United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-MT-L060-2010-0033-EA
October 22, 2010 ~~August 12, 2010~~

Project Title: Lewistown Field Office
Oil & Gas Lease Parcel Review

Location: Parcel Nos.

MTM 97300-BA
T. 14 N., R. 22 E., PMM Fergus Co. MT (329.54 ac.)
sec. 1, Lots 3, 4;
sec. 1, SW¼NW¼, NW¼SW¼;
sec. 2, Lots 1, 2;
sec. 2, SE¼NE¼, NE¼SE¼;

MTM 97300-BB
T. 13 N., R. 23 E., PMM Fergus Co. MT (40.0 ac.)
sec. 28, NW¼NW¼;

MTM 97300-BC
T. 14 N., R. 23 E., PMM Fergus Co. MT (39.06 ac.)
sec. 3, Lot 1;

MTM 97300-BD
T. 14 N., R. 24 E., PMM Fergus Co. MT (89.47 ac.)
sec. 31, Lot 1;
sec. 31, NE¼NW¼;

MTM 97300-BH
T. 12 N., R. 25 E., PMM Petroleum Co. MT (160.0 ac.)
sec. 32, S½NE¼, N½SE¼;

MTM 97300-BO
T. 14 N., R. 30 E., PMM Petroleum Co. MT (80.0 ac.)
sec. 10, S½SW¼;

MTM 79010-V3
T. 18 N., R. 20 E., PMM Fergus Co. MT (320 ac.)
sec. 10, NE¼, SE¼NW¼, NE¼SW¼, N½SE¼;

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Lewistown Field Office
920 North East Main Street
Lewistown, Montana 59457-1160
www.blm.gov/mt

In Reply Refer To:
1600/3100 (MTL060)

October 22, 2010

Dear Reader:

The Bureau of Land Management (BLM) Lewistown Field Office prepared an Environmental Assessment (EA) in August to revisit our decision concerning an oil and gas lease that was issued in 2008, and subsequently suspended in March 2010. The EA was available for a 30-day public comment period that ended on September 13, 2010.

Based on our analysis and review of comments received, the EA has been updated. A competitive oil and gas lease sale is scheduled to be held on December 9, 2010. 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 22, 2010. I will also recommend deferring two parcels, MTM 97300-BH (160 acres) and MTM 97300 BO (80 acres), from this lease sale, pending additional study and analysis.

We anticipate preparing and finalizing our decision record after the December 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. The lease parcel that is suspended (refer to Appendix A) will not appear on the competitive oil and gas lease sale because it has already been through the competitive leasing process resulting in issuance of a lease. I will recommend keeping this lease in suspension, pending additional study and analysis.

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 EAs, Lease Sale Notices, and corresponding information can be found on the link titled "Oil and Gas Lease Sale Information." The BLM's decision to offer lands in the December 9, 2010 Oil and Gas Lease Sale is subject to a 30-day protest period, which begins October 22, 2010. 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 406-538-1900.

Sincerely,

William F. Frank
Field Manager

United States Department of the Interior
Bureau of Land Management
Lewistown Field Office
920 NE Main Street
Lewistown, MT 59457
Finding of No Significant Impact
Environmental Assessment DOI-BLM-MT-L060-2010-0033-EA

This unsigned Finding of No Significant Impact and the attached DOI-BLM-MT-L060-2010-0033-EA for the Lewistown Field Office were ~~are~~ available for public review and comment for 30 days beginning on August 12, 2010.

Impact identification and analysis of approving the project proposal and/or alternatives(s) has been completed. Environmental analysis has been conducted based on available inventory and monitoring data files. The proposed action conforms with and is within the scope of the land use decisions described in the Fergus Management Framework Plan (MFP) (approved January 1978), the Petroleum Management Framework Plan (approved November 1977), and the Lewistown District Oil & Gas Environmental Assessment of the BLM Leasing Program(approved September 1981). Although the Judith-Valley-Phillips Resource Management Plan (RMP) was approved in 1994, it did not make any decisions relative to leasing of fluid minerals due to a protest on the 1992 Final RMP. Therefore, I am relying on the aforementioned MFPs and existing programmatic analysis for leasing of nominated parcels that do not require special stipulations to protect important wildlife values.

Based on my review of the updated EA and supporting documents, I find that the project, including the implementation of required stipulations/mitigating measures, is not a major federal action and will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No potential environmental effects associated with the project meet the definition of significance in context or intensity as defined in 40 CFR 1508.27, nor do potential effects exceed those effects described in the JVP RMP/FEIS (1992) or the JVP Oil and Gas Supplemental RMP/DEIS (1998). An environmental impact statement (EIS) is not required. In the event that parcels are leased or, where the suspension would be lifted, resultant from this decision, any future proposed development on such parcels would be subject to additional site-specific NEPA analysis and documentation.

The decision to approve or deny the proposed action and preparation of a signed Finding of No Significant Impact with rationale, as appropriate, will be finalized and released after the 30-day protest period for the oil and gas lease sale scheduled December 9, 2010, and before lease issuance. ~~released after consideration of public comments and completion of the EA.~~

Recommended by _____ Date_____
William F. Frank, Field Manager

Concurrence by _____ Date_____
Gary L. Benes, District Manager

Approved by _____ Date_____
Theresa M. Hanley, Deputy State Director Division of Resources

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Lewistown Field Office Oil & Gas Lease Parcel Review
DOI-BLM-MT-L060-2010-0033-EA

1.0 PURPOSE & NEED

1.1 Introduction

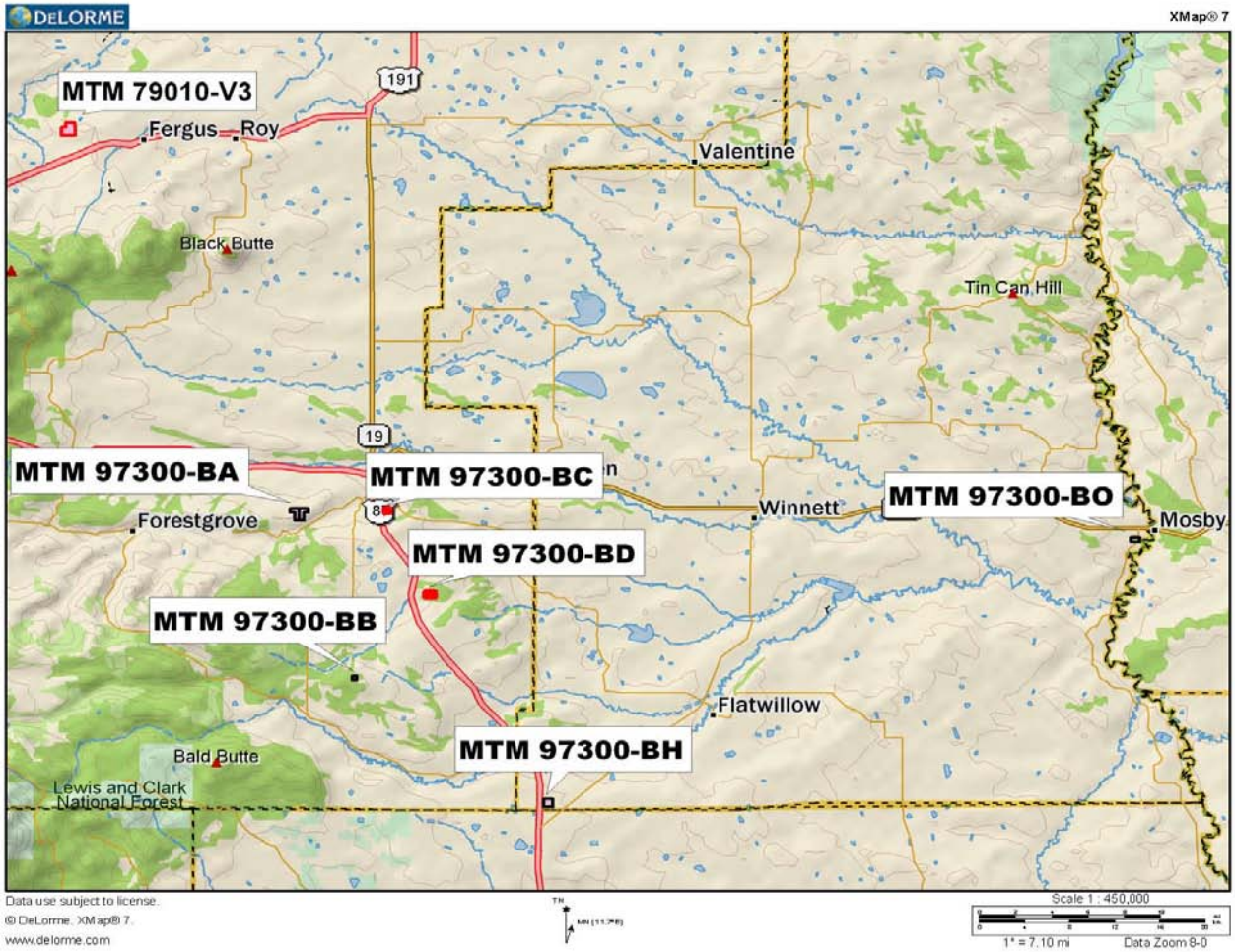
It is the policy of the Bureau of Land Management (BLM) to make mineral resources available for use and to encourage development of mineral resources to meet national, regional, and local needs. This policy is based in various laws, including the Mineral Leasing Act of 1920 and the Federal Land Policy 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 (USFS), 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 parcels located in the Lewistown Field Office (LFO) to be included as part of a competitive oil and gas lease sale tentatively scheduled towards the end of November, 2010, as proposed by the Montana State Office of the Bureau of Land Management.

The seven parcels analyzed in this EA are all located in Fergus and Petroleum Counties, Montana (Map 1).

Map 1



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 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.

The decision to be made is whether to sell oil and gas leases on six parcels in question, and, if so, what stipulations would be identified as required for specific parcels at the time of lease sale.

For the one leased parcel currently under suspension, the decision to be made is whether the conditions under which that parcel has been leased are still valid and in conformance with the land use plan and whether the lease suspension should be lifted.

1.3 Conformance with Land Use Plan(s)

Although the Judith-Valley-Phillips Resource Management Plan (JVP RMP) was approved in 1994 to guide management of all resources within the Lewistown Field Office (LFO), it did not make any specific decisions relative to leasing of fluid minerals due to a protest on the 1992 Final RMP. Since that time, the LFO has, and will continue to, defer leasing of nominated parcels that would require special stipulations to protect important wildlife values until a new RMP is completed. The leasing of nominated parcels not requiring special wildlife stipulations has continued in LFO through reliance on the leasing decisions made in previous land use plans and programmatic analyses.

This EA is tiered to the decisions, information, and analysis contained in the Fergus Management Framework Plan (MFP) (approved January 1978), the Petroleum Management Framework Plan (approved November 1977), and the Lewistown District Oil & Gas Environmental Assessment of the BLM Leasing Program(approved September 1981). A more complete description of activities and impacts related to oil and gas leasing, development, and production, etc. can be found in:

> Fergus MFP: M-2.1 The BLM will retain and assure the continued availability of public land and privately owned land having oil and gas reserved to the United States for oil and gas leasing and exploration.
>
> Petroleum MFP: M-1.1 The BLM will retain and assure the continued availability of public land and privately owned land having oil and gas reserved to the United States for oil and gas leasing and exploration.
>
> Lewistown District Oil & Gas Environmental Assessment of BLM Leasing Program, approved September 1981: Leasing federal minerals administered by the Bureau of Land Management, Lewistown Field Office for oil and gas exploration and development is specifically analyzed in the Lewistown District Oil & Gas Environmental Assessment of BLM Leasing Program, approved September 1981.
> Pertinent information in the EA: Chapter 1, Proposed Action, pages 1-26.

The parcels being addressed are within areas open to oil and gas leasing. Site-specific analysis was conducted by Lewistown Field Office resource specialists who relied on professional knowledge of the areas involved, review of existing databases and file information, and site visits to ensure that appropriate stipulations had 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 JVP 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.

1.4 Public Scoping and Identification of Issues

Public scoping 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 May 25, 2010; however, comments were received through June 21, 2010. Several scoping comment letters pertained to overall issues/concerns from oil and gas leasing within the Montana/Dakotas BLM. Refer to Section 5.2 of this EA for a more complete summary of the scoping comments received.

Issues identified through scoping related to oil and gas leasing include: greenhouse gas (GHG) emissions and impacts to climate change, protection of wildlife and fisheries habitat and corridors, preservation of wildlands/pristine landscapes, protection of scenic quality/viewsheds, protection of cultural areas, minimization surface (soil) disturbance, and identification of mitigation measures to minimize impacts from operations. One comment specifically suggested considering a no leasing alternative.

2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Alternative A - No Action

For 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.

The No Action alternative would exclude six parcels in the LFO from being included in upcoming lease sale. The one lease parcel currently under suspension would remain under suspension, and would be subject to cancellation. 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 six parcels of federal minerals for oil and gas leasing and to lift the lease suspension on one lease parcel, covering a total of 1,058.07 acres administered by the LFO. The parcels are located in Fergus and Petroleum counties. Parcel number, size, and detailed locations and associated stipulations are listed in Appendix A. Map 1 below indicates the general locations of the parcels. Maps in Appendix D indicate the detailed location and topography of each parcel.

Of the 1,058.07 acres of federal mineral estate considered in this EA, 929.54 acres are public surface with federal mineral estate and 128.53 are split estate (private surface with federal mineral estate). All parcels would be subject to leasing stipulations that would protect identified resources or resource uses that might be affected by the Proposed Action.

A total of 128.53 acres in two parcels are split estate. In these instances , the BLM has provided courtesy notification to private landowners that their lands are considered in this NEPA analysis and would be considered for inclusion in an upcoming lease sale. 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, stipulations, conditions, and operating procedures would apply to these parcels. 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.

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, 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.

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 specified at 43 CFR 3162.

3.0 AFFECTED ENVIRONMENT

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.

The seven parcels addressed in this analysis are located in Fergus and Petroleum counties in central Montana. Livestock grazing and hay production are the dominant land uses. Parcel elevation ranges from 2,550' to 4,600'; the annual precipitation zone is 10" – 14".

Specific components of the environment that may be affected by this project are discussed below. Only those aspects of the affected environment that are potentially impacted by this project are described in detail.

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 and BLM-authorized activities on air resources as part of the planning and decision making process.

The Environmental Protection Agency (EPA) 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.

3.1.1 Air Quality

Project area air quality is very good. The EPA air quality index (AQI) is an index used for reporting daily air quality (http://www.epa.gov/oar/data/geosel.html). 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 EPA 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, EPA 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 the EPA 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.

In the context of ozone, all areas throughout Montana and the Dakotas are currently meeting federal standards in all locations. Light and dark blue circles in Figure A indicate standards being met in 2008. Open circles in Figure B indicate static trends.

For haze, trends appear to be improving for the clearest days (Figure C), while there are no apparent trends for the haziest days (Figure D).

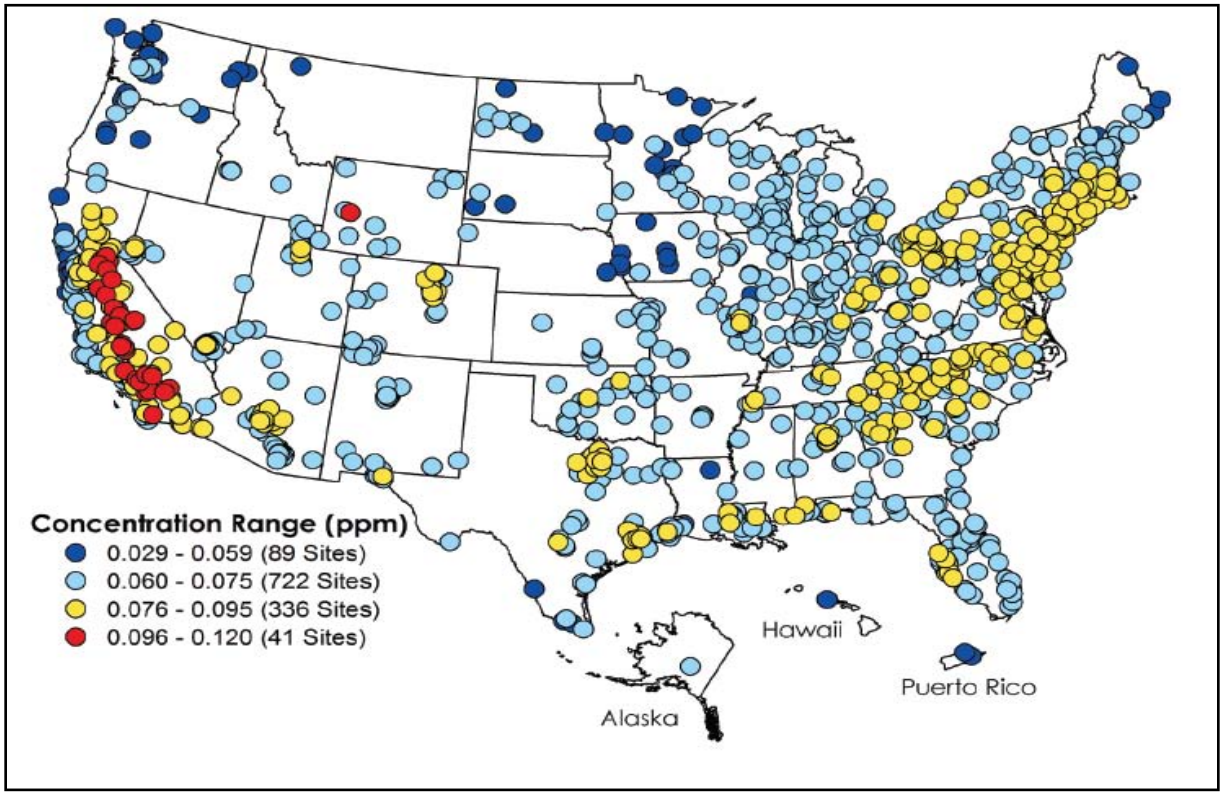


Figure A. Ozone concentrations in ppm, 2008 (fourth highest daily maximum 8-hour concentration).

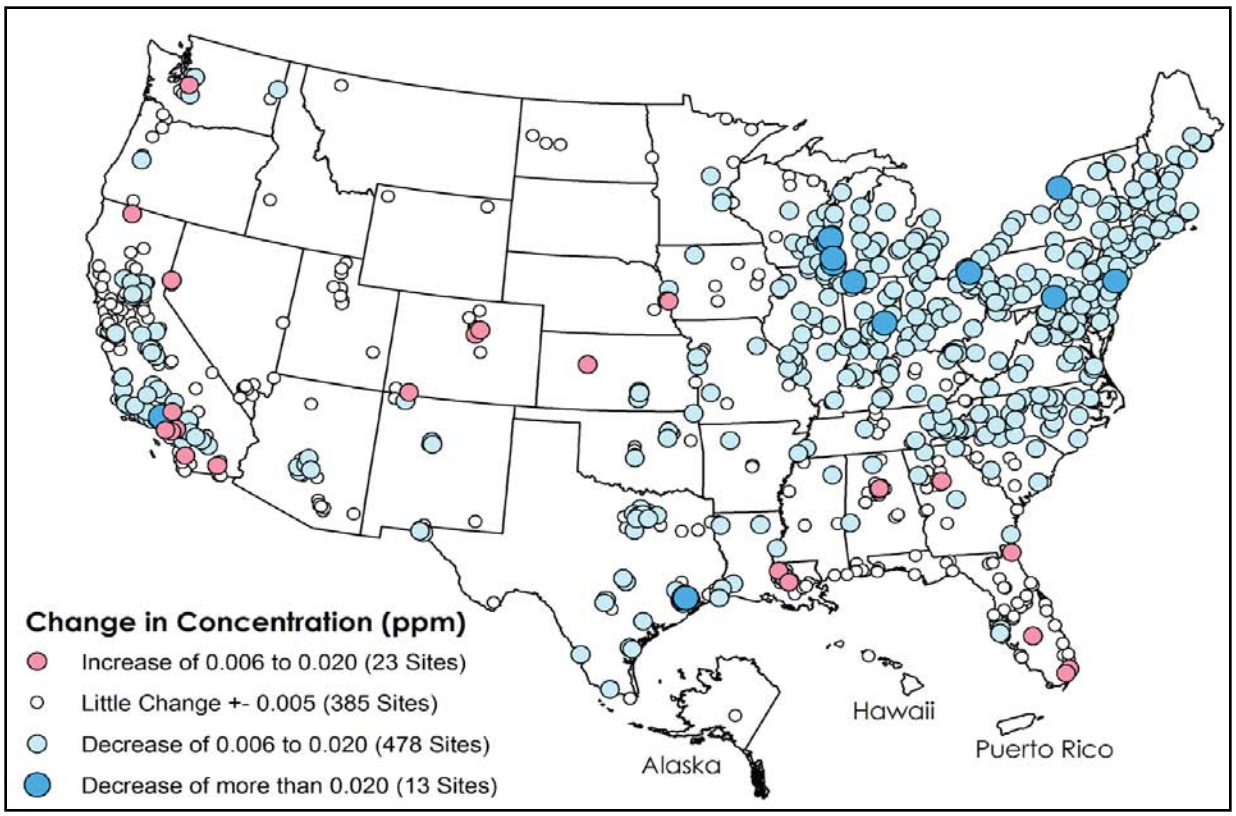


Figure B. Change in ozone concentrations in ppm, 2001-2003 vs. 2006-2008 (three-year average of the annual fourth highest daily maximum 8-hour concentrations).

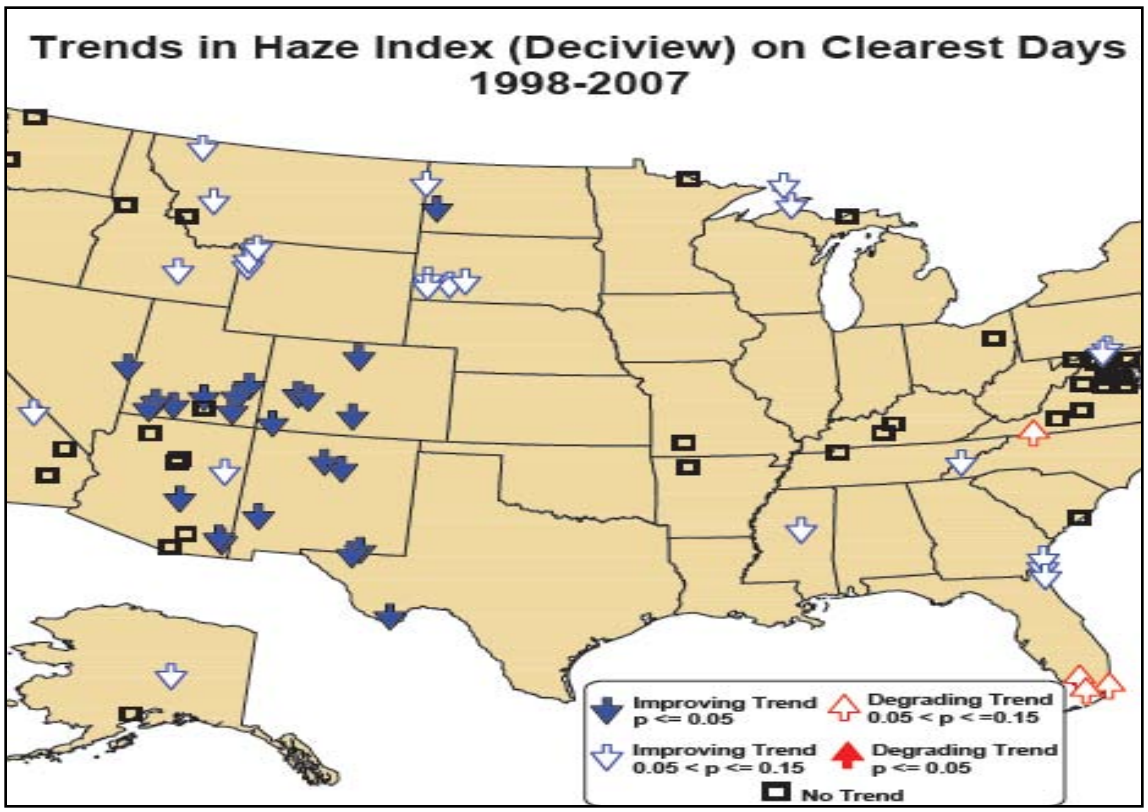


Figure C. Trends in haze index (deciview) on clearest days, 1998-2007.

