of Days Rated Good or No Data	# Days Rated Moderate	# Days Rated Unhealthy for Sensitive Groups	# Days Rated Unhealthy	# Days Rated Very Unhealthy
Gallatin	1,096	866	79%	210	0	0	0

Source: USEPA 2013b.

Although ozone concentrations above the NAAQS have been monitored in some rural areas in other states with oil and gas activity, moderate ozone concentrations have been monitored in Montana throughout oil and gas areas. Based on 2010-2012 data from monitors located near eastern Montana (Birney, Broadus, and Sidney), ozone concentrations are approximately 75 percent of the ozone NAAQS (MDEQ 2013).

Hazardous air pollutants (HAPs) would also be emitted from oil and gas operations, including well drilling, well completion, and gas and oil production. Recent air quality modeling performed for the Billings Field Office indicates that concentrations of benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene would be no more than11 percent of applicable health-based standards and that the additional risk of cancer would be less than 0.25 in one million (BLM 2013).

Air resources also include visibility, which can be degraded by regional haze due in part to sulfur, nitrogen, and particulate emissions. Based on trends identified during 2005-2009, visibility has visibility has improved at the nearest Interagency Monitoring of Protected Visual Environments (IMPROVE) monitors located in and near Yellowstone National Park on the clearest and haziest days, as shown in Figure A.

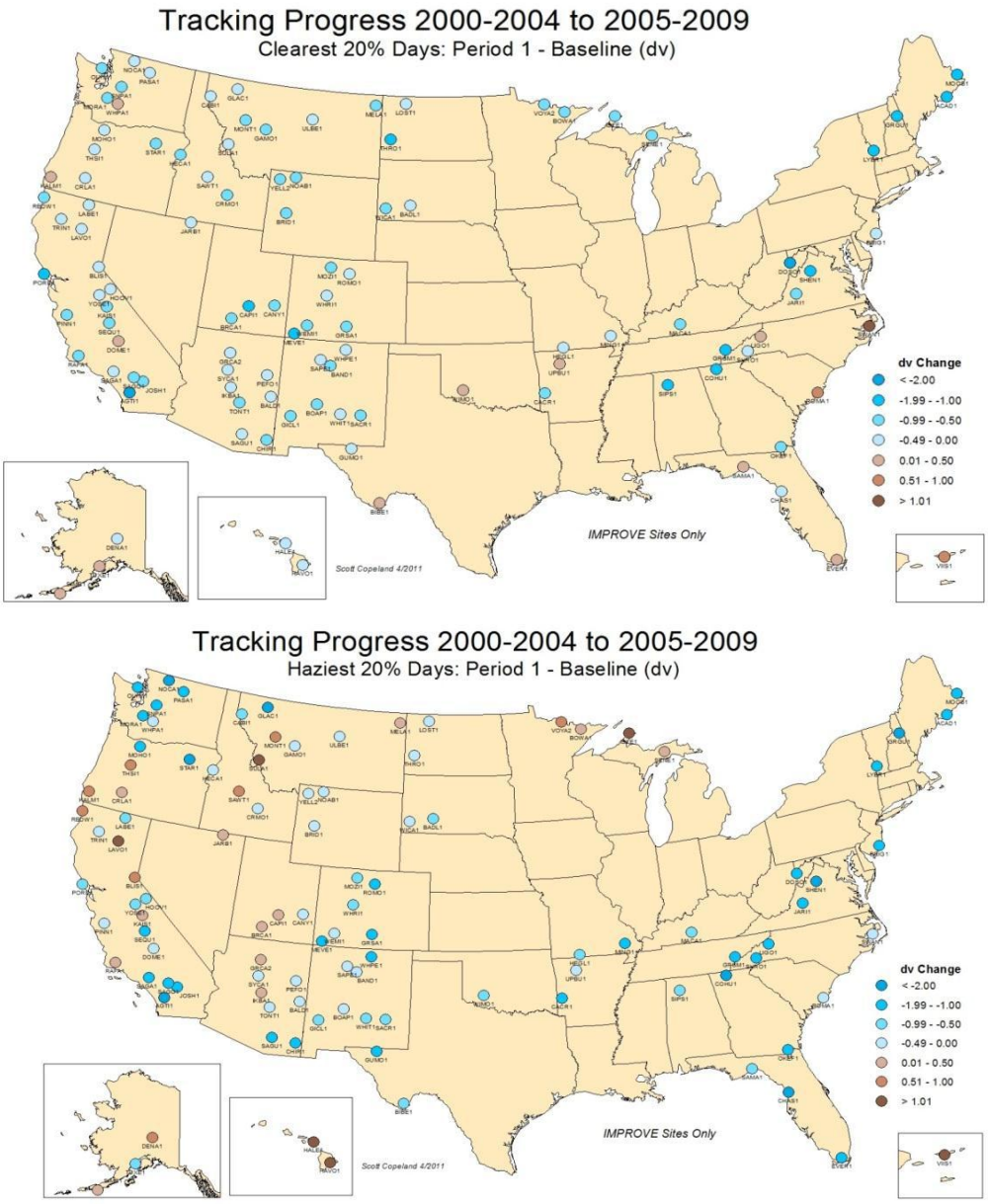


Figure A. Trends in haze index (deciview) on haziest and clearest days, 2005-2009. Source: IMPROVE 2011.

The Butte FO contains one Class 1 Area, the Gates of the Mountains Wilderness, and is close or adjacent to several other Class 1areas, including Yellowstone National Park, the Anaconda-Pintler Wilderness, the Bob Marshall Wilderness, the Scapegoat Wilderness, Absaroka-Beartooth Wilderness, and the Red Rock Lakes Wilderness Area. Distances from the lease sale parcels to Class I areas are greater than 40 miles.

3.3.1.1 Climate Change

Climate change is defined by the Intergovernmental Panel on Climate Change (IPCC) as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes

in the mean and/or the variability of its properties, and persist for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use." (IPCC 2013). Climate change and climate science are discussed in detail in the Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota, Bureau of Land Management (BLM 2010). This document is incorporated by reference into this EA.

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased." (IPCC 2013). The global average surface temperature has increased approximately 1.54°F from 1880 to 2012 (IPCC 2013).

In south-central Montana, surface air temperatures over the past 114 years have increased by an average of 0.16°F annually (NOAA 2014). Quarterly temperature increases over this period are shown in Figure B. Average temperature increases were 0.42°F for January-March, 0.02°F for April-June, 0.19°F for July-September, and 0.03°F for October-December.

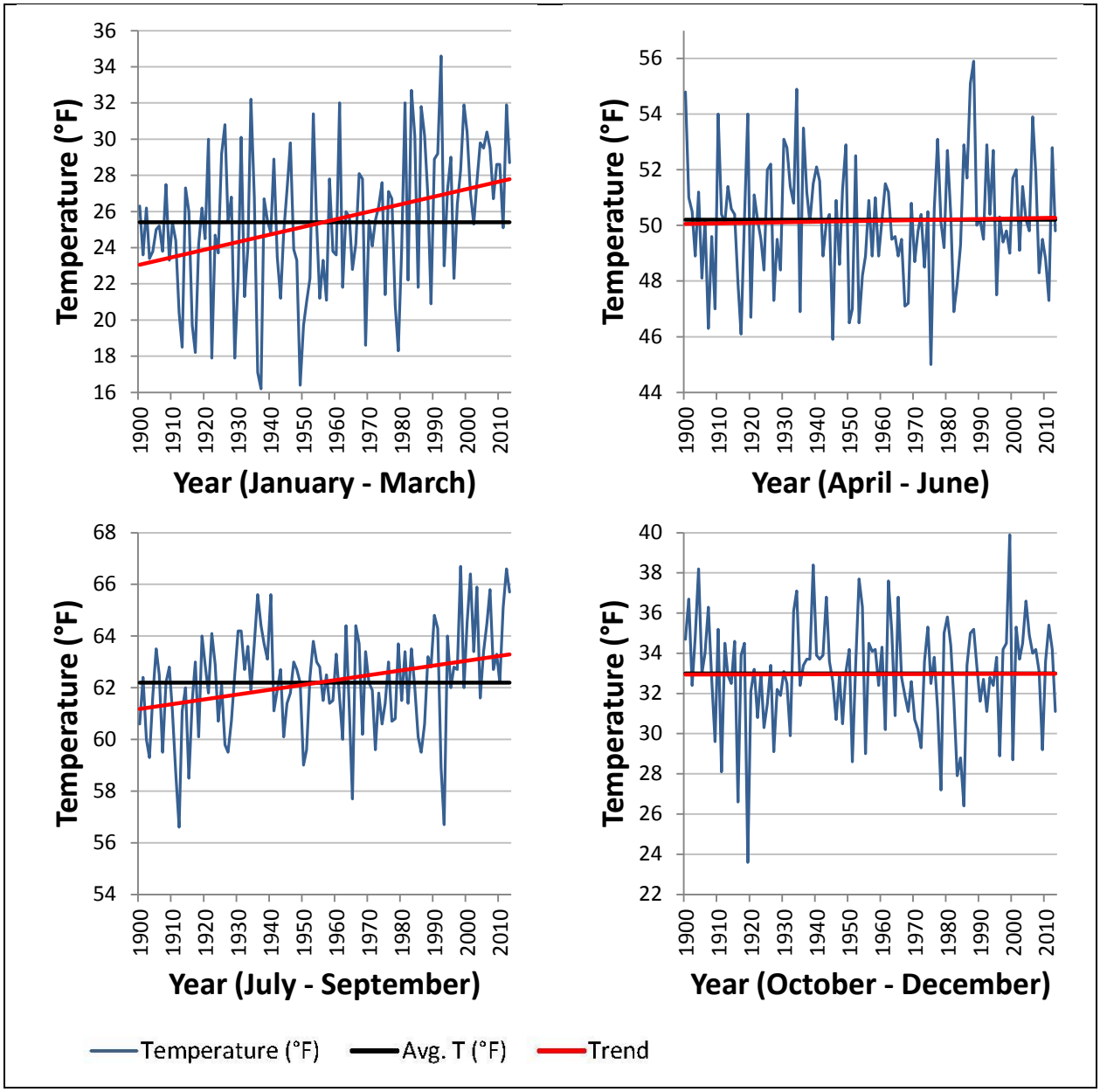


Figure B. South-central Montana temperature changes, 1900-2013.
Source: Adapted from NOAA 2014.

Long-term precipitation changes have also been observed globally and in south-central Montana. Total precipitation and shifts in precipitation timing and intensity have been observed. Within south-central Montana, annual precipitation has changed at an annual rate of 0.08 inches per decade from 1900-2013. Figure C illustrates quarterly precipitation changes. Precipitation has increased during the second and fourth calendar quarters, while decreasing in the first and third quarters.

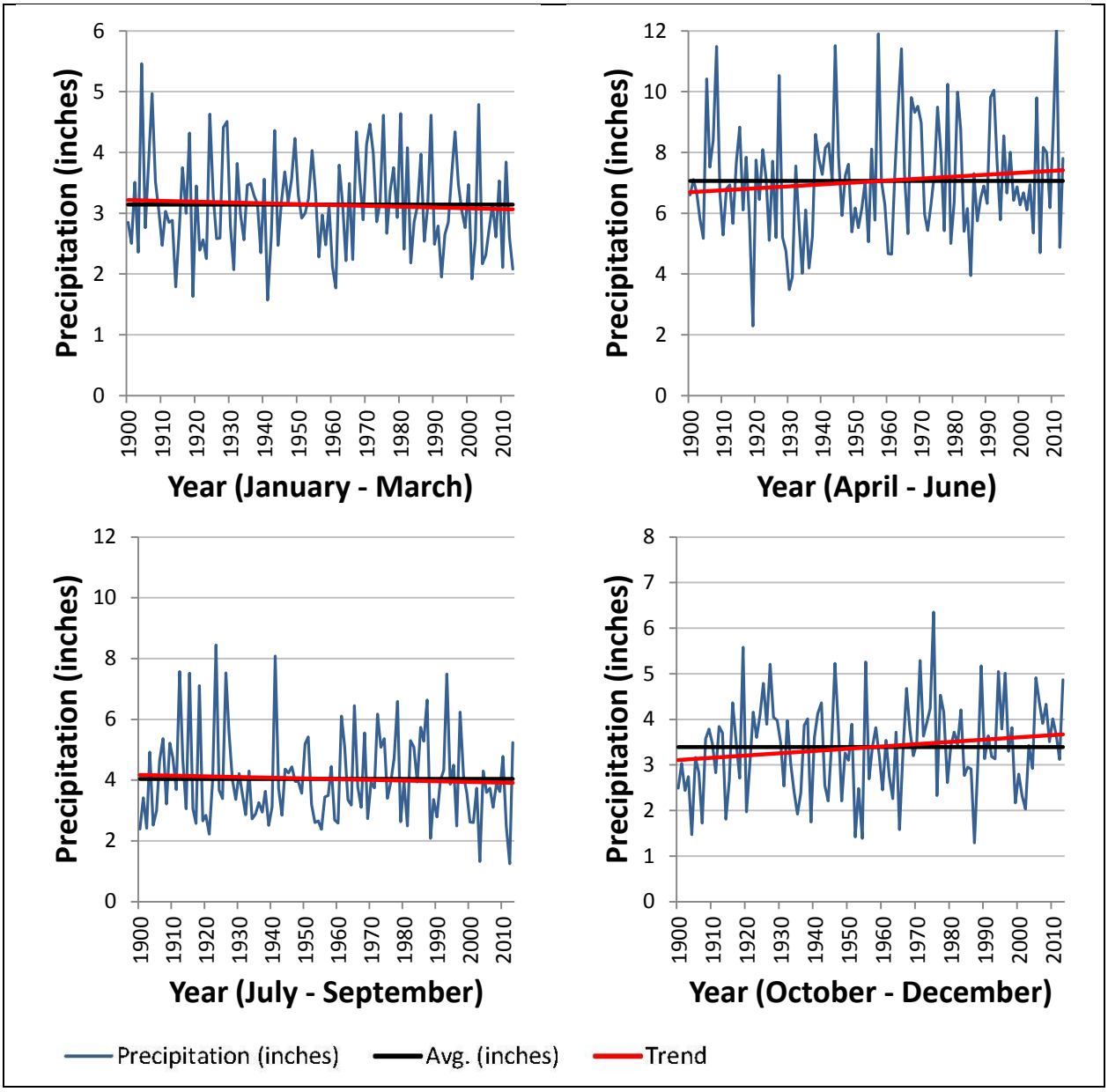


Figure C. South-central Montana precipitation changes, 1900-2013
Source: Adapted from NOAA 2014.

As summarized in the Climate Change SIR (BLM 2010), earth has a natural greenhouse effect wherein naturally occurring gases such as water vapor, CO_2, methane, and N_2O absorb and retain heat. Without the natural greenhouse effect, earth would be approximately 60°F cooler (USGCRP 2009). Current ongoing global climate change is linked to the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Each GHG has a global warming potential that accounts for the intensity of each GHG's heat trapping effect and its longevity in the atmosphere (BLM 2010). The buildup of GHGs such as CO_2, methane, N_2O, and halocarbons since the start of the industrial revolution has substantially increased atmospheric concentrations of these compounds compared to background levels. At such elevated concentrations, these compounds absorb more energy from the earth's surface and re-

emit a larger portion of the earth's heat back to the earth rather than allowing the heat to escape into space than would be the case under more natural conditions of background GHG concentrations.

A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development and production, large wildfires, combustion of fossil fuels, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo). GHGs have a sustained climatic impact over different temporal scales due to their differences in global warming potential (described above) and lifespans in the atmosphere. For example, CO_2 may last 50 to 200 years in the atmosphere while the estimated atmospheric lifetime of methane is 12 years (BLM 2010).

With regard to statewide GHG emissions, Montana ranks in the lowest decile when compared to all the states (Ramseur 2007). The estimate of Montana's 2005 GHG emissions of 37 million metric tons (MMt) of gross consumption-based carbon dioxide equivalent (CO_2e) account for approximately 0.6 percent of the U.S. GHG emissions (CCS 2007).

Some information and projections of regional impacts is becoming increasingly available. Chapter 3 of the Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota (BLM 2010) describes impacts of climate change in detail at various scales. The following bullets summarize potential changes that are expected to occur at the regional scale. The U.S. Global Climate Research Program (USGCRP) identifies the Butte FO as part of the Northwest and Great Plains regions (USGCRP 2009).

The region is expected to experience warmer temperatures with less snowfall.

- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow would be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs would be drier.
- More frequent, more severe, and possibly longer-lasting droughts are expected to occur.
- Crop and livestock production patters could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions would reduce the range and health of ponderosa and lodgepole pine forests, and increase the susceptibility to fire. Grasslands and rangelands could expand into previously forested areas.
- Ecosystems would be stressed and wildlife such as the mountain line, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

Other impacts could include:

- Increased particulate matter in the air as drier, less vegetated soils experience wind erosion.
- Shifts in vegetative communities which could threaten plant and wildlife species.
- Changes in the timing and quantity of snowmelt which could affect both aquatic species and agricultural needs.

Projected and documented broad-scale changes within ecosystems of the U.S. are summarized in the Climate Change SIR (BLM 2010). Some key aspects include:

- Large-scale shifts have already occurred in the ranges of species and the timing of the seasons and animal migrations. These shifts are likely to continue (USGCRP 2009). Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to 2 weeks earlier through much of the U.S. compared to 20 years ago. Multiple bird species now migrate north earlier in the year.
- Fires, insect epidemics, disease pathogens, and invasive weed species have increased and these trends are likely to continue. Changes in timing of precipitation and earlier runoff increase fire risks.
- Insect epidemics and the amount of damage that they may inflict have also been on the rise. The combination of higher temperatures and dry conditions have increases insect populations such as pine beetles, which have killed trees on millions of acres in western U.S. and Canada. Warmer winters allow beetles to survive the cold season, which would normally limit populations; while concurrently, drought weakens trees, making them more susceptible to mortality due to insect attack.

More specific to Montana, additional projected changes associated with climate change described in Section 3.0 of the Climate Change SIR (BLM 2010) include:

- Temperature increases in Montana are predicted to be between 3 to 5°F at mid-21st century. As the mean temperature rises, more heat waves are predicted to occur. In the late 21st century, the number of days per year with temperatures above 100°F is predicted to be between 10 and 45, depending on the level of GHG emissions, with the largest increase in the number days over 100°F occurring in the eastern portion of the state.
- Precipitation increases in winter and spring in Montana may be up to 25 percent in some areas. Precipitation decreases of up to 20 percent may occur during summer, with potential increases or decreases in the fall. In the fall western Montana may see little change in precipitation while the northwestern portion of the state may experience 5 to 10 percent increases.
- For most of Montana, annual median runoff is expected to decrease between 2 and 5 percent, but northwestern Montana may see little change in annual runoff. Mountain snowpack is expected to decline, reducing water availability in localities supplied by melt water.
- Glaciers are already known to be melting, and all glaciers in Glacier National Park are expected to be completely melted by 2030 or sooner.

- Wind power production potential is predicted to decline in Montana based on modeling focused on the Great Falls area.
- Conditions in Montana wetlands across much of the northern part of the state are predicted to remain relatively stable, although some wetland habitat near Cutbank is predicted to degrade to less favorable conditions.
- Water temperatures are expected to increase in lakes, reservoirs, rivers, and streams. Fish populations are expected to decline due to warmer temperatures, which could also lead to more fishing closures.
- Wildland fire risk is predicted to continue to increase due to climate change effects on temperature, precipitation, and wind. One study predicted an increase in median annual area burned by wildland fires in Montana based on a 1°C global average temperature increase to be 241 to 515 percent.

3.3.2 Soil Resources

The lease area includes many soil types and thirteen complexes. These include several that are sensitive and that could be adversely impacted by oil and gas-related activities. This includes those that have high erosion ratings, those with steep slopes, and those with limitations related to construction activities and reclamation.

Because the area of disturbance related to exploration and drilling may be smaller than the lease parcels, in-depth review of proposed activities should be reviewed in subsequent applications for permitting. Thirteen soil Map units are found within the lease parcels. They are generally characterized as a mix of alluvium, residuum, and colluviums from shale and sandstone parent materials. A range of soil physical and chemical soil properties is evident. Generally, soils in the analyzed area are loamy to stony.

Two primary limiting factors affecting development are present: 1) erosive soils; 2) Prime Farmland. Erosive soils are defined as those exceeding 30 percent slope on non-Boulder Batholith soils. 394 acres of soils with moderate to severe erosion ratings warrant concern for surface disturbance associated with oil and gas activities on the west parcel. Slopes are below 30% on the north parcel, so generally present a low erosion risk. Acreage was derived from published soil survey data. Soils were inventoried at a 1:24,000 or 1:12,000 scale; therefore, actual acreage will vary and must be assessed on a site-specific basis for plans of development.

Table 4. Soil Erosion Rating and Acreage

Soil Type	Rating	Landowner	Acres
Non-batholith	Moderate and Severe	BLM	8278
Non-batholith	Moderate and Severe	Private	9397
Non-batholith	Moderate and	State	392

	Severe		
Non-batholith	Slight and unrated	BLM	379
Non-batholith	Slight and unrated	Private	754
Non-batholith	Slight and unrated	State	85

Prime Farmland is a category of land protected from development under the Food Security Act of 1985. Combinations of soil physical and chemical properties that characterize soil important for production of crops, range, and forest land, independent of land use except for urban land, are grouped into categories considered to be Prime Farmland. Categories include Prime and Unique Farmlands, Farmlands of Statewide Importance, and Locally Important Farmland. Soil properties that define these categories are set respectively at a national, state, and local level. A total of 101 acres of Farmland of Local Importance are found within the lease parcels, and presented in Table 5.

Table 5. Prime Farmland

Landowner	Acres
BLM	0
Private	101
State	0

3.3.3 Water Resources

3.3.3.1 Hydrology – Surface Water Quality

The lease parcels cumulatively include approximately 1 mile of a perennial stream. Cottonwood creek has not been identified as impaired by the Montana Department of Environmental Quality. More detailed site-specific inventory and analyses may be required if development in floodplains is proposed.

3.3.3.2 Hydrology – Ground Water

Neither of these parcels is likely to host important ground water resources. There is no information on either parcel as there are no groundwater wells in the near proximity. More detailed site-specific inventory and analyses may be required if development is proposed.

3.3.4 Vegetation Resources

Existing influences on local distribution of plant communities include soils, topography, surface disturbance, availability of water, and management boundary fence lines. Human activities have affected vegetation communities for over a century. Some of these activities include infrastructure developments (roads, power lines, pipelines, etc.), chemical applications, logging, livestock grazing, farming, and wildfire rehabilitation, prevention, manipulation, and suppression.

3.3.4.1 Vegetation Communities

Rough Fescue-Bluebunch-Wheatgrass, and Ponderosa Pine mixed Grassland are vegetation communities that are found in the Butte Field Office but may not occur on the two lease parcels.

Sagebrush Grassland
Sagebrush grasslands (Mueggler and Stewart 1980) are common in Gallatin, and Park counties. Dominant sagebrush subspecies that may occur within this habitat type include Wyoming big sagebrush, mountain big sagebrush, and basin big sagebrush. Dominant grass species include bluebunch wheatgrass, Idaho fescue, needle-and-thread grass, green needle grass, Sandberg's bluegrass, and prairie junegrass. Varieties of forbs are common in sagebrush habitat types and may include western yarrow, rose pussytoes, and Hood's phlox.

Idaho Fescue-Bluebunch Wheatgrass Grassland
The Idaho fescue-bluebunch wheatgrass grassland habitat type (Mueggler and Stewart 1980) represents a much smaller portion of grassland habitat types in the analyzed area. Dominant species in addition to Idaho fescue and bluebunch wheatgrass include prairie junegrass, Sandberg's bluegrass, western yarrow, rose pussytoes, and Hood's phlox. Shrubs occur at a very low percentage and may include green rabbitbrush and big sagebrush.

Douglas Fir-mixed Grassland
The Douglas Fir-mixed grassland community generally occurs on moderate-to-steep cooler upland north slopes. Grassland types may include rough fescue, bluebunch wheatgrass, western wheatgrass, and prairie junegrass, with forbs comprising about 41 percent of cover and 50 percent of herbaceous production.

Wetland-Riparian
Riparian-wetland areas are among the most productive and important ecosystems, comprising approximately one percent of the public lands. Characteristically, riparian-wetland areas display a greater diversity of plant, fish, wildlife, and other animal species and vegetative structure than adjoining ecosystems. Some of the more common vegetative species that occur in riparian-wetland areas in the project area include bluejoint, redtop, sedges (*Carex spp.*), rushes (*Juncus spp.*), and several different species of willows, alder, chokecherry, and narrow leaf cottonwood. Healthy riparian systems filter and purify water as it moves through the riparian-wetland zone, reduce sediment loads and enhance soil stability, provide micro-climate moderation when contrasted to temperature extremes in adjacent areas, and contribute to ground water recharge and base flow. Approximately 1 mile of stream reach occurs within one of the lease parcels. Precipitation-dependent wetland sites fluctuate annually, in a range from dry to wet, in direct response to seasonal moisture, temperature, and wind.