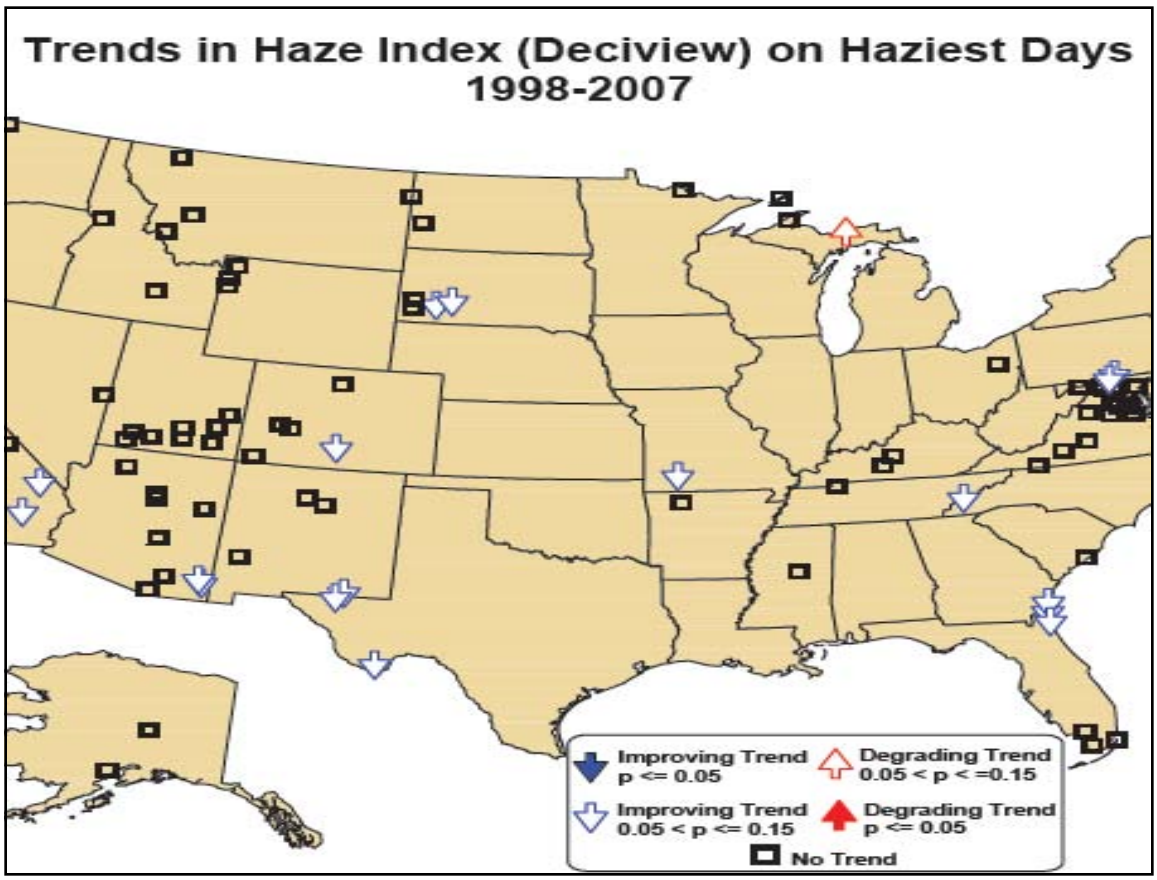


Figure D. Trends in haze index (deciview) on haziest days, 1998-2007.

The AQI data shows that there's little risk to the general public from degraded air quality. The data shown depicts the only data available within the Lewistown Field Office, Cascade, and Fergus Counties. Between 1998 and 2008, 99 percent of the days monitored rated "good" with 1 percent being "moderate." While there were five days that posed a health risk in Cascade County, these are very rare and of short-term occurrence. The three days in 2003 appear to have been related to large wildfires in Glacier National Park and to the Lincoln Complex Fire. Fergus County has not experienced any exceedence; this station was discontinued in 2006.

1. US EPA – Air Data Air Quality Index Report – Field Office Summary (1998-2008)							
County	State	# Days with Data	# Days Rated Good	Percent of Days Rated Good	# Days Rated Mod	# Days Rated Unhealthy for Sensitive Groups	# Days Rated Unhealthy
Cascade 2008	MT	320	316	99	4	0	0
Cascade - 2007	MT	365	355	97	8	2	0

Cascade - 2006	MT	365	363	99	2	0	0
Cascade - 2005	MT	365	361	99	4	0	0
Cascade - 2004	MT	366	365	99+	1	0	0
Cascade - 2003	MT	365	354	97	8	3	0
Cascade - 2002	MT	364	356	98	8	0	0
Cascade – 2001	MT	365	358	98	7	0	0
Cascade 2000	MT	366	351	96	15	0	0
Cascade – 1999	MT	365	365	100	0	0	0
Cascade - 1998	MT	365	363	99	2	0	0
Cascade -All	MT	3971	3907	98	59	5	0
Fergus - 2006	MT	120	119	99	1	0	0
Fergus - 2005	MT	122	122	100	0	0	0
Fergus – 2004	MT	119	118	99	1	0	0
Fergus – 2003	MT	106	106	100	0	0	0
Fergus – 2002	MT	107	107	100	0	0	0
Fergus – 2001	MT	104	104	100	0	0	0
Fergus - 2000	MT	89	88	99	1	0	0
Fergus All	MT	767	764	99+	3	0	0
Field Office	MT	4738	4671	98.6	62	5	0
Field Office Percentages	MT	-	-	98.6 percent	1.3 percent	0.1 percent	

In 2008 the lands within the LFO were in compliance with all air quality standards. The following information presents the worst case scenario as they reflect the largest city within the

LFO boundary (Great Falls). Carbon monoxide reached 22% (one-hour), while $PM_{2.5}$ reached 48.3% (24-hour) of the standard. This indicates that current air quality is very good, falling well below applicable standards.

Monitoring data show that the primary pollutants for this project area vary by county. In Cascade County, the primary pollutants are carbon monoxide (CO), sulfur dioxide (SO_2) and particulate matter ($PM_{2.5}$). The primary source of CO are light duty gas vehicles and motorcycles (39 percent), light duty gas trucks (29 percent), off-road gas vehicles (19 percent), and residential wood burning (5 percent). The primary sources of SO_2 are industrial gas combustion (64 percent), petroleum refining (8 percent), off-road diesel (7 percent), and industrial oil combustion (7 percent). The primary sources of $PM_{2.5}$ are fugitive dust (54 percent), agriculture and forestry (15 percent), residential wood consumption (12 percent), mineral products (7 percent), and off-road diesel (5 percent). In Fergus County, the primary pollutant is $PM_{2.5,}$ and off-road diesel (6 percent) is the primary source. It is important to note that the presence of a source does not automatically mean that air quality is impaired. As shown above, these emissions do not necessarily lead to impaired air quality. The emissions information is simply intended to identify those sectors which have the greatest likelihood to influence current and future air quality for this project area.

No air quality non-attainment areas are located within Fergus and Petroleum counties or the entire Lewistown Field Office. Four class 1 areas are found near the project area, UL Bend Wilderness in the Charles M. Russell National Wildlife Refuge, the Gates of the Mountains Wilderness, the Bob Marshall Wilderness, and the Scapegoat Wilderness. Because of prevailing west winds in central Montana, the only one which would have the potential of being impacted is the UL Bend Wilderness.

3.1.2 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. It refers to any change in climate over time, whether due to natural variability or as a result of human activity." (IPCC 2007a). 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 (Climate Change SIR 2010). This document is incorporated by reference into this EA.

The Intergovernmental Panel on Climate Change (IPCC) (Climate Change SIR, 2010) states that "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Global average temperature has increased approximately 1.4°F since the early 20th century (Climate Change SIR, 2010). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere (lowest layer of earth's atmosphere, up to

4-12 miles above the earth). Other indications of global climate change described by IPCC 2007b (Climate Change SIR, 2010) include:

- Rates of surface warming increased in the mid-1970s, and the global land surface has been warming at about double the rate of ocean surface warming since then;
- Eleven of the last 12 years rank among the 12 warmest years on record since 1850;
- Lower-tropospheric temperatures have slightly greater warming rates than the earth's surface from 1958-2005.

As discussed and summarized in the Climate Change SIR, 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 (Climate Change SIR, 2010). Current ongoing global climate change is believed by scientists to be 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 (Climate Change SIR, 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, large wildfires, and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will 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 proper may last 50 to 200 years in the atmosphere while methane has an average atmospheric life time of 12 years (Climate Change SIR, 2010).

North Dakota, Montana and South Dakota are all in the lower third of GHG emitting states (by volume). North Dakota ranks 37, Montana ranks 42, and South Dakota ranks 43. Only Hawaii and Idaho have lower emissions than Montana and South Dakota among western states (http://assets.opencrs.com/rpts/RL34272_20071205.pdf, Ramseur 2007). Montana, North Dakota, and South Dakota combine for 1.8 percent of the United States' (U.S.) greenhouse gas emissions.

Some information and projections of impacts beyond the project scale are becoming increasingly available. Chapter 3 of the Climate Change SIR describes impacts of climate change in detail at various scales, including the state scale when appropriate. The following bullet points

summarize potential changes identified by the EPA (EPA, 2008) that are expected to occur at the regional scale, where the proposed action and its alternatives are to take place. The EPA identifies this area as part of the Mountain West and Great Plains region (http://www.epa.gov/Region8/climatechange/pdf/ClimateChange101FINAL.pdf):

- 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 lion, 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. 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. Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to two 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 the 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 include:

- Temperature increases in Montana are predicted to be between 3 to 5°F at mid-21st century and between 5 to 9°F at the end of the 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 meltwater.
- 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 Cut Bank 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.

While long-range regional changes might occur within this project area, it is impossible to predict precisely when they could occur. The following example summarizing climate data for the West North Central Region (MT, ND, SD, WY) illustrates this point at the regional scale. A potential regional effect of climate change is earlier snowmelt and associated runoff. This is directly related to spring-time temperatures. Over a 112-year record, overall warming is clearly evident with temperatures increasing 0.21 degrees per decade (Figure E). This would

suggest that runoff may be occurring earlier than in the past. However, data from 1991-2005 indicates a 0.45 degree per decade cooling trend (Figure F). This example is not an anomaly, because several other 15-year windows can be selected to show either wa

- -

, and the eruption of large volcanoes (Climate Change SIR, 2010). This information illustrates the difficulty of predicting actual regional or site-specific changes or conditions which may be due to climate change during any specific time frame.

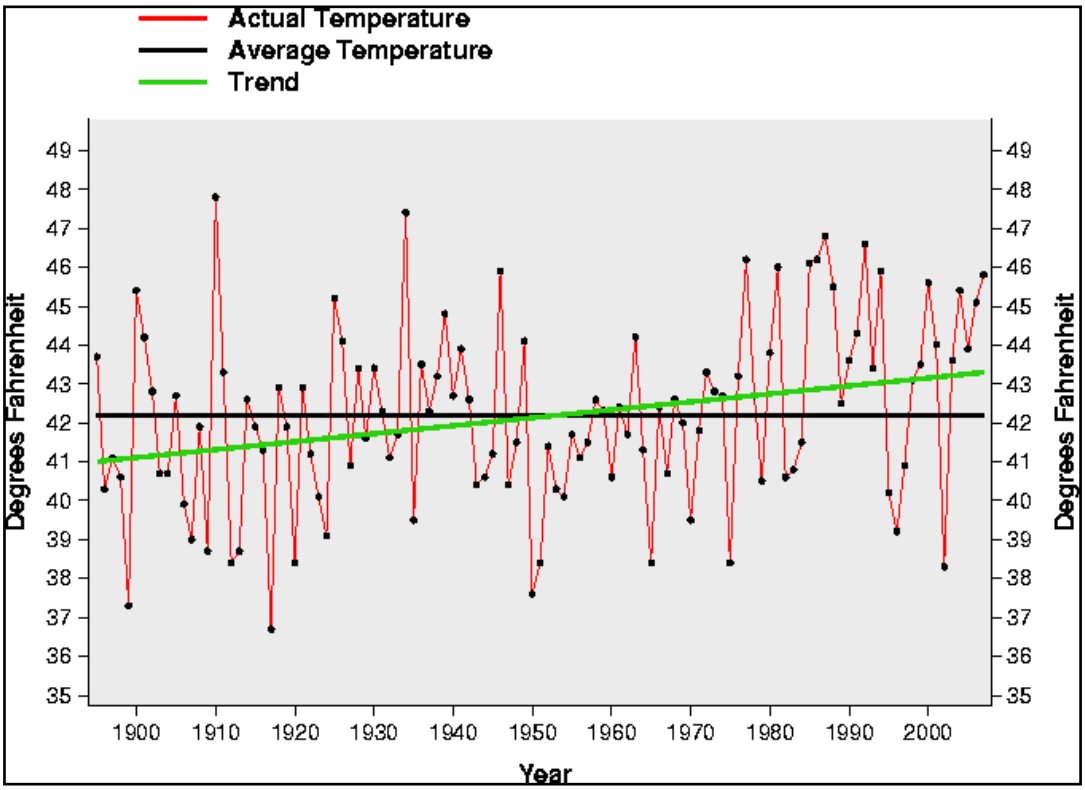


Figure E. Regional climate summary of spring temperatures (March-May) for the West North Central Region (MT, ND, SD, WY), from 1895-2007. (Source: NOAA website – http://www.ncdc.noaa.gov/oa/climate/research/cag3/wn.html**)**

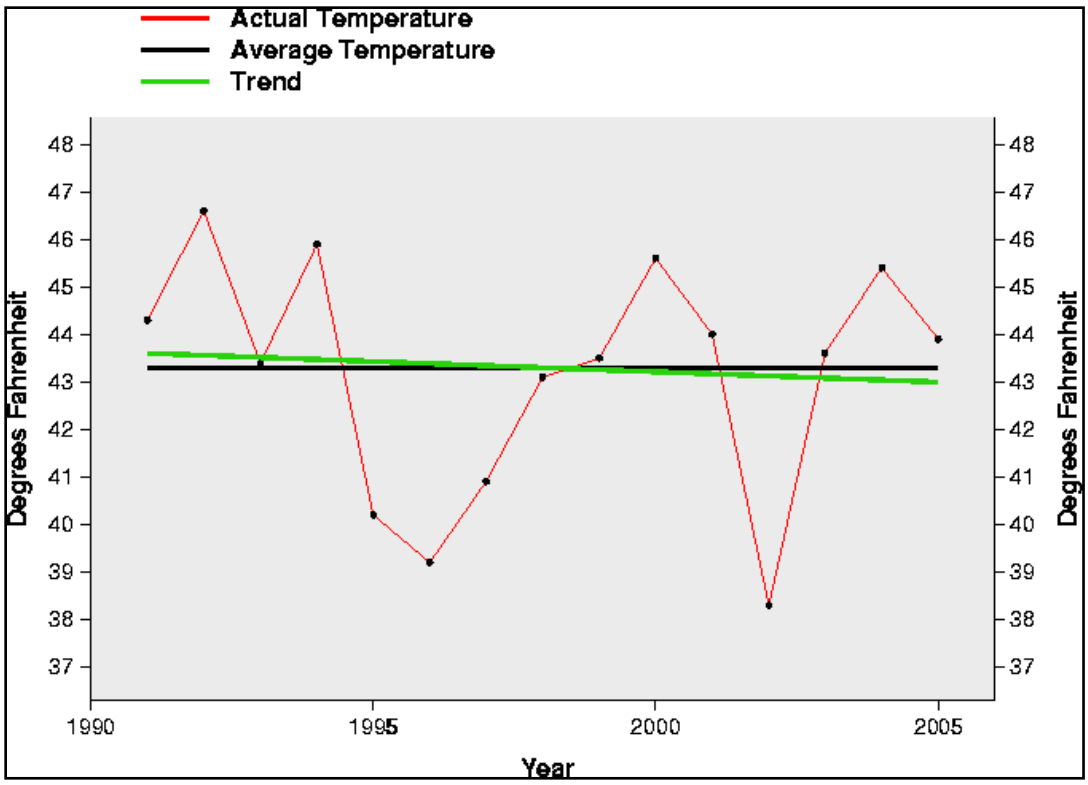


Figure F. Regional climate summary of spring temperatures (March-May) for the West North Central Region (MT, ND, SD, WY), from 1991-2005. (Source: NOAA website – http://www.ncdc.noaa.gov/oa/climate/research/cag3/wn.html**)**

3.2 Soil Resources

Soils were identified from the United States Department of Agriculture's Natural Resources Conservation Service's (USDA-NRCS) Soil Survey Geographic (SSURGO) dataset and the Soil Data Mart (SDM) website (http://soildatamart. nrcs.usda.gov/). Soil surveys were performed by the USDA-NRCS according to National Cooperative Soil Survey (NCSS) standards. Pertinent information for review and analysis is from the SDM and the National Soils Information System (NASIS) database for the area.

Soils within the lease area parcels developed from alluvium from limestone, shale and mixed sources, and residuum and colluviums from sedimentary sandstone and shale. The primary map units (MU) are the: Map unit 6 - Attewan loam, 0 to 4 percent slopes; Map unit 7 - Absarokee-Bitton-Maginnis complex, 15 to 60 percent slopes; Map unit 8 - Bascovy-Neldore silty clays, 2 to 15 percent slopes; Map unit 19 - Amor loam, 2 to 8 percent slopes; Map unit 20 - Amor-Cabba loams, 4 to 8 percent slopes; Map unit 25 - Crago gravelly loam, 0 to 8 percent slopes; Map unit 26 - Borky-Sinnigam very stony loams, 2 to 15 percent slopes; Map unit 27 - Crago-Musselshell complex, 0 to 4 percent slopes; Map unit 47 - Harlem-Havre complex, saline, 0 to 2 percent slopes; Map unit 54 - Kobar-Zatoville silty clay loams, 1 to 6 percent slopes; Map unit 64 - Neldore-Bascovy-Rock outcrop complex, 6 to 60 percent slopes; Map unit 67 - Doney-Wayden

complex, 15 to 60 percent slopes; Map unit 70 - Doney-Winifred-Wayden complex, 15 to 45 percent slopes; Map unit 80 - Eltsac-Norbert clays, 8 to 25 percent slopes; Map unit 82 - Ustic Torriorthents, moderately saline, 15 to 45 percent slopes; Map unit 132 - Judith-Windham gravelly clay loams, 0 to 2 percent slopes; Map unit 133 - Judith-Windham gravelly clay loams, 2 to 8 percent slopes; Map unit 152 - Linwell silty clay loam, 2 to 8 percent slopes; Map unit 170 - Mocmont-Oraid complex, 2 to 25 percent slopes; Map unit 171 - Mocmont-Oraid complex, 25 to 60 percent slopes; Map unit 242 - Timberg-Castner complex, 15 to 45 percent slopes; Map unit 267 - Windham very gravelly loam, 2 to 8 percent slopes; Map unit 273 - Winifred-Judith clay loams, 8 to 15 percent slopes; and, Map unit 275 - Winifred-Windham-Eltsac complex, 15 to 45 percent slopes.

Appendix B provides a description of the major soils that occur in a MU. Descriptions of non-soil (miscellaneous areas) and minor MU components are not included. Table 2 breaks out the MUs within a lease parcel and provides acres, soil ratings, and interpretations.

Table 2. MUs and associated acres, ratings, and interpretations for Lease Area Parcels based on dominant condition of each MU. (Source: USDA-NRCS SSURGO dataset (USDA-NRCS, 2010)).

Parcel #	Map Unit	Acres[1]	Water Erosion Hazard[2]	Wind Erosion Hazard[3]	BLM-Reclamation Suitability (MT)[4]	
					Rating Class	Limiting Feature(s)
MTM79010-V3	19	16	Slight	Slight	Well Suited	-
	20	4	Slight	Slight	Well Suited	-
	67	74	Severe	Moderate	Poorly Suited	Water Erosion Wind Erosion Droughtiness Rooting Depth
	70	145	Severe	Moderate	Poorly Suited	Water Erosion Wind Erosion Droughtiness Rooting Depth
	152	50	Slight	Moderate	Moderately Suited	Wind Erosion
MTM97300-BA	7	95	Severe	Slight	Poorly Suited	Water Erosion Droughtiness Rooting Depth
	132	60	Slight	Moderate	Moderately Suited	Wind Erosion Droughtiness
	133	123	Slight	Moderate	Moderately Suited	Wind Erosion Droughtiness
	242	4	Severe	Moderate	Poorly Suited	Water Erosion Wind Erosion Droughtiness Rooting Depth
	267	6	Slight	Moderate	Moderately Suited	Droughtiness Wind Erosion

	275	42	Severe	Moderate	Poorly Suited	Water Erosion Wind Erosion Droughtiness
MTM97300-BB	26	18	Slight	Slight	Moderately Suited	Droughtiness Rooting Depth
	170	22	Slight	Moderate	Moderately Suited	Droughtiness Wind Erosion
MTM97300-BC	80	35	Moderate	Moderate	Moderately Suited	Water Erosion Wind Erosion Droughtiness Rooting Depth
	273	4	Moderate	Slight	Moderately Suited	Water Erosion Wind Erosion
MTM97300-BD	170	83	Slight	Moderate	Moderately Suited	Droughtiness Wind Erosion
	171	6	Slight	Slight	Moderately Suited	Droughtiness
MTM97300-BH	6	15	Slight	Slight	Well Suited	-
	25	9	Slight	Moderate	Moderately Suited	Droughtiness Wind Erosion
	27	101	Slight	Moderate	Moderately Suited	Droughtiness Wind Erosion
	47	35	Slight	Moderate	Moderately Suited	Wind Erosion
MTM97300-BO	8	6	Moderate	Moderate	Moderately Suited	Wind Erosion Water Erosion Sodium Content Droughtiness Rooting Depth
	54	44	Slight	Slight	Moderately Suited	Sodium Content Wind Erosion
	64	14	Severe	Moderate	Poorly Suited	Water Erosion Droughtiness Wind Erosion Rooting Depth Sodium Content
	82	16	Not Rated	Not Rated	Well Suited	-

1. Approximate acres of each MU within the lease area parcel. Approximate acres based on GIS calculations.
2. The water erosion hazard for bare, non-compacted, soil is estimated by using the formula: Water Erosion Hazard = Kw factor x Representative Value (RV) Slope. The soil erodibility factor (Kw) quantifies soil detachment by runoff and raindrop impact. This erodibility factor is an index used to predict the long-term average soil loss, from sheet and rill erosion. The Kw factor applies to the whole soil, which includes rock fragments. Kw is based primarily on percentage of silt, sand, and organic matter, soil structure, saturated hydraulic conductivity, and rock fragments (USDA-NRCS, 2010). Representative Value (RV) Slope indicates the expected slope value for a given MU (USDA-NRCS8 2010).
3. The wind erosion hazard is estimated from the Wind erosion Index (WEI).The WEI is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. This index is divided into three rating classes: slight (0, 38, 48, 56), moderate (86), and severe (134, 160, 180, 220, 250, 310) (USDA-NRCS, 2010).
4. Vulnerability to degradation is a function of resistance to degradation. Resistance to degradation of a rangeland or woodland site is a measure of its ability to function without change throughout a disturbance. The magnitude of decline in the capacity to function determines the degree of resistance to change. Resistance to degradation thus could be described as an areas buffering capacity. This depends upon soil type, vegetation, climate, land use, disturbance regime, temporal and spatial scales. The

disturbance regime determines the type of stresses placed upon the soil, vegetation, and wildlife components of the site. Thus, soil factors of vulnerability to degradation will vary based upon the disturbance regime for a particular site. The Hazard to site degradation ratings represent the soil factors that dominate these processes. Factors for vulnerability to site degradation include relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and/or redistribution, loss of adequate rooting depth to maintain desired plant communities. Dynamic soil properties which vary with time, e.g. microbial biomass/diversity and carbon/nitrogen ratio, are not used since they are not contained within STATSGO or SSURGO databases. This rating should be used with the objective to protect vulnerable sites from the type of degradation that would result in accelerated erosion, reduction in water and air quality, invasion by annual grasses or noxious weeds, and other large scale potential natural plant community conversions. When degradation of soil and natural plant community characteristics goes beyond the threshold for the ecological site, the ecological site characteristics cannot be restored without intensive inputs of energy (USDA-NRCS, 2010).

3.3 Water Resources

Hydrology – Surface Water Quality

No perennial or intermittent streams are located within the lease parcels. However, two of the seven lease parcels are located within watersheds that contain streams that have been identified as impaired by the Montana Department of Environmental Quality although parcel MTM79010-V3 is actually located below the impaired reach. These streams and the probable causes and sources of their impairment are identified in Table 3.

Table 3. Watersheds (5th-code HUC) and impaired streams and associated causes and sources. (Source: Montana Department of Environmental Quality MT-DEQ Clean Water Act Information Center (MT DEQ, 2008).

Parcel #	Watershed (5th-code HUC)	Impaired Streams within Watershed	Probable Causes	Probable Sources	Stream Channel Distance from Parcel to Impaired Waterbody
MTM79010-V3	Upper Armells Creek (1004010404)	Armells Creek (headwaters to Deer Creek)	Cadmium, Copper, Mercury, pH, Zinc	Impacts from Abandoned Mine Lands (inactive)	Parcel is located below the impaired reach.
MTM79010-V3	Lower Armells Creek (1004010405)	None	N/A	N/A	N/A
MTM97300-BA	North Fork McDonald Creek (1004020405)	None	N/A	N/A	N/A
MTM97300-BA	South Fork McDonald Creek (1004020404)	None	N/A	N/A	N/A
MTM97300-BB	Elk Creek (1004020303)	None	N/A	N/A	N/A
MTM97300-BC	South Fork McDonald Creek	None	N/A	N/A	N/A

	(1004020404)				
MTM97300-BD	Elk Creek (1004020303)	None	N/A	N/A	N/A
MTM97300-BH	Little Wall Creek (1004020208)	None	N/A	N/A	N/A
MTM97300-BO	Musselshell River – Weede School (1004020501)	Musselshell River (Flatwillow Creek to Fort Peck Reservoir)	Alteration in Stream-side or Littoral Vegetative Covers, Low Flow Alterations	Agriculture, Grazing in Riparian or Shoreline Zones, Streambank Modifications/destabilization, Flow Alterations from Water Diversions, Impacts from Hydrostructure, Flow Regulation/modification, Impacts from Resort Areas (Winter and Non-winter Resorts)	0.63 miles

Hydrology – Ground Water

The quality and availability of ground water varies greatly across the three-state region (Montana, North Dakota, South Dakota). Residents in eastern Montana and the Dakotas commonly get their ground water from aquifers consisting of unconsolidated, alluvial valley-fill materials, glacial outwash, or consolidated sedimentary rock formations. Aquifers that residents most commonly use in the area covered in this EA include the Fort Union, Hell Creek, Fox Hills, Judith River, and Eagle consolidated formations. In some areas east of the Rocky Mountains, near-surface thick shale deposits such as those of the Colorado Group and Bearpaw (Pierre) Shale severely limit the economic availability of water to wells, or provide water of quality too poor for most uses. Eastern Montana aquifers typically yield less water and produce more salty, or mineralized, water compared to those in western Montana. The water in some eastern aquifers is suitable only for livestock consumption. Two springs are located on parcel MTM 97300-BA and provide water to stock tanks.

In eastern Fergus County and Petroleum County, which contain the lease parcels, many areas contain rocks that do not have a principal aquifer. Most aquifers are located within Quaternary alluvium and fluvial-glacial gravels or in Mesozoic formations such as the Hell Creek-Fox Hills, Judith River, Eagle, Kootenai, and Ellis Group. In the areas of Fergus and Petroleum Counties containing the lease parcels, the water quality of the bedrock aquifers is extremely variable; however, the specific conductance (microsiemens/centimeter at 25 degrees C) is often in Class II (1000-2500) or Class III (2500-15000). Total dissolved solids range from 500 to 1,800 milligrams/liter (mg/L) in the Hell Creek Formation to 160 to 27,000 mg/L in the Judith River Formation. Water quality is generally better closer to outcrop areas near the mountains and decreases away from recharge zones.

3.4 Vegetation Resources

Vegetation of the project area is characteristic of the Central Sedimentary Plains of Montana in the 11 to 14-inch precipitation zone. The proposed lease parcels are located in a broad landscape that is described from a vegetative stand point as the northern mixed grass prairie. The portion of this landscape that remains relatively undisturbed is dominated by native perennial grass species that are both cool and warm season. Various forb and shrub species are present but occur as a minor species component throughout the area. Undisturbed areas where soils are shallow and at higher elevations may have a ponderosa pine-mixed grassland community that is still dominated by perennial grasses.

Existing influences on local distribution of plant communities include soils, topography, surface disturbance, availability of water, management boundary fence lines, and soil salinity. Vegetation communities have been affected by human activities for over a century. Some of these activities include: infrastructure developments (roads, powerlines, pipelines, etc.); chemical applications; logging; livestock grazing; farming; and wildfire rehabilitation, prevention, manipulation, and suppression; and the introduction of non-native invasive plant species and noxious weeds.

Competition from invasive, non-native plants constitutes a potential threat to native plant species and wildlife habitat within the proposed lease parcels. Several invasive, non-native plant species occupy the project area including: crested wheatgrass (*Agropyron cristatum*), Japanese brome (*Bromus japonicas*), cheatgrass (*Bromus tectorum*), and foxtail barley (*Hordeum jubatum*). Crested wheatgrass occurs in areas as a result of being planted to increase forage production or to stabilize soils by reducing erosion. Cheatgrass, Japanese brome, and foxtail barley are all 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 plant diversity. Cheatgrass is an invasive species well known for completely replacing native vegetation and changing fire regimes. One or more of the following noxious weeds including leafy spurge, Canada thistle, hounds tongue, Russian knapweed and spotted knapweed are widespread throughout a majority of the proposed lease parcels. These weeds are all aggressive invasive species that out-compete desirable vegetation for water and soil nutrients and reduce cattle grazing performance, wildlife habitat quality and native plant diversity. Management of existing infestations of noxious weeds is specifically discussed in section 3.4.1.8 below.

3.4.1 Vegetation Description by Parcel

The vegetation descriptions are derived from vegetative inventories conducted during rangeland health assessments and lease parcel site visits conducted in preparation for the completion of this environmental analysis.

3.4.1.1 MTM 79010-V3

This proposed lease parcel is dominated by cool season perennial grasses including needle-and-thread, Kentucky bluegrass, green needlegrass, Idaho fescue, prairie junegrass, and bluebunch wheatgrass. Shrub and forb species identified on the allotment include silver sagebrush,

chokecherry, russet buffaloberry, snowberry, blue flax, lupine, and western yarrow. The existing vegetative community is providing adequate amounts of canopy cover and vegetative litter to protect the soil resources from erosion.

3.4.1.2 MTM 97300-BA

This proposed lease parcel is dominated by native perennial grasses in areas that were not previously farmed, i.e. the drainages and steeper slopes leading into the drainages as well as the southwest corner of the parcel. Native species present on the undisturbed portions of the parcel include bluebunch wheatgrass, prairie Junegrass, needleandthread, threadleaf sedge, blue grama, western wheatgrass and Sandberg's bluegrass. Non-native grass species present on the parcel include Kentucky bluegrass and crested wheatgrass. The portion of the parcel that was farmed during the homesteading era and then returned to public ownership is dominated by a virtual mono-culture of crested wheatgrass, a non-native perennial bunch grass. The existing vegetative communities are providing adequate amounts of canopy cover and vegetative litter to protect the soil resources from erosion.

3.4.1.3 MTM 97300-BB

This proposed lease parcel is dominated by native perennial grasses including needle-and-thread, prairie Junegrass, bluebunch wheatgrass, green needlegrass and Idaho fescue. Non-native Kentucky bluegrass is also present. Numerous forbs, most of which increase with grazing pressure, also occur on the allotment. Ponderosa pine also occurs on the allotment and was commercially thinned in 2009. Leafy spurge is present in large amounts throughout the proposed lease parcel. The existing vegetative community is providing adequate amounts of canopy cover and vegetative litter to protect the soil resources from erosion.

3.4.1.4 MTM 97300-BC

This proposed lease parcel is a split estate parcel so no rangeland health assessment data exists. The vegetation described was observed during a site visit associated with this environmental assessment. The parcel is dominated by alfalfa that has been planted in order to produce hay for horse and cattle production. A minor ephemeral drainage crosses the parcel. Disturbed areas within the drainage showed some evidence of erosional deposition and higher levels of alkalinity in the soils. Foxtail barley, Japanese brome and other annual grass and forb species were present in the drainage. The existing stands of alfalfa are providing adequate amounts of canopy cover to protect soil resources.

3.4.1.5 MTM 97300-BD

This proposed lease parcel is a split estate parcel so no rangeland health assessment data exists. The vegetation described was observed during a site visit associated with this environmental assessment. The parcel is dominated by native perennial grasses and non-native invasive and noxious weed species. Green needlegrass, Kentucky bluegrass, bluebunch wheatgrass and fescue species and large amounts of cheatgrass are the grass species that exist. Arrowleaf balsamroot, houndstongue, and leafy spurge are the forb and noxious weed species on the allotment. The parcel was logged an estimated 10-15 years ago; a ponderosa pine overstory still

exists which includes many pockets of dog-hair pine stands. Vegetative conditions and litter amounts are not providing adequate soil protection to prevent erosion on portions of this parcel.

3.4.1.6 MTM 97300-BH

This proposed lease parcel is dominated by native perennial grasses including needle-and-thread, western wheatgrass, bluebunch wheatgrass, prairie junegrass, Sandberg's bluegrass, and threadleaf sedge. Shrub and forb species present include silver sagebrush, American vetch, death camus, dandelion, scarlet globemallow, and fringed sagewort. The Montana Natural Heritage Program indicates that a BLM and Montana sensitive plant, poison suckleya (*Suckleya suckleyana*) has been known to occur in the vicinity of this proposed lease parcel. The occurrence of the plant in the area has not been documented for at least 20 years. Section 3.5.2 of this section provides information regarding the description of the plant and its habitat. Ground lichen was also observed on the parcel. The existing vegetative community is providing adequate amounts of canopy cover and vegetative litter to protect the soil resources from erosion.

3.4.1.7 MTM 97300-BO

This proposed lease parcel is dominated in places by non-native grass species including crested wheatgrass and Japanese brome. Other portions of the parcel are dominated by native short grass species including blue grama and Sandberg's bluegrass, indicating that a shift in plant communities from mid-grass-dominated to short-grass-dominated species has occurred. Limited amounts of native perennial grass species including western wheatgrass, and green needlegrass are present. Wyoming big sagebrush and greasewood are present on the parcel where historic farming has not taken place. An ephemeral drainage is located towards the southern end of the parcel, where Rocky Mountain juniper and plains cottonwood are present. There is no recruitment of cottonwood due to the lack of conditions required for seedling establishment. Southwest of the aforementioned drainage, a limited amount of ponderosa pine exists in the shallow, clay-type soils. Vegetative conditions and litter amounts are not providing adequate soil protection to prevent erosion; however, the presence of large amounts of club moss does provide protection from erosion on the relatively flat portions of the parcel that has not been farmed. Recent changes to the livestock grazing management on this parcel shall, over time allow for improved vegetative conditions and a shift away from the invasive annual grasses that dominate a large portion of the site.

3.4.1.8 Noxious Weeds

Noxious weeds were inventoried on six of the seven parcels (one private surface parcel is a cultivated alfalfa field). Weed species include leafy spurge, spotted knapweed, Russian knapweed, Canada thistle, and houndstongue. Weeds are controlled on each of the five federal surface parcels though a cooperative effort between the BLM and the livestock grazing permittees. Range improvement cooperative agreements have been executed with each of the permittees whereby the BLM provides an inventory and map of noxious weed infestations and herbicide and/or biological control agents specific to the weed species present. The permittees provide equipment and labor to apply the herbicide and/or bio-control agent. Noxious weeds on

private surface land are the responsibility of the surface owner; county weed districts provide technical assistance and oversight.

Parcel No.	Weed Species	Surface Mgt.	Herbicide	BioControl
MTM 79010-V3	spotted knapweed	BLM	Yes	No
MTM 97300-BA	leafy spurge	BLM	Yes	Yes
MTM 97300-BB	leafy spurge, houndstongue	BLM	Yes	Yes
MTM 97300-BC	None	Private	N/A	N/A
MTM 97300-BD	leafy spurge, houndstongue, Canada thistle	Private	Unknown	Unknown
MTM 97300-BH	leafy spurge	BLM	Yes	Yes
MTM 97300-BO	Canada thistle, houndstongue	BLM	Yes	No

3.5 Special Status Species

3.5.1 Special Status Animal Species

Based on information obtained from the Montana Natural Heritage Program website (MNHP 2010), there are no known occurrences of federally threatened, ~~and~~ endangered, proposed candidate or BLM sensitive species within the ~~project areas~~ proposed lease parcels. No USFWS critical habitat has been defined in any of the proposed lease parcels.

Several BLM Sensitive Species birds such as Swainson's hawk (*Buteo swainsoni*), chestnut-collared longspur (*Calcarius ornatus*) , loggerhead shrike (*Lanius ludovicianus*) , long-billed curlew (*Numenius americanus*), McCowan's longspur (*Calcarius mccownii*), Ferruginous hawk (*Buteo regalis*), and burrowing owl (*Athene cunicularia*) have been observed within the outlying areas of parcels MTM 79010-V3, MTM 97300-BH, and MTM 973000-BO. Habitat may occur within the project areas that may support the species mentioned, as well as other special status species birds that have not been recorded or observed.

Northern leopard frogs (*Lithobates pipiens*) have occurred within the outlying area of parcel number MTM 79010-V3 and MTM 97300-BA near Southfork of McDonald Creek. Habitat for Great Plains toad (*Bufo cognatus*), and Plains spadefoot (*Spea bombifrons*) may occur near parcel MTM 97300-BO. Plains spadefoot tadpoles were observed during the 2010 field season in parcel MTM 97300-BO. Long-billed curlew (*Numenius americanus*) was observed during the 2010 field season in parcel MTM 97300-BA.

There have been no occurrences of BLM Special Status Species on parcels MTM 97300-BB, MTM 97300-BC, and MTM 97300-BD.

Fish species that are listed on the BLM Special Status Species list do not occur near any of the project parcels. The nearest occurrence of fish species on the BLM Special Status Species list is

a sturgeon chub (*Macrhybopsis gelida*) at Kipp Recreation Area on the Missouri River, which is 28 miles north of parcel MTM 79010-V3.

No formal surveys/inventories for wildlife have been completed in the proposed lease parcels. Where potential habitat exists (as described in Section 3.4.1) species presence is assumed. Appendix C lists the species that may occur in the project area and rationale for excluding TES species from further analysis. There are No Effects/No Impacts to TES species excluded from further analysis as noted in Appendix C and these species are not addressed further. The information presented below identifies parcels containing potential habitat for species identified in Appendix C. It is important to note that the greater sage-grouse (*Centrocercus urophasianus*) and Sprague's pipit (*Anthus spragueii*) are ~~is listed as a~~ candidate species and listing is warranted but precluded under the Endangered Species Act. On June 29, 2010 the U.S. Fish and Wildlife Service reinstated a proposal to list the mountain plover as a threatened species under the Endangered Species Act.

Sprague's pipit was found warranted, but precluded by higher priority actions for listing as a Threatened or Endangered Species (9/15/2010). They are currently considered a Candidate species. Sprague's pipits are strongly tied to native prairie (land which has never been plowed) throughout their life cycle (Owens and Myres 1973, pp. 705, 708; Davis 2004, pp. 1138-1139; Dechant et al. 1998, pp. 1-2; Dieni et al. 2003, p. 31; McMaster et al. 2005, p. 219). They are rarely observed in cropland (Koper et al. 2009, p. 1987; Owens and Myres 1973, pp. 697, 707; Igl et al. 2008, pp. 280, 284) or land in the Conservation Reserve Program (a program whereby marginal farmland is planted primarily with grasses) (Higgins et al. 2002, pp. 46-47). Sprague's pipits will use nonnative planted grassland (Higgins et al. 2002, pp. 46-47; Dechant et al. 1998, p. 3; Dohms 2009, pp. 77-78, 88). Vegetation structure may be a better predictor of occurrence than Species composition (Davis 2004, pp. 1135, 1137). Native grassland is disturbance dependant. Without disturbance, the vegetative species mix changes, and grasslands are ultimately overgrown with woody vegetation (Grant et al. 2004, p. 808) unsuitable for Sprague's pipits. ([Federal Register: September 15, 2010 (Volume 75, Number 178)]

Montana Natural Heritage Tracker has documented observations of Sprague's pipits in Fergus and Petroleum Counties within the Lewistown Field Office area. Lease parcels MTM 79010-V3 and MTM 97300-BA are approximately 9 miles from the documented observations and MTM 97300-BH is approximately 5.5 miles from a documented observation. The nearest documented occurrence for MTM 97300-BO is approximately 35 miles.

Based on BLM records, there are no known active greater sage-grouse leks within ~~the project area~~any lease parcel. A known lek occurs less than 4 miles from MTM 97300-BH and approximately 5.5 miles from MTM 97300-BO. Sage grouse use is expected in both MTM 97300-BH and BO for brood rearing, nesting and or wintering habitat. Parcel Nos. MTM 97300-BH and MTM 97300-BO are within sage grouse core area 3 located in Fergus and Petroleum counties.

Table 4. Federally Threatened, Endangered and Candidate Species

Species	Status	Occurrence
~~Pallid Sturgeon (*Scaphirhynchus albis*)~~	~~Endangered~~	~~Fergus and Petroleum County~~
~~Blackfooted Ferret (*Mustela nigripes*)~~	~~Endangered~~	~~Fergus and Petroleum County~~
Greater Sage-Grouse *(Centrocercus urophasianus)*	Candidate	Fergus and Petroleum ~~County~~Counties
Sprague's pipit (*Anthus spragueii*)	Candidate	Fergus and Petroleum Counties
Mountain plover (*Charadrius montanus*)	Proposed	Fergus and Petroleum Counties

~~The Montana Natural Heritage Program also indicates no known occurrences of BLM Special Status Species (IM MT-2009-039) within the proposed parcels. Long-billed curlew (*Numenius americanus*) was observed during the 2010 field season in parcel MTM 97300-BA.~~

~~Several BLM Special Status Species birds such as Swainson's hawk (*Buteo swainsoni*), chestnut-collared longspur (*Calcarius ornatus*) , loggerhead shrike (*Lanius ludovicianus*) , long-billed curlew (*Numenius americanus*), McCowan's longspur (*Calcarius mccownii*), Ferruginous hawk (*Buteo regalis*), and burrowing owl (*Athene cunicularia*) have been observed within the outlying areas of parcels MTM 79010-V3, MTM 97300-BH, and MTM 973000-BO. Habitat may occur within the project areas that may support the species mentioned, as well as other special status species birds that have not been recorded or observed.~~

~~Northern leopard frogs (*Rana pipiens*) have occurred within the outlying area of parcel number MTM 79010-V3 and MTM 97300-BA near Southfork of McDonald Creek. Habitat for Great Plains toad (*Bufo cognatus*), and Plains spadefoot (*Spea bombifrons*) may occur near parcel MTM 97300-BO. Plains spadefoot tadpoles were observed during the 2010 field season in parcel MTM 97300-BO.~~

~~Fish species that are listed on the BLM Special Status Species list do not occur near any of the project parcels. The nearest occurrence of fish species on the BLM Special Status Species list is a sturgeon chub (*Macrhybopsis gelida*) at Kipp Recreation Area on the Missouri River, which is 28 miles north of parcel MTM 79010-V3.~~

~~There have been no occurrences of BLM Special Status Species on parcels MTM 97300-BB, MTM 97300-BC, and MTM 97300-BD.~~

3.5.2 Special Status Plant Species

Information obtained from the Montana Natural Heritage Program (2010) indicates no known occurrences of federally threatened and endangered species within the proposed parcels. The same information does indicate that there is a historic collection site of a known federal and state

sensitive plant species and the potential for that species to be located on proposed lease parcel MTM 97300-BH within Petroleum County.

The BLM and state sensitive species is poison suckleya (*Suckleya suckleyana)*. A historic collection site of this plant is located within the same township and range of proposed lease parcel MTM 97300-BH; however, the only known current occurrence of the plant in the state of Montana is in Dawson County in eastern Montana. The MNHP website indicates that very little is known about these site locations or the distribution, abundance, and threats to the species in Montana. The habitat for this plant is drying mud along ponds and streams and in disturbed, often alkaline soils on the plains (MNHP 2010). Based on the soils analysis, if the plant does occur on parcel MTM 97300-BH, it would be on soil map unit 47 (Appendix B and section 3.2 of this chapter).

3.6 Fish and Wildlife

The BLM coordinates with 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.

Managing wildlife 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 understand 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 its Crucial Areas Planning System (CAPS: http://fwp.mt.gov/gis/maps/caps/). The oil and gas lease parcels were reviewed in the CAPS GIS 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.

A vast variety of wildlife may be found within or in the outlying areas of the proposed parcels. During the 2010 field season, mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) have been observed in parcels MTM 79010-V3, MTM 97300-BD and MTM 97300-BA. Pronghorn antelope (*Antilocapra americana*) has been observed in parcel MTM 79010-V3. Bobcats (*Lynx rufus*) and coyotes (*Canis latrans*) have been observed in the outlying areas of the parcels. Various species of birds such as raptors, songbirds, waterfowl, and upland game birds may also be present. Feathers found at parcel MTM 97300-BD indicated wild turkeys (*Meleagris gallopavo*) utilize this parcel. Several species of reptiles such as prairie rattlesnakes (*Crotalus viridis*) and garter snakes (*Thamnophis sirtalis*), as well as amphibians

such as the boreal chorus frog (*Pseudacris maculate*), have been observed in the outlying areas. No fish species occur near or on any of the parcels.

3.7 Cultural Resources

Cultural resources are discussed in the JVP Final RMP/EIS on page 131. To update and supplement that data, in 2010 the BLM completed a Class I Overview of the historic, prehistoric, and paleontological resources present throughout the Central Montana District. That document is on file at the Lewistown Field Office.

The BLM broadly defines cultural resources as any traditional lifeway belief or cultural property. Cultural properties are defined as distinct evidence in areas of past human occupation, activity, and use. Traditional lifeway beliefs are defined as traditional value systems of religious beliefs, cultural practices, or social exchange that are not closely and tangibly defined or identified with definite locations (JVP RMP 1992).

Early peoples in the study area were mobile hunters and gatherers throughout and up until the historic period. The following brief overview explains changes through time as summarized by other archaeologists (Frison 1978; Ruebelmann 1983).

The Early Prehistoric Period (roughly 10,000-5,700 B.C.) is characterized by a tool assemblage consisting of large lanceolate and/or fluted spear points and multipurpose tools made of stone or ivory. Subsistence strategies specialized in hunting megafauna, but smaller game and plant foods were utilized as well. Typical site types include kill and butchering sites, open air camp sites, and limited activity sites.

The Middle Prehistoric Period (roughly 5,000 B.C.-A.D. 400) is characterized by a shift in tool types from thrusting spears with lanceolate spear heads to spear throwers and darts with diagnostic spear points. Ground stone tools also begin to show up in the assemblages. Subsistence strategies shift from more specialized hunting of megafauna to a broader spectrum strategy which becomes focused on bison by the end of this period. Plant procurement and use also occurs. Evidence of storage in the form of storage pits begins to show up during this period as do large cooking pits. Site types typical of this period include kill and butcher sites, camp sites, and rock shelters.

The Late Prehistoric Period (roughly A.D. 500-1800), is characterized by a technological shift from spear throwers and darts to bow and arrows. Tool assemblages consist of small side, corner, or tri-notched points. Some ceramics become evident in the record in limited number on the northwest plains at this time. Grooved mauls, bone fleshers, and shell beads are common. Subsistence strategies continue to focus on bison procurement. Large communal bison kill/jump sites, rock shelters, wind breaks, and caves are the site types typically found in this area.
More recently, settlers by the thousands came into the area to live on homesteads. Germans and Scandinavians came from the Midwest, as did eastern European immigrants such as Bohemians and Yugoslavs (JVP RMP, 1992).

Cultural sites can be considered significant for several reasons, some because information about the past can be learned through methodical study of the sites, others because the sites communicate a sense of a particular time period they represent in history. Finally, sites can be considered to be important because of the current use or values associated with the location. An important consideration for management actions in this area is preserving the values of the cultural properties contained within. In order to preserve the integrity of a cultural property, it is sometimes necessary to preserve the location in which the cultural property is found. This is an important consideration when the management actions have the potential to affect the location of a cultural property, thus affecting the overall integrity of the cultural property.

The Montana Historical Society's State Historic Preservation Office, through funding provided by the BLM for a cultural resource data sharing project, maintains the State Antiquities Database. This database maintains records of all sites recorded and all cultural resource inventories completed on federal, state, and private lands. The legal descriptions of the seven lease parcels were compared against this database to determine the potential for effects resulting from the leasing of the parcels. One prehistoric site (24PT0470) has been documented on MTM 97300-BO, but it has yet to be evaluated for eligibility for inclusion in the National Register of Historic Places. Until its eligibility is resolved, it is afforded the same protection as if it were eligible for listing.

Three Class III, or intensive, cultural resource inventories have been completed within the affected parcels. None of the private surface land has been inventoried on the two split estate parcels. Cultural resource inventories in the analysis area have been completed for timber sales (two within the same parcel) as well as for a buried telephone cable. Total acreage of the inventories equals 43 acres, or 4 percent of the analysis area.

In 2010, the LFO archaeologist visited all seven of the parcels to make an initial assessment on site probability and the potential for cultural resources to be present.

MTM 79010-V3 has not been inventoried. Initial assessment work identified remains of two cultural sites. This parcel has the potential to contain both historic and prehistoric resources. It had three homestead patents issued in 1914 and 1916, but reverted to public ownership in 1939 and 1940.

MTM97300-BA has not been inventoried. Initial assessment work identified remains of two cultural sites. This parcel has the potential to contain both historic and prehistoric resources. It had two homestead and cash entry patents issued in 1914, but they reverted to public ownership in 1939. There is also evidence of CCC (Civilian Conservation Corps) water development on the parcel.

MTM97300-BB was inventoried for a timber sale in 2009, with negative results. It had one homestead patent issued in 1919, but it reverted to public ownership in 1941. Based on the

results from past the inventory, this parcel has low potential to contain historic and prehistoric resources.

MTM97300-BC has not been inventoried. It is private surface that is cultivated. This parcel has low potential to contain historic and prehistoric resources.

MTM97300-BD has not been inventoried. It is private surface that has been logged. Based on past logging activity this parcel has low potential to contain intact historic and prehistoric resources.

MTM97300-BH has not been inventoried. This parcel has the potential to contain both historic and prehistoric resources. It had one homestead patent issued in 1913, but reverted to public ownership in 1940.

MTM97300-BO has not been inventoried in its entirety. One prehistoric site has been recorded on the parcel. This parcel has the potential to contain both historic and prehistoric resources due to: 1) the known prehistoric site, 2) a known travel route bisecting it, and 3) its location on a tributary of the Musselshell River, near its confluence. This parcel has never left public ownership.

3.8 Paleontology

The subject oil and gas lease parcels are located within areas of varying potential fossil yield classifications (PFCY) assigned from the associated geologic units. The paleontological potentials based on Montana Bureau of Mines and Geology maps and the LFO Class I Overview (Hanna 2009) are evaluated below by parcel.

MTM 97300-BA: This parcel area lies within the geologic units identified as the Kootenai Formation and Lower Colorado Shale. According to the Class I Overview, five vertebrate and 11 non-vertebrate fossil localities are documented in the Kootenai Formation and 21 vertebrate and seven non-vertebrate localities are located within the Lower Colorado Shale. The Kootenai Formation is a Class 3a with moderate potential for paleontological resources, while the Lower Colorado Shale is a Class 2 unit with a low potential for producing vertebrate fossils or scientifically significant non-vertebrate fossils.

MTM 97300-BB: This parcel area lies within the Kootenai Formation. The Class I Overview states that five vertebrate and 11 non-vertebrate fossil localities are documented in the LFO resource area within the Kootenai Formation. The Kootenai Formation is a Class 3a with moderate potential for paleontological resources.

MTM 97300-BC: This parcel area lies within the Thermopolis Formation, part of the geologic unit designated as the Lower Colorado Shale. The Class I Overview identifies that within the Lower Colorado Shale, there are 21 vertebrate and seven non-vertebrate localities. The Lower

Colorado Shale is a Class 2 unit with a low potential for producing vertebrate fossils or scientifically significant non-vertebrate fossils.

MTM 97300-BD: This parcel area lies within the geologic units identified as the Swift Formation and the Alaska Bench Formation. Within the LFO, three non-vertebrate fossil localities are documented in the Swift Formation and three vertebrate and five non-vertebrate localities within the Alaska Bench Formation as described in the Class I Overview. The Swift Formation is a Class 2 with low potential for yielding vertebrate or scientifically significant non-vertebrate fossil remains, while the Alaska Bench Formation is a Class 3b unit with unknown potential for yielding vertebrate or scientifically significant non-vertebrate fossil remains.