Invasive, Non-Native Species, Noxious Weeds
Competition from invasive, non-native plants constitutes a potential threat to native plant species and wildlife habitat within the project area. Several invasive, non-native plant species occupy the project area including: cheatgrass, spotted knapweed, diffuse knapweed, Russian knapweed, houndstongue, Canada thistle, musk thistle, black henbane, whitetop, leafy spurge, and hoary

alyssum. All of these species are aggressive invasive species that out-compete desirable vegetation for water and soil nutrients. These species may also reduce cattle grazing performance, wildlife habitat quality, and native species diversity. Cheatgrass is an invasive species well-known for completely replacing native vegetation and changing fire regimes. Noxious weed control is the responsibility of the surface management agency in cooperation with the local weed control board. Chemical and biological control methods are utilized, with chemical control being the more predominant.

3.3.5 Wildlife

3.3.5.1 Special Status Animal Species

3.3.5.1.1 Federally Listed or Candidate Species

The two parcels comprise a total of 520 from acres in Appendix A in northern Gallatin and Park Counties. Canada lynx and grizzly bear are listed Threatened in Gallatin and Park Counties. The greater sage-grouse is a Candidate species in Gallatin and Park Counties (USDI 2010). Candidate species receive no special protection under the Endangered Species Act, but are treated by BLM as Bureau Sensitive Species.

General habitat, as opposed to priority habitat for greater sage-grouse does cover both of the BFO parcels. Data provided by MT MFWP indicates that three known leks are in close proximity (within four miles) of listed parcels. Research focused on coal-bed natural gas development has indicated that maintaining stands of sagebrush of approximately four miles around leks is necessary for sage-grouse breeding populations to persist (Walker 2007).

3.3.5.1.2 Sensitive Species

Species designated Sensitive by Montana BLM with the potential to occur in or near the lease parcel areas in the analysis area are listed below.

Mammals: gray wolf, fringed myotis, long-eared myotis, long-legged myotis, Townsend's big-eared bat.

Birds (migrants only not listed): bald eagle, black-backed woodpecker, bobolink, Brewer's sparrow, ferruginous hawk, golden eagle, greater sage-grouse, long-billed curlew, McCown's longspur, mountain plover, northern goshawk, peregrine falcon, sage sparrow, sage thrasher, Sprague's pipit, Swainson's hawk, three-toed woodpecker, white-faced ibis, yellow-billed cuckoo.

Reptiles: greater short-horned lizard, milk snake.

Amphibians: northern leopard frog, plains spadefoot toad, western toad.

Fish: Yellowstone cutthroat trout.

Special status animal species with stipulations specifically for them include greater sage-grouse, bald eagle, golden eagle, Swainson's hawk, peregrine falcon, ferruginous hawk, westslope cutthroat trout, and Yellowstone cutthroat trout. Areas covered by stipulations for these species would encompass habitat used by other special status and non-status species.

3.3.5.2 Big Game Species

Big game common in or near the analysis area includes elk and mule deer yearlong and pronghorn antelope and white-tailed deer in the summer. Both of the parcels are considered to be in winter range for elk or mule deer. Both parcels are within black bear and mountain lion range. As Montana Fish Wildlife and Parks determines winter range area and population goals for Big Game Species, the BLM coordinates with Montana Fish Wildlife and Parks for potential effects of Oil and Gas development on Big Game Species at the APD stage.

3.3.5.3 Migratory Birds

Migratory birds can be classified as canopy nesters, shrub nesters, and cavity nesters. The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC. 703-711) states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg or product, manufactured or not. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (2001), addresses the need to "minimize . . . adverse impacts." This order also requires that each agency shall "restore and enhance habitat for migratory birds."

Specific surveys for neotropical birds were not done in the lease parcels. However, based on the habitats found in the parcels, it is reasonable to expect the following birds to occur (this does not include BLM sensitive bird species): Lewis's woodpecker, western flycatcher, dusky flycatcher, Hammond's flycatcher, willow flycatcher, black-headed grosbeak, common nighthawk, killdeer, ruby-crowned kinglet, red-naped sapsucker, warbling vireo, Cassin's vireo, western tanager, mountain bluebird, western bluebird, Swainson's thrush, hermit thrush, spotted towhee, white-throated swift, yellow warbler, yellow-rumped warbler, orange-crowed warbler, pine siskin, dark-eyed junco, tree swallow, violet green swallow, lazuli bunting, Bullock's oriole, grey catbird, western kingbird, vesper sparrow, lark sparrow, chipping sparrow, savannah sparrow, and white-crowned sparrow.

3.3.5.4 Priority Linkage Areas

Potter Basin Priority Linkage Area

The Potter Basin linkage is rated as intermediate priority and provides connectivity for local ungulate movement east-west across Highway 89 into the foothills and higher elevations of the Crazy Mountains. Vegetation is open sagebrush grassland with a few scattered small patches of Douglas fir, Rocky Mountain juniper, and limber pine.

3.3.5.5 Gallatin and Park County

Birds most commonly found along breeding bird survey (BBS) routes near the analysis area include western meadowlark, European starling, horned lark, vesper sparrow, red-winged blackbird, Brewer's blackbird, mourning dove, American robin, cliff swallow, black-billed magpie, and pine siskin. Birds more rarely found along the routes include loggerhead shrike, yellow-crowned warbler, merlin, dark-eyed junco, greater sage-grouse, red-breasted nuthatch (Sauer et al 2008). Habitat along the BBS routes is similar to the proposed lease parcels--primarily grassland, shrubland, agricultural land, evergreen forest, and riparian stringers in descending order.

Cottonwood Creek runs through parcel MTM-105431-E7. This creek is known to be inhabited by Yellowstone cutthroat trout. Other fish species present include lake chub, longnose dace, white sucker, and longnose sucker (http://fwp.mt.gov/fishing/mFish accessed 3/31/2014).

Other wildlife that can be found in or near the analysis area include typical species of the region: small mammals, coyotes, foxes, skunks, badgers, snakes, arachnids, and insects.

3.3.5.6 Climate Change Effects on Wildlife

It is widely accepted by the scientific community that the earth, which has always experienced climate variation, is now undergoing a period of rapid climate change that is enhanced by anthropogenic atmospheric carbon enrichment during the past 100 years (Inkley et al. 2004). These climatic changes are accelerating and projections for the next 100 years indicate extensive warming, changing patterns of precipitation, changes in season lengths, decreasing range of nighttime versus daytime temperatures, declining snowpack, and increasing frequency and intensity of severe weather events. The many components of climate change, and especially the unprecedented rapid rate of change, are just as important as increasing temperatures.

Wildlife species are closely adapted to their environments and readily respond to climate variation. However, the climate change now underway has extensive potential to affect wildlife throughout Montana, either directly or indirectly through responses to changing habitat conditions. When considered in combination with other factors (e.g., pollution, ozone depletion, urbanization, etc.), the potential effect is even greater (Inkley et al. 2004).

Animals are showing many different types of changes related to climate. These changes include changes in ranges; abundances; phenology (timing of an event such as breeding); morphology and physiology; and community composition, biotic interactions and behavior. Although specific studies have not been completed in southwest Montana, changes are being seen in all different types of taxa, from insects to mammals, in North American as well as on many other continents (Root and Schneider 2002).

Changes in climate can influence the timing and length of seasons, which in turn can have a direct effect on plants and animals. Root and Schneider (2002) summarize evidence from 45

studies that indicate significant changes in the timing of life-cycle events for a wide range of plant and animal species in response to 20th-century climate change. These changes included trees coming into leaf sooner, grasses and forbs flowering earlier, the abundance of many insects peaking earlier, and some birds and butterflies migrating earlier. Most (80%) of the changes appeared to be linked with species' physiological tolerances.

The overall ranges of many bird species are now thought to be as much influenced directly by climate as by availability of particular habitats (Inkley et al. 2004). An example is the case of the American robin, which was found to arrive at a high-elevation site in Colorado 14 days earlier on average than they did in 1981 and for which the interval between arrival time and time at which bare ground was first observed had grown by 18 days (Inouye et al. 2000). Climate change was suspected in causing warmer winter temperatures and earlier snowmelt allowing robins to migrating from lower elevations to higher elevations earlier in the spring (Inouye et al. 2000).

An example of a shift in range can be seen with the northern expansion of the porcupine in central Canada. This extension of the porcupine's range has been associated with a warming-associated poleward shift in the location of the tree line (Root and Schneider 2002).

Although climate change is widely accepted by the scientific community and contributing to changes in wildlife behavior, range and associated habitats, the responses to climate change of biological communities, such as sagebrush, grasslands, riparian and forests, and the wildlife they support, are uncertain because many causal factors are involved and much information on specific causal relationships is missing or imperfect (ISAB 2007). Although the expected changes in climate and the direct responses of some species to them can be predicted, there is considerable uncertainty of the final resulting communities as well as species distribution and numbers under unprecedented climatic and landscape conditions, and under unprecedented rates of change.

3.3.6 Cultural Resources

Issues regarding public land include the presence of prehistoric Native American sites, historic sites, and traditional cultural properties (TCP). These resources may be identified at several stages: during the leasing process, during consultation with tribal governments, during development of the lease parcel – both prior to construction, as well as inadvertently during construction.

A file search conducted by the Butte FO archeologist has yielded no archeological reports for the proposed action lease parcels. If development were to occur a cultural analysis would need to be completed before and ground disturbing activities take place. **1 Unresolved indicates a determination of eligibility or significance has not been made.**

3.3.7 Paleontology

The geology of the Butte Field Office area is complex, with many rock types and ages complexly mingled. Paleontological resources are present in various rock units exposed. Some of the fossiliferous formations include the Kootenai, Two Medicine, Horsethief Sandstone, Lance, Fort Union, Renova, and Madison Valley formations to name just a few. The parcels nominated in this lease sale contain exposures the Lower Cretaceous Thermopolis, and the Upper Cretaceous Frontier and Sedan Formations. All of these units have produced paleontological resources in other areas.

The BLM utilizes the Potential Fossil Yield Classification System (PFYC) (IM 2008-009) as a predictive model for identifying exposures likely to produce significant paleontological resources. The PFYC is a ranking of formations from 1 (very low potential) to 5 (very high potential) based upon the unit's lithology and its history of producing significant paleontological finds. This model is just predictive, as there is a potential to find significant fossils almost anywhere, regardless of a rock unit's PFYC rank. Therefore, no rock unit has zero potential to produce significant paleontology resources and so at a minimum we apply LN 14-3 to all units, which simply says it is the responsibility of a developer to be aware of the potential to find fossils or any other objects of scientific interest, and to bring those discoveries to the attention of the Surface Management Agency immediately.
Parcels that include higher ranked PFYC rock units (3-5) are given LN 14-12 which indicates that the parcels need further assessment for their paleontological resources. Such assessment may include a pre-disturbance survey, onsite monitoring during ground disturbing activities, and an unanticipated discovery plan for paleontological resources. These issues are determined at the time of lease development.

Both of the lease parcels are assigned LN 14-12 based upon their PFYC rank.

3.3.8 Native American Religious Concerns

The National Register of Historic Places defines a "traditional cultural property" as "… one that is eligible for inclusion the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community." (National Register Bulletin #38; Guidelines for Evaluating and Documenting Traditional Cultural Properties; pg. 2) Issues regarding cultural resources on public land include the presence of prehistoric Native American sites; traditional cultural properties (TCP); historic ranching, homesteading and perhaps some mining sites. A file search conducted in April, 2014 at the Butte Field Office revealed that no data exists for the areas under consideration. Site files, manuscript files, flat files and map files were inspected with negative results. Consultation with tribal governments and Class III inventory prior to any ground disturbance may indicate that cultural resources may be present on lease parcels.

3.3.9 Lands and Realty

The lands proposed for competitive leasing of the federal mineral estate are private lands overlying either federal minerals or federal oil and gas. There are a total of 2 split estate parcels totaling 520 acres. For split estate parcels, the United States owns the minerals in the land as well as any surface entry rights. Unless access to a BLM parcel is available using existing legal access, it is the responsibility of the lease holder/operator to determine appropriate access routes and make arrangements with the respective surface owners. Any access to private parcels will require arrangements with the respective surface owners. The issuance of a federal oil and gas lease does not guarantee access across adjacent private lands to access the federal oil and gas lease. It is the responsibility of the lease holder/operator to determine if legal access can be arranged through private lands.

3.3.10 Forest Products

The 2 parcels are comprised of approximately 520 total acres. Of these, only 44 percent, or about 229 acres, is comprised of open savannah woodlands. There are no true forest habitats on these parcels. Parcel MTM-105431-E7 is located in Gallatin County and is approximately 360 acres. Parcel MTM-105431-HP is located in Park County and is 160 acres; this parcel has no trees or woodland habitat.

These parcels lie within the South - Central Montana Forest region as described by Arno (1976). The South – Central forest region includes the Gallatin and upper Yellowstone River drainages and encompasses the northern part of an extensive, high-elevation forested upland surrounding Yellowstone National Park. Most of the forests in the region are dominated by Douglas-fir, lodgepole pine, spruce, and fir. Nearly half of the land here supports forests and most of the remaining area is potentially grassland – occupying the lower elevation valleys. Lower timberline averages about 5000 feet and alpine is located at about 9500 feet.

South-central Montana has a continental climate, and red belt injury is often severe at lower timberline. The valleys have high base elevations and are too cold for any significant amounts of Ponderosa pine. Average annual precipitation in the subalpine forests is generally 30 to 45 inches.

Elevation on the Gallatin County parcel range from 5800 feet to 6600 feet. Savannahs – open grown woodlands characterized by 25% or less tree canopy cover – are found on approximately 229 acres. Given the lower elevation these are likely comprised of Limber pine and Douglas – fir trees. (Arno 1979, Ross & Hunter 1976).

The limber pine habitat types commonly are associated with bunchgrass or juniper in the understory (Pfister 1977). Limber pine is more likely on the warmer sites. Douglas fir habitat types in the setting are also commonly associated with bunchgrasses. Bunchgrasses such as bluebunch wheatgrass (*Pseudotsuga/Agropyron spicatum*), Idaho fescue (*Pseudotsuga/Festuca idhaoensis*), and rough fescue (*Pseudotsuga /Festuca scabrella)* are examples of those found in the understories of the driest Douglas fir types such as these.

Timber productivity ranges from low to moderate in these Douglas fir savannahs. The lowest mean square feet of basal area per acre are found on the warmest driest sites such as PSME/AGSP (Pseudotsuga menziesii/Agropyron spicatum h.t.) (e.g., 133 ft^2 +/- 38).

3.3.11 Minerals

3.3.11.1 Fluid Minerals

It is the policy of the BLM to make mineral resources available for disposal and to encourage development of these resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable prices. At the same time, the BLM strives to assure that mineral development occurs in a manner which minimizes environmental damage and provides for the reclamation of the lands affected.

3.3.11.1.1 Federal Oil and Gas Lease Information and Federal, State and Private Oil and Gas Development Activity within the External Boundaries of the Field Office

Currently there are 121,650 federal mineral acres that are leased for oil and gas in the Butte FO, with 16,304 acres leased in Gallatin County and 10,723 acres leased in Park County. There is no existing production activity on or adjacent to this lease acreage. Since 1917, there has been a total of 32 oil and gas wells drilled in Park County, with the latest drilling activity occurring in Section 28, T. 5 N., R. 8 E. in May 2008. For Gallatin County, 38 oil and gas wells have been drilled since 1901, with the latest drilling activity occurring in Section 3, T. 2 N., R. 7 E., in July 2008. Information on numbers and status of wells on these leases and well status and numbers of private and state wells within the two townships containing lease parcels can be found in Table 6. Numbers of townships, leases acres within those townships, and development activity for all jurisdictions are summarized in Table 6. Since T. 5 N., R. 9 E. straddles both Park and Meagher Counties, the information in Table 6 summarizes the entire township.

If a lease parcel receives leasing interest and oil and gas lease sales lead to lease issuance, there could be interest in exploration or development activity during the term of the lease. Exploration and development proposals in the future would require a separate environmental document to consider specific proposals and site-specific resource concerns.

Table 6. Oil and Gas Leasing and Existing Development within Townships Containing Lease Parcels.

	FEDERAL WELLS	PRIVATE AND STATE WELLS
Drilling Well(s)	0	0
Producing Gas Well(s)	0	0
Producing Oil Well(s)	0	0
Water Injection Well(s)	0	0
Shut-in Well(s)	0	0
Temporarily Abandoned Well(s)	0	0

	Gallatin County	Park County
Number of Townships Containing Lease Parcels	1	1

Total Acres Within Applicable Township(s)	23,040	23,040
Federal Oil and Gas Minerals	5,210	3,200
Percent of Township(s)	22.6	13.9
Leased Federal Oil and Gas Minerals	0	0
Percent of Township(s)	0	0
Leased Federal Oil and Gas Minerals Suspended	0	0
Percent of Township(s)	0	
Federal Wells	0	0
Private and State Wells	0	0

3.3.11.2 Geothermal

Geothermal resources are administered under the Mineral Leasing Act of 1920. There has been no interest in any of the identified KGRAs in the Butte Field Office.

3.3.11.3 Solid Minerals

Federal solid mineral resources are classified into three major categories: locatable minerals (e.g., base metals such as copper, lead, and zinc), precious metals (gold, silver, platinum, and palladium), limestone, marble, talc, asbestos, mica, gypsum, bentonite, and gemstones); leasable minerals (coal and phosphate); and saleable minerals (e.g., common varieties of sand and gravel and clay). Southwest and west-central Montana has a rich mineral history including the copper molybdenum deposit at Butte, several areas of historic placer gold production as well as more recent mines including the Golden Sunlight and Montana Tunnels mines. These deposits and other solid mineral resources are covered in detail in the Butte RMP (Chapter 3, page 277, and the supporting 2005 Mineral Potential Report).

3.3.11.3.1 Locatable Minerals

Locatable minerals are those minerals which fall under the jurisdiction of the General Mining Law of 1872 and subsequent mining laws. The two lease parcels have low potential for the occurrence of locatable minerals.

3.3.11.3.2 Leasable Minerals

Leasable minerals fall under the 1920 Mineral Leasing Act. In the Butte Field Office, these include coal and phosphate. There are no deposits of coal or phosphate close to either of the lease parcels.

3.3.11.3.3 Salable Minerals

Salable minerals (mineral materials) are those common varieties of sand, stone, gravel, cinders, pumice, pumicite, and clay that may be acquired under the Materials Act of 1947. The development of salable mineral commodities such as sand and gravel are usually driven by local need and transportation costs, but the resources themselves can be found in many localities. There are no BLM mineral material sales in the general vicinity of either proposed lease parcels.

3.3.12 Social and Economic Conditions

Certain existing demographic and economic features influence and define the nature of local economic and social activity. Among these features are the local population, the presence and proximity of cities or regional business centers, longstanding industries, infrastructure, predominant land and water features, and unique area amenities. Several additional parcels in Gallatin and Park counties have been nominated for leasing in the October 2014 lease sale. While the majority of nominated land is unoccupied there are social and economic linkages which connect nominated parcels to people and businesses in surrounding communities.

In 2012, Beaverhead and Madison counties were estimated to have a combined total population of 108,181 people, with 48,279 households earning an average annual household income of $87,621 (IMPLAN, 2012). In 2012, this 2-county area economy supported approximately 75,791 jobs in 236 industrial sectors, equating to approximately 1.4 people or 0.6 households per job. The top five industries operating in the local economy included: real estate, food service and drinking places, nonresidential construction, medical physicians, and wholesale trade (IMPLAN, 2012). Much of this economic activity is concentrated in Bozeman, the county seat of Gallatin County and largest businesses center in Southwestern Montana.

Mineral rights can be owned by private individuals, corporations, Indian tribes, or by local, State, or Federal Governments. Typically companies specializing in the development and extraction of oil and gas lease the mineral rights for a particular parcel from the owner of the mineral rights. As of April, 2014, there were 16,304 acres in Gallatin and 10,723 acres in Park leased from the BLM for oil and gas development. Federal oil and gas leases are generally issued for 10 years unless drilling activities result in one or more producing wells, or the lease is part of a communitization agreement and incorporated into an existing field or unit. Once production of federal minerals from a lease has begun, the lease is considered to be held by production and the lessee is required to make royalty payments to the Federal Government. Of 27,027 acres leased from the BLM in these counties, zero acres were classified as held by production at the time of this analysis.

Leasing mineral rights for the development of oil and gas generates public revenue through the bonus bids paid at lease auctions and annual rents collected on leased parcels not held by production. Nominated parcels approved for leasing are offered by the BLM at a minimum rate of $2.00 per acre at periodic mineral auctions. These sales are competitive and parcels with high potential for oil and gas production command bonus bids in excess of the minimum bid. The last sale in which BLM minerals administered by the Butte Field Office were competitively sold was

in August 2008. During this sale four parcels were sold. Two of which, totaling 245 acres in Gallatin County were sold for an average of $6 per acre. Prior to the 2008 sale, parcels in this region generally went for $2 an acre. The Federal Government is estimated to have received an estimated $57,000 in one-time lease bids from the leasing of 27,027 acres of BLM fluid minerals in these counties.

In addition to bonus bids, lessees are required to pay rent annually until the lease is classified as held by production, or until the lease expires. These rent payments are equal to $1.50 an acre for the first five years and $2.00 an acre for the second five years of the lease. On annual average, total federal rental revenue on the 27,027 acres currently leased from the BLM in Gallatin and Park counties is valued around $47,000. As mentioned above, Federal oil and gas production in Montana is subject to production taxes or royalties. The Federal oil and gas royalties on production from public domain minerals equal 12.5 percent of the value of production (43 CFR 3103.3.1). Although there was a brief period between 2008 and 2009 were small amounts of oil were produced in Park County, no other production in this two-county area has occurred prior or since. At the time of this analysis there was no royalty revenue associated with fluid minerals in Gallatin or Park counties.

Forty-nine percent of Federal revenue from leasing and production of public domain minerals are distributed to the State, who then distributes 25 percent of this state revenue back to the counties of production (Title 17-3-240, MCA). If production comes from acquired Federal minerals under the Bankhead Jones authority, 25 percent of the Federal revenues are distributed directly to the counties of production. All fluid minerals leased from the Butte Field Office were public domain at the time of this analysis. The redistribution of federal revenue from the leasing and development of public domain minerals administered by the BLM in these counties is estimated to generate about $23,000 in state revenue on annual average, with approximately $6,000 returning back to Gallatin and Park counties. Since the distribution of revenue back to the counties is proportionate to the level of leasing and production in each county, slightly more of these revenues are distributed back to Gallatin County. Federal revenues distributed back to counties helps fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

The economic contribution of oil and gas related activities to the local economy can be measured by estimating the employment and labor income generated by 1) payments to counties associated with the leasing and rent of Federal minerals, 2) local royalty payments associated with production of Federal oil and gas, and 3) economic activity generated from exploration, drilling and associated activities. Activities related to oil and gas leasing, exploration, development, and production form a basic industry that brings money into the State and region and creates jobs in other sectors. Although oil and gas development and production in these counties is limited,

Bozeman serves as the services center of oil and gas related activities in a number of surrounding counties. As of 2012, the extraction of oil and natural gas (NAICS sector 20), drilling oil and gas wells (NAICS sector 28), and support activities for oil and gas operations (NAICS sector 29) supported an estimated 156 jobs[1], about $6 million in employee compensation, and another $1 million in proprietor income within the two counties with parcels nominated for additional leasing (IMPLAN, 2012). Since BLM minerals in these counties are associated with only a small portion of fluid mineral activity in the surrounding area, only a fraction of total employment and income in these oil and gas related sectors can be attributed to leasing and development of minerals administered by the Butte Field Office in. While additional employment and income may be attributable to the payments to counties from federal minerals within county lines, these contributions are also minimal.

3.3.13 Nature of the Oil and Gas Industry in the Butte Field Office

In the fifteen-year period between 2000 and 2014, very little oil and gas exploration or production occurred within the seven counties (four oil wells, three gas wells, and 5 dry holes were drilled). There was no production from any of these wells. Since drilling and production on federal minerals is anticipated in the future, relevant statewide data that will be used in this EA include the following: average wellhead prices were $104.00 per bbl (barrel) for crude oil and $4.50 per MCF (thousand cubic feet) for natural gas (EIA [U.S. Energy Information Administration], 2014). Statewide average output per producing well was 18 bbl of crude oil per day and 23 MCF per day for natural gas (Montana Board of Oil and Gas Conservation Annual Review 2012).

Local economic effects of leasing federal minerals for oil and gas exploration, development, and production are influenced by the number of acres leased, number of wells drilled, and estimated levels of production. These activities influence local employment, income, and public revenues (indicators of economic impacts).

3.3.13.1 Leasing

As of April 2014, there are 121,650 acres of federal minerals leased for oil and gas in the Butte FO. Currently, annual lease rental is paid on all these acres because none are held by production. Total annual lease and rental revenues to the federal government were an estimated $237,218. Federal oil and gas leases generate a one-time lease bid as well as annual rents. The minimum lease bid is $2.00 per acre; lease rental is $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Typically, oil and gas leases expire after 10 years unless held by production. Annual lease rentals continue until one or more wells are drilled that result in production and associated royalties. Within the Butte FO, none of the leases are held by production. Forty-nine percent of these federal leasing revenues are distributed to the state, and

[1] IMPLAN job estimates are not full-time equivalents and include all full-time, part-time, and temporary positions supported oil and gas activities within the planning area. These activities may support, or partially support a number of jobs annually. In this respect, 1 job in IMPLAN lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months

the state distributes a portion back to the counties. The federal government collects an estimated annual average of about $237,000 in lease bids and rent of which an estimated $116,000 is distributed to the state/local governments.