MTM 97300-BH: This parcel area lies within Quaternary alluvium. The Class I Overview states that there is very low potential for the occurrence of paleontological remains in Quaternary alluvium, and in most cases, any faunal, floral, vertebrate, or invertebrate material found in association with cultural material is considered archaeological (or historical) rather than paleontological. Quaternary alluvium is a Class 2 unit with low potential for yielding vertebrate fossils or scientifically significant non-vertebrate fossils.

MTM 97300-BO: This parcel area lies within the Carlile Shale, part of the geologic unit designated as the Upper Colorado Shale. Within this unit, the Class I Overview identifies that there are two vertebrate and nine non-vertebrate fossil localities documented in the LFO. The Upper Colorado Shale is a Class 2 unit with low potential for yielding vertebrate fossils or scientifically significant non-vertebrate fossils.

MTM 79010-V3: This parcel area lies within the Judith River Formation. Within this unit, the Class I Overview identifies 82 vertebrate and 18 non-vertebrate fossil localities documented in the. The Upper Colorado Shale is a Class 5 unit that is highly fossiliferous and well-exposed where drainages have incised into bedrock (such as along the Missouri River Breaks) or where structural uplift has occurred. An on-site visit determined that bedrock from this unit is overlain with a protective soil and vegetative layer, classifying the unit as a 5b. Any exposed outcrops in the area are smaller than two contiguous acres.

None of the documented fossil localities in any of the geologic units were identified within the subject oil and gas parcels.

3.9 Native American Religious Concerns

None of the Native American tribes consulted identified traditional cultural properties (TCP) or sacred areas within the analysis area. This area has generally been treated as open territory or on the margins of many tribal claims. At various times, the Blackfeet, Crow, and Gros Ventre have dominated the area, but none have been able to claim it solely as their tribal land. Chippewa and Cree as well as Métis and the Salish and Kootenai have used this area as well. Geographic features near the analysis area of known importance to the various tribes include the Musselshell

River, Black Butte, and Bear Gulch. These areas have been used as collection sites for plants and minerals, as sacred areas, and for camping and habitation.

3.10 Visual Resources

The JVP RMP/EIS established visual resource management (VRM) classes within the LFO.

Parcels BA, BB, and BH (529.54) are in VRM Class II areas. This classification means that the character of the landscape is dominated by natural features, and activities or modifications of the environment should not be evident or attract the attention of the casual observer. Changes caused by management activities should repeat the basic elements found in the natural features of the existing, characteristic landscape.

Parcels BO and V3 are in VRM Class III areas. This classification means that the characteristic of the landscape has had modifications, but the level of change to the character of the landscape should be moderate. Changes caused by management activities should not detract from the existing landscape features.

Visual resource management is only applied to federally managed surface, as such, the affected environment for visual resources only consists of 929.54 acres of the 1,058.07 acres in the Proposed Action.

3.11 Minerals

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.

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 243 oil and gas leases covering approximately 199,678 acres in the Lewistown Field Office. Existing production activity holds approximately 10.3 percent of this lease acreage. Information on numbers and status of wells on these leases and well status and numbers of private and state wells within the external boundary of the field office is displayed in Table 5. Numbers of townships, leased acres within those townships, and development activity for all jurisdictions are summarized in Table 6.

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 5. Existing Development Activity

	FEDERAL WELLS	PRIVATE AND STATE WELLS
Drilling Well(s)	0	0
Producing Gas Well(s)	9	124
Producing Oil Well(s)	31	348
Water Injection Well(s)	5	45
Shut-in Well(s)	18	371
Temporarily Abandoned Well(s)	20	35

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

	Fergus County	Petroleum County
Number of Townships Containing Lease Parcels	5	2
Total Acres Within Applicable Township(s)	116,551	36,443
Federal Oil and Gas Minerals	10,206	9,389
Percent of Township(s)	8.7	25.8
Leased Federal Oil and Gas Minerals	5,732	3,454
Percent of Township(s)	4.9	9.5
Leased Federal Oil and Gas Minerals Suspended	291	0
Percent of Township(s)	0.2	0
Federal Wells		
Private and State Wells		

3.11.2 Solid Minerals

Leasables

Since the oil and gas lease parcels are on acquired lands, the solid minerals normally considered locatable do not fall under the jurisdiction of the General Mining Law of 1872. Management by the BLM consists of implementation of 43 CFR 3500 leasing regulations of solid minerals other than coal and oil shale.

Currently, there are no prospecting permits, preference right leases, or partial right leases within the area of the subject oil and gas lease parcels. Bentonite does occur in the Cretaceous Bearpaw

Shale of the Montana Group that occurs in or is adjacent to lease parcel MTM 79010-V3. Because of the limited exposures, there is little data available regarding the quantity and quality of bentonite, so an accurate determination of its development potential is difficult. However, since there are no active bentonite mining operations in the area, it is anticipated that future development potential of this resource is very low.

Salable

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 (Maley, 1979).

Disposal of mineral materials is a discretionary action of the authorized officer. It is sold to companies and private individuals either competitively or non-competitively depending on the volumes of material involved and presence of competitive interest. Mineral materials may also be obtained free of charge by public bodies and nonprofit organizations through a free use permit. The majority of mineral material disposals in the area are free use permits for road surfacing and maintenance

Mineral materials occurring within the analysis area consist primarily of sand and gravel (with small amounts of petrified wood, agate, and building stone). Mineral materials occurring on public land are reserved to the government and the land patented under the Stock Raising Homestead Act.

The resource area contains deposits of sand and gravel that originated from glacial and fluvial sources. Tertiary gravels make good material for road surfacing and construction projects. Most deposits contain adequate fines for roadwork, though some may require crushing. The deposit can be a cap terrace occurring hundreds of feet above a river (such as the area of lease parcel MTM 97300-BO above the Musselshell River), but no mineral material disposals are within any of the lease parcel boundaries.

3.12 Social and Economic Conditions

Economics

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. The affected local economy is made up of nine counties in Montana within the BLM Lewistown Field Office boundaries (Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Meagher, Petroleum, Pondera, and Teton). The distribution of these economic effects is based on acres leased and levels of production as well as business patterns.

The nine-county local economy had an estimated 2007 population of 174,560 people. Total employment was estimated to be 119,830 full and part-time jobs; there were an estimated 70,795 households; there were 215 North American Industrial Classification System (NAICS) industrial

sectors represented in the local economy; average income per household was $77,944; total personal income was $5,518 million (IMPLAN, 2007). The local economy includes Great Falls (one of the larger population and business centers in Montana). Within this local economy, there were 1.46 people per job.

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).

Leasing

In 2010, there were 201,070 acres of federal minerals leased for oil and gas in the Lewistown Field Office. Currently, annual lease rental is paid on 180,485 acres that are not held by production. Total annual lease and rental revenues to the federal government were an estimated $353,348. Lease rents were not paid on 20,585 acres that were held by production. Instead, royalties are paid on oil and gas production from these leases.

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 Lewistown Field Office, about 14 percent of the leases and about 10 percent of the leased acres are held by production. Forty-nine percent of these federal leasing revenues are distributed to the state, and the state distributes a portion back to the counties. The federal government collects an estimated minimum annual average of about $ 356,000 in lease bids and rent of which an estimated $174,000 is distributed to the state/local governments.

Nature of the Oil and Gas Industry in the Lewistown Field Office

In the nine-year period between 2000 and 2008, oil and gas drilling and production occurred in five of the nine counties within the Lewistown Field Office. During this period, an annual average of 7.34 oil wells, 21.89 gas wells, and 5.5 dry holes were drilled ((MT DNRM, Oil and Gas Conservation Commission, 2010). Based on 2007 federal production levels provided by the Minerals Management Service (MMS) (2008), it is assumed that about five percent of the oil wells, 18 percent of the gas wells, and 15 percent of dry holes were associated with federal minerals. In 2007, about 10,865 barrels (bbl) of oil and 398,488 thousand cubic feet (MCF) of natural gas were produced from federal minerals. Statewide average wellhead prices were $64.64 per bbl for crude oil and $5.72 per MCF for natural gas (Independent Petroleum Association of America (IPAA), 2008). Statewide average output per producing well was 7,144 bbls of crude oil and 14,314 MCF for natural gas (IPAA,2008). The statewide average cost of drilling and equipping each well was $4,507,413 for oil wells, $552,867 for gas wells, and $1,311,719 for dry holes (IPAA, 2008).

Production

In 2007, production from federal minerals in the Lewistown Field Office equaled 10,865 bbls of oil and 398,488 MCF of natural gas (MMS, 2008). Average production from federal mineral estate within the Lewistown Field Office boundaries in 2007 was 0.05 barrels of oil per leased acre and 2.00 MCF of natural gas per leased acre.

Oil and gas leasing and production influences fiscal conditions of local governments and school districts through contributions to oil/gas production taxes and distribution of federal mineral royalty payments on production from public mineral estate. Local oil and gas exploration, development and production, as well as oil and gas transmission, all support jobs and income in the local economy.

The amounts of federal minerals and the contributions of that production to local economies vary among the counties. Table 7 displays the amount of 2007 oil and gas production for each county. About five percent of the oil and 18 percent of the natural gas produced in the planning area comes from federal minerals. The only oil produced from federal minerals occurs in Petroleum County. Across the field office area, about five percent of all the oil production comes from federal minerals. Chouteau County is the largest producer of natural gas from federal minerals. The largest share of total gas production from federal minerals occurs in Fergus County.

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). In 2007, estimated annual federal royalty revenues from production in the Lewistown Field Office were about $373,000, of which about $183,000 were distributed to the state and counties.

Table 7. 2007 County Oil and Gas Leasing and Production

County/Area	Federal Oil Produced: (Barrels)*	Total Oil Produced (Barrels)**	Federal Oil Produced (% of Total Oil Produced)	Federal Natural Gas Produced: (MCF)*	Total Gas Produced (MCF) **	Federal Gas Produced(% of Total Gas Produce)
Cascade	0	0	_	0	0	_
Chouteau	0	0	_	310,577	1,619,986	19
Fergus	0	0	_	59,000	59,850	99
Judith Basin	0	0	_	0	0	_
Lewis/Clark	0	0	_	0	0	_
Meagher	0	0	_	0	0	_
Petroleum	10,865	26,326	41	0	3,930	0
Pondera	0	131,204	0	7,572	548,295	1
Teton	0	51,535	0	0	1,507	0
Lewistown FO Total	10,865	209,065	5	398,488	2,233,568	18

*Stacey Browne, MMS, 2/23/2008
**Montana DNRC, Oil and Gas Conservation Division, Annual Review, 2007 County Drilling and Production Statistics

Local Economic Contribution

The economic contribution to a local economy is measured by estimating the employment and labor income generated by 1) payments to counties associated with the leasing, rent, and production of federal minerals, 2) local royalty payments associated with production of federal oil and gas, and 3) economic activity generated from 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. 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 110 total full and part-time jobs and $ 9.348 million in total employee compensation and proprietor income per year in the local economy (IMPLAN, 2007). (IMPLAN is an economic model used in the Input-Output analysis that allows the assessment of change in overall economic activity as a result of some corresponding change in one or several activities.)

Based on 2007 federal mineral production levels, total federal revenues from federal oil and gas leasing, rents, and royalty payments are an estimated $ 729,000 annually. Federal revenues distributed to the state of Montana amount to an estimated $ 357,000 million per year. The state redistributed an estimated $89,000 to the Montana counties with federal leases and production within the Lewistown Field Office boundaries per year. These revenues help fund traditional county functions such as law enforcement, justice administration, tax collection and disbursement, provision of orderly elections, road and highway maintenance, fire protection, and/or 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 average annual local economic contribution associated with federal leases, rents, drilling, production, and royalty payments combined to support about 40 total local full and part-time jobs and $2.2 million in local labor income, respectively (IMPLAN, 2007). This amounts to less than one-tenth of one percent of the local employment and local income. The NAICS aggregated sectors that experience the most influence from oil and gas related leasing, exploration, development, and production are mining, professional scientific and technical services, construction, retail trade, health care, and social assistance. Table 8 shows the current contributions of leasing federal oil and gas minerals and the associated exploration, development, and production of federal oil and gas minerals to the local economy. The information in Table 8a 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 8. Current Average Annual Contributions of Federal Oil and Gas Leasing, Exploration, Development, and Production to the Local Economy

	Employment (jobs)		Labor Income (Thousands of 2009 dollars)	
Industry	Area Totals	Federal O&G -Related	Area Totals	Federal O&G-Related
Agriculture	8,029	0	$81,739.6	$7
Mining	645	17	$70,348.9	$1,295
Utilities	416	0	$51,667.5	$27
Construction	8,565	3	$335,273.7	$105
Manufacturing	2,423	0	$105,387.1	$18
Wholesale Trade	3,090	1	$158,238.3	$52
Transportation & Warehousing	13,262	1	$338,369.1	$52
Retail Trade	3,044	2	$134,313.1	$62
Information	1,805	0	$84,998.8	$12
Finance & Insurance	5,366	1	$275,568.4	$68
Real Estate & Rental & Leasing	3,099	1	$82,310.5	$34
Prof, Scientific, & Tech Services	6,506	4	$303,637.3	$200
Mngt of Companies	294	1	$13,426.5	$31
Admin, Waste Mngt & Rem Serv	4,268	1	$97,335.2	$17
Educational Services	1,561	0	$27,840.2	$6
Health Care & Social Assistance	12,806	2	$527,379.0	$98
Arts, Entertainment, and Rec	2,811	0	$40,143.7	$6
Accommodation & Food Services	8,489	2	$130,335.1	$28
Other Services	7,480	2	$150,910.4	$33
Government	25,873	1	$1,601,282.6	$42
Total	119,830	41	4,610,505	2,195
Federal O&G as Percent of Total	---	0.03%	---	0.05%

Source: IMPLAN, 2007

Table 8a. 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).

Social and Environmental Justice

The social section focuses on the area in the immediate vicinity of the leases being examined. No alternative would affect the demographics, social trends, or social organization in the area. The leases being examined are located in Fergus and Petroleum counties in the vicinity of the incorporated communities of Lewistown, Grass Range, Winnett, and Roundup (in Musselshell County). The population of these communities in 2009 was 5,933, 143, 165, and 1,966, respectively. Population density (persons per square mile) is less than one person for Petroleum County and 1.7 for Fergus County compared to a statewide figure of 6.7 and a national figure of approximately 100. The area in the vicinity of the leases is home to large cattle ranches. Very little oil and gas production development has taken place in the vicinity of the leases. Approximately 12 percent of the acreage being considered is split estate.

In 2008, the percent of American Indian or Alaska Natives in Fergus and Petroleum counties was 1.7 and 0.7, respectively. The 2008 figures for population living below the poverty level were 13.7 percent for Fergus County and 16.1 percent for Petroleum County. No Indian reservations are located in the immediate vicinity of the leases. The social environment of Fergus County is described in detail in the Upper Missouri Breaks National Monument Proposed RMP EIS (2008).

4.0 ENVIRONMENTAL IMPACTS

4.0.1 Assumptions and Reasonably Foreseeable Development Scenario Summary

At this stage of the leasing process, the act of lifting suspensions or leasing parcels would not result in any activity that might affect various resources. Even if parcels are leased, it remains unknown whether development would actually occur, and if so, where specific facilities would be placed. This would not be determined until the BLM receives an APD in which more detailed information about proposed activities and facilities would be clarified for particular lease parcels. Therefore, this EA discusses potential effects that could occur in the event of development.

Upon receipt of an APD, the BLM would initiate site-specific National Environmental Policy Act (NEPA) analysis to more fully analyze and disclose effects of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of best management practices (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 conditions of approval (COA), 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.

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 of the Proposed Action are identified by resource below.

The following assumptions are from the RFD developed for the Lewistown FO. The BLM administers approximately 1,329,799 acres of federal minerals (for fluid minerals) available for leasing within the Lewistown FO. The RFD forecasts the following level of development in the Lewistown planning area.

The Lewistown Field Office includes portions of the Headwaters and Judith/Valley/Phillips (JVP) planning areas. All parcels under review in this EA are in that portion of the LFO that was included in the Judith Resource Area and the JVP RMP. An RFD scenario was prepared for this RMP. It is dated; however, a new look at the RFD is part of this EA in order to provide assumptions for the EA. After review, it has been determined that the development potential portrayed on maps in the RMP is still valid. Only six townships in Fergus and Petroleum Counties have high development potential for oil and gas. The rest of the area is moderate potential for oil and gas.

This new look includes a review of the drilling and production histories for both counties for the prior 20 years using the Montana Board of Oil and Gas Conservation online database. Between 1990 and 2010, about 19 wells were drilled in Fergus County, with eight completed as shut-in

gas wells; the remainder were dry holes. Existing natural gas production is steadily declining; there is no oil production. During the same time frame, the drilling of approximately 15 wells occurred in Petroleum County. One completion is a shut-in oil well in the Cat Creek Field; the others were dry holes. Production in Petroleum County is oil and associated gas. No wells 10,000 feet or greater were drilled in either of the two counties. Historically, approximately 17 wells in Fergus County and 22 wells in Petroleum County were drilled to a depth greater than or equal to 5,000 feet.

The context of alternatives considered in this EA relative to these assumptions is described below.

Alternative A (No Action Alternative)
Under the No Action Alternative, the proposed parcels would not be leased; and the suspension would be maintained on one lease parcel and would be subject to cancellation. There would be no new impacts from oil and gas production on the parcel lands. No additional natural gas or crude oil would enter the public markets and no royalties would accrue to the federal or state treasuries. The No Action Alternative would result in the continuation of the current land and resource uses on the parcels.

Unless specifically indicated by resource area, no further analysis of the No Action alternative is presented in the following sections.

Alternative B Assumptions
The act of leasing the parcels and lifting the suspension on the already-leased parcel would, in and of itself, have no impact on any natural resources in the area administered by the Lewistown Field Office. Standard terms and conditions as well as special stipulations would apply to the lease parcels. All impacts would link to as yet undetermined future levels of lease development.

If the lease parcels are developed, short-term impacts would be stabilized or mitigated rapidly (within two to five years) and long-term impacts are those that would substantially remain for more than five years.

There are seven parcels in the Lewistown FO. One suspended lease (MTM 98343) is located in T. 18 N., R. 20 E., Fergus County. This township is located immediately north of a township classified as high development potential. During 2008, eight gas wells were drilled and shut-in in the general vicinity of the parcel location. The operator is Kykuit Resources, LLC. The well depths range from 2,500 to 4,500 feet. The parcel contains 320 acres. It could be developed on a 640-acre basis with a communitization agreement (CA).

The parcels in the April sale include four in Fergus County and two in Petroleum County. They are in three areas. Parcels 04-10-17 through 21 are located in T. 14 N., R. 22 through 24 E. and T. 13 N., R. 23 E. These townships were all classified as having moderate development potential in the RMP. One dry hole was drilled in T. 13 N., R. 23 E., and one was drilled in T. 14 N., R.

24 E. in the early 1990s. Based on the lack of production, a low level of exploration activity is expected. The largest parcel is 04-10-17 which is 329.54 acres. The other three are less than 160 acres in size.

Parcel 04-10-21 is located in T. 12 N., R. 25 E., north of the Winnett Junction Field. This field is a Tyler oil field based on 80-acre spacing. There may be interest in this parcel. Parcel 04-10-22 is located T. 14 N., R. 30 E. It is located several miles from the Cat Creek Anticline. Production (oil) from this area is shallow.

Assume statewide spacing for all parcels; 80 acres for oil (the Petroleum County parcels) and 640 acres for gas (the Fergus County parcels).

4.1 Air Resources

4.1.1 Direct and Indirect Effects

Air Quality

Lifting lease suspensions on one parcel and leasing six additional parcels under Alternative B would have no direct impacts on air quality. Any potential effects on air quality from activities on these lease parcels would occur at such time that the leases were developed.

Current monitoring data show that the criteria pollutants fall well below applicable air quality standards indicating very good air quality. The potential level of development and mitigation (section 4.1.2.) is expected to maintain this level of air quality by limiting emissions. In addition to the limited level of development, pollutants would be regulated through the use of state-issued air quality permits or air quality registration processes developed to maintain air quality below applicable standards.

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 and to scope of specific activities proposed in an APD.

Greenhouse Gas Emissions at the Lewistown FO and Project Scales

Sources of GHGs associated with development of lease parcels may include construction activities, operations, and facility maintenance in the course of oil and gas exploration, development, and production. Estimated GHG emissions are discussed for these specific aspects of oil and gas activity because the BLM has direct involvement in these steps. However, the current proposed activity is to offer parcels for lease and lift the suspension on one parcel. No

specific development activities are currently proposed or potentially being decided upon 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 APD on any of the parcels considered here.

Anticipated greenhouse gas emissions presented in this section are taken from the Climate Change Supplementary Report for Montana, North Dakota, and South Dakota (Climate Change SIR 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 (2010). Based on the assumptions summarized above for the Lewistown FO RFD, Table 9 discloses projected annual greenhouse gas source emissions from BLM-permitted activities associated with the RFD (note: the source year selected to disclosed the estimated GHG emissions was the year with the highest expected combined construction and production emissions for oil and gas sources in the planning area).

Table 9. BLM RFD projected annual emissions of greenhouse gases associated with oil and gas exploration and development activity in the Lewistown FO RFD.

Source	BLM Projected Greenhouse Gas Emissions in tons/year from Lewistown FO RFD			Emissions (metric tons/yr)
	CO_2	CH_4	N_2O	CO_2e
Conventional Natural Gas	593.9	2.1	0.0	580.9
Coal Bed Natural Gas (none forecasted in RFD)	0.0	0.0	0.0	0.0
Oil	727.6	1.4	0.0	696.6
Total	**1,321.5**	**3.5**	**0.0**	**1,277.5**

Under Alternative A, there would be no greenhouse gas emissions resultant from this project because under this alternative no additional parcels would be leased, and the suspended lease parcel would remain under suspension and would be subject to cancellation.

To estimate potential GHG emissions associated with the Proposed Action, 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 (and/or lifting of lease suspensions), 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 (with highest year emission output used) to estimate GHG emissions for that particular alternative.

Under Alternative B, approximately 1,058 acres of lease parcels with federal minerals would be leased or would have lease suspensions lifted. These acres constitute 0.080 percent of the total

federal mineral estate of approximately 1,329,799 acres identified in the Lewistown FO RFD. Therefore, based on the approach described above to estimate GHG emissions, 0.080 percent of the Lewistown FO RFD total estimated BLM emissions of 1,277.5 metric tons/year would be approximately 1.0 metric tons/year of CO_2e if the parcels were to be developed.

Climate Change

The assessment of GHG emissions and climate change is in its formative phase. As summarized in the Climate Change SIR (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 (IPCC 2007b, as cited in the Climate Change SIR 2010).

It is currently not possible to know with certainty the net impacts from developing lease parcels 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 greenhouse gas emission or sequestration 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 greenhouse gas 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 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.

4.1.2 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;
- vapor recovery systems where petroleum liquids are stored;
- tier II or greater, natural gas or electric drill rig engines;
- secondary controls on drill rig engines;
- no-bleed pneumatic controllers (most effective and cost effective technologies available for reducing volatile organic compounds (VOCs));
- gas or electric turbines rather than internal combustions engines for compressors;
- nitrogen oxides (NOx) 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;
- interim reclamation to re-vegetate 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;
- directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- gas-fired or electrified pump jack engines;
- install velocity tubing strings;
- cleaner technologies on completion activities (i.e. green completions), and other ancillary sources;
- centralized tank batteries and multi-phase gathering systems to reduce truck traffic;
- forward looking infrared (FLIR) technology to detect fugitive emissions; and
- air monitoring for NOx and ozone (O3).

More specific to reducing GHG emissions, Section 6 of the Climate Change SIR (2010) identifies and describes in detail commonly used technologies to reduce methane emissions from natural gas, coal bed natural gas (CBNG), and oil production operations. Technologies discussed in the Climate Change SIR (2010) and as summarized below in Table 10 (reproduced from Table 6-2 in the Climate Change SIR (2010)) display common methane emission technologies reported under the USEPA Natural Gas STAR Program and associated emission reduction, cost, maintenance and payback data.

Table 10. 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
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

Table 10. 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)
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 (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 (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 FO. 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 (Climate Change SIR, as updated October 2010, Section 6.5 and Table 6-3). The emissions reductions technologies and practices are identified as mitigation measures that could be imposed during development. (Note: except for the light-duty vehicle GHG emission standards, no federal or state regulations mandate these GHG emissions reductions).

4.2 Soil Resources

4.2.1 Direct and Indirect Effects

While the act of leasing a parcel would produce no effects, the development of the leases would result in reasonably foreseeable disturbances to soils. Construction and operation of well pads, access roads, pipelines, powerlines, reserve pits, and other facilities would result in the exposure of mineral soil, soil compaction and rutting, mixing of soil horizons, 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. Effects would be both short-term (well pads and pipelines) and long-term (production areas and access roads). Areas needed for production, access roads, and facilities

would require a long-term commitment of the soil resource. These sites remain non-productive and continue to be at risk of erosion and compacted until abandonment and final reclamation. Production water, when spilled, could contaminate soils and vegetation (depending on properties of the water). This would affect reclamation by altering chemical characteristics of the soils (high electrical conductivity, exchangeable sodium percentage, sodium adsorption ratio, pH, etc.). Potential site-specific effects would be addressed in more detail at the APD stage.
Lease parcels/development would be subject to stipulations that protect soils on slopes over 30 percent, erodible soil on slopes over 20 percent, slumping soils, and/or wet soils. Table 11 shows the approximate acres of soils on slopes over 30 percent and erodible soils on slopes over 20 percent for each lease parcel.

Table 11. Approximate acres of soils on slopes over 30 percent and erodible soils on slopes >20 percent for each Lease Area Parcel. (Source: USDA-NRCS SSURGO dataset (USDA-NRCS, 2010)).

Parcel #	>30% slope Acres[1]	Erodible soils on slopes >20% Acres[2]
MTM790010-V3	74*	219
MTM97300-BA	0	141
MTM97300-BB	0	1
MTM97300-BC	0	0
MTM97300-BD	6	0
MTM97300-BH	0	0
MTM97300-BO	14*	14

* Acres are included in the total acres of erodible soils on slopes >20%.

1. Approximate acres calculated from MU RV slope where RV slope is >30%. Approximate acres based on GIS calculations.
2. Approximate acres calculated from MU RV slope and Water Erosion Hazard where RV slope > 20% and Water Erosion Hazard is severe. Approximate acres based on GIS calculations.

4.2.2 Mitigation

Any surface use or occupancy on slopes over 30 percent, or 20 percent on extremely erodible or slumping soils, will be strictly controlled or, if absolutely necessary, excluded. Use or occupancy will be restricted only when the BLM demonstrates that the restriction is necessary for the protection of slopes over 30 percent, or 20 percent on extremely erodible or slumping soils.

Surface-disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operations and maintenance of producing wells using authorized roads.

In the event of exploration/development, a number of measures would be taken to prevent, minimize, or mitigate effects to soil resources. Typical measures include, but are not limited to:

- Stripping and stockpiling topsoil separate from sub-soils/spoil;
- Applying erosion/sediment control/containment products and structures, such as mulch, straw wattles, water bars, rolling dips, silt fence, bale filters, erosion control blankets and mats, cover crops, etc;
- Alleviating compaction;

- Applying soil amendments, when necessary;
- Re-contouring to approximate original contours or blend with surrounding topography;
- Re-seeding with native vegetation;
- Completing interim reclamation on all disturbed areas associated with producing well locations and associated facilities.
- Monitoring for reclamation success and applying additional measures as needed.

Measures included in the Gold Book (USDI-BLM 2007) would be applied. Additional mitigation measures and/or BMPs, if necessary, would be applied once a site-specific plan of development is proposed.

Upon abandonment of wells and/or when access roads are no longer needed, the authorized officer would issue instructions and/or orders for surface reclamation/restoration of the disturbed areas as described in attached conditions of approval (COA).

4.3 Water Resources

4.3.1 Direct and Indirect Effects

The action of leasing the parcel in and of itself would not have any impact on water resources. The subsequent development of the leases could result in reasonably foreseeable disturbances to hydrologic resources. Standard stipulations regarding steep slopes, erosive soils, and activities on floodplains and in wetlands would minimize potential impacts and are applied. Special areas such as slopes over 30 percent, or 20 percent on extremely erodible or slumping soils; and 500 feet (or 25-year flood plain) from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams; and 1,000 feet (or 100-year flood plain) from larger perennial streams, rivers, and domestic water supplies would be strictly controlled or excluded if absolutely necessary.

The development of the lease (construction and operation of well pads, access roads, pipelines, powerlines, reserve pits, and other facilities) would create surface disturbances that can subsequently lead to surface and ground water degradation through non-point source pollution. Removal of vegetation and construction of operation facilities such as those listed above would result in decreased infiltration rates. This would allow for increased rates and volumes of runoff from these surfaces which can lead to erosion and sediment delivery to streams. However, in all potential exploration and development scenarios, the BLM would encourage the use of BMPs in the Gold Book (USDI and USDA 2007). These best management practices would result in adequate road drainage design which would remove runoff from constructed surfaces before velocity or volume increases to the level that subsequent erosion would occur. The intercepted water would have the opportunity to infiltrate and drop sediments across vegetative filters before entering streams.

Evaluation of the lease parcels identified that no perennial or intermittent streams exist on the parcels although vegetated ephemeral drainages do exist. Even though increased runoff would

occur on disturbed surfaces, the disturbed surface area would be small relative to watershed size and no directly connected impervious area would occur, so any increased volume would have the opportunity to infiltrate. Therefore, the likelihood of an indirect effect of downstream erosion as a result of increased runoff would be negligible. Furthermore, although some erosion would be likely on disturbed surfaces, vegetative filters and the length of vegetative buffers (miles in some cases) would prevent any measurable sediment from reaching streams.

Five of the seven parcels (MTM 97300-BA, BB, BC, BD, and BH) have no impaired streams within their watersheds, so there would be no impact on water quality impaired streams. Furthermore, based upon BMPs identified in the Gold Book and the proximity of parcels to streams, it would be unlikely that a water quality standard would be exceeded. Parcel MTM 79010-V3 is located within a watershed that contains an impaired stream, Armells Creek. However, the listed reach is above the parcel in the watershed. Furthermore, the cause of impairment is cadmium, mercury, zinc, pH, and copper. Management activities associated with the lease of this parcel would not contribute pollutants of concern to the waterbody. Parcel MTM 97300-BO is located within a watershed that contains a listed stream, the Musselshell River, and an ephemeral drainage does run through the parcel. The lease stipulations for the parcel allow for special area consideration of 500 feet from ephemeral streams. Based upon the 500-foot buffer, flat topography, and 0.63 mile vegetated channel distance from the parcel to the Musselshell River, no measurable increase in sediment (which could exacerbate causes of impairment such as low flow alteration) would reach the Musselshell,.

Application for permit to drill packages must include a drilling plan which provides measures to protect comingling of aquifers and protect groundwater quality. Operating procedures are based upon anticipated site geology and aquifers. As a result, groundwater quality would be protected, and no direct or indirect effect would be anticipated. According to Onshore Order 7, produced water may be stored in the reserve pit for up to 90 days unless prohibited by the authorized officer. An application for disposal of produced water would require the approval of the authorized officer and a National Pollutant Discharge Elimination System (NPDES) permit. Produced water is generally disposed of by injection into the substance, pits, or other acceptable methods approved by the authorized officer.

The likelihood and magnitude of these occurrences is dependent upon local site characteristics, climatic events, and the success of specific mitigation measures applied. Potential impacts would be addressed in more detail at the APD stage.

4.3.2 Mitigation

In all potential exploration and development scenarios, the BLM would encourage the use of BMPs documented in the Gold Book (USDI and USDA 2007).

The operator would salvage and stockpile the topsoil from the surface of well pads and constructed surfaces which would then be used for interim and final reclamation. Once the ground surface is restored to the original landform or a landform that approximates and blends

with the surrounding landform, the topsoil is applied and vegetation is re-established, the impacts would be remediated.

If the well site becomes needed for production operations, interim reclamation would occur. All portions of construction not needed for operational or safety purposes would be recontoured to a final or intermediate contour that blends with the surrounding topography. Topsoil would be re-spread to the extent possible and re-vegetated. All salvaged topsoil would be spread over the area of interim reclamation, rather than stockpiled, to reduce final reclamation costs; maintain healthy, biologically active topsoil; and to minimize habitat, visual, and forage loss during the life of the well.

The use of plastic-lined reserve pits would reduce or eliminate the risk of drilling fluid seeping into the soil and eventually reaching ground water. 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 ground water contamination from drilling muds and other surface sources.

Reserve pits would be reclaimed to a safe and stable condition and restored to a condition that blends with the rest of the reclaimed pad area. If it is necessary to line the pit with a synthetic liner, the pit would not be breached or filled while still containing fluids.

Road construction requirements found in the Gold Book for the appropriate road type based upon anticipated traffic volume would be used, and roads would be designed and constructed to allow for successful interim and eventual final reclamation. Revegetation of road ditches and cut and fill slops would help stabilize exposed soils and reduce sediment loss.

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

4.4 Vegetation Resources

At this stage (lease sale) there are no impacts because ground-disturbing activities are not associated with lease sales. Impacts (both direct and indirect) would occur when the lease is developed in the future. The potential impacts would be analyzed on a site-specific basis prior to oil and gas development during the APD stage.

4.4.1 Direct and Indirect Effects

Direct and indirect effects would be analyzed on a site-specific basis if/when an APD is received. The following description identifies effects to vegetation on a general broad scale basis. A full analysis of impacts would occur at the time an APD is submitted. Impacts to native vegetation would depend on the existing vegetation and the topography of each lease parcel. The lease parcels contain grasslands and grassland/coniferous forest vegetation communities. Habitat

disturbance in grasslands generally has less of an impact than disturbance in grassland/coniferous forest communities since trees take longer to become re-established. The mixed grassland/coniferous forest community types typically support a greater diversity and number of wildlife species. As the diversity of habitat structure increases from grassland to grassland and timber, so does the wildlife species richness of the habitat. Thus, there is more potential for impacts to wildlife in grassland/coniferous forest communities than in grassland communities. The two parcels that are comprised of the mixed grassland/coniferous forest community type (MTM 97300-BB and MTM 97300-BD) have been commercially thinned or logged in the past. Thus impacts from the construction of roads and removal of trees in order to develop oil and gas resources will be minimized. 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.

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 are not constrained by topography. In hilly areas, cut and fill may be required which disturbs additional land. Road routes may be longer to meet engineering requirements and may also require cut and fill. Areas lacking roads near potential drilling sites would have more disturbance, because the entire access route would need to be constructed rather than just a short spur route from an existing road.

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 as both current and future generations would be adversely affected. Weeds which are introduced and/or promoted by soil-disturbing activities will compete against and displace native vegetation.

Development associated with oil and gas activities has the potential to affect rare plants. 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. Roads generate weedy habitat along their edges, as well as avenues for weed invasion into unoccupied territory. 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.

4.4.2 Mitigation

Following APD and COA approval, the lease holder and all associated agents would be required to pressure wash or otherwise thoroughly clean all construction equipment and vehicles at an approved wash station prior to entering BLM land in the project area as a preventative weed

control measure. The lease holder would also be required to control noxious weeds which may become established within the lease; this requirement would be for the life of the lease. The lease holder would be responsible for consultation with the authorized officer for acceptable weed control methods and materials.

Additional mitigation would be addressed at the site-specific APD stage of development. Needed COAs would be identified and addressed during planning at the APD stage.

4.5 Special Status Species (SSS)

4.5.1 Special Status Animal Species Direct and Indirect Effects

The analysis area for sage grouse is core area 3 in Fergus and Petroleum counties.
The analysis area for all other wildlife is the footprint of the proposed lease parcels. Appendices C and D list the TES species with potential to occur and which parcels have potential habitat.

While the act of leasing a parcel would produce no effects, subsequent development would result in reasonably foreseeable disturbances to wildlife. Construction and operation of well pads, access roads, pipelines, powerlines, reserve pits, and other facilities would result in direct habitat loss for the footprint of the facilities and disturbance from associated construction and maintenance operations. Effects would be both short-term (well pads and pipelines) and long-term (production areas and access roads) until suitable habitats are reestablished. Potential site-specific effects would be addressed in more detail at the APD stage.

Sage grouse

The nearest known lek is less than 4 miles from MTM 97300-BH and 5.5 miles from MTM 97300-BO, although intensive surveys have not been conducted recently to identify new leks. Sage grouse use is expected during brood rearing, nesting and/or wintering seasons in parcels MTM 97300-BH and BO and use would likely decline with development. Both of these parcels could affect sage grouse core area 3, especially given the wide ranging impacts of oil and gas development discussed in Taylor et al. (2010). Effects of oil and gas development were detected most strongly at 273 square miles (9 mile radius) around each lek, the largest scale tested (ibid). "Impacts (*on male lek attendance*) are indiscernible at < 1 well per square mile, but above this threshold, lek losses are 2-5 times greater inside than outside of development, and abundance at remaining leks declines by 32 to 77% (Doherty et al. 2010)" in Taylor et al. 2010. Leasing and subsequent development of parcels MTM 97300-BH and BO that are within core area 3 would add to the stressors affecting sage grouse . Sage grouse are not expected to occur at the other 5 lease locations given the habitats, sage grouse range and current land uses.

Sprague's pipit

Energy development (oil, gas, and wind) and associated roads and facilities increase the fragmentation of grassland habitat. A number of studies have found that Sprague's pipits appear to avoid non-grassland features in the landscape, including roads, trails, oil wells, croplands,

woody vegetation, and wetlands (Dale et al. 2009, pp. 194, 200; Koper et al. 2009, pp. 1287, 1293, 1294, 1296; Greer 2009, p. 65; Linnen 2008, pp. 1, 9-11, 15; Sutter et al. 2000, pp. 112-114). Sprague's pipits avoid oil wells, staying up to 350 meters (m) (1148 feet (ft)) away (Linnen 2008, pp. 1, 9-11), magnifying the effect of the well feature itself. Oil and gas wells, especially at high densities, decrease the amount of habitat available for breeding territories. ([Federal Register: September 15, 2010 (Volume 75, Number 178)]. The observations of Sprague's pipits in Fergus County from Montana Natural Heritage Tracker were within 9 miles of lease parcels MTM 79010-V3, MTM 97300-BA and BH and approximately 35 miles from MTM 97300-BO. There are several parcels which have potential habitat for Sprague's pipit based on the field visits and the vegetation description in section 3.4.1.

Parcels MTM 79010-V3 and MTM 97300-BH are entirely native prairie parcels and would be preferred nesting habitat for Sprague's pipit. V3 is completely surrounded by native prairie, while BH is bordered by cropland on the west and northeast. Oil & gas development subsequent to leasing within or immediately adjacent to these intact native prairie habitats would cause additional habitat loss and fragmentation, which are two of the major factors associated with the species' population decline.

MTM 97300-BO is connected to unfragmented habitat to the southwest. However, Parcel MTM 97300-BO itself is sagebrush/grass habitat that would not be preferred habitat for Sprague's pipit due to the shrub cover and the small isolated area containing potential nesting habitat. Therefore, no impacts would be expected to the Sprague's pipit on this parcel from leasing and subsequent oil & gas development.

MTM 97300-BA contains small portions of Native prairie habitats with the majority of the parcel converted to crested wheatgrass. There is additional fragmentation due to an existing access road and public gravel road. As such, leasing and potential development on parcel MTM 97300-BA would be expected to have a negligible impact on Sprague's pipit provided development occurs within crested wheatgrass and other fragmented areas within the parcel.

Mountain plover

Mountain plovers are only expected to occur on MTM 97300-BH and BO. The heavily grazed grasses in BO create suitable nesting habitat and the shorter grasses in BH could also be used for nesting. Surveys prior to development and locating ground disturbance outside of these habitats would reduce potential impacts.

Bald eagles, Golden eagles, Ferruginous and Swainson's hawk

None of the parcels contain potential nesting habitat and no bald eagle roost sites have been identified nor are expected in the forested parcels MTM 97300-BB or BD. Potential foraging habitat covers most non-forested portions of the state and subsequent development would not impact use of the area. Potential site-specific effects would be addressed in more detail at the APD stage.

Bats and Amphibians
Very little information exists for many bat species across much of Montana. The highest potential for use occurs at standing water bodies located in MTM 97300-BO. Forested habitats in parcels MTM 97300-BB and BD are unlikely to provide roosting habitat for fringed myotis given the relatively young age and recent harvest activities. Standard stipulations and potential site-specific effects addressed in more detail at the APD stage would address potential impacts.

Reptiles
Little is known about milk snakes and western hog-nosed snakes in Montana, with only a handful of observations. Minimizing ground disturbance associated with development would minimize potential impacts. Standard stipulations and potential site-specific effects addressed in more detail at the APD stage would mitigate potential impacts. Greater short-horned lizards are likely to occur at MTM 97300-BO and could occur at MTM 97300-BA and MTM 79010-V3.

Native Prairie Associates
Similar to the Sprague's pipit, development of parcels within suitable native prairie habitat would cause additional fragmentation and direct habitat loss. The entire area within parcels MTM 97300-BH and MTM 79010-V3 are considered potential habitat. Native prairie habitats within parcel MTM 97300-BA are small portions of the parcel, with the majority converted to crested wheatgrass. Development in this disturbed habitat would mitigate potential impacts to native prairie associates.

Sagebrush Associates
Dense sagebrush habitat only occurs in parcel MTM 97300-BO. Brewer's sparrow and sage thrasher could occur in these areas and development would cause additional fragmentation and direct habitat loss. Development in the heavily grazed portion of this parcel would mitigate potential habitat loss to sagebrush associates, but would have a greater potential impact on mountain plover (a proposed species for listing).

Migratory Birds
The proposed action would be in conformance with the MBTA. Effects to migratory birds from oil and gas development could include direct loss of habitat from roads, well pads and other infrastructure, disturbance, powerline strikes and accidental direct mortality, fragmentation of habitat, change in use of habitats, and potential threats and competition from edge species.

~~Occurrences of BLM special status species have been recorded in the outlying areas of the parcel proposals and in some cases within some parcels. Any development in the parcel proposals would have a negligible impact to BLM special status species.~~

~~Standard stipulations would limit potential impacts such as nest disturbance to bird species on the BLM SSS list that may be nesting within the parcel areas. There would be no impact to mammals and reptiles within the parcel areas. An ephemeral drainage located in parcel~~

~~MTM97300-BO provides habitat for Plains spadefoot as evidenced by tadpoles in the drainage. Through application of standard stipulations there would be no impact on the Plains spadefoot~~.

4.5.1.1 Mitigation

Sprague's pipit and Native Prairie Associates:
Parcels MTM 79010-V3 and MTM 97300-BH are entirely intact native prairie grassland habitat and would be preferred nesting habitat for Sprague's pipit. In order to better assess potential impacts should subsequent development occur, further analysis and study would be needed to determine appropriate mitigation measures that could be applied as Conditions of Approval should subsequent development occur. Therefore, the lease suspension would be continued on the MTM 79010-V3 parcel and lease parcel MTM 97300-BH would be deferred from leasing pending further study.

BLM would apply the Sprague's Pipit Lease Notice (LN 14-15) to MTM 97300-BA. In addition, BLM would require completion of wildlife inventories at the APD stage of development to detect the presence of pipits. If pipits are found in the area, pertinent Conditions of Approval (COAs) would be applied at the site-specific APD stage to ensure the protection of Sprague's pipit and their habitat. These COAs may limit development of surface-disturbing facilities (wells, roads, pipelines and other ancillary facilities) to areas that would not reduce the amount of or further fragment potential Sprague's pipit habitat. Field surveys for Sprague's pipit and other migratory birds would occur at proposed development sites containing potential habitat between April 15 and August 30.

Sage grouse:
While the nearest known lek is less than 4 miles away from MTM 97300-BH and 5.5 miles away from MTM 97300-BO, current, intensive surveys have not been conducted to identify potential new leks. In order to better assess potential impacts to the habitat, these parcels would be deferred pending further review and analysis and consider updated information.

Mountain plover:
Development would only occur outside of potential mountain plover nesting habitat located in parcels MTM 97300-BH and BO. Field surveys for nesting birds at proposed development sites would be conducted for activities planned between May 1 and August 30.

Greater short-horned lizards:
Development would not occur on ridge crests or between coulees to minimize potential impacts to greater short-horned lizards. Potential short-horned lizard habitat occurs in parcels MTM 79010-V3, MTM 97300-BA and BO.

Migratory Birds:

Field surveys for nesting birds at proposed development sites would be conducted for activities planned between May 1 and August 30. Mitigation measures would be assigned at the development stage to ensure there would be no measurable negative effect on migratory birds. These mitigation measures would be required as Conditions of Approval.

Refer to Appendix C for a determination summary for Threatened and Endangered Species that could occur in the area.

4.5.2 Special Status Plant Species Direct and Indirect Effects

The development of parcel MTM 97300-BH could lead to the direct destruction of poison suckleya (*Suckleya suckleyana)* and or its habitat through earth moving activities, crushing, and/ or soil compaction from vehicle and equipment traffic.

4.5.2.1 Mitigation

A vegetative inventory of parcel MTM 97300-BH would be required prior to any development to determine the presence or absence of the BLM and Montana sensitive species poison suckleya (*Suckleya suckleyana)* because development on this parcel could impact this species. If poison suckleya is found to occur on parcel MTM 97300-BH, standard stipulations would mitigate potential impacts.

4.6 Fish and Wildlife

4.6.1 Direct and Indirect

Potential impacts to animals, including listed species, include disturbance of nests and displacement during fawn and elk calving seasons due to subsequent development.

Other impacts could include raptors' use of buildings for perches. Raptors that may utilize these perches include bald eagles (*Haliaeetus leucocephalus*), golden eagles (*Aguila chrysaetos*), Swainson's hawk, and ferruginous hawk. This may result in increased predation on small mammals and birds since this will provide a perch for raptors in an area that previously did not provide perches.

The nearest fisheries reservoir is Vogel Reservoir, which is 22 miles west of parcel MTM 97300-BO. As such, there would be no impacts to fisheries or reservoirs.

4.6.2 Mitigation

In order to limit the potential impacts to elk calving areas, activities would be limited during May 1 to June 30, in accordance with standard stipulations (refer to Appendix A).

4.7 Cultural Resources

4.7.1 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 are not 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.

Based on existing information there is one recorded but unevaluated cultural resource site located on the nominated parcels (MTM 97300-BO). If developed, this property potentially could be impacted by a site-specific proposal. Two other parcels also contain cultural resources that have been noted but not evaluated for National Register eligibility. Based on the landforms and the sites that have been documented in Fergus and Petroleum counties, historic and prehistoric resources could be expected on most of the parcels. Parcel MTM 97300-BC, a private surface parcel, has been cultivated, and the likelihood of intact cultural resources is low.

4.7.2 Mitigation

Specific mitigation measures, including, but not limited to possible site avoidance or excavation and data recovery would have to be determined when site-specific development proposals are received. If a conflict were to exist between the Proposed Action and the presence of cultural resources, mitigation measures would be factored into the project's design. Such measures could include complete documentation of the site to exhaust its information potential, evaluating the site and making a determination that the site is not eligible for inclusion on the National Register of Historic Places, avoiding the site through project redesign, or implementing protective measures to prevent impacts to the characteristics of the site that make the site eligible. Such measures could include installing fences or barriers to protect sites, placing mats or other pads to prevent erosion or soil compaction if a site needed to be crossed, or installing sections of jack-leg fence in areas where subsurface disturbance would be a concern.

4.8 Paleontology

4.8.1 Direct and Indirect Effects

The act of leasing a nominated parcel would not impact paleontological resources; however, subsequent development could have impacts on those resources. For the parcels within areas of Class 3 and below of the Potential Fossil Yield Classification system, there is low potential for adverse effects to paleontological resources through oil and gas development. Parcel MTM 79010-V3 has been identified as Class 5b, where development could potentially have a negative impact to underlying paleontological resources if mitigation measures are not taken.

4.8.2 Mitigation

Since no localities have been documented within any of the lease parcels, site-specific avoidance can't be recommended at this time. For parcel MTM 79010-V3 that has been identified as a Class 5b unit, on-site monitoring or spot checks at key times would need to be conducted if a Proposed Action will penetrate through the protective soil layers.

4.9 Native American Religious Concerns

4.9.1 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.

None of the seven parcels has been identified as containing TCPs and/or properties of religious or cultural importance to tribes.

4.10 Visual Resources

4.10.1 Direct and Indirect Effects

Visual resource management is broken into four VRM classes. The parcels proposed for lease fall into VRM classes II and III. While the act of leasing federal minerals produces no visual impacts, subsequent development of a lease would result in some new development and modifications to the existing landscape. Through the use of best management practices and mitigation guidelines for visual resources, impacts to visual resources would be minimal because the potential new development/modifications are expected to favorably blend with the form, line, color, and texture of the existing landscape.

4.10.2 Mitigation

All new development would implement, as appropriate for the site, BLM Best Management Practices for VRM in Oil and Gas Development. This includes (but would not be limited to) proper site selection, minimizing disturbance, selecting color(s)/color schemes that blend with the background, and reclaiming areas that are not in active use. Wherever practical, no new development would be allowed on ridges or mountain tops. Overall, the goal is to not reduce the visual qualities that currently exist.

4.11 Minerals

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 controlled surface

use (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.

4.11.1 Direct and Indirect Effects

4.11.1.1 Fluid Minerals

Under Alternative B, the seven lease parcels would be offered for lease subject to standard terms and conditions only. The lease parcels would not be subject to major or moderate constraints.

4.11.1.2 Solid Minerals

Leasables

All of the subject oil and gas lease parcels have been reviewed, and none fall within the boundaries of existing solid mineral mining or exploration. Thus, there are no conflicts between the oil and gas lease parcels and existing solid mineral leases.

Salables

Disposal of salable minerals is a discretionary decision of the authorized officer, and thus future potential resource development conflicts would be avoided either by not issuing sales contracts in oil and gas development locations or conditioning the APD or mineral material contract to avoid conflicts between operations.

4.12 Social and Economic Conditions

4.12.1 Direct and Indirect Effects

Economic Conditions

Alternative A

Economic impacts associated with Alternative A would be similar to those described in the economic section of the Affected Environment. These effects are summarized in Table 12.

The No Action alternative would result in the continuation of the current land and resource uses and would cause no social or environmental justice impacts.

Alternative B

This alternative 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. For leases where the surface is privately owned and the mineral estate is federally owned, surface owner agreements, standard lease stipulations, and BMPs could address many of the concerns of private surface owners

Public Revenues related to leasing, rent, and production

Leasing an additional 1,058 acres of federal minerals (Alternative B) would increase average annual oil and gas leasing and rent revenues to the federal government by an estimated $ 2,000 (Table 12). Average annual leasing and rent revenues that would be distributed to state/local governments would increase by an estimated $1,000. Average annual federal oil and gas royalties would increase by an estimated $2,000. Average royalties distributed to the state/counties would increase by an estimated $1,000 annually.

Total average annual federal revenues related to leasing 202,128 acres of federal minerals and associated annual rent and royalty revenues related to annual production of federal minerals would amount to an estimated $733,000. This would be an estimated average annual increase of $4,000 compared to Alternative A. Total average annual revenues distributed to the state and counties would be an estimated $ 359,000, an estimated $2,000 more than with Alternative A.