3.3.13.2 Production

In 2014, no production from federal minerals in the Butte FO was reported.

Local Economic Contribution

The economic contribution to a local economy is measured by estimating the employment and labor income generated by payments to counties associated with the leasing, rent, and production of federal minerals. Activities related to oil and gas leasing, exploration, development, and production form a basic industry that brings money into the state and region and creates jobs in other sectors. Extraction of oil and natural gas (NAICS sector 20), drilling oil and gas wells (NAICS sector 28), and support activities for oil and gas operations (NAICS sector 29) supported an estimated 174 total jobs and $14.817 million in total employee compensation and proprietor income in the local economy (IMPLAN, 2007).

Total estimated federal revenues from federal oil and gas leasing and rents are an estimated $321,000 annually. Federal revenues distributed to the State of Montana amount to an estimated $157,000 per year. The state redistributes an estimated $39,000 to the local Montana counties with federal leases within the Butte FO boundaries per year. These revenues may help fund traditional county functions such as law enforcement, administration of justice, collection and disbursement of tax funds, provision of orderly elections, road and highway maintenance, fire protection, and record keeping. Other county functions that may be funded include primary and secondary education administration and the operation of clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

The estimated annual average local economic contribution associated with federal leases, rents, drilling, production, and royalty payments combined to support less than one total local full or part-time job and an estimated $20,000 in local labor income, respectively (IMPLAN, 2007).

The information below shows the bonus and rental revenue received for each suspended parcel and totals for each Field Office are displayed below. Because operator's lease rights have been suspended without any monetary compensation to the operators, the end result of this 'involuntary' suspension is stranded capital incurred by the operator. If lease stipulations are changed as a result of this analysis and the lessee chooses to relinquish the lease, the lessee would be entitled to a full refund of bonus bids and rent.

Table 7. Bonus and Rents Paid and Revenue Distribution Related to Suspended Leases

Field Office	Bonus Paid	Rent Paid	Total Revenue	Federal Revenue	Revenue to State	Revenue to Counties
	Totals					
Billings	$361,422	$22,175	$383,597	$195,634	$187,962	$46,991
Butte	$5,761	$3,590	$9,351	$4,769	$4,582	$1,145

Dillon	$13,996	$10,497	$24,493	$12,491	$12,002	$3,000
Lewistown	$3,840	$480	$4,320	$3,240	$0	$1,080
Malta	$2,500	$110	$2,610	$1,331	$1,279	$320
Miles City	$693,319	$17,441	$710,760	$362,487	$348,272	$87,068
ND / SD	No suspended lease parcels					
Source: USDOI, Bureau of Land Management, Montana State Office, LR 2000. 2010						

In addition to the local economic contributions from the oil and gas industry, the industry contributions to the state of Montana are further documented in a recent article (Scott Rickard, Ph.D.). Dr. Rickard's oil and gas industry analysis is based on private as well as federal oil and gas activity. He wrote that the 28 million barrels of oil and 105 million MCF of gas produced from Montana wells in 2009 were worth an estimated $1.9 billion. He notes that although total annual production of both has been declining since 2006, the 2009 output levels were valued at $1.9 billion and provided an estimated at $308 million in state and local production taxes. The 4,600 jobs directly related to the oil and gas industry also support several thousand additional indirect and induced jobs. (Rickard, 2010). He notes that in 2009, the industry paid an estimated $44 million in property taxes on pipelines and flow lines to state and local government in Montana (Rickard, 2010).

4.0 ENVIRONMENTAL IMPACTS

4.1 Assumptions and Reasonably Foreseeable Development (RFD) Scenario Summary

This chapter describes the environmental effects (direct, indirect, and cumulative) that would result from the alternatives. This analysis is tiered to the final environmental impact statement (EIS) for the Butte RMP/ROD. The analysis contained within that RMP/FEIS remains adequate. The RMP determined which areas are available for oil and gas leasing and under what conditions those leases are to be offered and sold.

The act of leasing parcels would not impact the resources. The only direct effects of leasing are creation of valid existing right and related to revenue generated by the lease sale receipts.

Potential indirect effects associated with a lease sale would result from any future developments. The BLM assumes there is a high interest in development of any leased parcels but, even if lease parcels are leased, it is speculative to assume development would actually occur, and if so, it is speculative to assume where specific wells would be drilled and where facilities would be placed. This would not be determined until the BLM receives an APD in which detailed information about proposed wells and facilities would be provided for particular leases. Upon receipt of an APD, the BLM would initiate a more site-specific NEPA analysis with public review opportunities to more fully analyze and disclose site-specific effects of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of BMPs documented in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (USDI and USDA 2007), also known as the "Gold Book." The BLM could also identify APD COAs, based on site-specific analysis that could include moving the well location, restrict timing of the project, or require other reasonable measures to minimize adverse impacts (43 CFR 3101.1-2 Surface use rights; Lease Form 3100-11, Section 6) to protect sensitive resources, and to ensure compliance with laws, regulations, and land use plans.

For split-estate leases, the BLM would notify the private landowners that oil and gas exploration or development activities are proposed on their lands and they are encouraged to attend the onsite inspection to discuss the proposed activities. In the event of activity on such split estate leases, the lessee and/or operator would be responsible for adhering to BLM requirements as well as reaching an agreement with the private surface landowners regarding access, surface disturbance, and reclamation.

The RFD for this EA (Appendix D) is based on information contained in the RFD developed in 2007 for the BFO RMP. The RFD prepared for the BFO RMP contains the number of potential oil and gas wells that could be drilled and produced in the MCFO area and used to analyze the

potential number of wells drilled for the 2 nominated lease parcels. The projected number of wells is used to conduct analysis for economic resources. These well numbers are only an estimate based on historical drilling and geologic data. A detailed description of the RFD forecast for this EA is found in Appendix D.

No surface disturbance would occur as a result of issuing leases. For analysis purposes, cultural resources use the potential number of acres disturbed by exploration and development activities in Appendix D to determine the number of cultural site potentially impacted within the nominated lease parcels. The potential acres of disturbance reflect acres typically disturbed by construction, drilling, and production activities, including infrastructure installation throughout the BFO. Typical exploration and development activities and associated acres of disturbance were used as assumptions for analysis purposes in this EA.

The assumptions were not applied to Alternative A because the lease parcels would not be offered for lease; therefore, no wells would be drilled or produced on the lease parcel, and no surface disturbance would occur on those lands from exploration and development activities).

Environmental consequences are discussed below by alternative to the extent possible at this time for the resources described in Chapter 3. As per NEPA regulations at 40 CFR 1502.14(f), 40 CFR 1502.16(h), and 40 CFR 1508.20, mitigation measures to reduce, avoid, or minimize potential impacts are identified by resource below.

Table 8. Total RFD Projected Direct Cumulative Surface Disturbance

	Unsuccessful Wildcat Wells		Productive Wells	
	Acres Disturbed Pre-Site Reclamation	Post-Site Reclamation	Acres Disturbed Pre-Site Reclamation	Post-Site Reclamation
	Conventional Oil and Gas			
Well Sites	45.5	0	63	21.5 (2 years)
Access Roads	221	0	189.6	103.7 (2 years)
Pipelines	0	0	254.5	0 (2 years)
	CBNG			
Well Sites	1	0	7.5	5 (2 years)
Compressors, Pipelines and Access Roads	3	0	220	147 (2 years)
Total Acres Disturbed	270.5	0	734.6	272.2 (2 years)

4.2 Alternative A (No Action Alternative)

4.2.1 Direct Effects Common to All Resources, not including Economics

Under Alternative A, the 2 parcels, covering 520 Federal mineral acres would not be offered for competitive oil and gas lease sale. Under this alternative, the State and private minerals could

still be leased in surrounding areas. Surface management would remain the same and ongoing oil and gas development would continue on surrounding Federal, private, and State leases.

There would not be new impacts from oil and gas exploration or production activities on the Federal lease parcel lands at this time. No additional natural gas or crude oil would enter the public markets, and no royalties would accrue to the Federal or State treasuries from the parcel lands. The No Action Alternative would result in the continuation of the current land and resource uses on the lease parcels.

4.2.2 Economics

4.2.2.1 Direct and Indirect Effects:

The economic contributions of activities associated with oil and gas development on BLM administered Federal minerals are measured in terms of the employment and labor income generated by 1) payments to counties associated with the leasing and rent of Federal minerals, 2) royalty payments associated with production of Federal oil and gas, and 3) economic activity generated from drilling and associated activities. Forward and backward linkages between businesses and people in communities surrounding parcels leased for the development of Federal minerals has enabled the oil and gas industry to attract new revenue to the region, growing the local economy and creating new employment and income opportunities in a wide range of industrial sectors.

Alternative A is the no action alternative. Under Alternative A, no additional parcels would be leased and no additional public revenue would be generated. The economic contributions of activities associated with oil and gas development would remain consistent with existing conditions described in the Economics section of Chapter 3. Economic effects are summarized and displayed in comparative form in Table 9.

Table 9. Summary Comparison of Estimated Average Annual Economic Impacts

Alternative	Acres Leased	Change in Local Revenue to Counties
A	0	0
B	520	$111

***These impacts would be in addition to impacts from existing Federal leases, rents, royalties and related activities.**

4.2.2.2 Cumulative Effects:

The lack of measurable direct and indirect effects to economic conditions under the No Action Alternative translates to a lack of measurable cumulative effects. Under this alternative the BLM will not make any additional Federal minerals available for leasing and Federal minerals leased from the Butte Field Office will likely continue at existing levels. Current levels of BLM mineral leasing Gallatin and Park counties support jobs and income in the 2-county local economy and

the economic contributions of oil and gas activities associated with these leases will continue to be similar to those discussed in Chapter 3.
Cumulative economic impacts associated with Federal mineral leasing under the alternatives are shown below in Table 10.

Table 10. Summary Comparison of Cumulative Annual Economic Impacts by Alternative

Activity	A	B
Existing Acres leased	27,027	27,027
Acres that would be leased based on this EA	0	520
Total acres leased	27,027	27,547
Acres held by production	0	0
Total acres leased for which lease rents would be paid	27,027	27,547
Total average annual Federal lease and rental revenue	$47,297	$49,320
Average annual distribution to State*	$23,176	$24,167
Average annual distribution to Counties**	$5,794	$6,042
Average annual oil production (bbl)	0	0
Average annual gas production (MCF)	0	0
Total Average annual Federal O&G royalties	0	0
Average annual distribution to State*	0	0
Average annual distribution to Counties**	0	0
Total average annual Federal Revenues	$47,297	$49,320
Total average annual State Revenues	$23,176	$24,167
Total average annual revenue distributed to counties	$5,794	$6,042

4.3 Alternative B (Proposed Action)

Under Alternative B, 2 lease parcels of Federal minerals for oil and gas leasing, covering 520 Federal mineral acres would be offered for competitive oil and gas lease sale. No parcels would be deferred.

4.3.1 Direct Effects Common to All Resources

The action of leasing the parcels in Alternative B would, in and of itself, have no direct impact on resources. Direct effects of leasing are the creation of a valid existing right and those related to the revenue generated by the lease sale receipts.

4.3.2 Indirect Effects Common to All Resources

Any potential effects on resources from the sale of leases would occur during lease exploration and development activities, which would be subject to future BLM decision-making and NEPA analysis upon receipt of an APD or sundry notice.

Oil and gas exploration and development activities such as construction, drilling, production, infrastructure installation, vehicle traffic and reclamation could be indirect effects from leasing the lease parcels in Alternative B. As mentioned above, it is speculative to make assumptions about whether a particular lease parcel would be sold and, even if so, it is speculative to assume when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment would be used and the types of infrastructure needed for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors.

Typical impacts to resources from oil and gas exploration and development activities such as well sites, roads, facilities, and associated infrastructure are described in the Butte Field Office RMP/EIS (2007),the Montana Statewide Oil & Gas Amendment/EIS (2003) and the Supplement (2008) to that document.

4.3.1 Air Resources

Direct and Indirect Effects

Air Quality

Issuing leases for the 2 parcels under the Proposed Action would have no direct impacts to air quality. Any potential effects on air quality from activities on these lease parcels would occur if and when the leases were developed, which would be subject to additional NEPA and public review.

Potential impacts of development could include increased airborne soil particles blown from new well pads or roads, exhaust emissions from drilling equipment, compressors, vehicles, and dehydration and separation facilities, as well as potential releases of GHGs and volatile organic compounds during drilling or production activities. The amount of increased emissions cannot be precisely quantified at this time since it is not known for certain how many wells might be drilled, the types of equipment needed if a well were to be completed successfully (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company for drilling any new wells. The degree of impact would also vary according to the characteristics of the geologic formations from which production occurs, as well as the scope of specific activities proposed in an application for permit to drill.

HAPs would also be emitted from oil and gas operations, including well drilling, well completion, and gas and oil production. Recent air quality modeling performed for the BiFO indicates that concentrations of benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene would be less than 11 percent of applicable health-based standards and that the additional risk of cancer would be less than 0.25 in one million (BLM 2013).

Current monitoring data show that the criteria pollutants fall below applicable air quality standards, which indicates good air quality. The potential level of development and mitigation (see below) is expected to maintain good air quality in the lease area. Pollutant emissions would be regulated under Montana's oil and gas registration permitting system. SO_2 emissions would be low due to requirements for vehicles and non-road engines to use ultra-low sulfur diesel fuel.

Greenhouse Gas Emissions

Subsequent development of any leases issues may result in sources of GHGs associated including construction activities, operations, and facility maintenance in the course of oil and gas exploration, development, and production. The current proposed activity is to offer parcels for lease. No specific development activities are currently proposed for any parcels being considered in this EA. Potential development activities would be analyzed in a separate NEPA analysis effort if the BLM receives an application for permit to drill on any of the parcels considered here.

Anticipated GHG emissions presented in this section are taken from the Climate Change SIR for Montana, North Dakota, and South Dakota (BLM 2010). Data are derived from emissions calculators developed by air quality specialists at the BLM National Operations Center in Denver, Colorado, based on methods described in the Climate Change SIR (BLM 2010). Based on the assumptions summarized above for the Butte FO RFD, Table 11 discloses projected annual GHG source emissions from BLM-permitted activities associated with the Butte FO RFD.

Table 11. BLM projected annual GHG emissions associated with oil and gas exploration and development activity in the Butte FO.

Source	BLM Projected GHG Emissions in tons/year from Butte FO RFD			Emissions (metric tons/yr.)
	CO_2	CH_4	N_2O	CO_2e
Conventional Natural Gas	420.2	9.4	0.0	560.8
Coal Bed Natural Gas (none forecasted in RFD)	0.0	0.0	0.0	0.0
Oil (none forecasted in RFD)	0.0	0.0	0.0	0.0
Total	**420.2**	**9.4**	**0.0**	**560.8**

Under Alternative A, there would be no GHG emissions resulting from this project, because no additional parcels would be leased.

To estimate potential GHG emissions associated with Alternative B, the following approach was used:

1. The proportion of each project-level action alternative relative to the total RFD was calculated based on total acreage of parcels under consideration for leasing relative to the total acreage of federal mineral acreage available for leasing in the RFD.
2. This ratio was then used as a multiplier with the total estimated GHG emissions for the entire RFD to estimate GHG emissions for that particular alternative.

Under the Proposed Action, approximately 520 acres of lease parcels with federal minerals would be leased. These acres constitute 0.079 percent of the total federal mineral estate of approximately 660,819 acres managed by the Butte Field Office. Therefore, based on the approach described above to estimate GHG emissions, 0.079 percent of the Butte RFD total-estimated BLM emissions of 561 metric tons/year would be approximately 0.44 metric tons/year of CO_2e if the parcels within the Proposed Action were to be developed.

4.3.1.1 Climate Change

The assessment of GHG emissions and climate change is in its formative phase. As summarized in the Climate Change SIR (BLM 2010), climate change impacts can be predicted with much more certainty over global or continental scales. Existing models have difficulty reliably simulating and attributing observed temperature changes at small scales. On smaller scales, natural climate variability is relatively larger, making it harder to distinguish changes expected due to external forcings (such as contributions from local activities to GHGs). Uncertainties in local forcings and feedbacks also make it difficult to estimate the contribution of GHG increases to observed small-scale temperature changes (BLM 2010).

It is currently not possible to know with certainty the net impacts from lease parcel development on climate. The inconsistency in results of scientific models used to predict climate change at the global scale coupled with the lack of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level. It is therefore beyond the scope of existing science to relate a specific source of GHG emission with the creation or mitigation of any specific climate-related environmental effects. Although the effects of GHG emissions in the global aggregate are well-documented, it is currently impossible to determine what specific effect GHG emissions resulting from a particular activity might have on the environment. For additional information on environmental effects typically attributed to climate change, please refer to the cumulative effects discussion below.

While it is not possible to predict effects on climate change of potential GHG emissions, as discussed above, in the event of lease parcel development for alternatives considered in this EA, the act of leasing does not produce any GHG emissions in and of itself. Releases of GHGs would occur at the exploration/development stage.

Mitigation

The BLM encourages industry to incorporate and implement BMPs to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Measures may also be required as conditions of approval on permits by either the BLM or the applicable state air quality regulatory agency. The BLM also manages venting and flaring of gas from federal wells as described in the provisions of Notice to Lessees (NTL) 4A, Royalty or Compensation for Oil and Gas Lost.

Some of the following measures could be imposed at the development stage:

- flare or incinerate hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion;
- install emission control equipment of a minimum 95 percent efficiency on all condensate storage batteries;
- install emission control equipment of a minimum 95 percent efficiency on dehydration units, pneumatic pumps, produced water tanks;
- operate vapor recovery systems where petroleum liquids are stored;
- use tier II or greater diesel drill rig engines or use natural gas or electric drill rig engines;
- operate secondary controls on drill rig engines;
- use no-bleed pneumatic controllers (most effective and cost effective technologies available for reducing volatile organic compounds (VOCs));
- use gas or electric turbines rather than internal combustions engines for compressors;
- operate nitrogen oxides (NO_x) emission controls for all new and replaced internal combustion oil and gas field engines;
- water dirt and gravel roads during periods of high use and control speed limits to reduce fugitive dust emissions;
- implement interim reclamation to revegetate areas of the pad not required for production facilities and to reduce the amount of dust from the pads;
- co-locate wells and production facilities to reduce new surface disturbance;
- use directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- operate gas-fired or electrified pump jack engines;
- install velocity tubing strings;
- capture gas during completion activities (e.g., green completions) and from other ancillary sources;
- use centralized tank batteries and multi-phase gathering systems to reduce truck traffic;
- use forward looking infrared (FLIR) technology to detect fugitive emissions; and
- Monitor ambient air concentrations of NO_x and ozone (O_3).

More specific to reducing GHG emissions, Section 6 of the Climate Change SIR (BLM 2010) identifies and describes in detail commonly used technologies to reduce methane emissions from

natural gas, coal bed natural gas, and oil production operations. Technologies summarized in Table 12 have been identified by the USEPA Natural Gas STAR Program. Estimated emission reduction, cost, and payback data are provided.

Table 12. Selected Methane Emission Reductions Reported Under the USEPA Natural Gas STAR Program[1]

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr.)	Capital Cost Including Installation ($)	Annual Operating and Maintenance Cost ($)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Wells					
Reduced emission (green) completion	7,000 [2]	$1K – $10K	>$1,000	1 – 3 yr	$3
Plunger lift systems	630	$2.6K – $10K	NR	2 – 14 mo	$7
Gas well smart automation system	1,000	$1.2K	$0.1K – $1K	1 – 3 yr	$3
Gas well foaming	2,520	>$10K	$0.1K – $1K	3 – 10 yr	NR
Tanks					
Vapor recovery units on crude oil tanks	4,900 – 96,000	$35K – $104K	$7K – $17K	3 – 19 mo	$7
Consolidate crude oil production and water storage tanks	4,200	>$10K	<$0.1K	1 – 3 yr	NR
Glycol Dehydrators					
Flash tank separators	237 – 10,643	$5K – $9.8K	Negligible	4 – 51 mo	$7
Reducing glycol circulation rate	394 – 39,420	Negligible	Negligible	Immediate	$7
Zero-emission dehydrators	31,400	>$10K	>$1K	0 – 1 yr	NR
Pneumatic Devices and Controls					
Replace high-bleed devices with low-bleed devices					
End-of-life replacement	50 – 200	$0.2K – $0.3K	Negligible	3 – 8 mo	$7
Early replacement	260	$1.9K	Negligible	13 mo	$7
Retrofit	230	$0.7K	Negligible	6 mo	$7
Maintenance	45 – 260	Negl. to $0.5K	Negligible	0 – 4 mo	$7
Convert to instrument air	20,000 (per facility)	$60K	Negligible	6 mo	$7
Convert to mechanical control systems	500	<$1K	<$0.1K	0 – 1 yr	NR

Source Type / Technology	Annual Methane Emission Reduction [1] (Mcf/yr.)	Capital Cost Including Installation ($)	Annual Operating and Maintenance Cost ($)	Payback (Years or Months)	Payback Gas Price Basis ($/Mcf)
Valves					
Test and repair pressure safety valves	170	NR	$0.1K – $1K	3 – 10 yr	NR
Inspect and repair compressor station blowdown valves	2,000	<$1K	$0.1K – $1K	0 – 1 yr	NR
Compressors					
Install electric compressors	40 – 16,000	>$10K	>$1K	>10 yr	NR
Replace centrifugal compressor wet seals with dry seals	45,120	$324K	Negligible	10 mo	$7
Flare Installation	2,000	>$10K	>$1K	None	NR

Source: Multiple USEPA Natural Gas STAR Program documents. Individual documents are referenced in the Climate Change SIR (BLM 2010).

[1] Unless otherwise noted, emission reductions are given on a per-device basis (e.g., per well, per dehydrator, per valve, etc.).
[2] Emission reduction is per completion, rather than per year.

K = 1,000
mo = months
Mcf = thousand cubic feet of methane
NR = not reported
yr = year

In the context of the oil sector, additional mitigation measures to reduce GHG emissions include methane reinjection and CO_2 injection. These measures are discussed in more detail in Section 6.0 of the Climate Change SIR (BLM 2010).

In an effort to disclose potential future GHG emissions reductions that might be feasible, the BLM estimated GHG emissions reductions based on the RFD for the Miles City Field Office. For emissions sources subject to BLM (federal) jurisdiction, the estimated emissions reduction represent approximately 51 percent reduction in total GHG emissions compared to the estimated Miles City FO federal GHG emissions inventory (BLM 2010, Section 6.5 and Table 6-3). The emission reductions technologies and practices are identified as mitigation measures that could be imposed during development. Furthermore, the USEPA is expected to promulgate new federal air quality regulations that would require GHG emission reductions from many oil and gas sources.

4.3.2 Soil Resources

Direct and Indirect Effects

Issuing leases for the tracts would have no impacts to soil resources. Any potential effects to soil resources would occur if and when the leases were developed. The development of the leases would result in reasonably foreseeable disturbances to soils. Potential development could

include construction and operation of well pads, access roads, pipelines, power lines, reserve pits, and other facilities and would result in the exposure of mineral soil, soil compaction, loss of soil productivity, and increased susceptibility to wind and water erosion. The likelihood and magnitude of these occurrences is dependent upon local site characteristics, climatic events, and the specific mitigation applied. Potential impacts would be addressed in more detail at the APD stage, which would also be subject to additional NEPA and public review.

Mitigation

In the event of exploration/development, a number of measures would be taken to prevent, minimize, or mitigate impacts to soil resources. The operator would stockpile the topsoil from the surface of well pads which would be used for surface reclamation. Once this topsoil is applied and vegetation is re-established the impacts would be remediated.

Reserve pits would be recontoured and reseeded as described in attached conditions of approval. Upon abandonment of wells and/or when access roads are no longer in service, the authorized officer would issue instructions and/or orders for surface reclamation/restoration of the disturbed areas as described in attached conditions of approval.

Road constructions requirements and regular maintenance would alleviate potential impacts to access roads from water erosion damage. Lease stipulations regarding steep slopes and erosive soils would minimize potential impacts. For the purpose of protecting slopes or fragile soils, surface disturbance would not be allowed on slopes over 30 percent.

Additional mitigation measures and/or best management practices would be assigned once a site-specific plan of development is proposed.

Both parcels have soils with a moderate to severe risk of erosion, due primarily to steep slopes. Avoidance of erosive soils for siting and design for mitigation would occur and be addressed on a site-specific basis for an APD. Depending on the scale of disturbance, it should be possible to mitigate risk of soil erosion. See Appendix A for soil erosion risk stipulations by parcel. Both parcels have stipulations attached to protect soil resources.

4.3.3 Water Resources

Direct and Indirect Effects

The action of leasing the parcel itself would not have any impact on water resources. Any potential effects to water resources would occur if and when the leases were developed. The subsequent development of the leases could result in reasonably foreseeable disturbances to hydrologic resources. Stipulations regarding steep slopes, erosive soils, and activities on floodplains and in wetlands would minimize potential impacts and are applied (refer to Appendix A).

Floodplain function along streams may be affected by oil and gas activities by the physical alteration of banks, introduction of contaminants and sediments, and removal of riparian vegetation. Maintaining floodplain function is important to dissipate stream energy during high-flow events, thereby preventing flooding downstream and providing vegetative cover for shading/thermal regulation of streams and riparian habitat.