Table 12. Summary of Estimated Average Annual Economic Impacts by Alternative

	Alternative		
Activity	**A**	**B**	**Alt. B-Alt. A**
Existing Acres leased*	201,070	201,070	0
Acres that would be leased based on this EA **	0	1,058	1,058
Total acres leased	201,070	202,128	1,058
Acres held by production*	20,585	20,585	0
Total acres leased for which lease rents would be paid	180,485	181,543	1,058
Lease rental first 5 years ($1.50/acre)	135,364	136,157	794
Lease rental second 5 years ($2.00/acre)	180,485	181,543	1,058
Minimum lease bid ($2.00/ac.)	40,214	40,426	212
Total annual federal lease and rental revenue	356,063	358,126	2,063
Distribution to State/local government	174,471	175,482	1,011
Annual oil production (bbl)***	10,865	10,922	57
Annual gas production (MCF)	398,488	400,585	2,097
Federal oil royalty (bblx$64.64x0.125)	87,789	88,251	462
Federal gas royalty (MCFx$5.72x0.125)	284,919	286,418	1,499
Total annual Federal O&G royalties	372,708	374,669	1,961
Distribution to State/local government	182,627	183,588	961
Total annual Federal revenues	728,771	732,795	4,024
Total annual State/local revenues	357,098	359,070	1,972
Total annual revenue distributed to counties	89,274	89,767	493

*LR2000, BLM, May 21, 2010
**RFD, May 28, 2010
***Estimated 2007 federal production level

IMPLAN: The IMPLAN Model is the most flexible, detailed and widely used input-output impact model system in the U.S. It provides users with the ability to define industries, economic relationships and projects to be analyzed. It can be customized for any county, region or state, and used to assess "multiplier effects" caused by increasing or decreasing spending in various parts of the economy. This can be used to assess the economic impacts of resource management decisions, facilities, industries, or changes in their level of activity in a given area. The current IMPLAN input-output database and model is maintained and sold by MIG, Inc. (Minnesota IMPLAN Group). The 2007 data set was used in this analysis.

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 average about 40 total full and part-time jobs and $2.2 million within the local economy (IMPLAN, 2007). Table 15 shows that this would be an average annual increase of less than one job and about $10,000 in labor income over levels anticipated with Alternative A. There would also be a corresponding increase in local population of less than five people.

Conclusion

The total federal contribution of Alternative B (leasing an additional 1,058 acres of federal minerals and anticipated related exploration, development, and production of oil and gas) would have negligible effects on local population, total local employment, number of households,

average income per household, and total personal income, i.e., the effects would be less than 0.1percent of current levels. The economic effects would continue to be spread unevenly among the counties. Leasing the additional 1,058 acres and anticipated exploration, development, and production under Alternative B would provide less than $1,000 per year of additional funds for county functions such as law enforcement, justice administration, tax collection and disbursement, provision of orderly elections, road and highway maintenance, fire protection, and/or 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.

Demand for these services would also increase as total local employment and population increase. Leasing the additional 1,058 acres and anticipated exploration, development, and production would not change local economic diversity (as indicated by the number of economic sectors), economic dependency (where one or a few industries dominate the economy), or economic stability (as indicated by seasonal unemployment, sporadic population changes, and fluctuating income rates).

Social Conditions

While the act of leasing federal minerals in and of itself would result in no social impacts, subsequent development of a lease may generate impacts to people living near or using the area in the vicinity of the lease. Oil and gas exploration, drilling, or production could create an inconvenience to these people due to increased traffic and traffic delays, noise, and visual impacts. This could be especially noticeable in these rural areas where oil and gas production has not occurred previously. The amount of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, length of time and season these activities occurred, etc. Creation of new access roads into an area could allow increased public access and exposure of private property to vandalism. For leases where the surface is privately owned and the mineral estate is federally owned, surface owner agreements, standard lease stipulations, and BMPs could address many of the concerns of private surface owners.

There would be no disproportionate effects to low income or American Indian populations. There are low income people in the county, but they do not appear to be associated with any specific BLM resources or activities.

4.13 Cumulative Impacts

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 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.

Unless otherwise indicated by resource, the scale of cumulative impacts analysis for this project is the combined area of Fergus and Petroleum counties. The timeframe associated with potential cumulative effects is anything greater than five years, based on the assumption that if initiated, and if potential exploration/development activity leads to production, activity on these lease parcels could potentially continue for an indefinite period.

The Final JVP RMP Environmental Impact Statement (USDI-BLM 1992) discloses environmental consequences of a broad range of resource management activities, including the fluid minerals RFD scenario upon which assumptions in this EA are based (pages 157-242). While the JVP RMP did not make decisions for fluid minerals, alternatives for fluid minerals management were described and analyzed in that EIS. The RFD scenaro for fluid minerals developed for that planning effort was used to identify assumptions related to fluid minerals management described in this EA. Pages 226-242 of the RMP/EIS (1992) discussed cumulative effects of management activities considered in the RMP at the entire RMP planning area scale which includes the southern portion of Choteau County as well as Fergus, Judith Basin, Petroleum, Phillips, and Valley counties. This document is hereby incorporated by reference into this EA.

The Draft Oil and Gas Supplemental Environmental Impact Statement to the Judith-Valley-Phillips Resource Management Plan and Environmental Impact Statement (USDI-BLM 1998) was completed in March 1998. This supplemental EIS described recent oil and gas leasing activity (from 1990-1995) in the JVP RMP area on pages 12-13 and considered two additional NEPA alternatives for fluid mineral leasing. This supplemental EIS discussed environmental consequences (pages 15-21), including cumulative effects, of these two alternatives in the context of recent and projected fluid mineral leasing activity. Information in this document is incorporated by reference into this EA.

4.13.1 Past, Present and Reasonably Foreseeable Future Actions

Past, present, or reasonably foreseeable future actions that have or could affect the same components of the environment as the Proposed Action in Fergus and Petroleum counties include forest management, mineral exploration and development, livestock grazing, road construction, agriculture, recreational activities, subdivision of private lands, energy/utility infrastructure development, vehicle travel, wild and prescribed fire activities and water flow alterations and diversions. Much of this activity has, and is expected to continue, occurred on private surface lands, which comprise approximately 92 percent of the total land ownership in Fergus and Petroleum counties.

4.13.2 Cumulative Impacts by Resource

4.13.2.1 Greenhouse Gas Emissions and Cumulative Impacts on Climate Change

The cumulative effects analysis area is the Lewistown Field Office, 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 Alternative B lease parcels are ever 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 this 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 Lewistown RFD are compared below with recent, available inventory data at the state, national, and global scales. Greenhouse gas 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 (Climate Change SIR, 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 1,277.5 metric tons/year CO_2e. Potential emissions under Alternative B would be approximately 0.08 percent of this total. Table 13 displays projected GHG emissions from non-BLM activities included in the Lewistown RFD. Total projected emissions of non-BLM activities in the RFD are 4,120.9 metric tons/year of CO_2e. When combined with projected annual BLM emissions, this totals 5,398.4 metric tons/year CO_2e. Potential GHG emissions under Alternative B would be 0.019 percent of the estimated emissions for the entire RFD. Potential incremental emissions of GHGs from exploration and development of fluid minerals on parcels within Alternative B would be minor in the context of projected GHG contributions from the entire RFD for the Lewistown FO.

Table 13. Projected non-BLM GHG emissions associated with the Lewistown FO Reasonably Foreseeable Development Scenario for fluid mineral exploration and development.

Source	Non-BLM Projected Greenhouse Gas Emissions in tons/year for Lewistown FO RFD			Emissions (metric tons/yr)
	CO_2	CH_4	N_2O	CO_2e
Conventional Natural Gas	939.3	6.2	0.0	973.2
Coal Bed Natural Gas (none forecasted in RFD)	0.0	0.0	0.0	0.0
Oil	3,116.0	12.6	0.3	3,147.7
Total	**4,055.3**	**18.8**	**0.3**	**4,120.9**

Montana's Contribution to U.S. and Global Greenhouse Gases (GHGs)
Montana's GHG inventory (http://www.eia.doe.gov/oiaf/1605/archive/gg04rpt/emission.html, Center for Climate Strategies 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 the IPCC, summarized in Climate Change SIR, 2010). Based on 2005 data in the state-wide inventory, the most pronounced source of Montana's 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).

Greenhouse emissions from all major sectors in Montana in 2005 added up to a total of approximately 36.8 million metric tons of CO_2e (Center for Climate Strategies (CCS) 2007). Potential emissions from development of lease parcels in Alternative B of this project represent approximately 0.0000027 percent of the state-wide total of GHG emissions based on the 2005 state-wide inventory (CCS 2007).

The EPA (USEPA 2010, as summarized in the Climate Change SIR 2010) published an inventory of U.S. GHG emissions, indicating gross U.S. emissions of 6,957 million metric tons, and net emissions of 6,016 million metric tons (when CO_2 sinks were considered) of CO_2e in 2008. Potential annual emissions under Alternative B of this project would amount to approximately 0.000000014 percent of gross U.S. total emissions. Global GHG emissions for 2004 (IPCC 2007, summarized by the Climate Change SIR 2010) indicated approximately 49 gigatonnes (10^9 metric tons) of CO_2e emitted. Potential annual emissions under Alternative B would amount to approximately 0.000000002 percent of this global total.

As indicated above, although the effects of greenhouse gas emissions in the global aggregate are well-documented, it is currently not credibly 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 Alternative B, 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 Alternative B. This is likely because many operators working in Montana, South Dakota and North Dakota are currently 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 (Climate Change SIR 2010).

4.13.2.2 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 (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 (IPCC 2007b, as cited in the Climate Change SIR 2010). Effects of climate change on resources are described in Chapter 3 of this EA and in the Climate Change SIR (2010).

4.13.2.3 Cumulative Impacts on Other Resources

As stated previously, activities within Fergus and Petroleum counties that have affected or have the potential to affect resource conditions in the past, present, and reasonably foreseeable future include timber harvest, mineral exploration and development, livestock grazing, road construction, agriculture, recreational activities, subdivision of private lands, energy/utility infrastructure development, vehicle travel, wild and prescribed fire activities and water flow alterations and diversions.

A large amount of private surface lands in Fergus and Petroleum counties are enrolled in various conservation programs with the Natural Resources Conservation Service (NRCS). Data regarding the implementation of these conservation measures from 1999 to 2008 on private surface lands within the two counties was utilized to assist in cumulative impact analysis. The information was obtained by BLM from the Montana NRCS website at http://www.mt.nrcs.usda.gov/technical/implementation/index.html and is summarized in Table 14.

Table 14. Conservation Implementation

Prescribed Grazing	189,585.9 ac
Range, Pasture, & Hay Planting	36,415.00 ac
Critical Area Planting	44.3 ac
Access Road	11208.2 ac
Spring Development	56.0 no
Watering Facility	446.0 no
Water Well	69.0 no
Windbreak/Shelterbelt Establishment	115,699.0 ft
Tree/Shrub Establishment	3.2 ac
Restoration of Rare and Declining Habitats	2,208.4 ac
Upland Wildlife Habitat Management	127,786.9 ac
Wetland Restoration	495.8 ac
Well Decommissioning	16.0 no
Riparian Forest Buffer	84.9 ac
Grazing Land Mechanical Treatment	1,640.2 ac
Forest Stand Improvement	1,209.3 ac
Irrigation Water Conveyance	53216.0 ft
Fence	1,053,750.8 ft
Filter Strip	70.2 ac
Use Exclusion	26,443.3 ac
Pipeline	1,293,170 ft

ac = acres no = number ft = feet

Implementation of projects and land management practices are likely to continue at current levels into the foreseeable future. Similar activities may be occurring simultaneously on private lands within the planning area that are not reported by NRCS.

Federally and state-managed range and forest lands will remain in their native conditions with uses and conditions varying across the landscape. The major uses will continue to be for grazing, timber harvest, and recreation. Limited numbers of range improvement projects, including fences and pipelines, may be constructed on BLM lands within the next five to 10 years in accordance with resource management objectives and the availability of range improvement funds.

Although impacts are discussed by pertinent resource below, the Proposed Action, when considered in combination with other past, present and reasonably foreseeable activities occurring on federal, state, and private lands, would not significantly contribute to any cumulative impacts.

Soil Resources

In general, the above actions could have cumulative impacts on soil resources by causing surface disturbance contributing to soil compaction, erosion, and subsequent sedimentation. Some of these impacts can be mitigated or avoided through proper design, construction, maintenance, and implementation of BMPs.

Water Resources

The aforementioned activities have the potential to increase runoff and erosion, deliver sediment to streams, and destabilize streambanks. These consequences result in the potential cumulative effects of increased sediment loading, increased water temperature, decreased dissolved oxygen concentrations, and less bank storage of water among many other non-point source pollutants. The flow alterations and diversion have the potential for increased water temperatures, salinity, total dissolved solids concentrations, and decreases in water availability.

However, the cumulative effect of these activities have not resulted in exceedence of water quality standards since five of the seven parcels are located within watersheds which do not contain water quality impaired streams. One parcel is located below the listed reach of Armells Creek, which would be unlikely affected by non-point source pollution based on its probable causes and sources. The lease parcel stipulations, and implementation of BMPs in the Gold Book would preclude any pollutants of concern from reaching the Musselshell River from the parcel located within that watershed. Based upon the analysis in the direct and indirect effects sections, the effect of non-point source pollutants on water resources would be immeasurable. Therefore, if the direct and indirect effects are immeasurable, the cumulative effects as a result of the Proposed Action on water resources would be immeasurable.

Vegetation
In general, the above actions could have cumulative impacts on vegetative resources including the direct destruction of vegetation through earth moving, vehicle traffic, limited vegetative production through soil compaction and limited water infiltration, and introduction of invasive and/or noxious weed species.

Fish and Wildlife
The aforementioned actions could have cumulative impacts on wildlife species and habitat such as displacement of wildlife, fragmentation of habitat, reduced amounts of available forage and thermal and escape cover.

Cultural Resources
Federal undertakings are required to comply with the National Historic Preservation Act and adverse effects mitigated. Non-federal undertakings on private lands as identified above can lead to artifact breakage, compaction, and mixing of temporal assemblages and vandalism.

Visual Resources
Non-federal actions could have cumulative impacts on the scenic quality of the landscape with the development of more roads, structures and facilities.

Economics
The cumulative effects of federal mineral leasing within the local economy as well as the specific effects of leasing an additional 1,058 acres under Alternative B are presented in the previous analysis. These effects are summarized in Tables 12 and 15. The total demographic and economic characteristics of the local economy would change very little with the economic activity associated with leasing an additional 1,058 acres of federal minerals.

Table 15. Average Annual Employment and Income by Major Industry by Alternative

Industry	Total Full and Part-time Jobs Contributed		Total Income Contributed ($1000)	
	Alt. A	Alt. B	Alt. A	Alt. B
Agriculture	0	0	$7.4	$7.5
Mining	17	17	$1,295.4	$1,301.5
Utilities	0	0	$27.4	$27.5
Construction	3	3	$104.6	$105.1
Manufacturing	0	0	$18.2	$18.2
Wholesale Trade	1	1	$52.1	$52.3
Transportation & Warehousing	1	1	$52.2	$52.5
Retail Trade	2	2	$62.0	$62.3
Information	0	0	$12.3	$12.4
Finance & Insurance	1	1	$68.3	$68.6
Real Estate & Rental & Leasing	1	1	$33.8	$33.9
Prof, Scientific, & Tech Services	4	4	$200.0	$200.8
Mngt of Companies	1	1	$30.7	$30.9
Admin, Waste Mngt & Rem Serv	1	1	$17.0	$17.1
Educational Services	0	0	$5.8	$5.8
Health Care & Social Assistance	2	2	$98.5	$98.9
Arts, Entertainment, and Rec	0	0	$6.3	$6.3
Accommodation & Food Services	2	2	$27.6	$27.7
Other Services	2	2	$33.4	$33.6
Government	1	1	$42.0	$42.2
Total Federal Contribution	41	41	$2,195.0	$2,205.1
Percent Change from Current	---	0.4%	---	0.5%

5.0 CONSULTATION AND COORDINATION

5.1 Persons, Agencies, and Organizations Consulted

Table 16 lists persons, agencies, and organizations who were 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 Purposes of this EA

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Tom Stivers	FWP; Impacts to Wildlife	Concurrence with BLM Recommendation
	USFWS – coordination letter to be transmitted.	

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 May 25, 2010; however, scoping comments were received through June 21, 2010. Surface owner notification letters were also distributed 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. A total of 325 surface owner notification letters were distributed for the oil and gas leasing analysis process in the entire Montana/Dakotas BLM, with two of those surface owner letters (less than 1 percent) geographically specific to the Lewistown Field Office.

A total of 14 written comment letters and 23 phone/verbal comments were received. The written and verbal communication resulted in a total of 108 individual scoping comments pertaining to oil and gas leasing in the Montana/Dakotas. Of the 108 scoping comments that addressed issues/concerns related to the entire Montana/Dakotas BLM, no comments were submitted by surface owners from the Lewistown Field Office, nor were any comments received pertaining to site-specific concerns related to the Lewistown Field Office lease parcels under consideration.

Of the 108 comments, about 20 were comments/requests for additional information (e.g., split estate brochure) regarding the general process of oil and gas leasing, split estate, questions about the planning process, and questions regarding the verification of mineral ownership. Other comments ranged from the need to address GHG emissions and cumulative impacts to climate change; concerns about impacts to wildlife and fisheries habitat and the fragmentation of wildlife corridors; and concerns related to wilderness, pristine landscapes and scenic viewsheds/quality. Other comments provided specific information pertaining to cultural areas, suggestions for mitigation measures from surface disturbance, and compliance with the NEPA process, including allowing for public comment, addressing a no leasing alternative, and addressing direct, indirect and cumulative impacts.

30-day Public Comment Period

On August 12, 2010, eight EAs along with an unsigned finding of no significant impact, were made available for a 30-day public comment period. A total of 131 written submissions were received after the 30-day comment period, which resulted in 79 individually-coded substantive comments. With the exception of some parcel-specific and/or EA-specific comments and issues, most of the comments applied to all eight EAs. After review and consideration of the comments, some modifications have been made to the EAs. Changes made to the analysis are noted with gray-scale shading and/or strikeout so the modifications to the EA can easily be identified.

The following is a summary of some of the changes that were made to the EA as a result of the 30-day public comment period:

- Some stipulations identified for the proposed action were changed based on updated information submitted by individual commentors;
- Updates to the economic analysis;
- A table was added in the Appendix to summarize the proposed stipulation changes;
- Updates to the Climate Change SIR, including an analysis of the effectiveness of some mitigation practices and techniques;
- Clarifications to the affected environment chapter (Chapter 3) and environmental impacts section (Chapter 4) were made to include habitat and/or species-specific comments. In some cases, these updates resulted in changes to proposed stipulations, specifically a Sprague's Pipit Lease Notice).
- Information was added to Chapter 4 – GHG emissions (direct and indirect impacts) section to clarify that the source year selected to disclose estimated GHG emissions was the year with the highest expected combined construction and production emissions for oil and gas sources in the planning area.

After the 30-day protest period and competitive oil and gas lease sale, but before lease issuance, the BLM will issue the Decision Record and signed Finding of No Significant Impact for this EA. This information, along with other updates and Lease Sale Notice information can be found on the Montana/Dakotas BLM website at www.blm.gov/mt. 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 and lease sale notices can be found on the link titled "Oil and Gas Lease Sale Information."

5.3 List of Preparers

Table 17. List of Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Lowell Hassler	NRS	Team Lead; Noxious Weeds
Willy Frank	LFO Field Manager	Oversight, Review, Concurrence and Signature
Adam Carr	Supervisory RMS	Vegetation, Special Status Plants
Zane Fulbright	Archaeologist	Cultural Resources, Native American Religions Concerns
Abel Guevara	Wildlife Biologist	Wildlife Resources, Special Status Wildlife Species
Chad Krause	Hydrologist	Water Resources, Air Resources
Mike Philbin	MSO Soil/Water/Air Program Lead	Air Resources and Climate
John Thompson	MSO Planning and Environmental Coordinator	Economic Analysis
Joan Trent	Sociologist	Social Analysis and Environmental Justice
John Bown	Petroleum Engineer	Minerals
Jerry Majerus	Environmental Coordinator	Review
Chris Rye	Geologist	Solid Minerals, Paleontology
Rod Sanders	Outdoor Recreation Planner	Visual Resources
Josh Sorlie	Soil Scientist	Soils

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APPENDIX A: Lease Parcel Summary Table –

Parcel Number	Acres	Legal Description	Proposed Stipulations
MTM 97300-BA	329.54	T. 14 N, R. 22 E, PMM MT Sec. 1 LOTS 3,4; 1 SWNW,NWSW; 2 LOTS 1,2; 2 SENE,NESE; Fergus County (027) ACQ	Cultural Resources 16-1 (All Lands) Lease Notice 14-15 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands)
MTM 97300-BB	40.00	T. 13 N, R. 23 E, PMM, MT Sec. 28 NWNW; Fergus County (027) ACQ	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands)
MTM 97300-BC	39.06	T. 14 N, R. 23 E, PMM, MT Sec. 3 LOT 1; Fergus County (027) PD	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands)
MTM 97300-BD	89.47	T. 14 N, R. 24 E, PMM, MT Sec. 31 LOT 1; 31 NENW; Fergus County (027) PD	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands)
MTM 97300-BH	160.00	T. 12 N, R. 25 E, PMM, MT Sec. 32 S2NE,N2SE; Petroleum County (069) ACQ 50% U.S. MINERAL INTEREST	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands) Recommend deferring from December 9, 2010 lease sale.
MTM 97300-B0	80.00	T. 14 N, R. 30 E, PMM MT Sec. 10 S2SW; Petroleum County (069) PD	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands) Recommend deferring from December 9, 2010 lease sale, pending further study.

APPENDIX A: Lease Parcel Summary Table – Suspended Parcel

Parcel Number	Acres	Legal Description	Proposed Stipulations/Changes
MTM 79010 V3 now is MTM 098343	320.00	T. 18 N, R. 20 E, PMM, MT Sec. 10 NE,SENW,NESW,N2SE; Fergus County (027) ACQ	Cultural Resources 16-1 (All Lands) Standard 16-3 (All Lands) TES 16-2 (All Lands)

Stipulation Number	Stipulation Name/Brief Description
Cultural Resources 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.
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.
Lease Notice 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.
Standard 16-3	**STANDARD LEASE STIPULATION** Stipulations regarding Esthetics, Erosion Control, Controlled or Limited Surface Use, Applications for Permit to Drill, Cultural and Paleontological Resources, and Endangered or Threatened Species.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
5001 Southgate Drive
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OIL AND GAS LEASE STIPULATIONS

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 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 erodable or slumping soils.

See Notice on Back

NOTICE

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 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:

1. Contact the appropriate SMA to determine if a site-specific cultural resource inventory is required. If an inventory is required, then:

2. 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.

3. 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 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.

Standard 16-3

APPENDIX B – SOILS

Soils[1]

Map unit: 6 - Attewan loam, 0 to 4 percent slopes
The Attewan component makes up 90 percent of the map unit. Slopes are 0 to 4 percent. This component is on terraces, fan remnants, foothills. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Farmland classification is Prime farmland if irrigated.

Map unit: 7 - Absarokee-Bitton-Maginnis complex, 15 to 60 percent slopes
The Absarokee component makes up 35 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills. The parent material consists of clayey residuum over consilidated interbedded sandstone and shale. Depth to a root restrictive layer, bedrock, lithic,is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent.

The Bitton component makes up 25 percent of the map unit. Slopes are 15 to 60 percent. The parent material consists of alluvium and/or colluvium derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

The Maginnis component makes up 20 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of residuum over hard interbedded sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 8 - Bascovy-Neldore silty clays, 2 to 15 percent slopes
The Bascovy component makes up 55 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock (paralithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

The Neldore component makes up 35 percent of the map unit. Slopes are 2 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock (paralithic), is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most

restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 19 - Amor loam, 2 to 8 percent slopes
The Amor component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on plains. The parent material consists of loamy residuum over semiconsolidated sandstone and siltstone. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Farmland classification is Farmland of statewide importance.

Map unit: 20 - Amor-Cabba loams, 4 to 8 percent slopes
The Amor component makes up 60 percent of the map unit. Slopes are 4 to 8 percent. This component is on plains. The parent material consists of loamy residuum over semiconsolidated sandstone and siltstone. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

The Cabba component makes up 30 percent of the map unit. Slopes are 4 to 8 percent. This component is on plains. The parent material consists of loamy residuum over semiconsolidated sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map unit: 25 - Crago gravelly loam, 0 to 8 percent slopes
The Crago component makes up 95 percent of the map unit. Slopes are 0 to 8 percent. This component is on fan remnants, terraces, plains. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC055MT Gravel (gr) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 55 percent.

Map unit: 26 - Borky-Sinnigam very stony loams, 2 to 15 percent slopes
The Borky component makes up 45 percent of the map unit. Slopes are 2 to 15 percent. This component is on plains. The parent material consists of residuum over interbedded sandstone and shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

The Sinnigam component makes up 25 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills. The parent material consists of residuum over fractured hard sandstone. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 27 - Crago-Musselshell complex, 0 to 4 percent slopes
The Crago component makes up 45 percent of the map unit. Slopes are 0 to 4 percent. This component is on fan remnants, terraces, plains. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC055MT Gravel (gr) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 55 percent.

The Musselshell component makes up 30 percent of the map unit. Slopes are 0 to 2 percent. This component is on terraces, plains. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC613MT Silty-Limy (sily) 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Map unit: 47 - Harlem-Havre complex, saline, 0 to 2 percent slopes
The Harlem component makes up 45 percent of the map unit. Slopes are 0 to 2 percent. This component is on plains, flood plains, terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC051MT Saline Lowland (sl) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

The Havre component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on terraces, flood plains, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC051MT Saline Lowland (sl) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 54 - Kobar-Zatoville silty clay loams, 1 to 6 percent slopes
The Kobar component makes up 60 percent of the map unit. Slopes are 1 to 6 percent. This component is on plains, fans, terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet

hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The Zatoville component makes up 25 percent of the map unit. Slopes are 1 to 6 percent. This component is on fans, plains. The parent material consists of alluvium derived from shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC615MT Clayey-Saline (cys) 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 64 - Neldore-Bascovy-Rock outcrop complex, 6 to 60 percent slopes
The Neldore component makes up 50 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock (paralithic), is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

The Bascovy component makes up 20 percent of the map unit. Slopes are 6 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock (paralithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

The Rock outcrop is a miscellaneous area.

Map unit: 67 - Doney-Wayden complex, 15 to 60 percent slopes
The Doney component makes up 40 percent of the map unit. Slopes are 15 to 60 percent. The parent material consists of semiconsilidated sedimentary rock loamy residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

The Wayden component makes up 25 percent of the map unit. Slopes are 15 to 50 percent. This component is on hills. The parent material consists of clayey residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 70 - Doney-Winifred-Wayden complex, 15 to 45 percent slopes
The Doney component makes up 35 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of semiconsilidated sedimentary rock loamy residuum. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R046XC508MT Silty (si) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

The Winifred component makes up 30 percent of the map unit. Slopes are 15 to 45 percent. This component is on plains, hills. The parent material consists of alluvium and/or residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The Wayden component makes up 20 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills. The parent material consists of clayey residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 80 - Eltsac-Norbert clays, 8 to 25 percent slopes
The Eltsac component makes up 50 percent of the map unit. Slopes are 8 to 25 percent. This component is on hills, plains. The parent material consists of clayey residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

The Norbert component makes up 45 percent of the map unit. Slopes are 8 to 25 percent. This component is on hills, plains. The parent material consists of clayey residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 82 - Ustic Torriorthents, moderately saline, 15 to 45 percent slopes
The Ustic Torriorthents component makes up 85 percent of the map unit. Slopes are 15 to 45 percent. Depth to a root restrictive layer is greater than 60 inches. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. This soil does not meet hydric criteria.

Map unit: 132 - Judith-Windham gravelly clay loams, 0 to 2 percent slopes
The Judith component makes up 50 percent of the map unit. Slopes are 0 to 2 percent. This component is on alluvial fans, terraces. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

The Windham component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on terraces, alluvial fans. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R044XC473MT Silty-Limy (sily) 15-19" P.z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Map unit: 133 - Judith-Windham gravelly clay loams, 2 to 8 percent slopes
The Judith component makes up 50 percent of the map unit. Slopes are 2 to 8 percent. This component is on alluvial fans, terraces. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

The Windham component makes up 40 percent of the map unit. Slopes are 2 to 8 percent. This component is on alluvial fans, terraces. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R044XC473MT Silty-Limy (sily) 15-19" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Map unit: 152 - Linwell silty clay loam, 2 to 8 percent slopes
The Linwell component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on alluvial fans. The parent material consists of clayey alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Farmland classification is Farmland of statewide importance.

Map unit: 170 - Mocmont-Oraid complex, 2 to 25 percent slopes
The Mocmont component makes up 50 percent of the map unit. Slopes are 2 to 25 percent. This component is on mountain slopes. The parent material consists of alluvium and/or colluvium and/or residuum weathered from igneous and sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a

depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

The Oraid component makes up 40 percent of the map unit. Slopes are 2 to 25 percent. This component is on hills, plains. The parent material consists of residuum over fractured hard sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 171 - Mocmont-Oraid complex, 25 to 60 percent slopes
The Mocmont component makes up 45 percent of the map unit. Slopes are 25 to 60 percent. This component is on mountain slopes. The parent material consists of alluvium and/or colluvium and/or residuum weathered from igneous and sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

The Oraid component makes up 40 percent of the map unit. Slopes are 25 to 60 percent. This component is on hills, plains. The parent material consists of residuum over fractured hard sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 242 - Timberg-Castner complex, 15 to 45 percent slopes
The Timberg component makes up 50 percent of the map unit. Slopes are 15 to 45 percent. This component is on plains. The parent material consists of clayey residuum over semiconsolidated sandstone and shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

The Castner component makes up 25 percent of the map unit. Slopes are 15 to 45 percent. This component is on plains. The parent material consists of residuum over hard sandstone. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC506MT Shallow (sw) 13-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map unit: 267 - Windham very gravelly loam, 2 to 8 percent slopes
The Windham component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on terraces, alluvial fans. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R044XC473MT Silty-Limy (sily) 15-19" P.z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Map unit: 273 - Winifred-Judith clay loams, 8 to 15 percent slopes
The Winifred component makes up 50 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills, plains. The parent material consists of alluvium and/or residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The Judith component makes up 25 percent of the map unit. Slopes are 8 to 15 percent. This component is on terraces, alluvial fans. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Map unit: 275 - Winifred-Windham-Eltsac complex, 15 to 45 percent slopes
The Winifred component makes up 40 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills, plains. The parent material consists of alluvium and/or residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The Eltsac component makes up 25 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills, plains. The parent material consists of clayey residuum over semiconsolidated shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R046XC503MT Clayey (cy) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

The Windham component makes up 25 percent of the map unit. Slopes are 15 to 45 percent. This component is on terraces. The parent material consists of alluvium derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R044XC473MT Silty-Limy (sily) 15-19" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

1. Map Unit Descriptions taken from USDA-NRCS Soil Data Mart Map Unit Description (Brief, Generated) Report (USDA-NRCS, 2010).

Appendix C – Determination Summary for the LFO Oil and Gas Leasing Project.

Species	No Action	Proposed Action
Northern leopard frog	NI	NI
Plains spadefoot	NI	NI
Greater short-horned lizard	NI	MIIH
Milk snake	NI	MIIH
Western hog-nosed snake	NI	MIIH
Baird's sparrow	NI	MIIH
Bald eagle	NI	NI
Bobolink	NI	MIIH
Brewer's sparrow	NI	MIIH
Chestnut-collared longspur	NI	MIIH
Dickcissel	NI	MIIH
Ferruginous hawk	NI	NI
Golden eagle	NI	NI
Greater sage-grouse	NI	MIIH
Loggerhead shrike	NI	MIIH
Long-billed curlew	NI	MIIH
Marbled godwit	NI	MIIH
McCown's longspur	NI	MIIH
Mountain plover	NI	NLJ/MIIH
Sage thrasher	NI	MIIH
Sprague's pipit	NI	MIIH
Swainson's hawk	NI	NI
Fringed myotis	NI	NI
Long-eared myotis	NI	NI
Long-legged myotis	NI	NI
Townsend's big-eared bat	NI	NI

Federally Listed Species

NE – No Effect
***LAA –** May Effect, Likely to Adversely Affect (formal USFWS consultation required)
NLAA – May Effect, Not Likely to Adversely Affect (informal USFWS consultation required)
BE – Beneficial Effect (informal USFWS consultation required)

Species Proposed For Listing

NE – No Effect
NLJ – Not likely to Jeopardize the continued existence of the species or result in adverse modification of proposed critical habitat
***LJ –** Likely to Jeopardize the continued existence of the species or result in or adverse modification of proposed critical habitat

Sensitive Species

NI – No Impact
MIIH – May Impact Individuals or Habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species
***WIFV –** Will Impact Individuals or habitat that is likely contribute to a trend toward federal listing or cause a loss of viability to the population or species
BI – Beneficial Impact

Appendix D – Maps (to follow)

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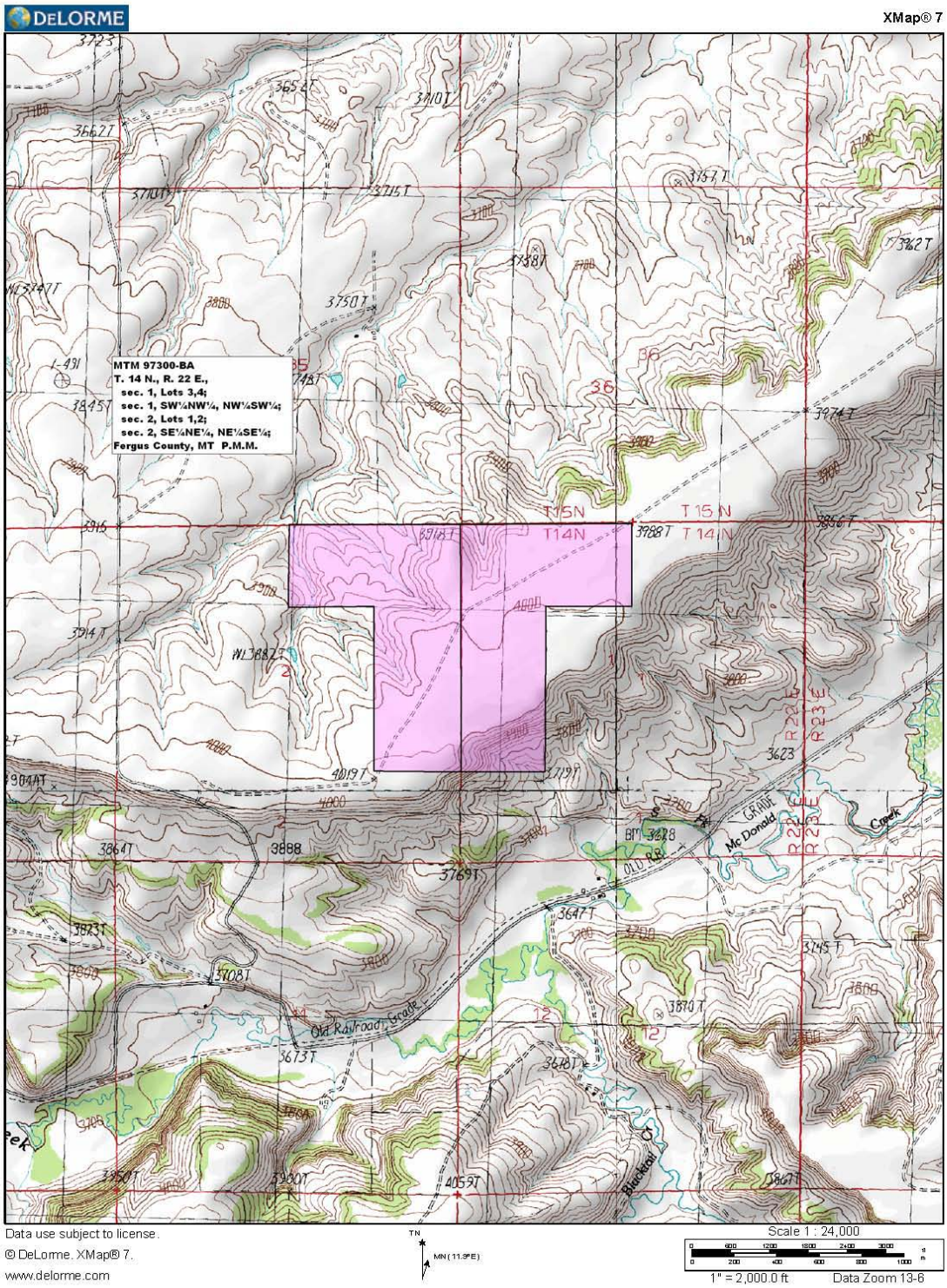

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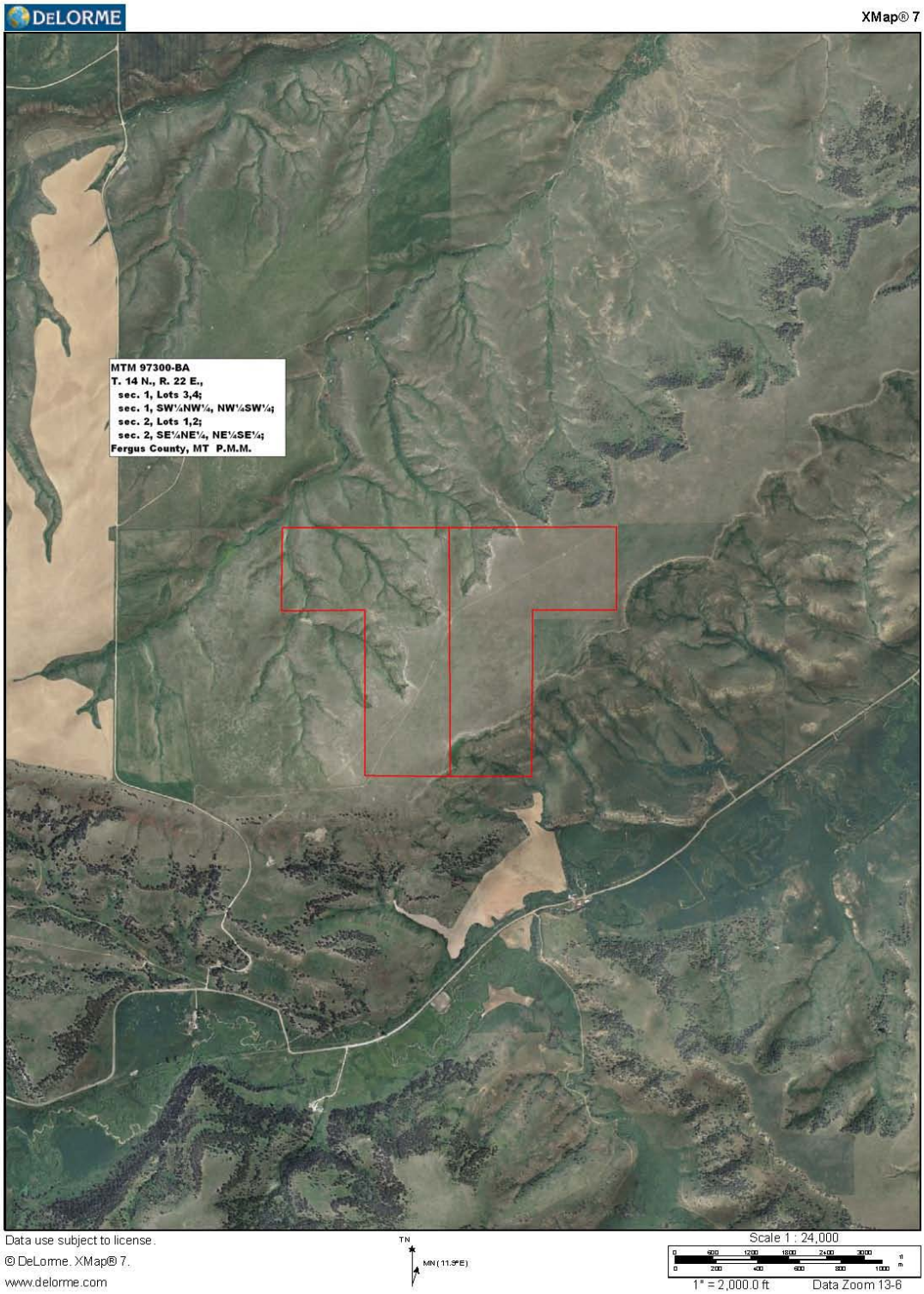

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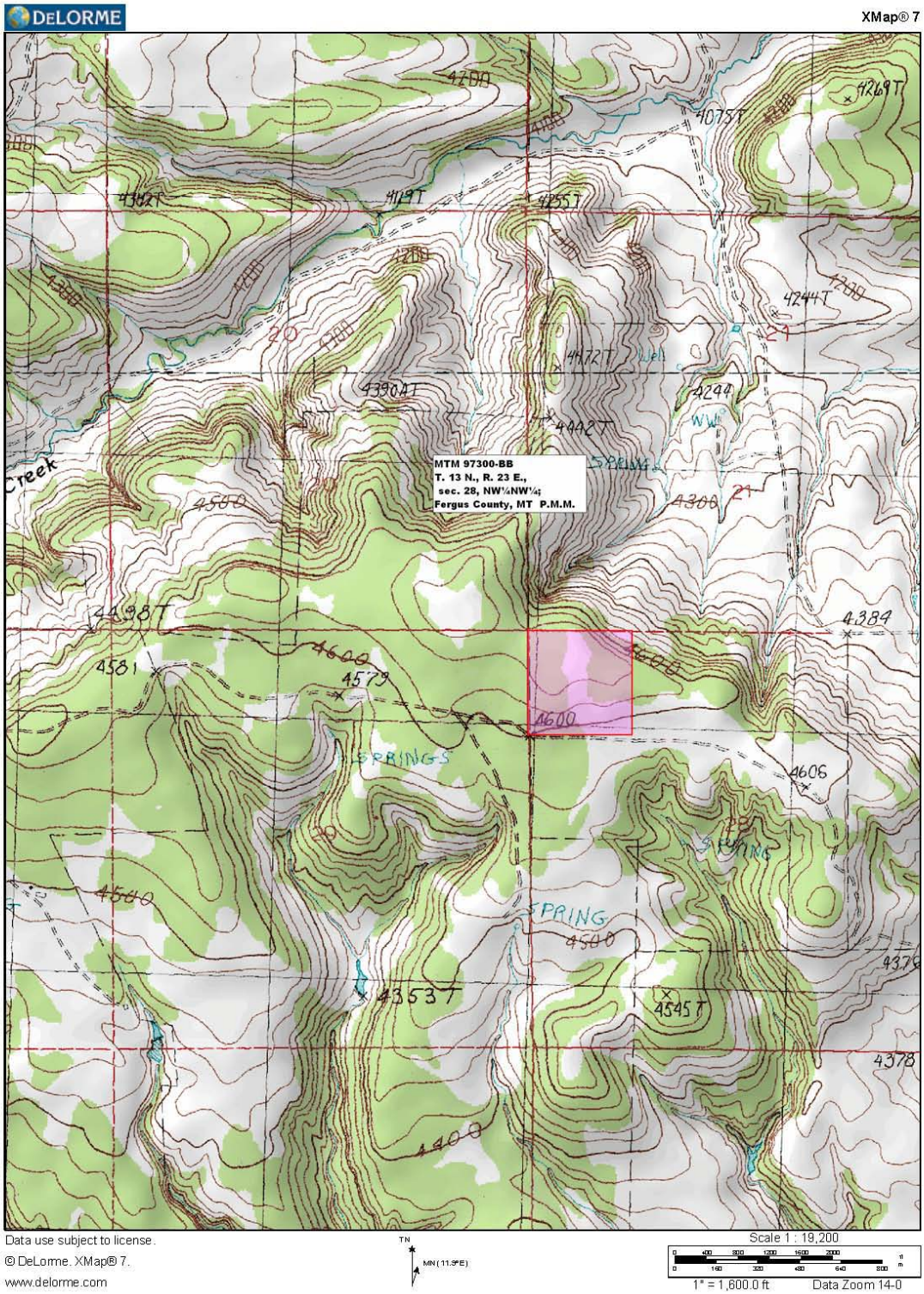

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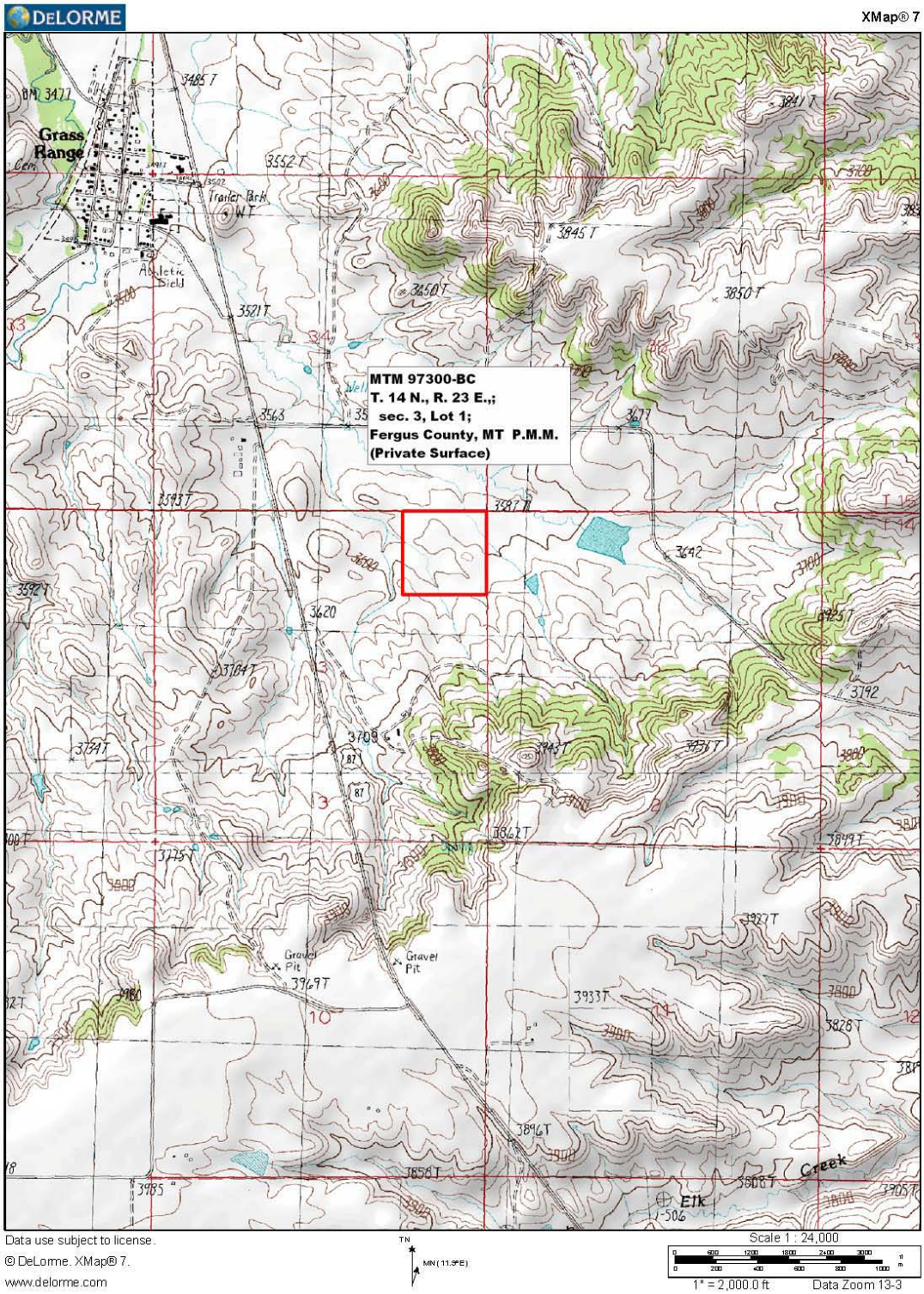

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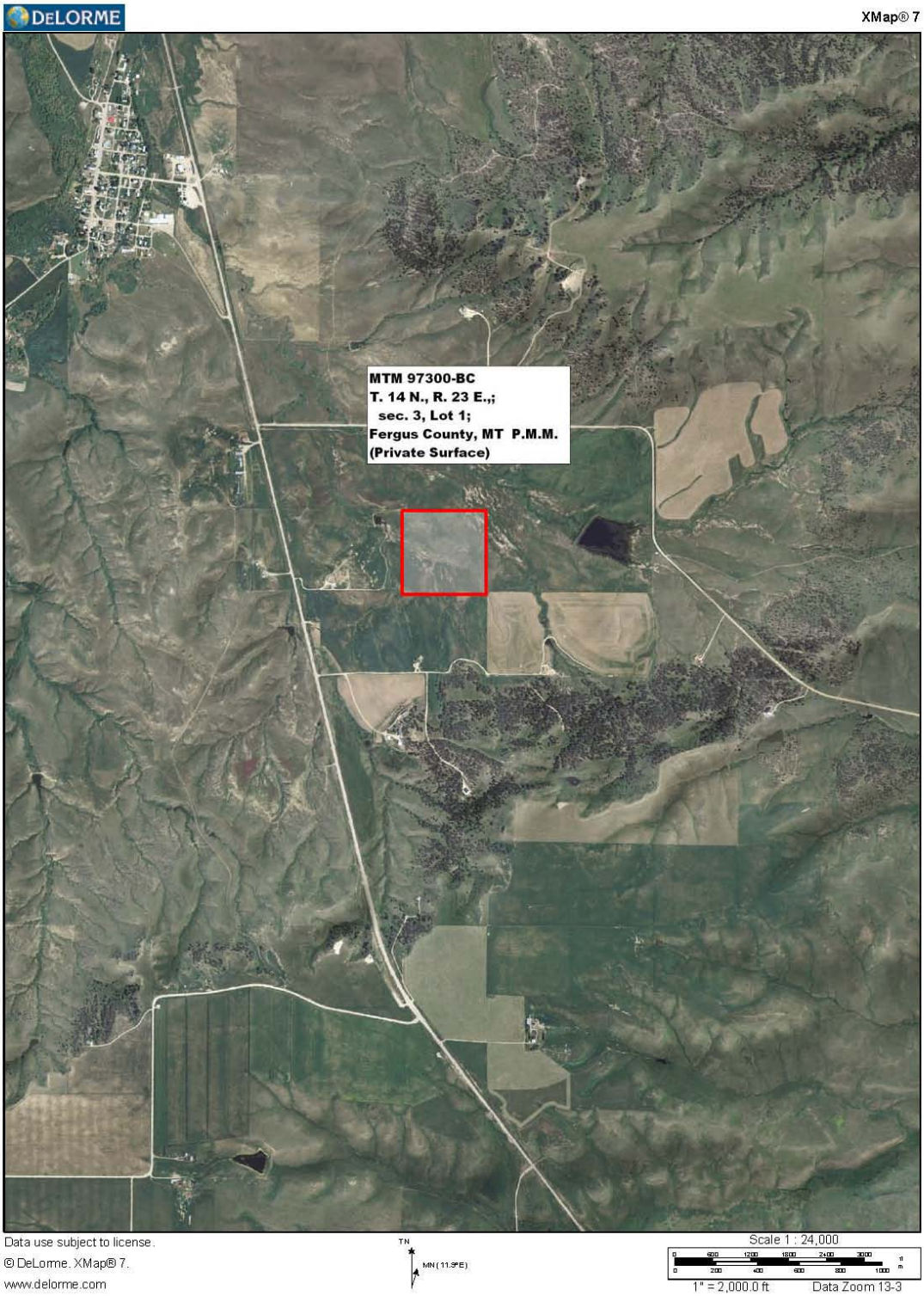