The development of the lease (construction and operation of well pads, access roads, pipelines, power lines, reserve pits, and other facilities) would create surface disturbances that can subsequently lead to surface and ground water degradation through non-point source pollution. The likelihood and magnitude of these occurrences is dependent upon local site characteristics, climatic events, and the success of the specific mitigation measures applied. The groundwater resources and their protection are administered by the Montana Department of Environmental Quality under authority from the U.S. Environmental Protection Agency

Well bores would most likely pass through useable groundwater. Potential impacts to groundwater resources could occur if proper cementing and casing programs are not followed. This could include loss of well integrity, surface spills, or loss of fluids in the drilling and completion process. It is possible for chemical additives used in drilling activities to be introduced into the water-producing formations without proper casing and cementing of the well bore. Changes in porosity or other properties of the rock being drilled through can result in the loss of drilling fluids. When this occurs, drilling fluids can be introduced into groundwater without proper cementing and casing. Site specific conditions and drilling practices determine the probability of this occurrence and determine the groundwater resources that could be impacted. In addition to changing the producing formations' physical properties by increasing the flow of water, gas, and/or oil around the well bore, hydraulic fracturing can also introduce chemical additives into the producing formations. Types of chemical additives used in drilling activities may include acids, hydrocarbons, thickening agents, lubricants, and other additives that are operator- and location-specific. These additives are not always used in these drilling activities and some are likely to be benign such as bentonite clay and sand. Concentrations of these additives also vary considerably since different mixtures can be used for different purposes in oil and gas development and even in the same well bore. If contamination of aquifers from any source occurs, changes in groundwater quality could impact springs and residential wells that are sourced from the affected aquifers. Onshore Order #2 requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones.

Known water bearing zones in the lease area are protected by drilling requirements and, with proper practices, contamination of ground water resources is highly unlikely. Casing along with cement is extended well beyond fresh-water zones to insure that drilling fluids remain within the well bore and do not enter groundwater.

Potential impacts to ground water at site specific locations are analyzed through the NEPA review process at the development stage when the APD is submitted. This process includes geologic and engineering reviews to ensure that cementing and casing programs are adequate to protect all downhole resources.

All water used would have to comply with Montana State water rights regulations and a source of water would need to be secured by industry that would not harm senior water rights holders.

Mitigation

In the event of exploration/development, a number of measures would be taken to prevent, minimize, or mitigate impacts to water resources. The same mitigation measures used to protect the soil resource would also be used to protect water resources.

The use of plastic-lined reserve pits would reduce or eliminate the risk of drilling fluid seeping into the soil and eventually reaching groundwater. Spills or produced fluids (e.g., saltwater, oil, and/or condensate in the event of a breech, overflow, or spill from storage tanks) could result in contamination of the soils onsite or offsite and may potentially impact surface and groundwater resources in the long term. The casing and cementing requirements imposed on proposed wells would reduce or eliminate the potential for groundwater contamination from drilling muds and other surface sources.

Additional mitigation measures and/or BMPs would be assigned once a site-specific plan of development is proposed. Thirty-four of the 38 parcels have stipulations attached to protect water and riparian resources. See Appendix A for riparian stipulations by parcel.

4.3.4 Vegetation Resources

Issuing leases for the tracts would have no impacts to vegetation resources. Impacts (both direct and indirect) would occur if and when the leases were developed in the future. The potential impacts would be analyzed on a site-specific basis prior to oil and gas development and during the APD stage of development.

Direct and Indirect Effects

Potential impacts to native vegetation would depend on the native vegetation type, the topography of the lease parcels, soils, and the amount of precipitation. The lease parcels contain a combination of grassland, shrubland, and woodland vegetation communities. In areas of habitat disturbance with limited precipitation, it typically takes more time to reestablish desirable native vegetation. The threat of less desirable species that establish more quickly is high on most of the lease parcels. The impacts associated with well pads and roads, however, would be very site-specific and are not expected to significantly affect these habitats at the community scale. The footprint of the disturbance is also expected to be a small proportion of the habitat area.

Impacts to riparian and wetland vegetation would be limited due to the no surface occupancy (NSO) stipulations in addition to the riparian buffers on lease parcels containing riparian areas. However, any overland water flows resulting from well development on uplands containing weeds could provide a source for weed establishment within riparian areas that would compete against desirable native vegetation and may reduce the amount of habitat occupied by riparian vegetation.

Establishment of noxious weeds and invasive species is likely to occur given the relative frequency of noxious weeds and invasive species within the project area. Weed seeds may be transported on equipment during well development and the soil surface disturbance provides gaps where noxious weeds and invasive species may become easily established or where they may easily expand if already present.

Topography can play a role in the amount of surface disturbance that results from well and road construction. Flat areas would require little or no cut and fill, and road routes would not be constrained by topography. In hilly areas, cut and fill may be required which disturbs additional land. Roads routes could be longer to meet engineering requirements and may also require cut and fill, which would cause further disturbance and potential removal of surface vegetation. Areas lacking roads near potential drilling sites would have more disturbances, because the entire access route would need to be constructed rather than just a short spur route from an existing road. Roadways are often very prone to weed establishment transported by vehicle tires and undercarriages. Greater amounts of surface disturbance increases the impacts expected on vegetation.

Potential impacts to plants include direct mortality from earth excavation or crushing by vehicles. Adverse impacts could also result from soil erosion resulting in loss of the supporting substrate for plants or from soil compaction resulting in reduced germination rates. Impacts to plants occurring after seed germination but prior to seed set could be particularly harmful because both current and future generations would be adversely affected. Weeds which are introduced and/or promoted by soil-disturbing activities compete against and displace native vegetation.

Soil-disturbing activities directly affect species by destroying habitat, churning soils, impacting biological crusts, disrupting seedbanks, burying individual plants, and generating sites for undesirable weedy species. Weeds may be introduced during construction and operation of the lease. Dust generated by construction activities and travel along dirt roads can affect nearby plants by depressing photosynthesis, disrupting pollination, and reducing reproductive success. Oil or other chemical spills could contaminate soils so as to render them temporarily unsuitable for plant growth until cleanup measures were fully implemented. If cleanup measures were less successful, longer term impacts could be expected on vegetation resources.

Mitigation

The parcels in this lease auction are generally grassland and shrubland habitats that return to their pre-project composition and structure relatively easily and quickly. To obtain desirable rehabilitation of vegetation resources, adequate data on plant composition and cover inventory must be completed prior to any site disturbance. Parcel lessees would be required to spray weeds prior to, during, and after development and keep vehicle undercarriages clean prior to driving onto parcels to help mitigate impacts to vegetation from weed expansion.

Mitigation would also be addressed at the site-specific APD stage of development. Needed mitigation and conditions of approval would be identified and addressed during planning at the APD stage. All 38 parcels have stipulations attached to protect sensitive vegetative resources. See Appendix A for special status plant stipulations by parcel.

4.3.5 Fish and Wildlife

Energy exploration and development on public lands can cause apparent changes in wildlife habitats such as the replacement of native vegetation with well pads, roads, and pipelines. Added to these direct losses may be the subtle or indirect habitat losses caused by behavioral avoidance of areas in and around structures associated with development. Behavioral changes may result from increased levels of traffic, noise, pollution, or human activity.

Direct and Indirect Effects
Special Status Species
Federally Listed or Candidate Species

In the context of complying with the Endangered Species Act (ESA), potential effects of oil and gas leasing and development on threatened and Endangered species were analyzed at the Butte Field Office scale in the Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) conducted for the Butte RMP (Biological Opinion [BO] transmitted January 22, 2008, USDI FWS 2008). No new information has been identified which would change the analysis on which this BO is based. In the context of potentially leasing the two parcels considered in this EA, appropriate stipulations have been applied, consistent with the Butte RMP and consistent with the BO from the USFWS. While the act of leasing in and of itself does not authorize any ground disturbance or activity that could impact federally listed species, should future, site-specific proposals for development be received in an Application for Permit to Drill on any parcels addressed in this EA, additional review, NEPA analysis, and ESA Section 7 consultation (as needed) would occur.

Adverse effects of oil and gas development can be divided into six general categories: 1) direct loss of habitat; 2) physiological stress to wildlife; 3) disturbance and displacement of wildlife; 4) habitat fragmentation and isolation; 5) introduction of competitive and predatory organisms; and 6) secondary effects created by work force assimilation and growth of service industries. Collectively, the amount of disturbance may encompass a small portion of the land. However,

avoidance and stress responses by wildlife extend the influence of each well pad, road, and facility to surrounding habitats.

Grizzly Bear
All parcels are outside of the grizzly distribution zone, so no stipulations are applied at this time to any of these parcels for this species. Occasional individual grizzly bears may disperse and seek new territory in the vicinity of a lease parcel and avoid the area if development were to occur. If a grizzly bear were found near a parcel, the controlled use stipulation under the ESA mentioned above would apply, and modifications to proposals could be made.

Canada Lynx
As mentioned in the issues section, the Lynx habitat in sufficient quantity to support a resident lynx does not occur on or near any of the parcels. Occasional individual lynx may disperse and pass through or near a lease parcel. However, if a lynx were found near a parcel, the controlled use stipulation under the ESA mentioned above would apply, and modifications to proposals could be made.

Bull Trout
Bull Trout habitat does not occur on or near any of the parcels.

Sensitive Species
While there would be no direct impacts from leasing the proposed parcels, impacts to special status species could occur from subsequent development of leased parcels in the future. Sensitive mammal species would likely avoid areas of development and be deprived of the amount of habitat involved.

Reptiles (greater short-horned lizards and milk snakes) could be crushed by equipment or have burrows crushed, and direct mortality and/or loss of reproductive success could be a result. Amphibians dispersing to new areas could also be victims of accidental direct mortality from equipment; however, the NSO stipulation for riparian areas would likely prevent direct mortality in their home ranges.

Similarly, NSO stipulations for riparian areas and cutthroat trout habitat should prevent negative impacts to these species. However, some tributaries used for spawning by cutthroat trout may not be recognized as habitat and would be under the NSO riparian stipulation rather than the NSO within one-half mile stipulation covering their recognized habitat.

Mitigation
Parcel-specific stipulations and lease notices can be found in Appendix A. These include NSO, TL, and controlled surface use (CSU) for special status species. Further information on general Butte FO lease terms and stipulations can be found in Table 23 and Appendix H of the Butte RMP.

Development activities can be displaced by up to 60 days and/or 200 meters if justified by wildlife concerns such as special habitat, hunting season access, block management areas, etc., through additional analysis.

Offsite mitigations such as habitat restoration in other locations could be developed if needed, depending on the site and duration of proposed developments. Other types of mitigations could be developed depending on the details of any APDs received.

Nonsensitive Wildlife Species

Indirect impacts to wildlife could occur from leasing if a well is developed on the offered lease parcels. These impacts would be similar to those for special status species. Small mammals, reptiles, migrating amphibians, and birds could be crushed or have burrows or nests crushed resulting in direct accidental mortality or reproductive failure. Big game summer range could be reduced by the amount of habitat involved in the action. Winter range would be protected by the timing limitation stipulation. Development activities could result in avoidance of migration and travel routes.

Mitigation

Stipulations for non-special status species wildlife in the Butte RMP/FEIS include NSO for wildlife management areas, timing limitations for big game winter/spring range and birthing areas, timing limitations for raptor breeding territories, NSO for streams with high restoration potential or Class I fisheries. Other mitigations could be developed for wildlife similarly to special status species; depending on the details of any APDs received (refer to Appendix B). Both of the parcels have stipulations attached to protect wildlife resources and help reduce impacts from potential lease activities. See Appendix A for wildlife resources by parcel.

Migratory Birds

Effects to migratory birds from oil and gas development include direct loss of habitat from roads, well pads and other infrastructure, disturbance, power line strikes and accidental direct mortality, fragmentation of habitat, change in use of habitats, and potential threats and competition from edge species such as the brown-headed cowbird. Direct and indirect effects to migratory birds would be expected to be low to moderate.

Priority Linkage Areas

The two parcels are within the Potter Basin linkage area. This linkage area contains a total of 132,439 acres and is considered intermediate priority. If all parcels originally identified in the 2010 EA in this linkage area were developed, ungulate movement patterns could be altered or hindered.

4.3.6 Cultural Resources

Direct and Indirect Effects

Leasing a nominated parcel gives a basic right to the operator to develop the lease. Leasing would not, however, result in effects to cultural resources. It is only when the lease is developed

that there is a potential for cultural resources to be affected by the Proposed Action. That is when the drilling location is known and cultural resource investigations can be centered on that location and other related developments such as roads, transmission lines, and pipelines.

Direct and Indirect impacts would not be anticipated from leasing nominated parcels. It is at the APD stage of development that specific impacts can be correctly assessed. Potential impacts to cultural resources at the APD stage include damage to archaeological sites through construction activities and the possibility of removal of, or damage to, archaeological materials by increased human activity in the area. Conversely, cultural resource investigations associated with development potentially adds to our understanding of the prehistory and history of the area under investigation.

Mitigation

Specific mitigation measures, including, but not limited to site avoidance or excavation and data recovery, would have to be determined when site-specific development proposals are received. Mitigation measures would be decided after government-to-government consultation with interested tribes.

If developed, these properties could be potentially impacted by a site-specific proposal. Each nominated lease parcel has the standard lease notice attached (stipulation 12-8) and the special cultural resource stipulation as written in IM 2005-030:

> *"This lease may be found to contain historic properties and /or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated."*

Where known resources are of such high value, field offices can consider deferring the parcel from sale or applying a stipulation; i.e., a CSU or an NSO. Refer to Appendix A of this document for pertinent parcel-specific lease stipulations as needed.

4.3.7 Paleontology

Direct and Indirect Effects

Leasing the parcels would have no direct impacts on paleontological resources. Any potential effects from the sale of leases could occur at the time the leases are developed.

Indirect impacts from the sale of leases would be from the surface disturbances associated with oil and gas exploration and development activities. It is anticipated that most significant fossil resources are located in those geologic units with a Potential Fossil Yield Classification (PFYC) of 3 or higher. However, significant fossil resources could be discovered anywhere. Surface-disturbing activities could potentially alter the characteristics of paleontological resources through damage, fossil destruction, or disturbance of the stratigraphic context in which paleontological resources are located, resulting in the loss of important scientific data. Identified paleontological resources could be avoided by project redesign or relocation before project approval which would negate the need for the implementation of mitigation measures.

Conversely, surface-disturbing activities could potentially lead to the discovery of paleontological localities that would otherwise remain undiscovered due to burial or omission during review inventories. The scientific retrieval and study of these newly discovered resources would expand our understanding of past life and environments of Montana.

Mitigation

The application of lease terms, the paleontological no surface occupancy stipulation (NSO 11-12), and the paleontological lease notices (LN 14-3 and LN 14-12) at leasing, provides protection to paleontological resources during development. The paleontological lease notice LN 14-12 is applied to those lease parcels that fall within geological units with a PFYC Class of 3 or higher, usually requiring a field survey prior to surface disturbance. These inventory requirements could result in the identification of paleontological resources. Avoidance of significant paleontological resources or implementation of mitigation prior to surface disturbance would protect paleontological resources. However, the application of lease terms only allows the relocation of activities up to 200 meters, unless documented in the NEPA document, and cannot result in moving the activity off lease.

Specific mitigation measures could include, but are not limited to, site avoidance or excavation. Avoidance of paleontological properties would be a best management practice. However, should a paleontological locality be unavoidable, significant fossil resources must be mitigated prior to implementation of a project. Also, significant fossil resources could be discovered in areas that had not been evaluated (PFYC of less than 3) during surface disturbance. Those resources must also be professionally mitigated. These mitigation measures and contingencies would be determined when site specific development proposals are received.

In order to protect paleontological resources, both of the 2 parcels are recommended to have the Paleontological lease notice 14-12 applied per guidance identified in IM 2009-011 and 2008-009. No parcels are recommended for the no surface occupancy lease stipulation (NSO 11-12) based upon paleontological resources. See section 3.3.7 Paleontology for list of parcels.

4.3.8 Native American Religious Concerns

Direct and Indirect Effects

Leasing of nominated parcels would not have an impact on TCPs and/or areas of religious or cultural importance to tribes. A lease sale would not interfere with the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act (AIRFA) or EO 13007. It would not prevent tribes from visiting sacred sites or prevent possession of sacred objects. A specific development authorized through the APD process may, however, have an impact Native American religious practices and TCPs.

4.3.9 Forest Products

Direct and Indirect Effects

At this stage (lease sale) there would be no impacts to forest products. Impacts (both direct and indirect) would occur if a lease is developed in the future. The potential impacts would be analyzed on a site-specific basis prior to oil and gas development and during the APD stage of development. Based on the RFD scenario discussed above, there are no foreseeable effects to forest products.

Mitigation

Mitigation would be deferred to the site-specific APD stage of development. Best management practices would be incorporated into conditions of approval (COA) and might include slash treatment, root wad removal/disposal, and commercial or non-commercial product removal.

4.3.10 Lands and Realty

4.3.10.1 Direct and Indirect Effects

Leasing BLM lands for oil and gas exploration and production in the project area would not typically impact land uses because the potential of a successful new find is low.

Along with the ownership of the minerals, the government retains the right to use any part of the surface for exploration or development. These "surface entry rights" can cause distress for private surface owners who do not wish to see new roads and well pads on their land. Adjacent private lands can also be impacted due to leasing if new road access to the leased areas is necessary. Although the responsibility for obtaining access to leased areas is the lessee's and not BLM's, leasing can sometimes cause an indirect impact to adjacent lands due to the need for road access.

Any surface-disturbing activity requires BLM approval. For those parcels that are split estate, the BLM requires the lessee/operator to make a good faith effort to obtain an agreement with the private surface owner prior to access on the leased land issued through competitive bid.

4.3.11 Minerals

4.3.11.1 Fluid Minerals

Stipulations applied to various areas with respect to occupancy, timing limitation, and control of surface use would have the greatest effects on oil and gas exploration and development. Leases issued with major constraints (NSO stipulations) may decrease some lease values, increase operating costs, and to a lesser extent require relocation of well sites and modification of field

development. Leases issued with moderate constraints (timing limitation and CSU stipulations) may result in similar but reduced impacts and delays in operations and uncertainty on the part of operators regarding restrictions.

If areas are deferred, some development plans could be delayed, relocated, or completely dropped because of the need to include federal acreage as part of an exploration or development plan.

Hydraulic Fracturing

Hydraulic fracturing has been utilized by the oil and gas industry since the late 1940's. Within the planning area, hydraulic fracturing, in conjunction with horizontal drilling described above, has allowed for development of unconventional zones that were once considered uneconomical, like the Bakken and Three Forks Formations in the Williston Basin area.

Hydraulic fracturing is a technique used to create additional space and connecting existing fractures and existing rock pores with newly created fractures that are located in deep underground geologic formations. The induced space allows the rock to more readily release oil and natural gas so it can flow to the surface via the well bore that would otherwise be uneconomical to develop. Wells that undergo hydraulic fracturing may be drilled vertically, horizontally, or directionally and the resultant fractures induced by the hydraulic fracturing can be vertical, horizontal, or both. The typical steps of hydraulic fracturing can be described as follows:

1. Water, sand and additives are pumped at high pressures down the wellbore.
2. The liquid goes through perforated sections of the wellbore and into the surrounding formation, fracturing the rock and injecting sand or other proppants into the cracks to hold them open.
3. Experts continuously monitor and gauge pressures along with the volume of fluids and proppants, while studying how the sand reacts when it hits the bottom of the wellbore; slowly increasing the density of sand to water as the frac progresses.
4. This process may be repeated multiple times, in "stages" to reach maximum areas of the wellbore. When this is done, the wellbore is temporarily plugged between each stage to maintain the highest water pressure possible and get maximum fracturing results in the rock.
5. Frac plugs are drilled or removed from the wellbore and the well is tested for results.
6. The water pressure is reduced and fluids are returned up the wellbore for disposal or treatment and re-use, leaving the sand in place to prop open the cracks and allow the oil/gas to flow to the well bore.

Fracturing fluid is typically more than 98 percent water and sand, with small amounts of readily available chemical additives used to carry the proppant and control the chemical and mechanical

properties of the water and sand mixture. Proppant, consisting of synthetic or natural silica sand, may be used in quantities of few hundred tons for a vertical well to a few thousand tons for a horizontal well. The amount of water needed to fracture a well in the planning area depends on the geologic basin, the formation, and depth and type of well (vertical, horizontal, directional), and the proposed completion process.

Several sources of water are available for hydraulic fracturing in the planning area. The Fluid Minerals Operations and Procedures Appendix contain further details on sources of water that could potentially be used for hydraulic fracturing or drilling operations. The use of any specific water source on a federally administered well, requires the proposal be reviewed and analyzed through the NEPA process for BLM approval during the APD stage to ensure compliance with Montana water laws and federal regulations.

Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface in accordance to Onshore Order #2, MBOGC rules and regulations, and API standards. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation.

MBOGC regulations also ensure that all resources including groundwater are protected. The MBOGC regulations require new and existing wells, which will be stimulated by hydraulic fracturing, must demonstrate suitable and safe mechanical configuration for the stimulation treatment proposed. If the operator proposes hydraulic fracturing through production casing or through intermediate casing, the casing must be tested to the maximum anticipated treating pressure. In accordance with MBOGC Rule 36.22.1015 operators are required to disclose and report the amount and type of fluids used in well stimulation to the Board or, if approved by the Board, to the Interstate Oil and Gas Compact Commission/Groundwater Protection Council hydraulic fracturing web site (FracFocus.org).

4.3.11.2 Solid Minerals

Based on the RFD scenario discussed above, there are no foreseeable changes in solid minerals activity under either alternative.

4.3.12 Economics

4.3.12.1 Direct and Indirect Effects

Under Alternative B, 2 parcels in Gallatin and Park counties will be made available for leasing at the October 2014 lease auction. The leasing of an additional 520 acres of BLM administered minerals in these counties would generate additional public revenue and stimulate economic activity. It is estimated that the leasing of all minerals nominated for the October auction would generate about $1,000 in one-time bonus bids and $900 annually in rent revenue for the Federal government. Forty-nine percent of Federal revenue collected from public domain minerals and 25 percent of Federal revenue from acquired minerals (acquired under Bankhead Jones authority)

are redistributed to the State. Montana then distributes 25 percent of public domain revenue and all of acquired mineral revenue back to the counties where the leases exist. All minerals leased by the Butte Field Office are public domain minerals. If these additional parcels were to be leased, an additional $1,000 would be paid to the State of Montana and combined Gallatin and Park counties would receive an additional $250 from the redistribution of federal revenue.

Although leasing under Alternative B would increase the number of acres of BLM minerals leased from the Butte Field Office, the area is characterized as having very low potential and future production associated with these minerals is not anticipated at this time. Under this alternative, BLM minerals engineers anticipate that there will continue to be zero oil and gas production in this region using current industry practices. While future technological advances may increase the ability of lessees to develop these minerals, it is unknown how changes in industry practices may affect future mineral extraction.

Federal revenues distributed back to these counties from the leasing of an additional 520 acres within county lines will be used for traditional county functions such as law enforcement, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems. As local governments spend money redistributed from federal mineral revenue, these dollars will ripple through the local economy stimulating economic activity in the private sector. This ripple effect of local government spending will help support a very small portion of employment in a wide range of sectors providing goods and services directly to the local government, and to households through their local spending.

Table 13. Summary of Estimated Average Annual Economic Impacts by Alternative

Activity	Alternative		
	A	B	Alt. B-Alt. A
Existing Acres leased*	164,781	164,781	0
Acres that would be leased based on this EA **		8,169	8,169
Total acres leased	164,781	172,950	8,169
Acres held by production*	0	0	0
Total acres leased for which lease rents would be paid	164,781	172,950	8,169
Lease rental first 5 years ($1.50/acre)	123,586	129,713	6,127
Lease rental second 5 years ($2.00/acre)	164,781	172,950	8,169
Minimum lease bid ($2.00/ac.)	32,956	34,590	1,634
Total annual federal lease and rental revenue	321,323	337,253	15,930
Distribution to State/local government	157,448	165,254	7,805
Annual oil production (bbl)***	786	825	39
Annual gas production (MCF)	3,150	3,307	156
Federal oil royalty (bblx$64.64x0.125)	6,352	6,667	315
Federal gas royalty (MCFx$5.72x0.125)	2,253	2,364	112

Total annual federal Oil and Gas royalties	8,605	9,031	427
Distribution to State/local government	4,216	4,425	209
			0
Total annual federal revenues	329,928	346,284	16,356
Total annual State/local revenues	161,665	169,679	8,015
Total annual revenue distributed to counties	40,416	42,420	2,004
*LR2000, BLM, May 21, 2010 **RFD, May 28, 2010 ***Estimated 2007 federal production level			

Total estimated average annual federal revenues related to leasing an additional 8,169 acres of federal minerals and associated annual rent and royalty revenues related to annual production of federal minerals would amount to about $346,000. This would be an estimated $16,000 more than Alternative A. Total estimated annual revenues distributed to the state and counties would be about $170,000, about $8,000 more than with Alternative A.

Federal oil and gas production in Montana is subject to production taxes or royalties. These federal oil and gas royalties generally equal 12.5 percent of the value of production (43 CFR 3103.3.1). Forty-nine percent of these royalties are distributed to the state. In Montana, 25 percent of the royalty revenues that the state receives are redistributed to the counties of production (Title 17-3-240, MCA). Between 2000 and 2008, no federal royalty revenues were collected by the federal government or distributed to the state and counties for federal mineral production within these counties.