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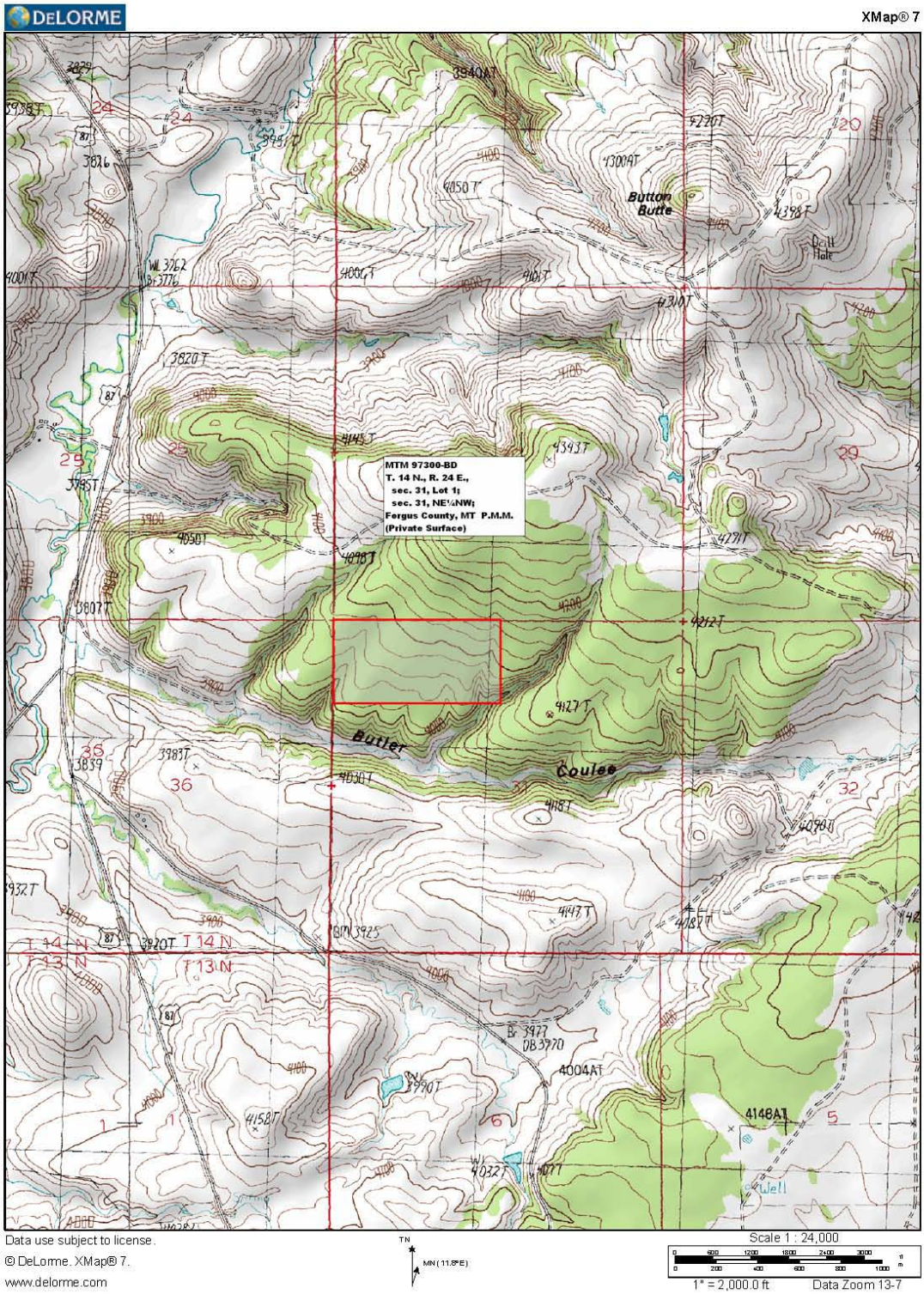

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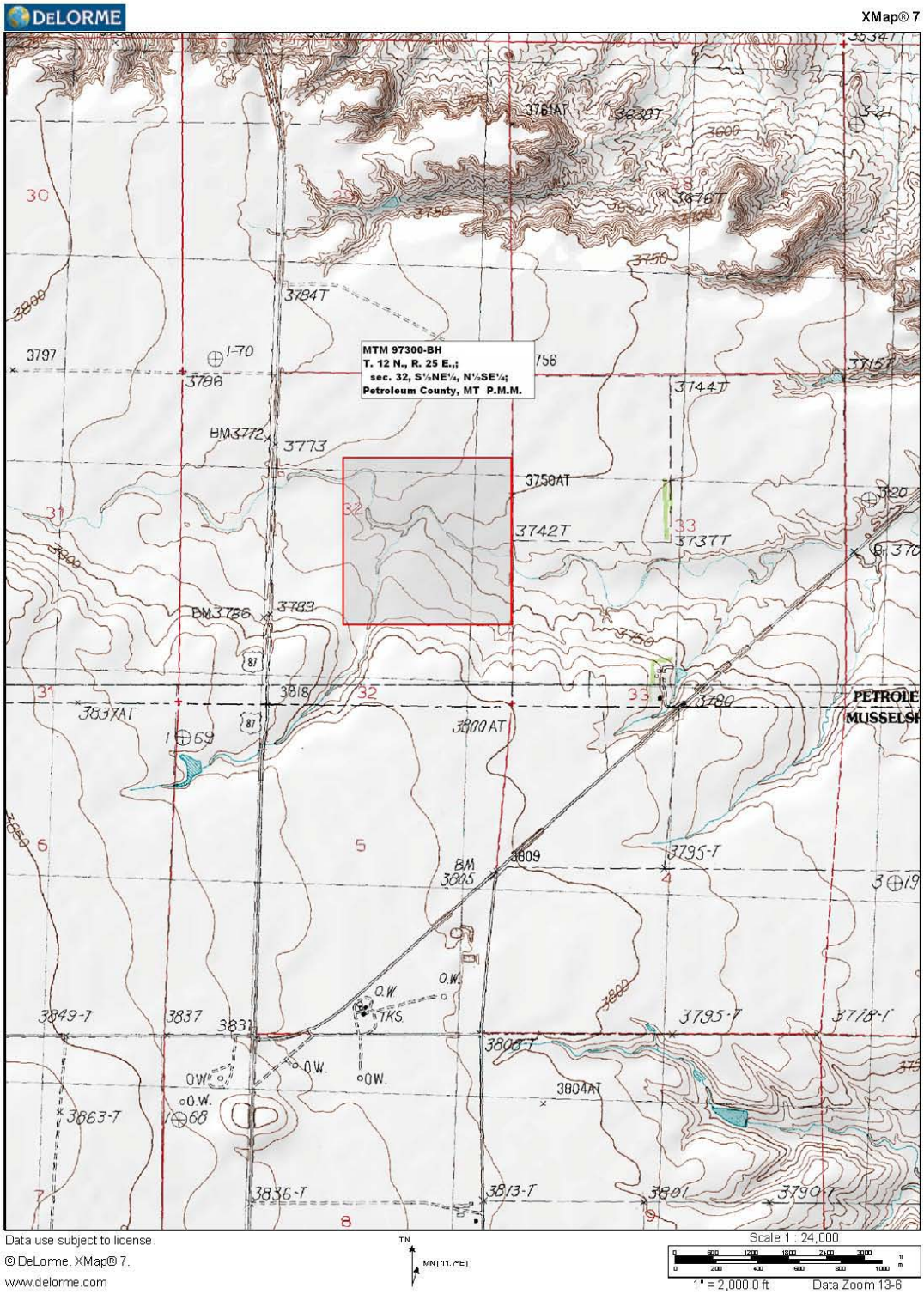

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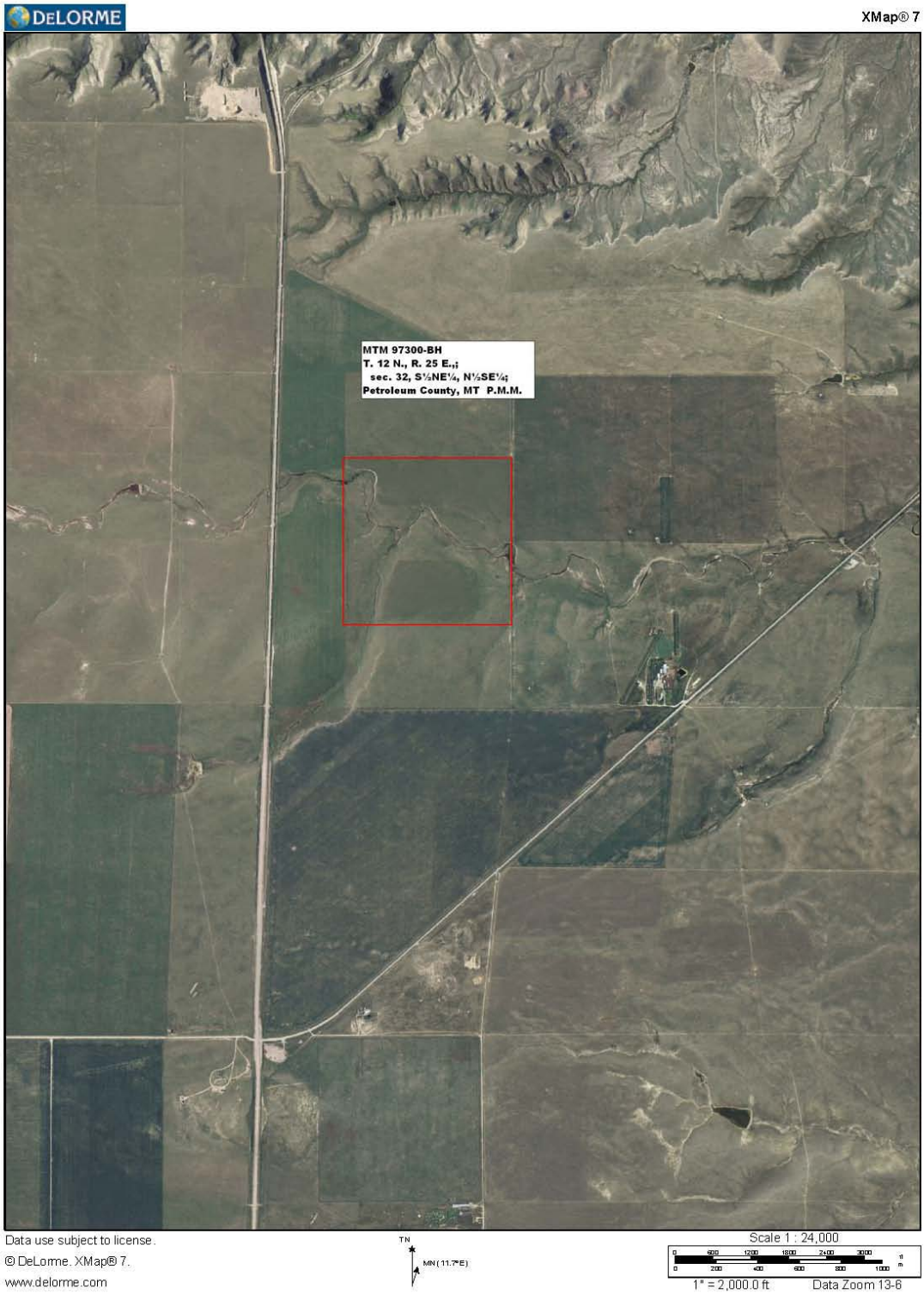

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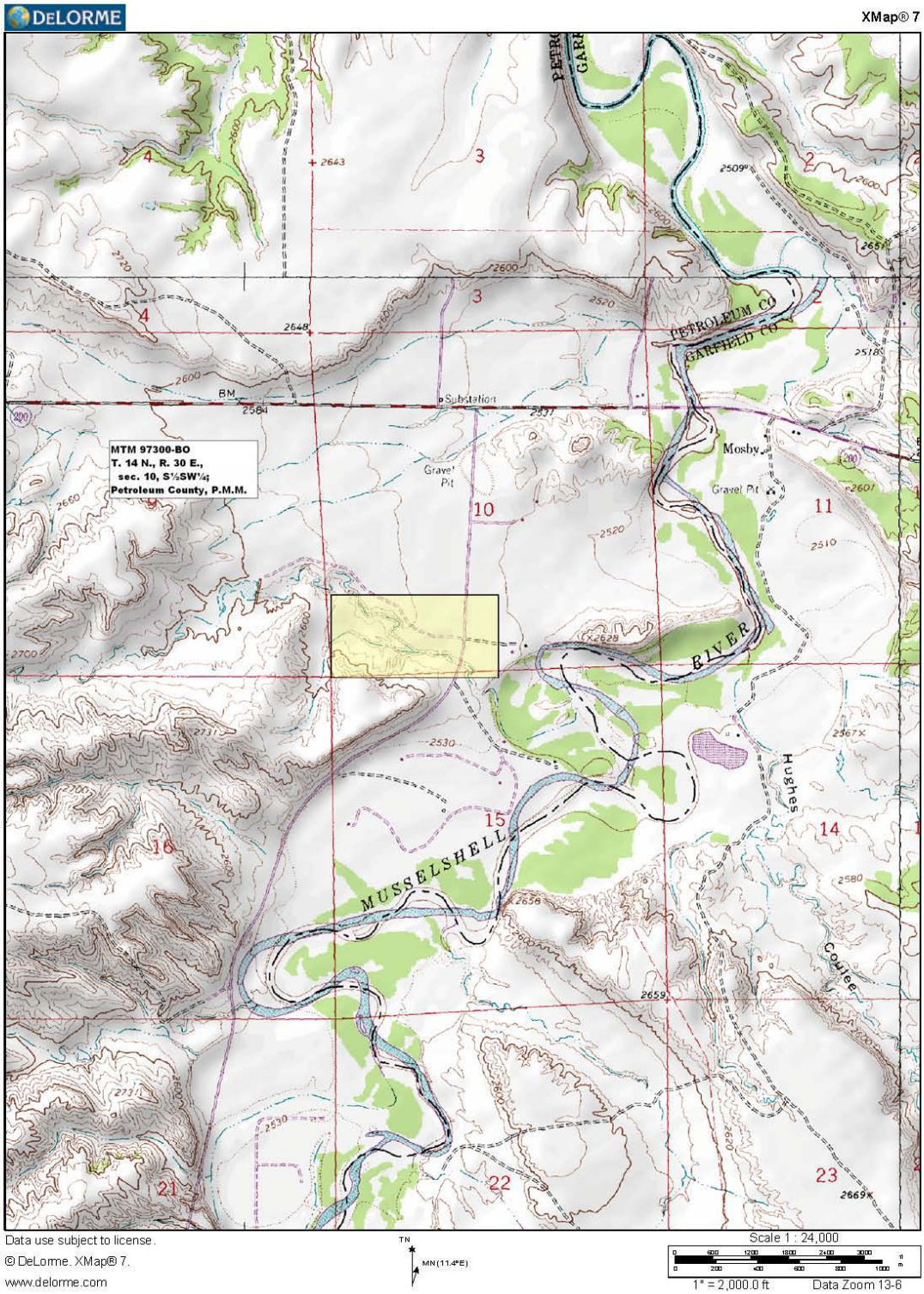

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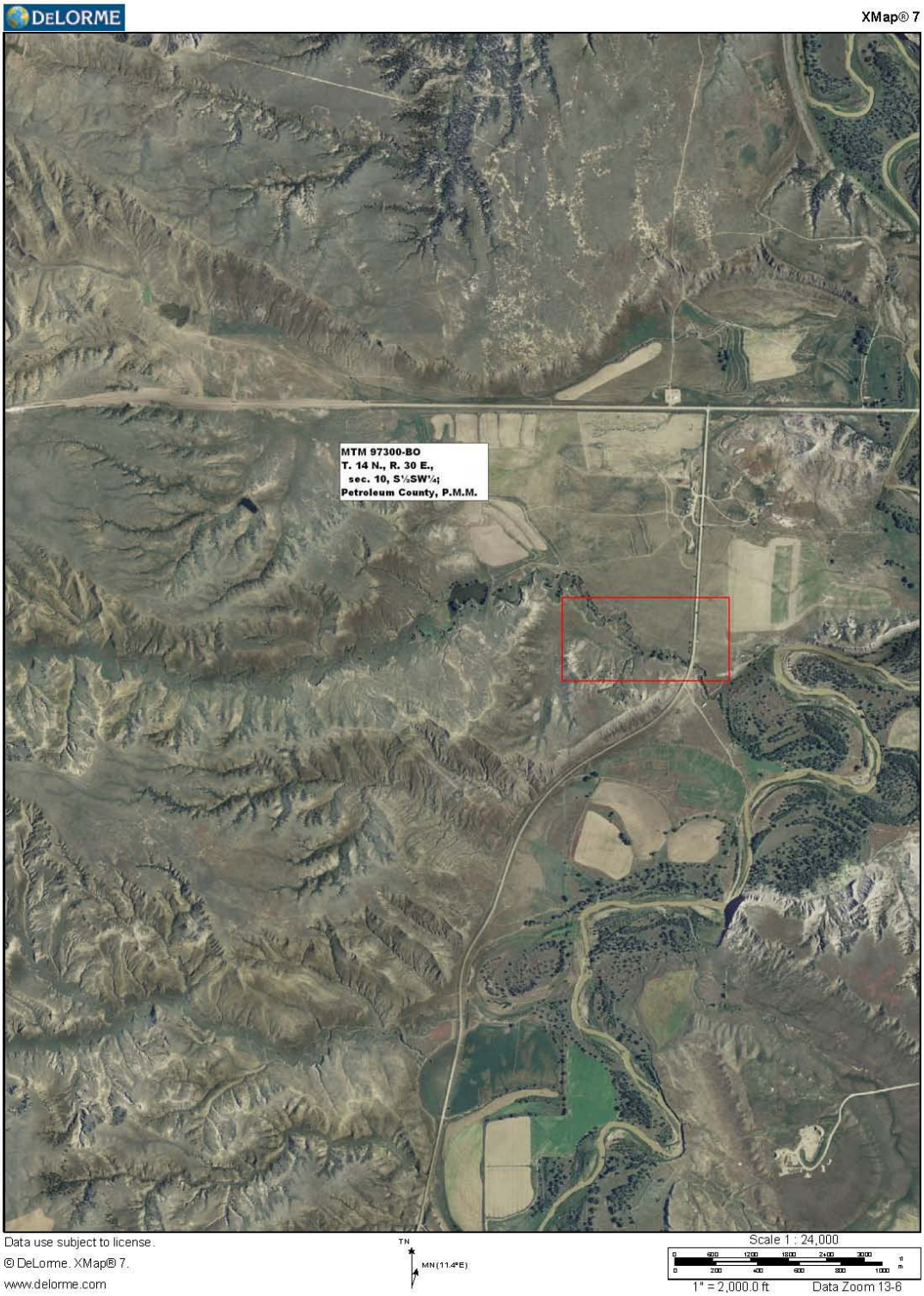

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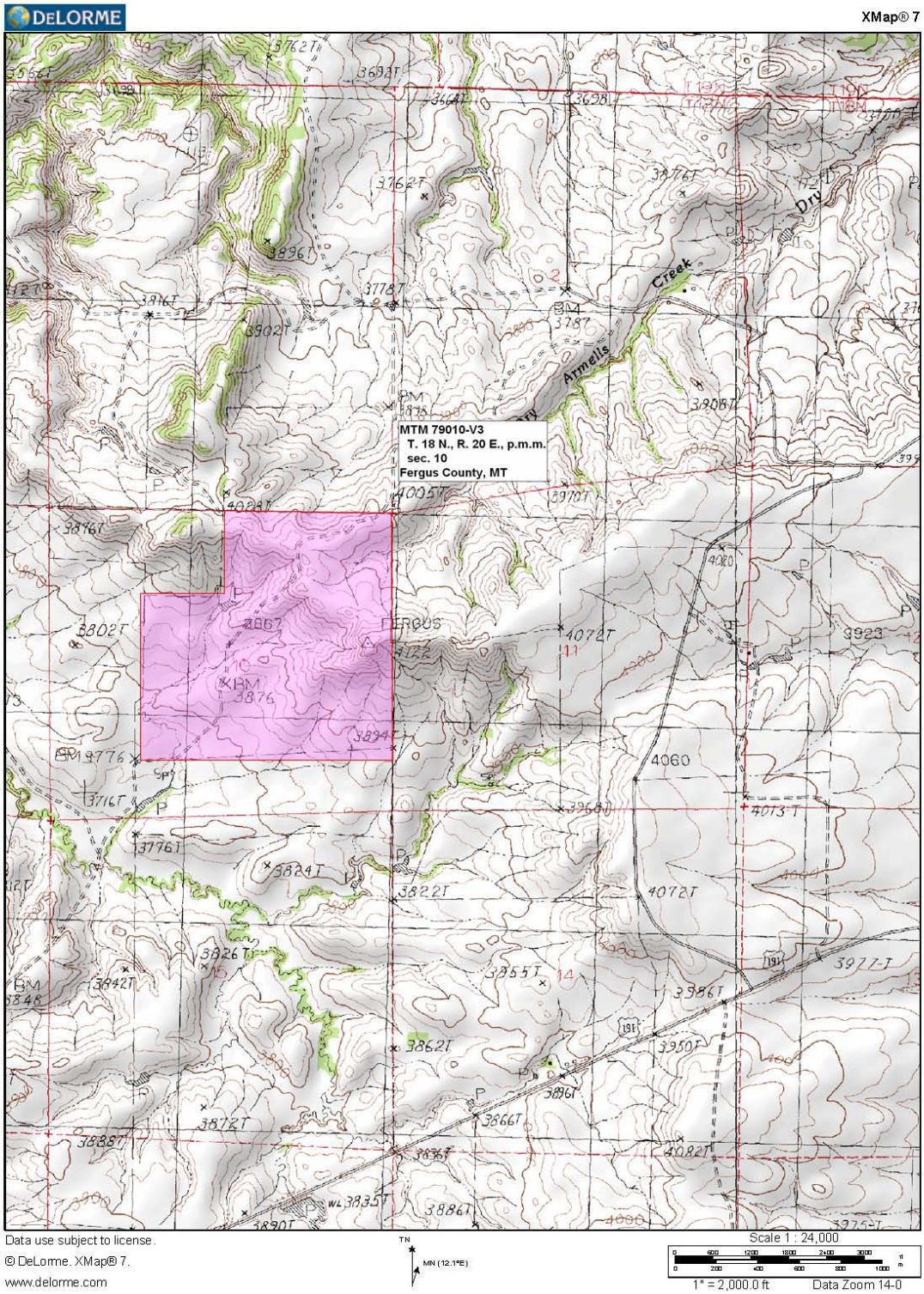
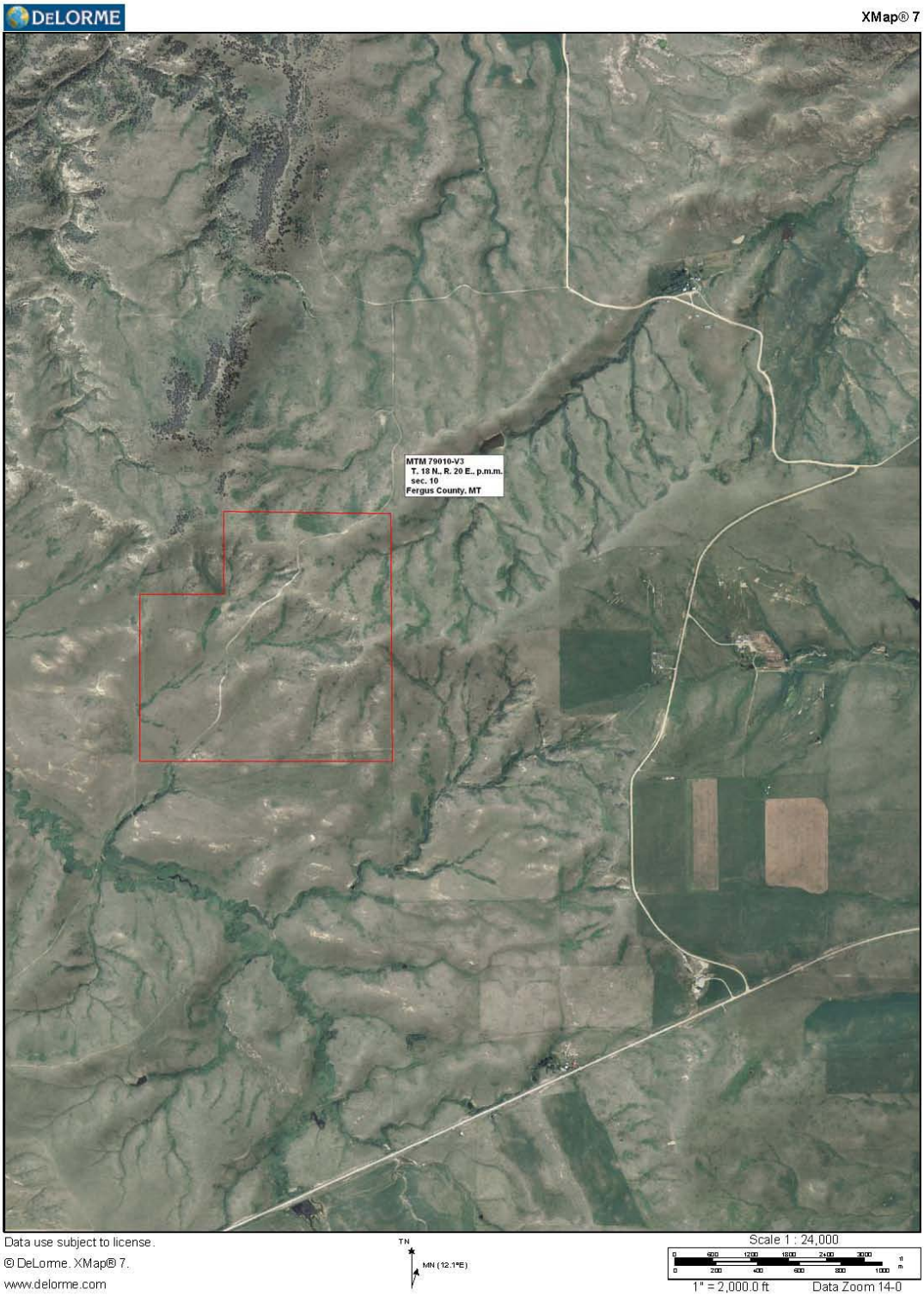
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