Local Economic Contribution

The estimated combined total average annual employment and income supported by federal oil and gas leasing, distributions of royalties to local governments, drilling wells, and production would amount to less than five total jobs and about $210,000 within the local economy (IMPLAN, 2007). Table 14 shows that this probably would not cause an annual increase in total jobs and less than a $10,000 increase in labor income over levels anticipated with Alternative A. There would be an estimated increase in local population of less than ten people (about the same as with Alternative A).

Table 14. Estimated Average Annual Employment and Income by Major Industry by Alternative

Industry	Total Jobs Contributed			Total Income Contributed ($1000)		
	Current	Alt. A	Alt. B	Current	Alt. A	Alt. B
Agriculture	0	0	0	$0.0	$1.0	$1.1
Mining	0	2	2	$0.3	$96.3	$102.4
Utilities	0	0	0	$0.2	$2.5	$2.6
Construction	0	0	0	$1.5	$4.7	$4.9
Manufacturing	0	0	0	$0.2	$3.3	$3.5
Wholesale Trade	0	0	0	$0.3	$6.7	$7.1
Transportation and Warehousing	0	0	0	$0.3	$7.6	$8.1
Retail Trade	0	0	0	$0.5	$5.7	$6.0

Information	0	0	0	$0.1	$1.4	$1.5
Finance and Insurance	0	0	0	$0.8	$7.1	$7.5
Real Estate and Rental and Leasing	0	0	0	$0.4	$4.1	$4.4
Prof, Scientific, and Tech Services	0	1	1	$1.6	$24.9	$26.5
Mngt of Companies	0	0	0	$0.0	$4.3	$4.6
Admin, Waste Mngt and Rem Serv	0	0	0	$0.3	$2.3	$2.5
Educational Services	0	0	0	$0.0	$0.5	$0.5
Health Care and Social Assistance	0	0	0	$0.7	$8.4	$8.9
Arts, Entertainment, and Rec	0	0	0	$0.1	$0.7	$0.7
Accommodation and Food Services	0	0	0	$0.3	$2.8	$3.0
Other Services	0	0	0	$0.3	$3.5	$3.7
Government	0	0	0	$10.5	$12.7	$13.3
Total Federal Contribution	0	5	5	$18.4	$200.4	$212.9

Disclosure of the direct, indirect, and cumulative effects of GHG emissions provides information on the potential economic effects of climate change including effects that could be termed the "social cost of carbon" (SCC). The USEPA and other federal agencies developed a method for estimating the SCC and a range of estimated values (USEPA 2014). The SCC estimates economic damages associated with climate change impacts to net agricultural productivity, human health, property damage, and ecosystems. Using a 3 percent average discount rate and year 2020 values, the incremental SCC is estimated to be $46 per metric ton of annual CO_2e increase. Based on the GHG emission estimate provided in Section 4.3.3.1.2, the annual SCC associated with potential development on lease sale parcels is negligible at $20 (in 2011 dollars). Estimated SCC is not directly comparable to economic contributions reported above, which recognize certain economic contributions to the local area and governmental agencies but do not include all contributions to private entities at the regional and national scale. Direct comparison of SCC to the economic contributions reported above is also not appropriate because costs associated with climate change are borne by many different entities.

Direct and Indirect Effects

The Proposed Action would have a beneficial effect on mineral exploration and development, since the land would be offered for competitive auction. The practical utilization of the lands would have a positive local effect in the generation of long-term jobs and revenues to the state and county. The royalties and rentals from competitive auctions are also a dependable source of long-term income for the federal government. The impacts from this particular auction may be small, including an unknown (but probably relatively small) amount of new reserves, due to the small amount of acreage offered. However, the positive action of the auction would provide the

industry with increased opportunity for exploration, potentially resulting in increased stability and profitability of domestic companies.

4.3.13 Environmental Justice

Impacts Common to All Alternatives:

Impacts to the social environment of Gallatin and Park counties would be contingent upon the revenue coming back to these counties from bonus bids and rent of the parcels. Based upon the economics analysis, there would be little impact to the social qualities, community infrastructure, and community services of these counties.

Direct and Indirect Effects

Alt A (No Action)

The No Action alternative would result in the continuation of the current land and resource uses and would cause no additional social impacts. There would be no disproportionate effects to low income or minority populations under this alternative.

Alternative B

The act of leasing Federal minerals will provide additional revenue to the counties which can be used for county services and infrastructure as indicated in the economics section. Given current technology it is not anticipated BLM minerals engineers that oil and gas production will occur and therefore no additional social effects are expected. There would be no disproportionate effects to low income or minority populations.

4.4 Cumulative Impacts- Alternative B

Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions. This section describes cumulative impacts associated with this project on resources. The ability to assess the potential cumulative impacts at the leasing stage for this project is limited for many resources due to the lack of site-specific information for potential future activities. Upon receipt of an APD for any of the lease parcels addressed in this document, more site-specific planning and NEPA analysis would be conducted in which the ability to assess contributions to cumulative impacts in a more detailed manner would be greater due to the availability of more refined site-specific information about proposed activities.

Cumulative effects associated with all BLM programs in the Butte FO, including implementation of the RFD scenario described above, are described in the Butte RMP/FEIS on pages 496-511. Anticipated exploration and development activity associated with the lease parcels considered in this EA are within the range of assumptions used and effects described in this cumulative effects analysis for all resources and programs other than air resources and climate. This analysis is tiered to the Butte RMP final EIS, and is also hereby incorporated by reference to this EA.

4.4.1 Past, Present and Reasonably Foreseeable Future Actions:

Past, present, or reasonably foreseeable future actions that affect the same components of the environment as the Proposed Action are discussed in detail in the Butte RMP/FEIS on pages 496-511 and are incorporated by reference.

4.4.2 Cumulative Impacts by Resource

4.4.2.1 GHG Emissions and Cumulative Impacts on Climate Change

The cumulative effects analysis area is the Butte FO, with additional discussion at state-wide, national, and global scales for GHG emissions and climate change.

This section incorporates an analysis of the potential contributions to GHG emissions in the event that the Proposed Action lease parcels are developed followed by a general discussion of potential impacts to climate change. Potential emissions relate to those derived from potential exploration and development of fluid minerals. Additional emissions beyond the control of the BLM, and outside the scope of analysis, would also occur during any needed refining processes, as well as end uses of final products.

Projected GHG emissions for this project and the Butte FO RFD are compared below with recent available inventory data at the state, national, and global scales. GHG emissions inventories can vary greatly in their scope and comprehensiveness. State, national, and global inventories are not necessarily consistent in their methods or in the variety of GHG sources that are inventoried (BLM 2010). However, comparisons of emissions projected by the BLM for its oil and gas production activities are made with those from inventories at other scales to provide a context for the potential contributions of GHGs associated with this project.

As discussed in the Air Quality section of Chapter 4, total projected BLM GHG emissions from the RFD are 561 metric tons/year CO_2e. Potential emissions under the Proposed Action would be approximately 0.079 percent of this total. Table 15 displays projected GHG emissions from non-BLM activities included in the Butte FO RFD. Total projected emissions of non-BLM activities in the RFD are 4,886 metric tons/year of CO_2e. When combined with projected annual BLM emissions, this totals 4,887 metric tons/year CO_2e. Potential GHG emissions under the Proposed Action would be 0.009 percent of the estimated emissions for the entire RFD. Potential incremental GHG emissions from exploration and development of fluid minerals on parcels within the Proposed Action would be negligible in the context of projected GHG contributions from the entire RFD for the Butte FO.

Table 15. Projected non-BLM GHG emissions associated with the Butte FO Reasonably Foreseeable Development Scenario for fluid mineral exploration and development.

Source	Non-BLM Projected GHG Emissions in tons/year for Butte FO RFD			Emissions (metric tons/yr)
	CO_2	CH_4	N_2O	CO_2e
Conventional Natural Gas	630.4	14.1	0.0	840.9
Coal Bed Natural Gas	1,218.9	59.6	0.0	2,242.8

Oil	1,890.7	3.3	0.1	1,802.1
Total	**3,740**	**77**	**0.1**	**4,885.8**

Montana's Contribution to U.S. and Global GHGs

Montana's GHG inventory (CCS 2007) shows that activities within the state contribute 0.6 percent of U.S and 0.076 percent of global GHG emissions (based on 2004 global GHG emission data from IPCC 2007). Based on 2005 data in the state-wide inventory, the primary source of Montana's GHG emissions is combustion of fossil fuels to generate electricity, which accounts for about 27 percent of Montana's emissions. The next largest contributors are the agriculture and transportation sectors (each at approximately 22 percent) and fossil fuel production (13.6 percent).

GHG emissions from all major sectors in Montana in 2005 totaled approximately 36.8 million metric tons of CO_2e (Center for Climate Science [CCS] 2007). Potential emissions from development of lease parcels in the Proposed Action of this project represent approximately 0.000001 percent of the state-wide total of GHG emissions based on the 2005 state-wide inventory (CCS 2007).

The USEPA published an inventory of U.S. GHG emissions, indicating gross U.S. emissions of 6,702 million metric tons and net emissions of 5,797 million metric tons (when CO_2 sinks were considered) of CO_2e in 2011 (USEPA 2013a). Potential annual emissions under the Proposed Action would be a negligible increase in gross U.S. total emissions. Global GHG emissions for 2004 (BLM 2010) indicated approximately 49 gigatonnes (10^9 metric tons) of CO_2e emitted. Potential annual GHG emissions under the Proposed Action would represent a negligible increase to this global total.

As indicated above, although the effects of GHG emissions in the global aggregate are well-documented, it is currently not possible to determine what specific effect GHG emissions resulting from a particular activity might have on climate or the environment. If exploration and development occur on the lease parcels considered under the Proposed Action, potential GHG emissions described above would incrementally contribute to the total volume of GHGs emitted to the atmosphere and, ultimately to climate change.

Mitigation measures identified in the Chapter 4 Air Quality section above may be in place at the APD stage to reduce GHG emissions from potential oil and gas development on lease parcels within the Proposed Action. This is likely because many operators working in Montana are USEPA Natural Gas STAR Program Partners, and future regulations may require GHG emission controls for a variety of industries, including the oil and gas industry (BLM 2010).

4.4.2.2 Cumulative Impacts of Climate Change

As previously discussed in the Air Quality section of Chapter 4, it is difficult to impossible to identify specific impacts of climate change on specific resources within the project area. As summarized in the Climate Change SIR (BLM 2010), climate change impacts can be predicted with much more certainty over global or continental scales. Existing models have difficulty reliably simulating and attributing observed temperature changes at small scales. On smaller scales, natural climate variability is relatively larger, making it harder to distinguish changes expected due to external forcings (such as contributions from local activities to GHGs). Uncertainties in local forcings and feedbacks also make it difficult to estimate the contribution of GHG increases to observed small-scale temperature changes (BLM 2010). Effects of climate change on resources are described in Chapter 3 of this EA and in the Climate Change SIR (BLM 2010).

4.4.2.3 Cumulative Impacts to Wildlife

Wildlife and Special Status Animal Resources

Cumulative impacts to wildlife and special status species would include loss and fragmentation of habitat in addition to other human activities such as subdivisions and conversion of natural habitat to agricultural land. The disturbance of development would also add to other human activities causing wildlife avoidance of previously used areas.

4.3.21.4 Cumulative Impacts to Economic Conditions

The leasing of an additional 520 acres of Federal minerals by the Dillon Field Office would result in a total of 27,547 acres of BLM fluid minerals leased in Gallatin and Park counties. The leasing of Federal minerals in these counties by the BLM would generate about $49,000 in Federal revenue. The redistribution of Federal revenue associated with leasing of these Federal minerals is estimated to generate nearly $24,000 in State revenue for Montana and nearly $6,000 in local public revenue in the two counties.

Historically there has been relatively no oil and gas production in Gallatin and Park counties. Although leasing under Alternative B would increase the number of acres of BLM minerals leased from the Butte Field Office, BLM minerals engineers anticipate that there will continue to be zero oil and gas production in this region using current industry practices. While future technological advances may increase the ability of lessees to develop these minerals, it is unknown how changes in industry practices may affect future mineral extraction. Under Alternative B, there is anticipated to be zero federal royalty revenue collected over the life of these leases. Since there is not anticipated to be any federal royalty revenue, there are not anticipated to be any distribution of royalty related payments back to the state of Montana or to these counties.

If all 520 acres of fluid BLM minerals are leased under Alternative B, Federal revenues distributed back to counties are estimated to be approximately $6,000 on annual average. These revenues will be used to fund law enforcement and fire departments, roads and highway maintenance, public education, local clinics/hospitals and county libraries. Public services and infrastructure investments by the State and local municipalities with redistributed Federal dollars

supports employment and income in the public sector and in industries providing goods and services to the public sector. While there is not anticipated to be any future production associated with these nominated parcels, exploration and drilling activities may also stimulate future economic activity which will ripple through the private sector, directly and indirectly supporting local employment and income in nearly every part of the economy. Since current development potential of fluid minerals in this region is very low and not anticipated to increase in the near future, local employment and income associated with oil and gas related sectors is anticipated to continue to account for a small fraction of total employment and income within the local economy.

5.0 CONSULTATION AND COORDINATION:

5.1 Persons, Agencies, and Organizations Consulted

Table 16 lists the persons, agencies, and organizations consulted during development of this EA along with the findings and conclusions associated with consultations.

Table 16. List of all Persons, Agencies and Organizations Consulted for this EA.

Name	Purpose and Authorities for Consultation or Coordination	Findings and Conclusions
Montana Fish, Wildlife and Parks	Wildlife Coordination	General discussion of game numbers, stipulation review and the EA process.

5.2 Summary of Public Participation

Scoping

Public scoping for this project was conducted through a 15-day scoping period advertised on the BLM Montana State Office website and posting on the field office website NEPA notification log. Scoping was initiated March 25, 2014. The BLM also sent surface owner notification letters which briefly explained the oil and gas leasing process and planning process. The surface owner notification letter requested written comments regarding any issues or concerns that should be addressed in the environmental analysis. No individual scoping comments were received during the 15-day scoping period pertaining to this EA.

Public Comment Period

The public comment period for this project was conducted through a 30-day public comment period advertised on the BLM Montana State Office website and posting on the field office website NEPA notification log. The comment period began May 19, 2014 and closed June 18, 2014. No individual public comments received during the 30-day comment period pertained directly to this EA, however public concern addressed the safety and preservation of locations of national importance near, but not included in, areas analyzed in this EA. Lease stipulation NSO 11-26 addresses this issue, as it implements No Surface Occupancy or use is allowed within one-half mile of designated National Historic Trails. Public concern also addressed issues pertaining to the posterity and preservation of big game habitat and winter range, as well as concern of oil and gas development as it pertains to Greater Sage Grouse habitat. These concerns have been

addressed in the EA and standard lease stipulations. The application of stipulations listed in the Butte RMP will also mitigate any negative affect the lease sale will have on all identified sensitive habitats.

5.3 List of Preparers:

Table 17. List of Preparers.

Name	Title	Responsible for the Following Section(s) of this Document
Tessa Wallace	Natural Resource Specialist	Author
Joan Gabelman	Geologist	Project Lead – Butte Field Office
Corey Meier	Assistant Field Manager Nonrenewables	Soils, Editorial review
Carrie Kiely	Archaeologist	Cultural Resources
Scot Franklin	Wildlife Biologist	Wildlife
Roger Olsen	Range Conservationist	Range, Plants, Riparian
Eric Broeder	Range Conservationist	Riparian
Jennifer Dobb	Economist	Social/Economic
Jessica Montage	Economist	Environmental Justice
Susan Bassett	Air Resource Specialist	Air Resources, Climate
Brad Colin	(NRS) Recreation	Recreation, VRM, Special Management Areas
Mike Wyatt	Realty Specialist	Lands
Bradlee Matthews	GIS Specialist	GIS Support
David Williams	Geologist	Solid Minerals, Geology, Geothermal,
Barney Whiteman	Petroleum Engineer	Fluid Minerals
Samantha Iron Shirt	Legal Law Examiner	Appendix A
Gregory Liggett	Paleontologist	Paleontology

5.4 List Reviewers and Roles:

In addition to the primary preparers listed above, the following individuals provided document review:

Table 18. List of Reviewers and Roles.

Name	Title	Responsible for the Following Section(s)
Corey Meier	Assistant Field Manager	Editorial Review

	Nonrenewables	
Richard M. Hotaling	Butte District Manager	General Review

6.0 REFERENCES

Adair, Ann and Scott Rickard, 2005 "The Economic and Fiscal Impacts of Montana's Petroleumand Natural Gas Industry in 2003", Montana State University-Billings, Center for AppliedResearch.

American Wildlands. 2009. Priority Linkage Assessment: The Hub Conservation Area. Technical Report. Version 1.0. http://www.wildlands.org/programs/corridors/pla

Arno, S.F. 1976. Forest regions of Montana. USDA Forest Service Research Paper INT-218, 39 pp. Intermountain Forest and Range Experiment Station, Ogden, UT.

BLM 2008. Proposed Butte resource management plan and final environmental impact statement. http://www.blm.gov/mt/st/en/fo/butte_field_office/rmp/proposed.html

Burns, R. M. and B.H. Honkala, tech. cords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. USDA Forest Service, Washington, DC. Vol 2, 877 pgs.

Carnefix, G. 2003. Bull trout classification and distribution. Available online at http://www.fisheries.org/units/AFSmontana/SSCpages/Bull%20Trout.htm. Accessed 7/1/10.

Center for Climatic Strategies (CCS). 2007. http://www.epa.gov/RDEE/energy-resources/refs.htmlMontana Greenhouse Gas Inventory and Reference Case Projections 1990-2020. Center for Climate Strategies and Montana Department of Environmental Quality. September 2007.

CEQ, 1997. Environmental Justice: Guidance under the National Environmental Policy Act. Council for Environmental Quality (CEQ).

Christensen, A.G., L.J. Lyon, and J.W. Unsworth. 1993. Elk management in the northern region: considerations in forest plan updates and revisions. Gen. Tech. Rep. INT-303. Ogden, UT: U.S. Dept. of Agriculture, Forest Service, Intermountain Research Station. 10 p.

IMPLAN, 2007. Minnesota IMPLAN Group 2007.

Independent Petroleum Association of America, The Oil and Gas Producing Industry in Your State 2008-2009.

Independent Statistics and Analysis-Montana. (2010). Retrieved June 3, 2010 from U.S. Energy Information Administration: http://www.eia.doe.gov.

Inkley, D.B., M.G. Anderson, A.R. Blaustein, V.R. Burkett, B. Flezer, B. Griffith, J. Price, and T.L. Root. 2004. Global climate change and wildlife in North America. Wildlife Society Technical Review 04-2. The Wildlife Society, Bethesda, Maryland, USA. 26pp.

Inouye, D. W., B.Barr, K.B. Armitage and B.D. Inouye. 2000. Climate change is affecting altitudinal migrants and hibernating species. PNAS, Vol. 97, No. 4. 1630-1633.

Interagency Monitoring of Protected Visual Environments (IMPROVE). 2011. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V. June.

Intergovernmental Panel on Climate Change (IPPC). 2007. IPCC Fourth Assessment Report: Climate Change 2007 (AR4).

Intergovernmental Panel on Climate Change (IPPC). 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

Koehler, G.M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Canadian Journal of Zoology 68:845-851.

Liebig, M.A., J.R. Gross, S.L. Kronberg, R.L. Phillips, and J.D. Hanson. 2010. Grazing Management Contributions to Net Global Warming Potential: A Long-term Evaluation in the Northern Great Plans. J. Environ Qual. 39:799-809.

MacArthur, R.A., V. Geist, and R.H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46(2):351-358.

Mace, R.D. and T.L. Manley. 1993. South Fork Flathead River Grizzly Bear Project: Progress Report for 1992. 34 pp.

Mallory, W.W., M.R. Mudge, V.E. Swanson, D.S. Stone and W.E. Lumb. eds. 1972. Geologic Atlas of the Rocky Mountains; Rocky Mountain Association of Geologist. p. 331.

Mincemoyer, S. 2005. Surveys of Significant Plant Resources and Related Vegetation Types for the Butte Office of the Bureau of Land Management. Montana Natural Heritage Program; Natural Resource Information System, Montana State Library.

Montana Department of Envirnomental Quality (MDEQ). 2013. State of Montana Air Quality Monitoring Network Plan. May.

Montana Department of Natural Resources and Conservation, Oil and Gas Conservation Division. Annual Review 2000-2008 County Drilling and Production Statistics.

Montana Department of Revenue, 2009. Van Charlton.

Montana Fish, Wildlife and Parks. 2002. Pittman-Robertson project report - southwest Montana eco-region survey and inventory project (bighorn sheep). Montana Fish, Wildlife and Parks, Wildlife Division. Helena, MT. 10 pp.

Montana Fish, Wildlife and Parks. 2005. Montana elk management plan. Montana Fish, Wildlife and Parks, Wildlife Division, Helena, MT.

Montana Fish, Wildlife and Parks. 2010. Montana Bighorn Sheep Conservation Strategy. Montana Fish, Wildlife and Parks, Wildlife Division. Helena, MT. 313 pp.

Montana Fish, Wildlife and Parks, and Parks 2010a. Montana field guide. http://fieldguide.mt.gov/default.aspx

Montana Fish, Wildlife and Parks, and Parks 2010b. Montana fisheries information system. http://fwp.mt.gov/fishing/mFish/

Montana Fish, Wildlife and Parks, and Parks . 2010c. 2010 post season survey of elk in hunting district 339. Montana Fish, Wildlife and Parks. Wildlife Division, Helena MT. 5 pp.

Montana Fish, Wildlife and Parks, and Parks . 2010d. 2010 post season trend survey of mule deer in hunting districts 343 & 339. Montana Fish, Wildlife and Parks. Wildlife Division, Helena MT. 5 pp.

Montana Fish, Wildlife and Parks, and Parks . 2010e. 2010 spring recruitment survey of mule deer in hunting districts 343 & 339. Montana Fish, Wildlife and Parks. Wildlife Division, Helena MT. 6 pp.

Montana Fish, Wildlife and Parks. 2000. Restoration plan for bull trout in the Clark Fork River Basin and Kootenai River Basin Montana. Montana Fish, Wildlife and Parks. Helena, MT. 114 pp.

Mueggler, W.F., and W.L. Stewart. 1980. Grassland and Shrubland Types of Western Montana. USDA Forest Service General Technical Report INT-66, Intermountain Forest and Range Experiment Station, Ogden, Utah. 153 p.

NASS, 2014. 2012 US Census of Agriculture: Table 8. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2012 and 2007.

National Oceanic and Atmospheric Administration (NOAA). 2014. National Climatic Data Center. Climate at a Glance website. http://www.ncdc.noaa.gov/cag/. Accessed April 7, 2014.

NRCS, 2010. Soil Data Mart. Natural Resources Conservation Service. http://soilsdatamart.nrcs.usda.gov/

Pfister, R.D. *et* al. 1977. Forest Habitat Types of Montana. USDA Forest Service. GTR-INT-34, 174 pgs. Intermountain Forest and Range Experiment Station, Ogden, UT.

Ramseur, J.L. 2007. State greenhouse gas emissions: Comparison and analysis. Congressional Research Service Report RL34272 for Congress. December 5, 2007.

Rickard, Scott, 2010 "Economic and fiscal impacts of Montana's oil and gas industry", The Treasure State Journal, 2010, 36-39.

Rickard, Scott, 2008 "Economic and Fiscal Impacts of Montana's Petroleum and Natural Gas Industries", The Treasure State Journal, 18-28.

Root, T.L. and S.H. Schneider. 2002. Climate change: on overview and implication for wildlife. *In* Wildlife Response to Climate Change: North American Case Studies, Washington D.C., Island Press, 437 pp.

Ross, R.L. and H.E. Hunter. 1976. Climax Vegetation of Montana based on Soils and Climate. USDA Soil Conservation Service, Bozeman, MT.

Ruediger, Bill, Jim Claar, Steve Gniadek, Bryon Holt, Lyle Lewis, Steve Mighton, Bob Naney, Gary Patton, Tony Rinaldi, Joel Trick, Anne Vandehey, Fred Wahl, Nancy Warren, Dick Wenger, and Al Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.

Ryker R.A. and R.W.Steele 1980. *In*: Forest Cover Types of the United States and Canada. F.H. Eyre, editor. Published by the Society of American Foresters, Washington D.C. 148 pgsSauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 - 2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center**,** Laurel, MD

Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 - 2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center**,** Laurel, MD

Servheen, C. 1986. Habitat research needs for grizzly bear recovery. Pages 14-18 in: B.P. Contreras and K. E. Evans, eds. Proc. Grizzly Bear Habitat Symposium. U.S.D.A. Forest Service Intermountain Res. Stat., Ogden, Utah, Gen. Tech. Rep. Int-207.

Skagen, S.K., R. Hazlewood, and M.L. Scott. The importance and future condition of western riparian ecosystems as migratory bird habitat. USDA Forest Service Gen. Tech Rep. PSW-GRT-191. 525-527

Skolvin, J.M. 1983. Habitat requirements and evaluations. Pages 369-413 in J.W. Thomas and D.E. Toweill (eds) Elk of North America: Ecology and Management. Wildlife Management Institute. Stackpole Books, Harrisburg, PA.

State and County QuickFacts. (2010). Retrieved July 13, 2010 from U.S. Census Bureau: http://quickfacts.census.gov/qfd/index.html.

TetraTech, 2005. Mineral Assessment Report, prepared for U.S.D.I., B.L.M. Butte RMP. 137 pp.

U.S. Census. 2013a. Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States, States, and Counties. Population Division. Release date: June 2013.

U.S. Census. 2013b. Incorporated Places and Minor Civil Divisions Datasets: Subcounty Resident Population Estimates: April 1, 2010 to July 2012. Population Division. Release date: June 2013.

U.S. Department of the Interior (USDI). 1993. Grizzly Bear Recovery Plan. U.S. Fish and Wildlife Service. Denver, CO. 75 pp.

U.S. Department of the Interior Bureau of Land Management, 2008. *BLM Annual Report, 2008, Federal Oil and Gas Leases Issued in FY2008.* (2010). Retrieved July 21, 2010 from DOI: BLM: Montana/Dakotas Home Page: http://www.blm.gov/mt/st/en.html.

U.S. Department of the Interior Bureau of Land Management, 2008. BLM Annual Report, 2008, Federal Total Reported Royalty Revenues.

U.S. Department of the Interior Bureau of Land Management, 2010. BLM LR2000, 2010, Authorized Leases/Leases Held by Production, May 21, 2010.

U.S. Department of Mineral Management Service (MMS). 2008. Stacy Browne 2008.

U.S Department of the Interior (USDI) and U.S. Department of Agriculture (USDA). 2007. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. BLM/WO/ST-06/021+3071/REV 07. Bureau of Land Management. Denver, Colorado. 84 pp.

U.S Department of the Interior, BLM. 2008a. Proposed Bureau of Land Management Butte Resource Management Plan and Final Environmental Impact Statement. Bureau of Land Management, Butte Field Office. Butte, MT.

U.S Department of the Interior, BLM. 2008b. The Biological Assessment for the Bureau of Land Management Butte Resource Management Plan. Bureau of Land Management Butte Field Office. Butte, MT.

U.S Department of the Interior, BLM. 2009. Record of decision and approved Butte Resource Management Plan. Bureau of Land Management, Butte Field Office. Butte, MT.

U.S Department of the Interior, BLM. 2010. Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota, Bureau of Land Management. Report on Greenhouse Gas Emissions and Climate Change for Montana, North Dakota, and South

Dakota. Technical report prepared for the Montana/Dakotas Bureau of Land Management by URS Corporation.

U.S Department of the Interior, BLM. 2013. Draft Billings and Pompeys Pillar National Monument Draft Resource Management Plan and Environmental Impact Statement (DRMP/EIS). Bureau of Land Management, Billings Field Office. Billings, MT. March.

U.S Department of the Interior, U.S Fish and Wildlife Service (USDI-USFWS). 2008. Biological Opinion on the Effects of the Butte Bureau of Land Management Resource Management Plan on Grizzly Bears. U.S. Fish and Wildlife Service. Helena, MT.

U.S Department of the Interior, U.S. Fish and Wildlife Service. 2010. Montana ecological services field office website. http://www.fws.gov/montanafieldoffice/index.htm

U.S. Environmental Protection Agency (USEPA). 2013a. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2011. EPA 430-R-13-001. April 13. http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

U.S. Environmental Protection Agency (USEPA). 2013b. AirData Website (http://www.epa.gov/airdata/). Accessed December 13.

U.S. Environmental Protection Agency (EPA). 2014. The Social Cost of Carbon Website. (http://www.epa.gov/climatechange/EPAactivities/economics/scc.html). Accessed April 4, 2014.

U.S. Global Change Research Program (USGCRP). 2009. Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009. http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009

Van Dyke, F. and W. C. Klein. 1996. Response of elk to installation of oil wells. Journal of Mammalogy 77:1028-1041.

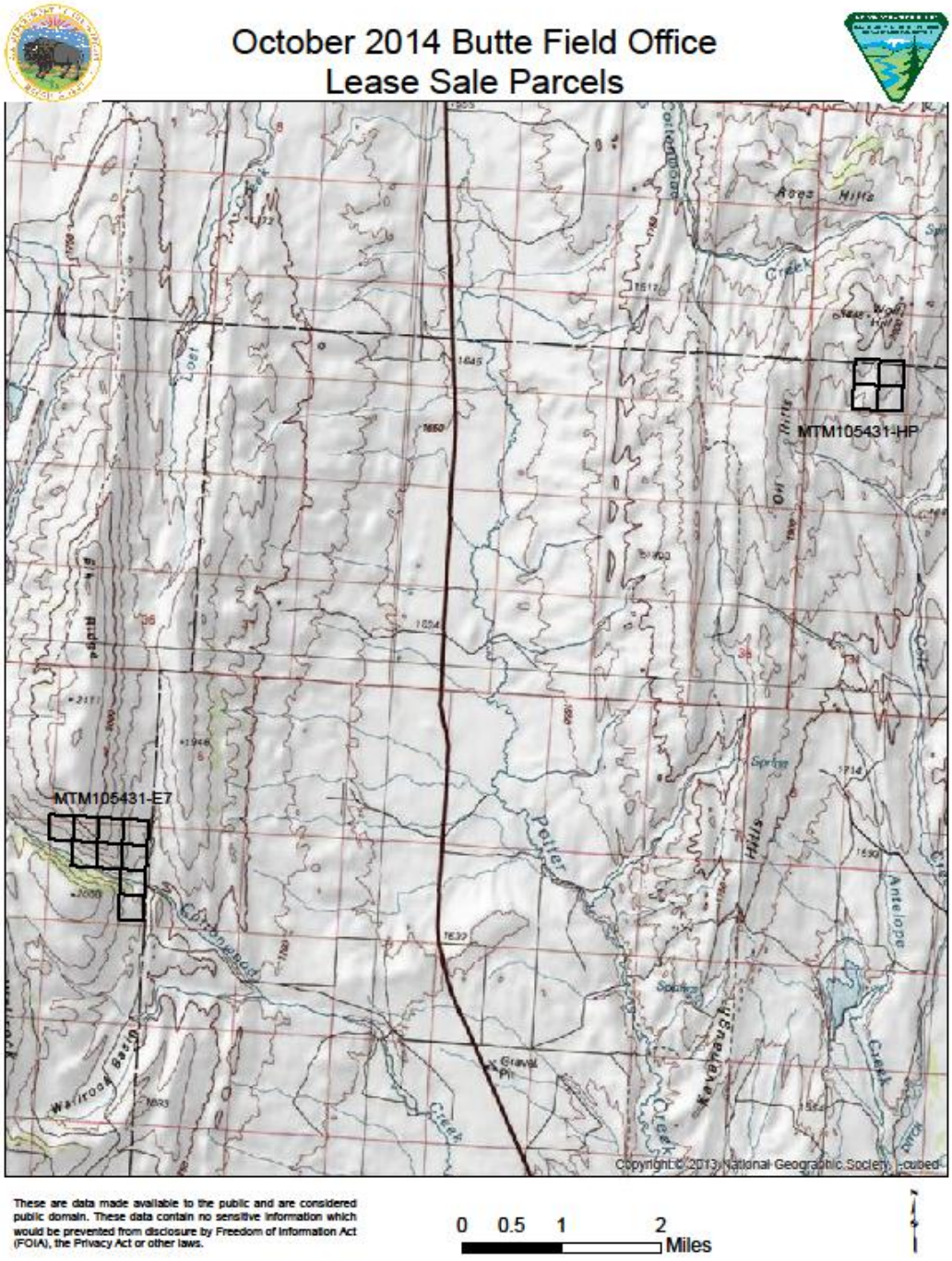
Veseth, R. and Montagne, C. 1980. Geologic Parent Materials of Montana Soils. Bull. 721. Montana Agric. Exp. Stn. Bozeman, MT.

Walker, B.L. et. al. 2007. Greater sage-grouse population response to energy development and habitat loss. Journal of wildlife management. 71(8):2644–2654.

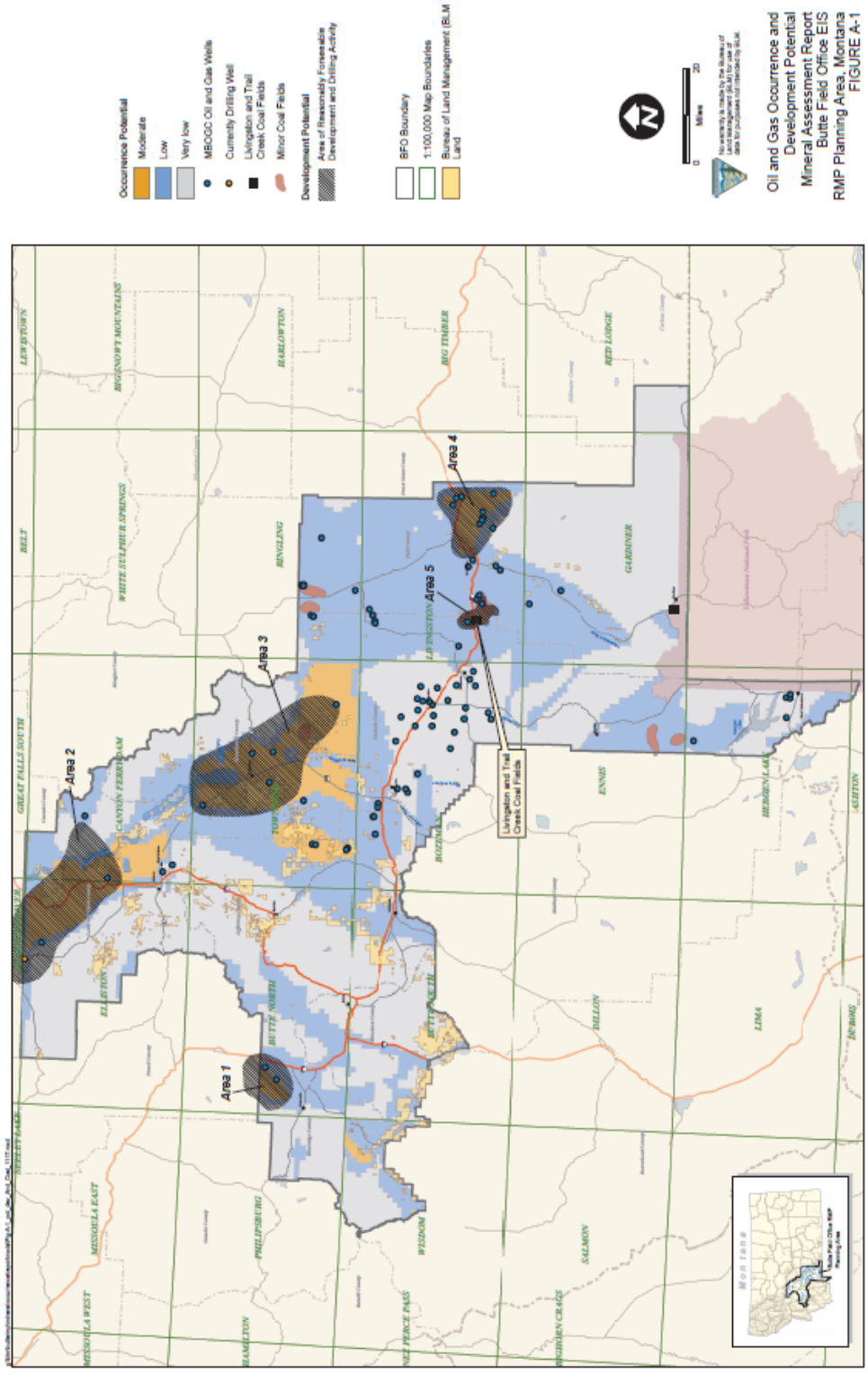
Western Regional Climate Center. 2004. http://www.wrcc.dri.edu/ . Reno, NV.

MAPS

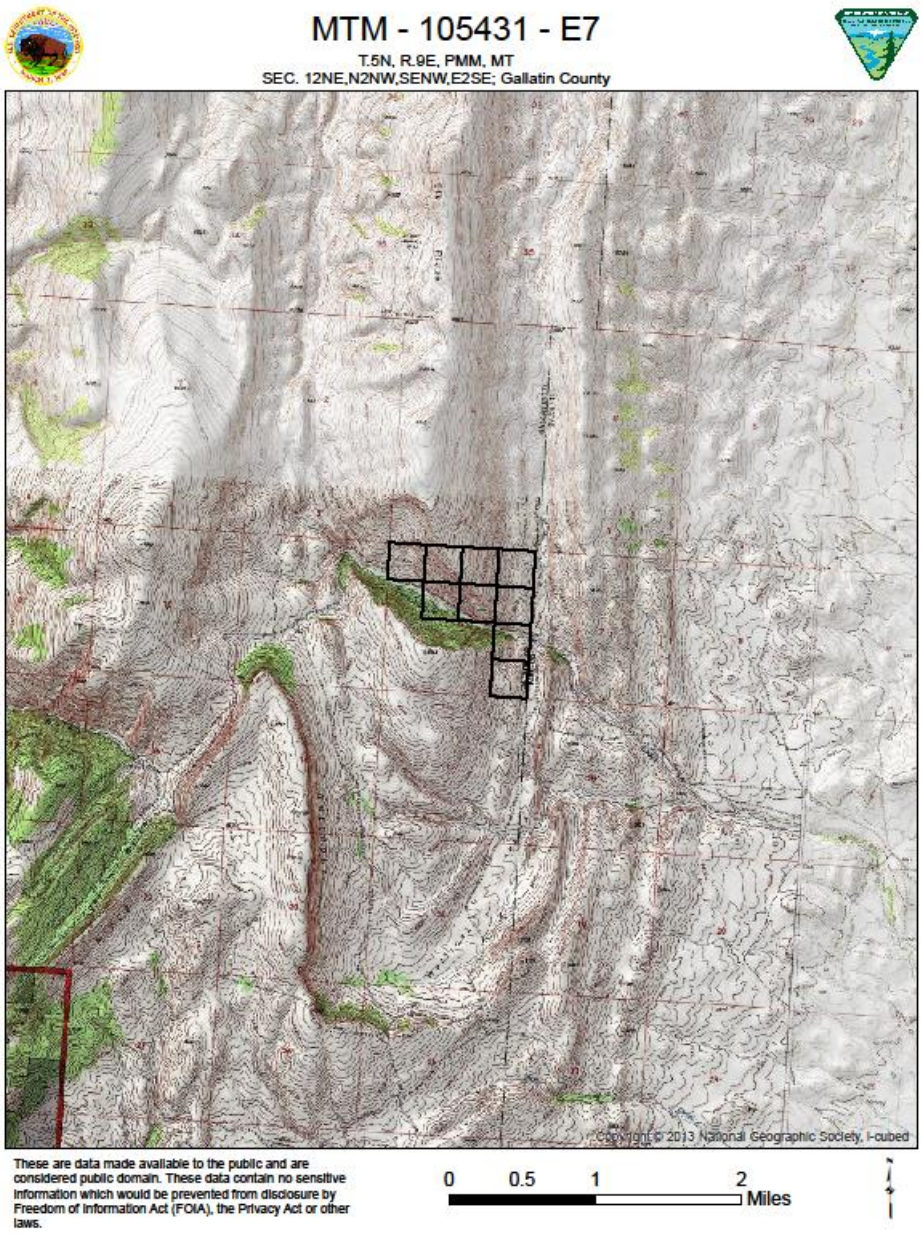
Map 1. Overview of Lease Sale Parcels



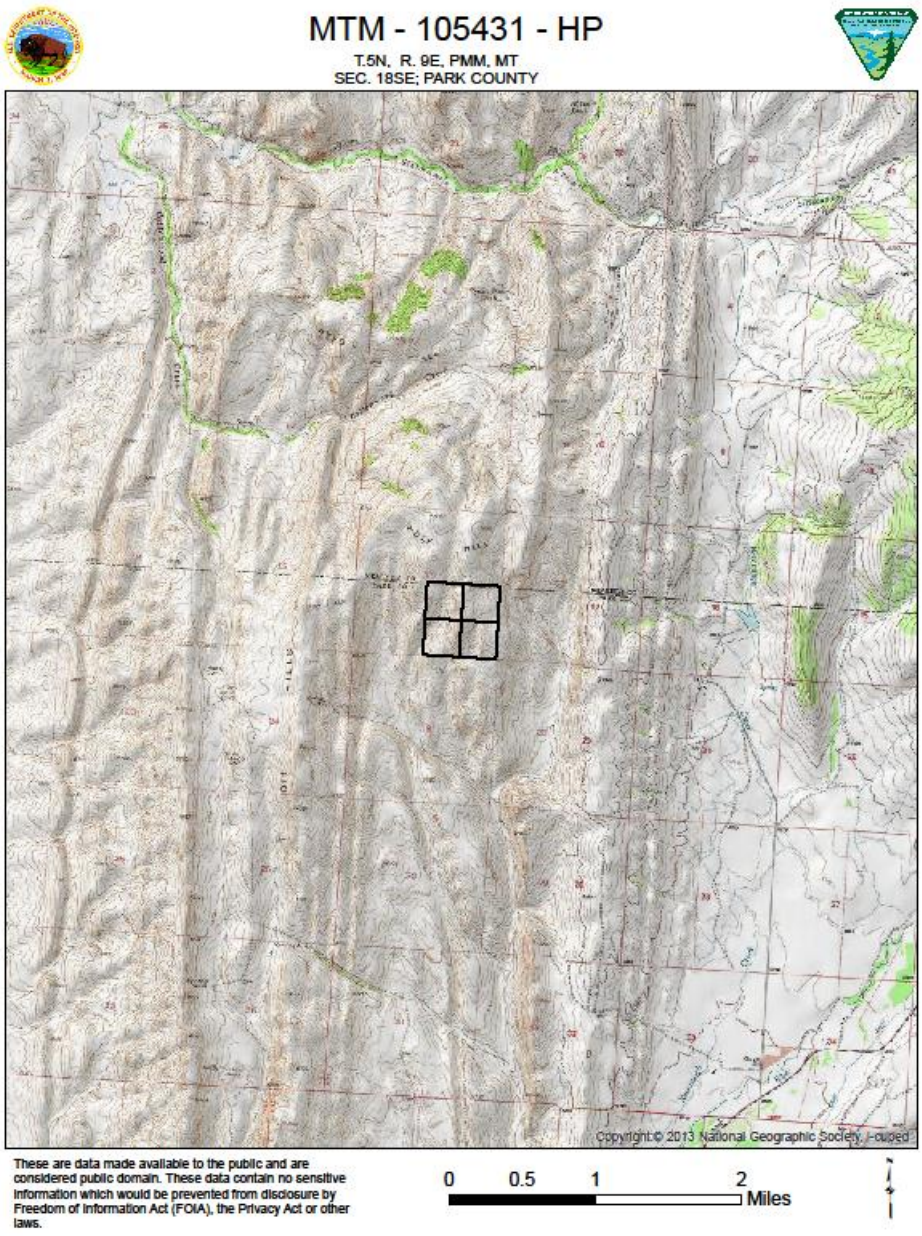
Map 2. Reasonably Foreseeable Development Map (Figure A-1) from the Butte RMP



Map 3. Lease Sale Parcel Butte FO



Map 4. Lease Sale Parcel Butte FO



Appendix A: Descriptions of Parcels and Lease Stipulations by Parcel – Lease Sale

PARCEL NUMBER	PARCEL DESCRIPTION	PROPOSED STIPULATIONS FOR ENTIRE PARCEL IF LEASED	PROPOSED FOR DEFERRAL-NO LEASING
MTM 105431-E7	T. 4 N, R. 7 E, PMM, MT SEC. 12 NE,N2NW,SENW,E2SE; GALLATIN COUNTY 360.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-1**2 (ALL LANDS) **NSO 11-48** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-14** (ALL LANDS) **TL 13-28** (ALL LANDS) **TL 13-30** (ALL LANDS)	
MTM 105431-HP	T. 5 N, R. 9 E, PMM, MT SEC. 18 SE; PARK COUNTY 160.00 AC PD	**CR 16-1** (ALL LANDS) **LN 14-12** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-14** (ALL LANDS) **TL 13-28** (ALL LANDS) **TL 13-30** (ALL LANDS)	

Appendix B – Master Stipulation List

Stipulation Number	Stipulation Name/Brief Description
CR 16-1	**CULTURAL RESOURCES LEASE STIPULATION** This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities.
CSU 12-1	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Prior to surface disturbance on slopes over 30 percent, an engineering/reclamation plan must be approved by the authorized officer.
CSU 12-2	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Prior to surface disturbance, a surface use plan of operations (SUPO) for oil and gas activities must be approved for black-footed ferret reintroduction areas by the authorized officer in consultation with the U.S. Fish and Wildlife Service.
CSU 12-3	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: 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.
CSU 12-4	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: All surface-disturbing activities, semi-permanent and permanent facilities in Visual Resource Management (VRM) Class II areas may require special design, including location, painting and camouflage, to blend with the natural surroundings and meet the visual quality objectives of the area.
CSU 12-5	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: No disturbance of riparian areas of wetlands, intermittent, ephemeral, or perennial streams and rivers would be allowed except for essential road and utility crossings.
CSU 12-6	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Operations within Special Recreation Management Areas (SRMAs) must be conducted in a manner that minimizes encounters and

Stipulation Number	Stipulation Name/Brief Description
	conflicts with recreation users. Proposed activities may not alter or depreciate important recreational values located outside of developed areas but within the SRMA boundary.
CSU 12-7	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Oil and gas activities will comply with all motorized vehicle use and travel plan restrictions, including seasonal restrictions and areas closed to motorized travel.
CSU 12-8	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources or paleontological localities are present and to identify needed mitigation measures.
CSU 12-9	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: In areas known to have a high potential for containing significant paleontological resources, the lessee may be required to conduct a paleontological inventory prior to any surface disturbance. If inventory is required, the lessee must engage the services of a qualified paleontologist, acceptable to the Surface Managing Agency, to conduct the inventory. An acceptable inventory report is to be submitted to the BLM for review and approval at the time a surface-disturbing plan of operations is submitted.
CSU 12-10	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: All surface disturbing activities and construction of semi-permanent and permanent facilities in Visual Resource Management (VRM) Class II, III, and IV areas may require special design including location, painting, and camouflage to blend with the natural surroundings and meet the visual quality objectives for each respective class.
CSU 12-11	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: A field inspection will be conducted for special status plant species by the lessee prior to any surface disturbance. A list of special status plant species and any known populations or suitable habitat will be provided after the issuance of the lease. Plant species on the list are subject to change over time as new information becomes available. Plant inventories must be conducted at the time of year when the target species are actively growing and flowering. An acceptable report must be provided to the BLM documenting the presence or absence of special status plants in the area proposed for surface disturbing activities. The findings of this report may result in restrictions to the operator's plans or may preclude use and occupancy.
CSU 12-12	**CONTROLLED SURFACE USE STIPULATION**

Stipulation Number	Stipulation Name/Brief Description
	Surface occupancy or use is subject to the following special operating constraints: The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. The BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. The BLM will not approve any ground-disturbing activity that may affect any such species or requirements of the Endangered Species Act as amended, 16 U.S.C. § et seq., including completion of any required procedure for conference or consultation.
CSU 12-13	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Activities within one-half mile of streams containing 90% up to 99% genetically pure westslope cutthroat trout may be relocated, require special design, or require on and off site mitigation measures to prevent impacts to sensitive trout populations.
CSU 12-18	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Prior to surface disturbance on areas of active mass wasting, unstable land areas, or slopes greater than 30 on non-Boulder Batholith soils or 20 percent on Boulder Batholith soils, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished: •site productivity will be restored. •surface runoff will be adequately controlled. •off-site areas will be protected from accelerated soil erosion. •surface disturbing activities will not be conducted during wet periods.
CSU 12-19	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: Operations within Special Recreation Management Areas (SRMAs) must be conducted within a manner that minimizes encounters and conflicts with recreation users. Proposed activities may not alter or depreciate important recreational values located within the SRMA boundary.
LN 14-1	**LEASE NOTICE** Land Use Authorizations incorporate specific surface land uses allowed on Bureau of Land Management (BLM) administered lands by authorized officers and those surface uses acquired by the BLM on lands administered by other entities. These BLM authorizations include

Stipulation Number	Stipulation Name/Brief Description
	rights-of-way, leases, permits, conservation easements, and recreation and public purpose leases and patents.
LN 14-2	**LEASE NOTICE 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.
LN 14-3	**LEASE NOTICE** The lessee or operator shall immediately bring to the attention of the Surface Management Agency (SMA) any paleontological resources or any other objects of scientific interest discovered as a result of approved operations under this lease, and shall leave such discoveries intact and undisturbed until directed to proceed by the SMA.
LN 14-4	**LEASE NOTICE** Portions of the lands in this parcel are occupied by a cemetery. As per the Standard Stipulation (May 2001) attached to this lease, occupancy will be excluded from the cemetery and a 300 foot buffer zone around the cemetery.
LN 14-5	**LEASE NOTICE CULTURAL RESOURCES** An inventory of the lease lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures.
LN 14-7	**LEASE NOTICE** This parcel contains the following occupancy exclusions: 1. Exploration and development activity must be conducted with roads constructed to an appropriate standard no higher than necessary to accommodate the intended use. 2. Anti-raptor perch devices are required on all aboveground structures. 3. U.S. Fish and Wildlife Service (FWS) staff responsible for the management of the Creedman Coulee National Wildlife Refuge will be notified of any exploration and development proposals by the Bureau of Land Management. This notice is necessary to provide the FWS an opportunity to participate in the evaluation of any proposed activity on the lease, including on-site inspections before site preparation occurs.
LN 14-8	**LEASE NOTICE** Cultural sites are located in the _____, Sec. __ T. , R. . This parcel is located adjacent to the Lake Mason National Wildlife Refuge. In accordance with 43 CFR 3101.1-2, additional mitigation may be required in regard to exploration and development.
LN 14-9	**LEASE NOTICE CULTURAL RESOURCES** The lease is located adjacent to known sacred sites and historic properties, and contains high potential for National Register eligible historic and cultural properties. Lessees are notified that archaeological resource inventory and mitigation costs may be high within this area. A cultural plan of operations will be developed in consultation with the Billings Field Office (FO) and must be approved before field

Stipulation Number	Stipulation Name/Brief Description
	development takes place. All surface use plans will be presented to the Billings FO archaeologist for approval.
LN 14-10	**LEASE NOTICE BLOCK MOUNTAIN GEOLOGIC AREA** The Block Mountain Geologic Area has been designated an area of critical environment concern (ACEC). As a result, special mitigation measures may be applied to any applications for permit to drill (APDs).
LN 14-11	**LEASE NOTICE GREATER SAGE-GROUSE HABITAT** The lease may in part, or in total, contain important Greater Sage-Grouse habitats as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on the Greater Sage-Grouse populations and habitat quality. Such measures shall be developed during the application for permit to drill on-site and environmental review process and will be consistent with the lease rights granted.
LN 14-12	**LEASE NOTICE PALEONTOLOGICAL RESOURCE INVENTORY REQUIREMENT** This lease has been identified as being located within geologic units rated as being moderate to very high potential for containing significant paleontological resources. The locations meet the criteria for Class 3, 4 and/or 5 as set forth in the Potential Fossil Yield Classification System, WO IM 2008-009, Attachment 2-2. The BLM is responsible for assuring that the leased lands are examined to determine if paleontological resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in WO IM 2008-009 dated October 15, 2007, and WO IM 2009-011 dated October 10, 2008. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or project proponent shall contact the BLM to determine if a paleontological resource inventory is required. If an inventory is required, the lessee or project proponent will complete the inventory subject to the following: • the project proponent must engage the services of a qualified paleontologist, acceptable to the BLM, to conduct the inventory. • the project proponent will, at a minimum, inventory a 10-acre area or larger to incorporate possible project relocation which may result from environmental or other resource considerations. • paleontological inventory may identify resources that may require mitigation to the satisfaction of the BLM as directed by WO IM 2009-011.
LN 14-13	**LEASE NOTICE GRASSLAND / WETLAND EASEMENT** The lease parcel is encumbered with a U.S. Fish and Wildlife Service wetland and/or grassland easement to restrict draining, burning, filling,

Stipulation Number	Stipulation Name/Brief Description
	or leveling of wetlands and/or protection of grassland depending on the specific easement. The operator may be required to implement specific measures to reduce the impacts of oil and gas operations on wetlands or grasslands on easements. Additional measures may be developed during the application for permit to drill during the on-site inspection as well as the environmental review process, consistent with the lease rights granted and in accordance with 43 CFR 3101.1-2.
LN 14-14	**LEASE NOTICE CULTURAL VISUAL SETTING** The lease area is within a Setting Consideration Zone (SCZ) which may contain a visual sensitive value in regard to the surrounding cultural setting. The leased lands may require an assessment by the authorized officer to determine the visual impacts of proposed and existing development. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on the cultural visual setting. Such measures would be developed during the application for permit to drill and environmental review processes, consistent with the lease rights.
LN 14-15	**LEASE NOTICE SPRAGUE'S PIPIT** The lease area may contain habitat for the federal candidate Sprague's pipit. The operator may be required to implement specific measures to reduce impacts of oil and gas operations on Sprague's pipits, their habitat and overall population. Such measures would be developed during the application for permit to drill and environmental review processes, consistent with lease rights. If the U.S. Fish and Wildlife Service lists the Sprague's pipit as threatened or endangered under Endangered Species Act, the BLM would enter into formal consultation on proposed permits that may affect the Sprague's pipit and its habitat. Restrictions, modifications, or denial of permits could result from the consultation process.
MT 15-1	**DRAINAGE** All of the lands contained in this lease are subject to drainage by a well located adjacent to the lease. The lessee shall, within 60 days of lease issuance, notify the field office of its plans to protect the lease from drainage or alternatively demonstrate to the authorized officer that a protective well would have little or no chance of producing in paying quantities.
NSO 11-1	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy, use or directional drilling is allowed within the boundaries of existing coal leases.
NSO 11-2	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within riparian areas, 100-year flood plains of major rivers, and on water bodies and streams.
NSO 11-3	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in the designated Bighorn Sheep Range.

Stipulation Number	Stipulation Name/Brief Description
NSO 11-4	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of grouse leks.
NSO 11-5	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of designated reservoirs with fisheries.
NSO 11-6	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of known bald eagle nest sites which have been active within the past seven years and within bald eagle nesting habitat in riparian areas.
NSO 11-7	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one mile of identified peregrine falcon nesting sites.
NSO 11-8	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of known ferruginous hawk nest sites which have been active within the past two years.
NSO 11-9	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of wetlands identified as piping plover habitat.
NSO 11-10	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of wetlands identified as interior least tern habitat.
NSO 11-11	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within sites or areas designated for conservation use, public use, or sociocultural use.
NSO 11-12	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within designated paleontological sites. – No surface occupancy or use is allowed within known paleontological sites.
NSO 11-13	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within developed recreation areas and undeveloped recreation areas receiving concentrated public use.
NSO 11-14	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in Visual Resource Management Class (VRM) I areas (i.e., wilderness, wild and scenic rivers, etc.).
NSO 11-15	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the boundary of State Game Ranges administered by the Fish, Wildlife and Parks.

Stipulation Number	Stipulation Name/Brief Description
NSO 11-16	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of North American Wetland Conservation Act/Intermountain Joint Venture (NAWCA/IMWJV) wetland projects.
NSO 11-17	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of ferruginous hawk nest sites.
NSO 11-18	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of stream containing known populations of 99 to 100% genetically pure westslope cutthroat trout.
NSO 11-19	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of occupied or influencing habitat for fluvial and adfluvial arctic grayling, including the North Fork of the Big Hole River, the Big Hole, the Beaverhead and Ruby Rivers, and tributaries to Upper Red Rock Lake.
NSO 11-20	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from the centerline of Class 1 fishery streams (Blue Ribbon trout streams).
NSO 11-21	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of developed recreation sites.
NSO 11-22	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within, and for a distance of 300 feet from the boundaries of cultural properties and archaeological/historic districts determined to be eligible or potentially eligible to the national register of historic places. This includes cultural properties designated for conservation use, scientific use, traditional use, public use and experimental use.
NSO 11-23	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of the boundaries of cultural properties determined to be of particular importance to Native American groups, determined to be traditional cultural properties, and/or designated for traditional use. Such properties include (but are not limited to) burial locations, plant gathering locations and areas considered sacred or used for religious purposes.
NSO 11-24	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-quarter mile of special status plants or populations.
NSO 11-25	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed on areas of active mass movement (landslides).
NSO 11-26	**NO SURFACE OCCUPANCY STIPULATION**

Stipulation Number	Stipulation Name/Brief Description
	No surface occupancy or use is allowed within one-half mile of designated National Historic Trails.
NSO 11-27	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of the Continental Divide National Scenic Trail.
NSO 11-28	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed on recreation and public purposes leases and patents and on leases and permits authorized under regulations found at 43 CFR 2920.
NSO 11-29	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the Beaverhead Rock, Muddy-Big Sheep Creek and Everson Creek ACECs.
NSO 11-30	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the Centennial Sandhills ACEC and within one mile of special status plants that are contained within the Centennial Sandhills ACEC.
NSO 11-31	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the Bighorn Sheep core areas in the Hidden Pasture Area and the Greenhorn Mountains reintroduction area.
NSO 11-33	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within 200 feet of wetlands, lakes, and ponds.
NSO 11-34	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of Prairie Falcon nests known to have been occupied at least once within the seven previous years.
NSO 11-35	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-fourth mile of active sage grouse strutting grounds.
NSO 11-36	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in the floodplain of the Yellowstone River.
NSO 11-37	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within 200 feet of wetlands, lakes or ponds.
NSO 11-38	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of golden eagle nests known to have been occupied at least once within the seven previous years.
NSO 11-39	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed on lands within the floodplain of the Missouri River.
NSO 11-40	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in a visible area within a 3.5

Stipulation Number	Stipulation Name/Brief Description
	mile radius of the Fort Union Historic Site.
NSO 11-41	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within 1,000 feet of wetlands, lakes or ponds.
NSO 11-42	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the bighorn sheep core areas.
NSO 11-43	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-fourth mile of developed recreation sites, regardless of administering agency.
NSO 11-44	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of bald eagle nest sites and within bald eagle nesting habitat in riparian areas.
NSO 11-45	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the boundary of the Recovery Zone for Grizzly Bears.
NSO 11-46	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the boundary of any prairie dog town.
NSO 11-47	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of streams containing known populations of bull trout.
NSO 11-48	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of streams containing known populations of 90-100% genetically pure Yellowstone cutthroat trout.
NSO 11-49	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of streams that are identified by the BLM as having high restoration potential for westslope cutthroat trout, Yellowstone cutthroat trout, arctic grayling and/or bull trout.
NSO 11-50	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in the following municipal watersheds: Missouri River Siphon, Tenmile Creek Drainage, Big Hole River Intake, and Moulton Reservoir.
NSO 11-51	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile from centerline of stream containing known populations of 90-99% genetically pure westslope cutthroat trout.
NSO 11-52	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within 300 feet of site boundaries and/or districts eligible for or listed on the National Register of Historic Places.

Stipulation Number	Stipulation Name/Brief Description
NSO 11-53	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile either side of the active river channel. This would apply to the following river segment lengths: 3.1 miles of the Upper Missouri River and 2.6 miles of Muskrat Creek.
NSO 11-54	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within one-half mile of ferruginous hawk nest sites which have been active within the past five years.
NSO 11-55	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed on lands acquired with Land and Water Conservation Funds.
NSO 11-56	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the Makoshika State Park and surrounding area of management concern except on designated sites identified in the 1999 Decision Record for Oil and Gas Leasing in the Makoshika State Park Area of Management Concern.
NSO 11-57	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed within the Terry Badlands limber pine areas.
NSO 11-58	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed in Finger Buttes ACEC.
NSO 11-59	**NO SURFACE OCCUPANCY STIPULATION** No surface occupancy or use is allowed on lands administered by the U.S. Fish and Wildlife Service (FWS) within a designated waterfowl production area or National Wildlife Refuge. These lands are managed for the purpose of protecting migratory birds, waterfowl habitat and/or wetland values suitable for breeding waterfowl and other migratory birds.
Standard 16-3	**STANDARD LEASE STIPULATION** **ESTHETICS--**To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the Federal Surface Managing Agency (SMA). **EROSION CONTROL**--Surface-disturbing activities may be prohibited during muddy and/or wet soil periods. **CONTROLLED OR LIMITED SURFACE USE STIPULATION** -- This stipulation may be modified, consistent with land use documents, when specifically approved in writing by the Bureau of Land Management (BLM) with concurrence of the SMA. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the SMA for more specific locations and information regarding the restrictive nature of this stipulation. The lessee/operator is given notice that the lands within this lease may

Stipulation Number	Stipulation Name/Brief Description
	include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled, or **if absolutely necessary**, excluded. Use or occupancy will be restricted only when the BLM and/or the SMA demonstrates the restriction necessary for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells. After the SMA has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the Agency will furnish further data on any special areas which may include: • 100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate federally-owned or controlled roads and recreation trails. • 500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams: 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies. • 500 feet from grouse strutting grounds. Special care to avoid nesting areas associated with strutting grounds will be necessary during the period from March 1, to June 30. One-fourth mile from identified essential habitat of state and federal sensitive species. Crucial wildlife winter ranges during the period from December 1 to May 15, and in elk calving areas during the period from May 1 to June 30. • 300 feet from occupied buildings, developed recreational areas, undeveloped recreational areas receiving concentrated public use and sites eligible for or designated as National Register sites. • Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive off-road vehicle designations. • On slopes over 30 percent or 20 percent on extremely erodible or slumping soils. **APPLICATIONS FOR PERMIT TO DRILL (APDs)**--The appropriate BLM field offices are responsible for the receipt, processing, and approval of APDs. The APDs are to be submitted by oil and gas operators pursuant to the requirements found in Onshore Oil and Gas Order No. 1 -- Approval of Operations on Onshore Federal and Indian Oil and Gas Leases (Circular No. 2538). Additional requirements for the conduct of oil and gas operations can be found in the Code of Federal Regulations Title 43, Part 3160. Copies of Onshore

Stipulation Number	Stipulation Name/Brief Description
	Oil and Gas Order No. 1, and pertinent regulations, can be obtained from the BLM field offices in which the operations are proposed. Early coordination with these offices on proposals is encouraged. **CULTURAL AND PALEONTOLOGICAL RESOURCES**--The SMA is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the SMA, shall: • Contact the appropriate SMA to determine if a site-specific cultural resource inventory is required. If an inventory is required, then: • Engage the services of a cultural resource specialist acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted. • Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as testing salvage and recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited. The operator shall immediately bring to the attention of the SMA any cultural or paleontological resources discovered as a result of approved operations under this lease, and not disturb such discoveries until directed to proceed by the SMA. **ENDANGERED OR THREATENED SPECIES**--The SMA is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats. The lessee/operator may, unless notified by the authorized officer of the SMA that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resources specialist

Stipulation Number	Stipulation Name/Brief Description
	approved by the SMA. An acceptable report must be provided to the SMA identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.
TES 16-2	**ENDANGERED SPECIES ACT SECTION 7 CONSULTATION STIPULATION** The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered or other special status species. BLM may recommend modifications to exploration and development, and require modifications to or disapprove proposed activity that is likely to result in jeopardy to proposed or listed threatened or endangered species or designated or proposed critical habitat.
TL 13-1	**TIMING LIMITATION STIPULATION** No surface use is allowed within crucial winter range for wildlife for the time period December 1 to March 31 to protect crucial white-tailed deer, mule deer, elk, antelope, moose, bighorn sheep and sage grouse winter range from disturbance during the winter use season, and to facilitate long-term maintenance of wildlife populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-2	**TIMING LIMITATION STIPULATION** No surface use is allowed within established spring calving range for elk for the time period April 1 to June 15 to protect elk spring calving range from disturbance during the spring use season, and to facilitate long-term maintenance of wildlife populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-3	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 to June 15 in grouse nesting habitat within two miles of a lek. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-4	**TIMING LIMITATION STIPULATION** No surface use is allowed within one-half mile of raptor nest sites which have been active within the past two years during the time period March 1 to August 1 to protect nest sites of raptors which have been identified as species of special concern. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-5	**TIMING LIMITATION STIPULATION** No surface use is allowed within one-half mile of occupied ferruginous hawk nests known to be occupied at least once within the seven previous years from March 15 to July 15 to protect ferruginous hawk nesting. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-6	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 through June 30 in nesting and early brood-rearing habitat (defined as within three miles of leks). This stipulation does not apply to operation and maintenance of production

Stipulation Number	Stipulation Name/Brief Description
	facilities.
TL 13-7	**TIMING LIMITATION STIPULATION** No surface use is allowed from December 1 through May 15 within big game winter/spring range for wildlife. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-8	**TIMING LIMITATION STIPULATION** No surface use is allowed from April 1 through June 30 in elk calving/big game birthing areas to protect mule deer, elk, antelope and moose birthing areas from disturbance and facilitate long-term maintenance of wildlife populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-9	**TIMING LIMITATION STIPULATION** No surface use is allowed from November 1 through June 30 in bighorn rutting, winter and lambing habitat to protect the habitat from disturbance and facilitate long-term maintenance of bighorn sheep populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-10	**TIMING LIMITATION STIPULATION** No surface use is allowed from February 1 through August 31 in a one mile radius around bald eagle nest sites/breeding habitat to protect nesting sites and/or breeding habitat in accordance with the Endangered Species Act and the Montana Bald Eagle Management Plan. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-11	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 through July 31 within one-half mile of raptor nest sites which have been active within the past five years. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-12	**TIMING LIMITATION STIPULATION** No surface use is allowed from April 1 through August 31 within one-half mile of waterfowl production and molting areas to protect these areas from disturbance and facilitate long-term maintenance of waterfowl populations. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-13	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 through August 31 within one mile of ferruginous hawk nest sites that have been active within the past five years. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-14	**TIMING LIMITATION STIPULATION** No surface use is allowed from December 1 through May 15 within winter and spring range for sage grouse. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-15	**TIMING LIMITATION STIPULATION**

Stipulation Number	Stipulation Name/Brief Description
	No seismic exploration is allowed within 500 feet of waterfowl nesting habitat from March 1 through July 1 to protect nesting waterfowl. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-16	**TIMING LIMITATION STIPULATION** No surface use is allowed within one-half mile of occupied prairie falcon nests from March 15 through July 15 to protect prairie falcon nesting. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-17	**TIMING LIMITATION STIPULATION** No surface use is allowed within two miles of active strutting grounds from March 1 to June 15 to protect sage grouse strutting activities. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-18	**TIMING LIMITATION STIPULATION** No surface use is allowed on bighorn sheep lambing range from April 1 to June 15 to protect bighorn sheep lambing activities. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-19	**TIMING LIMITATION STIPULATION** No surface use is allowed on bighorn sheep winter range from December 1 to April 1 to protect bighorn sheep winter range activities. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-20	**TIMING LIMITATION STIPULATION** No surface use is allowed from April 1 through August 15 to protect Creedman Coulee National Wildlife Refuge wildlife populations and habitats. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-21	**TIMING LIMITATION STIPULATION** No surface use is allowed within one-half mile of occupied golden eagle nests from February 15 to July 15 to protect golden eagle nesting. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-22	**TIMING LIMITATION STIPULATION** No surface use is allowed from June 1 to July 1 to protect elk calving. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-23	**TIMING LIMITATION STIPULATION** No surface use is allowed on elk winter range from November 30 to May 1 to protect wintering elk. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-24	**TIMING LIMITATION STIPULATION** No surface use is allowed from February 15 to July 15 within one-half mile of occupied golden eagle nests known to be occupied at least once within the seven previous years to protect golden eagle nesting. This

Stipulation Number	Stipulation Name/Brief Description
	stipulation does not apply to operation and maintenance of production facilities.
TL 13-25	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 through July 31 within one-half mile of raptor nest sites which have been active within the past five years. 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.
TL 13-26	**TIMING LIMITATION STIPULATION** No surface use is allowed from February 1 through August 31 in a one mile radius around bald eagle nest sites. 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.
TL 13-27	**TIMING LIMITATION STIPULATION** No surface use is allowed from November 1 through June 30 in bighorn rutting, winter and lambing habitat. 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.
TL 13-28	**TIMING LIMITATION STIPULATION** No surface use is allowed from December 1 through May 15 within winter range for wildlife. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-29	**TIMING LIMITATION STIPULATION** No surface use is allowed from April 1 through June 30 in big game birthing areas. This stipulation does not apply to operation and maintenance of production facilities.
TL 13-30	**TIMING LIMITATION STIPULATION** No surface use is allowed from March 1 through June 30 in nesting and early brood rearing habitat (defined as within three miles of leks). This stipulation does not apply to operation and maintenance of production facilities.
TL 13-31	**TIMING LIMITATION STIPULATION** No surface use is allowed from April 1 to June 30 and from September 15 to October 15 in the grizzly bear distribution zone.
TL 13-32	**TIMING LIMITATION STIPULATION** No surface use is allowed within a one mile buffer around wolf dens or rendezvous sites from April 15 to June 30 in the Northwest Montana Recovery Area. This stipulation does not apply to operation and maintenance of production facilities.
DPG 13d	

Stipulation Number	Stipulation Name/Brief Description
(McKenzie RD)	
DPG 13d (Medora RD)	
DPG NSO 14-1	
DPG NSO 14-4	
DPG NSO 14-5	
DPG NSO 14-6	
DPG NSO 14-7	
DPG NSO 14-9	
DPG NSO 14-10	
DPG NSO 14-11	
DPG NSO 14-13	
DPG NSO 14-14	
DPG NSO 14-15	
DPG NSO 14-16	
DPG TL 15-1	
DPG TL 15-2	
DPG TL 15-4	
DPG TL 15-6	
DPG TL 15-7	
DPG TL 15-8	
DPG CSU 16-1	
DPG CSU 16-2	
DPG CSU 16-5	
DPG CSU 16-6	
DPG CSU 16-7	
DPG CSU	

Stipulation Number	Stipulation Name/Brief Description
16-8	
DPG TES 18a	
DPG 22b	
DPG 22c	
DPG 23	
WO-10/05/2006	
R2-FS-2820-14	
R2-FS-2820-15	
R2-FS-2820-16	
R2-FS-2820-16	
BOR 17-1	
BOR 17-2	
COE 18-1	
COE 18-2	
COE 18-3	
COE 18-4	
COE 18-5	
COE 18-6	
COE 18-7	
FERC 19-1	
IBC 18-8	

Appendix C: MITIGATION MEASURES TO REDUCE WILDLIFE IMPACTS ASSOCIATED WITH OIL AND GAS DEVELOPMENT

Roads

– Use existing roads and two-tracks if they are sufficient and not within environmentally sensitive areas.
  – Construct the minimum number and length of roads necessary..
– Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.
– Salvage topsoil from all road construction and re-apply during interim and final reclamation.
– Locate roads away from bottoms of drainages, which often provide the most important sources of cover and forage for wildlife.
– Design road crossings of streams to allow fish passage at all flows. Types of crossing structures that minimize aquatic impacts, in descending order of effectiveness, are: a) bridge spans with abutments on banks; b) bridge spans with center support; c) open bottomed box culverts; and d) round culverts with the bottom placed no less than one foot below the existing stream grade. Perched culverts block fish passage and are unacceptable in any stream that supports a fishery.
– Locate and construct all structures crossing intermittent and perennial streams such that they do not decrease channel stability or increase water velocity.
– Use a variety of native grasses and forbs to establish effective, interim reclamation on road shoulders and borrow areas.

Wells

– If geologically and technically feasible, drill multiple wells from the same pad using directional (horizontal) drilling technologies (up to 16 wells per pad, as technologically feasible).
  – Disturb the minimum area (footprint) necessary to efficiently drill and operate a well.
– Salvage topsoil from all well pad excavations and re-apply during interim and final reclamation.
– If geologically and technically feasible, locate well pads in the least environmentally sensitive areas, well away from riparian habitats, streams or drainages, below ridge lines, away from important sources of forage, cover, reproductive habitats, winter habitats, parturition areas, brood-rearing habitats, etc.
– Use a variety of native grasses and forbs to establish effective, interim reclamation on all well pads and associated disturbances.

Ancillary Facilities

– Locate facilities including tanks, transfer stations, shops, equipment shelters, utility towers, etc. in the least environmentally sensitive areas, well away from riparian habitats, streams or drainages, below ridge lines, away from important sources of forage, cover, reproductive habitats, winter habitats, parturition areas, brood-rearing habitats, etc.
– Salvage topsoil from all facilities construction and re-apply during interim and final reclamation.
– Design all facilities such that they will not be used as perching or nesting substrates by raptors, crows, and ravens in open prairie or shrub-steppe environments.
– Modify new and existing power poles to prevent raptor electrocutions and perching.
– Use existing utilities, road and pipeline corridors to the extent feasible.
  – Bury power lines in or adjacent to roads where possible.
– Establish effective, interim reclamation on all surface disturbances associated with ancillary facilities, including equipment staging areas. Interim reclamation should be achieved using a variety of native grasses and forbs.

Noise

– Minimize noise generally. All compressors, vehicles, and other sources of noise should be equipped with effective mufflers or noise suppression systems (e.g., "hospital mufflers").
– To minimize the effects of continuous noise on bird populations, reduce noise levels to 49 dBA or less, particularly during the bird nesting season (1 April through 30 June). Constant noise generators should be located far enough away from sensitive habitats or muffled such that noise reaching those habitats is less than 49 dBA.

Traffic

– Develop a travel plan that minimizes the amount of vehicular traffic needed to monitor and service wells and other facilities.
– Prohibit or substantially limit traffic during high wildlife use hours (within 3 hours of sunrise and sunset) to the extent possible.

– Use pipelines to transport condensates off site, or install larger capacity storage tanks when frequent truck trips would impact habitat effectiveness.
– Transmit instrumentation readings from remote monitoring stations to reduce maintenance traffic.
– Post speed limits on all access and maintenance roads to reduce wildlife collisions and limit dust: 30-40 mph is adequate in most cases.

Pollutants, Toxic Substances, Fugitive Dust, Erosion and Sedimentation

– Avoid exposing or spilling hydrocarbon products on the surface. Oil pits should not be used, but if absolutely necessary, they should be enclosed in small-mesh netting and fence to prevent entrapment of birds and mammals. All netting and fence should be maintained and kept in serviceable condition.
– Limit the permitted discharge of produced water to those areas where it can be beneficially used by wildlife, provided water quality standards for wildlife and livestock are met. Produced water should not be discharged on the surface within big game crucial winter ranges or near complexes of sage grouse leks. New water sources within crucial winter ranges encourage yearlong use by livestock and wildlife, and may result in reduced or depleted forage during winter. Additional water sources near lek complexes could increase vulnerability of sage grouse to mosquito-borne, West Nile virus. However, produced water of suitable quality may be used for supplemental irrigation to improve reclamation success.
– Employ erosion control practices and sediment retention structures to prevent sediment transport off site during precipitation events and runoff.
– Sour gas (hydrogen sulfide) should not be released into the environment.
– Use dust abatement procedures including reduced speed limits, and application of [environmentally compatible] chemical suppressants or suitable quality water.

Monitoring and Environmental Response

– Monitor conditions or events that may indicate environmental problems. Such conditions or events can include any significant chemical spill or leak, detection of multiple wildlife mortalities, sections of roads with frequent and recurrent wildlife collisions (especially big game or sage grouse), poaching and harassment incidents, severe erosion into tributary drainages, raptor electrocutions, structures associated with frequent bird or bat collisions, migration impediments (e.g., pronghorn concentrating along a fence), wildlife entrapment, sick or injured wildlife, or other unusual observations.
– Promptly report observations of potential wildlife problems to the regional office of the MT Fish,Wildlife and Parks and, as applicable, the U.S. Fish and Wildlife Service.

Research and Special Studies

– Where questions or uncertainties exist about the degree of impact to specific resources, or the effectiveness of mitigation, companies should consider funding or cost-sharing special studies to collect data for evaluation and documentation.

Noxious Weeds

– Control noxious and invasive plants that become established along roads, on well pads, or adjacent to other facilities.
– Clean and sanitize all equipment brought in from other regions. Seeds and propagules of noxious plants are commonly imported by equipment and mud clinging to equipment.
– Request employees to clean mud from boots/work shoes before traveling to the work site, to prevent importation of noxious weeds.

Final Reclamation

– Salvage topsoil during decommissioning operations and reapply to reclaimed surfaces.
– Replant a mixture of forbs, grasses, and shrubs that are native to the area and suitable for the specific ecological site.
– Restore vegetation to achieve cover, composition, and diversity that are commensurate with the ecological site.
– Continue to monitor and treat reclaimed areas until plant cover, composition, and diversity standards have been met.

Stream habitats and Riparian Corridors

– Line reserve pits with a suitable, impermeable barrier to eliminate possible contamination of soil and groundwater.
– Design drill pad sites to drain excess water storm water and other fluids into a properly sized reserve pit. The

pit should have adequate capacity to intercept and hold excess precipitation. Discharges from the pit should meet NPDES standards or otherwise assure the discharged water is of suitable quality.

– All pipeline crossings of a watercourse should be protected against surface disturbances and damage to the pipeline, which could result in a spill event.
– Any stream crossing of a pipeline should be protected by installation of automatic shutoff valves.
– Any pipeline crossing of a perennial stream should be done by boring underneath the stream rather than trenching
— Design road crossings of streams to allow fish passage at all flows. Types of crossing structures that minimize aquatic impacts, in descending order of effectiveness, are: a) bridge spans with abutments on banks; b) bridge spans with center support; c) open bottomed box culverts; and d) round culverts with the bottom placed no less than one foot below the existing stream grade. Perched culverts block fish passage and are unacceptable in any stream that supports a fishery.
– Locate and construct all structures crossing intermittent and perennial streams such that they do not decrease channel stability or increase water velocity.
– Avoid stripping riparian canopy or stream bank vegetation if possible. It is preferable to crush or shear streamside woody vegetation rather than completely remove it. Any locations from which vegetation is stripped during installation of stream crossings, should be revegetated immediately after the crossing is completed.
– Staging, refueling, and storage areas should not be located in riparian zones or on flood plains. Keep all chemicals, solvents and fuels at least 500 feet away from streams and riparian areas.
– Hydrostatic test waters released during pipeline construction could cause alterations of stream channels, increased sediment loads and introduction of potentially toxic chemicals or invasive species into drainages. Avoid discharging hydrostatic test waters directly to streams. Release these waters first into a temporary, sediment retention basin if the concentration of total suspended solids is significantly higher than in the receiving water. Dewater temporary sedimentation basins in a manner that prevents erosion.
– Locate pipelines that parallel drainages, outside the 100-year floodplain. Construct pipeline crossings at right angles to all riparian corridors and streams to minimize the area of disturbance.
– Use the minimum practical width for rights-of-way where pipelines cross riparian areas and streams.

Appendix D: **Oil and Gas Reasonably Foreseeable Development (RFD)**

INTRODUCTION

At the time the 1984 Headwaters RMP was prepared little additional leasing was anticipated to take place because most available leases had aready been acquired under existing established leasing regulations with appropriate stipulations for special conditions. It was also anticipated that a relatively large number of permits to drill might be sought, given the accelerated level of exploration activity that was being driven by economic conditions at the time and relatively new discovery of prospects for deep structurally trapped oil in the Montana Overthrust Belt. Laws, regulations, and rules were in-place to provide guidance with these leasing and permitting activities. It was anticipated that oil and gas drilling would be a part of the foreseeable future of resource development within the Planning Area.

Despite the flurry of exploration activity in the Montana Overthrust belt in 1983, the only two areas of oil and gas production were in Teton and Ponderosa counties, east of the Rocky Mountain Front in areas that have since been removed from the Planning Area.

The Reasonably foreseeable Development scenario is resumed oil and gas leasing in the Planning Area. The scenario is hypothetical in that drilling may occur anywhere in the planning area where an oil and gas lease allowing surface occupancy is issued. Actual drilling proposals that result from leasing, if any, will likely differ in location from those anticipated by this RFD scenario. It is also possible that leasing could result in either more or fewer drilling proposals than presented in the scenario.

The RFD scenario attempts to portray the most reasonable and likely number of wells expected from a leasing decision on the Butte Field Office Planning Area. It is derived from knowledge of the USGS plays, Energy Information Administration price forecasts, oil and gas occurrence and development potential classifications for the Planning Area, and historical activity.

Development potential is a ranking system, which is created so planners can evaluate the potential cumulative impacts of an oil and gas leasing decision on a designated area. BLM petroleum geologists rank the development potential of the planning area based on the probability, at this point in time, of oil and gas drilling occurring in the future. It is important to understand that development potential is a dynamic ranking system, which changes with time as new data and ideas become available. The development potential can also change as a function of the economics of oil supply and demand.

OCCURRENCE AND DEVELOPMENT POTENTIAL

Occurrence and Development Potential Rankings

BLM staff geologists have classified the potential for occurrence and development of oil and gas resources within the Butte field Office Planning Area. Their analysis is based on bedrock geologic mapping, geophysical data, and 110 oil and gas wells drilled in the Planning Area. A summary of the geology, for each of the 1:100,000 quadrangles used for discussion and development of the occurrence and development potential sections of this report can be found in unpublished reports by Long (1990a-h, 1991a-c) that are on file in the BLM Montana State Office. The potential for oil and gas resource development within the Planning Area is shown on **Figure A-1**.

On **Figure A-1**, areas have been designated as having moderate, low, and very low potential for the occurrence and development of oil and gas resources. As with the occurrence potential, there are no areas of "high" development potential within the Butte Field Office Planning Area. High development potential areas occur only within proven producing petroleum provinces or in areas with a significant number of hydrocarbon "shows". Areas of moderate development potential have a significant thickness of sedimentary section present that includes possible source and reservoir rocks. An area having a low potential for development has a thin sedimentary section present or there is insufficient subsurface data available to analyze the potential. It also lacks source or reservoir rocks or is metamorphosed. An area of very low development potential has no sedimentary section at the surface or insufficient data for a different classification. These areas also include areas of federal lands that are unavailable for leasing. The principal source of information used to determine the development potential of the Butte Field Office Planning Area is a series of 1:100,000 quadrangles (Long, 1990a-h, 1991a-c).

Development potential is not a prediction of precise future drilling locations and should not be used as a gauge of future interest or lack of interest in leasing. Oil and gas companies have numerous sources of proprietary data not available to the BLM (such as seismic data or internal geologic reports), which they use prior to making financial commitments to lease or drill. Therefore, even though an area is rated as very low development potential at this time with a low probability for any wells being drilled, a company may still be interested in leasing that area, should it be made available.

DRILLING ACTIVITY FORECAST

In order for the BLM to be able to analyze the effects of renewed oil and gas leasing, and possible impacts related to exploration, development, and cumulative effects, it is necessary to estimate how many wells industry might drill in the next 20 years. The following RFD scenario has been developed using historical oil and gas development, and oil "play" information from the USGS, potential development maps and other data from BLM files, and a number of other technical sources.

The BLM has mapped the potential for occurrence of oil and gas under the Butte Field Office Planning Area and the potential for industry to develop those possible resources. The classification of development potential is depicted on **Figure A-1.** From these maps and other information, including leasing history and past and present economics, a forecast of the number of wells that might be drilled in the Planning Area on lands of all mineral ownerships is made.

Based on this analysis, an estimate was made that as many as fifteen (15) conventional oil and gas wildcat wells (exploratory wells drilled in an area with no existing production) might be drilled in the Butte Field Office Planning Area in the next 15 to 20 years (**Table 1**). Of these fifteen (15) wells, it is estimated that eleven
(11) would be "dry" holes (no economically producible oil or gas is discovered). Dry holes would be plugged and abandoned with surface reclamation occurring shortly afterward. It is further estimated that four (4) of the wells could have oil or gas discoveries, two (2) of which would become producers with one located on either BLM minerals or lands administered by the Forest Service, and the other located on privately owned mineral lands. Each of the discovery wells would probably prompt additional step-out wells. A "step-out well" is a well drilled adjacent to or near a proven well to establish the limits and continuity of the oil or gas reservoir

and/or to assist with production. It was estimated that a total of eight (8) step-out wells would be drilled, two for each discovery.

In addition to conventional oil and gas wells, it is anticipated that as many as 40 wells (**Table 1**) would be drilled for coal bed natural gas in limited and scattered areas of known sub-bituminous coal resources located Gallatin and Park Counties; most likely in the Trail Creek Road area near Bozeman Pass (Livingston and Trail Creek Fields).

The first four general geographic areas within the Butte Field Office Planning Area, where conventional oil and gas exploration is predicted to occur are shown on **Figure A-1**. Each of the four areas is associated with one or more play areas described above in the section entitled USGS Hydrocarbon Provinces and Plays. It is anticipated that the 15 projected wildcat wells would be drilled somewhere within the boundaries of these four play areas.

Table 1 Drilling Activity Forecast (RFD) Mineral Assessment Report

Area	Wildcat Wells	Discoveries	Step-out Wells	Commodity
Area 1	2	0	0	0
Area 2	5	1	2	Gas
Area 3	4	1	2	Gas
Area 4	4	1 deep	2	Gas
		1 shallow	2	Oil
Area 5	10	6	24	coal bed natural gas
TOTAL	**25**		**32**	

Area # 1 - Area #1 is referred to on **Figure A-1** as the "Southern Deerlodge Valley Basin Area". This area occurs in the southernmost portion of a fault bounded Tertiary-aged basin that is located in the Deerlodge Valley. Along the eastern edge of this basin volcanic rocks obscure a thin section of Tertiary age basin fill sediments that in turn overlie Boulder Batholith rocks (Long, 1990b). Further to the west within this basin, rocks of Miocene to Eocene age have been encountered in previous drilling. The rocks are all non-marine and consist of sands and gravels of alluvial channels interlayered with sand, silt, and clay-rich alluvial overbank deposits that are interspersed with fine-grained sediments deposited in lakes and marshes. These sediments have accumulated in thickness as great as 10,000 feet (3,048 meters). Fluvial sandstones are thought to be potential reservoir rocks with the source of oil and gas being either organic material buried deeply in the Tertiary basin proper or having migrated from Paleozoic sediments that lie beneath the Tertiary basin fill or across the basin margin faults. The thickest and most complete section of Paleozoic rocks lies to the west of the holes shown in the area of moderate potential (**Figure A-1**). Two holes have been drilled within the Planning Area and five more have been drilled in a similar geologic setting immediately to the north of this area. These holes were drilled from 6,411 feet (1,954 meters) to as much as 11,774 feet (3,589 meters) deep (Long, 1990b). One well, the Amoco 1 Johnson, encountered good oil shows in the Tertiary basin fill sediments. Two exploratory wells for oil and gas might be expected in the next 15-20 years in this portion of the Planning Area. They would probably lie to the north and west of the holes shown, closer to basin margin faults with potentially thicker sequences of Paleozoic source rocks underlying Tertiary basin fill adjacent to the fault zone. As only about 20 percent of the land within this basin is underlain by federally administered subsurface mineral rights and more than 87 percent of the

surface is privately owned (no BLM surface ownership), it is unlikely that any of the wells would be drilled on federal lands. It is also unlikely that there would be any discoveries in this area.

Area #2 -Area #2 is referred to on **Figure A-1** as the "Imbricate Thrust Zone". The area occurs both to the north and east of Helena, Montana, in a sequence of sediments that are thick and structurally thickened by imbricate thrust faulting associated with the Eldorado and Reff thrust faults. Here Cenozoic sediments unconformably overly Mesozoic and Paleozoic sediments, and basement Precambrian-age rocks. Only two oil and gas wells have been completed in this area between 1975 and 1990. One, the Getty well, was spudded in Mississippian Lodgepole Limestone and drilled in Paleozoic sediments to a final depth of 12,731 feet (3,880 meters). It encountered eleven thrust faults that repeated the Lodgepole Limestone eight (8) times. The other well drilled by Arco, was completed at a depth of 5,002 feet (1,525 meters). It was spudded in the Precambrian Belt sediments and drilled through the Eldorado thrust fault at 2,500 feet (762 meters) and into good potential host rocks of the Mississippian Madison Formation, in which it remained until the bottom of the hole. Unocal drilled a third, very deep (17,818 feet or 5,431 meters) dry well, in the northern portion of this area (**Table 1**). The recently drilled Suncor well, described in the Exploration Drilling section, is present in the northernmost portion of the Planning Area on the Sieban Ranch near Flesher Pass. Area 2 is thought to have moderate oil and gas potential because of the significant thicknesses of Paleozoic sediment (known to contain good reservoir and source rocks) in a zone that is complicated and repeated by thrust faulting that can create stratigraphic and structurally controlled traps by folding and the juxtapositioning of rocks across the thrust faults. Five wells are expected to be drilled in this area within the next 15-20 years. One of these wells is predicted to have significant shows of oil and gas warranting offset drilling of two additional wells. The tests in this area can be deep and expensive, and the structure complex and difficult to understand. Most of the BLM lands in Area 2 occur in two continuous blocks and when combined with split estate lands with federal minerals make up about 20% of the entire area. The large contiguous area in the northeastern portion of Area 2 lies to the east of the intensely imbricated thrust fault zone that has seen exploration drilling along the western margin of this play area. It is possible that one or more of the five exploration wells could be drilled on federal lands, but with a small likelihood of a discovery.

Areas #3 - Area #3 is referred to as the "Helena Salient Gas Play Zone". This zone occurs over a very large area in the east-central portion of the Planning Area (**Figure A-1**). The area is underlain by Jurassic (locally Cretaceous) through Cambrian age rocks in a sediment package as much as 10,000 feet (3,048 meters) thick. The area has been thrust faulted along north-south structures that have resulted in a series of parallel north-south anticlines and synclines. The entire sequence can be overlain by 1,600 feet (488 meters) (in the west) to as much as 5,000 feet in the east (1,524 meters) of volcanics in the Elkhorn Mountain area. Hydrocarbons have been reported from a well along the east flank of the Mauldow Basin in a well drilled to 11,592 feet (3,533 meters) into Precambrian rock. Gas shows were reported from Cambrian sediments at a depth of about 11,000 feet (3,353 meters). Elsewhere in the area, several shallow wells (<1,005 feet or 306 meters) had oil shows in the Cambrian and Devonian portion of the section. It may be necessary to drill through sub-thrust Precambrian rocks to find deep potential reservoir rocks (10,000-12,000 feet or 3,048-3,658 meters) in the western portion of the area and 15,000-25,000 feet (4,572-7,620 meters) in the eastern portion of the area. Areas of moderate potential in the Helena Salient area are coincident with the location of mapped anticlinal structures. Three wells have been drilled since 1975, one of which was a dry hole drilled in 1991. Four wells are

anticipated in the next 15-20 years, additional shows are expected, and one discovery well is predicted with one or two offset wells (limited number of wells because of depth and cost of drilling). Although the BLM owns surface and mineral rights to some 37,000 acres, about 20% of Area 3) more than half of that area lies within the Limestone Hill Montana Army National Guard Training area, which is contaminated with unexploded military ordinance and the subject of a current Legislative EIS that proposes to withdraw the area from future mineral entry. It is unlikely that any federal wells would be drilled in Area 3. Mineral withdrawal normally does not apply to access for the Mineral Leasing Act, therefore access for fluid mineral drilling within the Limestone Hills Training Area may be possible. Assuming the issue involving safe access with respect to unexploded ordinance can be resolved one well may be drilled on Federal lands within the Limestone Hills Training Area.

Area #4 - Area #4 consists of the "Crazy Mountain Oil and Gas Play" on **Figure A-1**. This area occupies most of the northern portions of Gallatin and Park Counties in the easternmost portion of the Planning Area as a broad extensive area of potential oil and gas resources. In particular the area east of Livingston appears to have a moderate potential. Non-marine Upper Cretaceous rocks of the Livingston group cover most of the area and range in thickness from 9,000 feet (2,743 meters) (in the west between Belgrade and Bozeman) to about 1,000 feet (305 meters) along the eastern Planning Area boundary. Concealed beneath these sediments are Cretaceous marine sediments and beneath them a complete sequence of Paleozoic sediments that have locally been thrust faulted, repeating the section. In this area, the Superior 22-25 Windsor well was drilled on the Hunter Anticline to a depth of 8,990 feet (2,740 meters). This well encountered gas in the Cretaceous Eagle sandstone at 1,950 feet (594 meters). Thrust faults were encountered in this well that bottomed in Cambrian sediments, suggesting that multiple stacked targets may be present at depths of 10,000-20,000 feet (3,048-3,658 meters), in addition to the shallow Cretaceous gas targets. Numerous anticlines have been identified in the section that may represent structural traps. Six wells have been drilled since 1975 and none in recent years (post 1990). It is envisioned that four (4) wells may be drilled in this area including one deep well east of Livingston around the interstate and three shallow wells exploring for Cretaceous gas resources. It is envisioned that the deep well and one of the shallow wells would yield discoveries that warranted step-out drilling of two holes for each discovery. These wells will be either on National Forest System Lands, or more likely, on lands with private mineral rights that make up about 94% of Area 4.

Area #5 - Other places within the Butte Field Office Planning Area, where gas exploration is predicted to occur are areas of coal bed natural gas potential associated with known sub-bituminous coal deposits. Areas of coal bed natural gas potential where activity is predicted in the reasonably foreseeable development scenario occur in one area labeled Area 5 on **Figure A 1**. Overall it is envisioned that initially ten exploration wells would be drilled, and that six of these would discover coal bed natural gas resources that would warrant the drilling of an additional 24 step-out wells to develop the resources (**Table 1**). These would all likely be non-federal wells.

The reasonably foreseeable development scenarios for these areas have been developed for Gallatin and Park Counties by the Bureau of Land Management and the Montana Board of Oil and Gas Conservation (BLM and MBOGC, 2003). It has been estimated that as many as five to 15 wells would be drilled in Gallatin County and that of these, as many as five to 10 would be producing wells from one field (BLM and State of Montana, 2003). Two locations were permitted for exploration drill holes for coal bed natural gas on untested private land in section

13 and 14 of T. 2 S., R. 7E. in the Trail Creek coal field by the state of Montana in 2001. The wells were scheduled to be drilled to depths of about 5,500 feet (1,676 meters) to test the Upper Cretaceous-age Telegraph Creek-Eagle Sandstone interval along the crest of an anticlinal structure. However, legal challenges involving Gallatin County and the formation of a local zoning district tied up the drilling process and the permits to drill expired in January of 2003. Legal issues need to be resolved in the Trail Creek area before drilling of this previously permitted well might be undertaken. The BLM administers a small number of isolated tracts of split estate minerals in the Trail Creek coal deposit area, but most of the exploration potential lies on private land with separated surface and mineral estate. Assuming that natural gas prices remain high, it is likely that exploration drilling will ultimately be permitted on private land in this area.

In Park County it has been estimated that as many as 10-25 coal bed natural gas exploratory wells might be drilled with as many as 10 to 20 becoming producing wells also from one field (BLM and state of Montana, 2003).

Surface Disturbance Impacts

[illegible]

Table 2
Cumulative Impacts of Oil and Gas Development

Type of Disturbance	Required Tasks		Acres Disturbed Pre-Site Reclamation	Acres Disturbed Post-Site Reclamation
Eleven (11) Unsuccessful Conventional Oil and Gas Wildcat Wells	Well Site - Maximum area of 3.5 acres (about 380 ft. x 400 ft.) cleared per well pad.		38.5	0 (2 years)
	Access Roads – 40 ft. width x lineal footage (3.5 miles or 18,480 lineal feet) or about 17 acres per well site.		187	0 (2 years)
Four (4) Unsuccessful Coal Bed Natural Gas Wildcat Wells	Well Site –Area of approximately 0.25 acres per cleared well pad		1	0 (2 years)
	Access Roads – 0.75 acres of access road disturbance per drill pad		3	0 (2 years)
Three (3) Conventional Gas Fields Discovered and Brought into Small Scale Production	Gas fields would be discovered east of Lincoln (Area #2), northeast of Townsend (Area #3), and east of Livingston (Area #4) Fields would be approximately 3 square miles in surface area. Compressor stations would be necessary along the pipeline route, with one of those stations located within one mile of the main line to boost pipeline gas to the pressure of the main line. Condensate, gas, and water separation would occur at the well sites. Water disposal would be into a lined pit at the surface or water would be injected into the subsurface through a dry hole converted into a water disposal well. Condensate would be shipped by truck (1 truck every 4 days).		Not Applicable	Not Applicable
	3 commercially productive discovery wells	Well Site - Maximum area of 3.5 acres (about 380 ft. x 400 ft.) cleared per well pad.(9 wells total)	31.5	10.8 (2 years)

	(1 per gas field). 2 additional step out wells per discovery well (total of 6 step out wells).	Access Roads – 40 ft. width x lineal footage. 3 at 17 acres (3.5 miles long)	94.8	52.0 (2 years)
		Pipelines - Trunk lines to existing transmission lines – 25 ft. width x lineal footage (35 miles long). - Field gathering pipelines will follow access roads and no additional disturbance will result.	318	0 (2years)
One (1) Conventional Oil Field Discovered and Brought into Small Scale Production	An oil field is possible in the area east of Livingston, in the vicinity of one of the gas fields identified above. Field would be approximately 1 ½ square miles in surface area. Oil would be transported by truck to refining facility. Oil, gas, and water separation would occur at the well sites. Water disposal would be into a lined pit at the surface or water would be injected into the subsurface through a dry hole converted into a water disposal well. Gas would be used on lease to separate oil and water and to heat oil. Gas not used on lease would be reinjected into the formation for pressure maintenance or would be vented / flared to the atmosphere. If sufficient gas quantities are produced this gas may also be captured and sold. For this analysis all unused gas is assumed to be reinjected for pressure maintenance.		Not Applicable	Not Applicable

Table 2
Cumulative Impacts of Oil and Gas Development

Type of Disturbance	Required Tasks		Acres Disturbed Pre-Site Reclamation	Acres Disturbed Post-Site Reclamation
	- 3 commercially productive wells (one discovery and two step-out wells)	Well Site - Maximum area of 3.5 acres (about 380 ft. x 400 ft.) cleared per well pad.	10.5	3.5 (2 years)
		Access Roads – 40 ft. width x lineal footage. 1 at 17 acres (3.5 miles long)	31.6	16.7 (2 years)
		Pipelines Field gathering pipelines will follow access roads and no additional disturbance will result.	0	0

Two (2) Coal Bed Natural Gas Fields Discovered and Brought into Small Scale Production	One coal bed natural gas field is possible; most likely in the Trail Creek- Livingston coal field area east of Bozeman, and one in the Electric coal field area near Gardiner. Each field would be approximately 1.5 square miles in surface area. One in-field compressor station would be necessary and a second station would need to be located within one mile of the main line to boost pipeline gas to the pressure of the main line. Condensate, gas, and water separation would occur at the well sites. Water disposal would be into a lined pit at the surface or water would be injected into the subsurface through a dry hole converted into a water disposal well. Condensate shipped by truck (1 truck every 4 days).		Not Applicable	Not Applicable
	- 30 commercially productive wells (6 discovery and 24 step-out)	Well Site - Maximum area of 0.25 acres cleared per well pad.	7.5	5 (2 years)
		Access Roads – 0.75 acres of access road disturbance per drill pad	31.6	16.7 (2 years)
		Pipelines-18 miles of field gathering pipelines will follow access roads and no additional disturbance will result. 20 miles of sales lines would be laid to the main transmission lines and require no additional disturbance	0	0