United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-MT-C030-2017-0133-EA

March 13, 2018

Project Title: Oil and Gas Lease Parcel, March 13, 2018 Sale

Location: North Dakota Field Office (see Appendix A for list of lease parcels by number and legal description and Appendix D for Parcel Map)

BLM

North Dakota Oil and Gas Lease Sale EA DOI-BLM-MT-C030-2017-0133-EA

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1.0 Purpose and Need

1.1 Introduction

This Environmental Assessment (EA) has been prepared to analyze and disclose the potential environmental consequences of leasing 1 nominated lease parcels encompassing a total of 120.00 surveyed Federal mineral acres located in the North Dakota Field Office (NDFO), to be included as part of a competitive oil and gas lease sale scheduled to occur on March 13, 2018. The EA is a site specific analysis of potential impacts that could result with the implementation of a Proposed Action or alternatives to the Proposed Action. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impacts" (FONSI). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the Proposed Action or another alternative. A DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental impacts.

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

Members of the public 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. The 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 are nominated by private individuals, companies, or the BLM, and therefore represent areas of high interest. The analysis area includes the 1 nominated parcel in McKenzie County (Appendix D).

1.2 Purpose and Need for the Proposed Action

The purpose of this Proposed Action is for BLM to process the Expressions of Interest (EOI) to explore and develop the oil and gas reserves within Federal mineral estate on the 1 lease parcel proposed for the March 13, 2018 Competitive Oil and Gas Lease Sale. The purpose of offering a parcel for competitive oil and gas leasing is to provide a response to EOIs in opportunities for private individuals or companies to explore and develop Federal oil and gas resources after receipt of necessary approvals and to sell the oil and gas in public markets.

The need for action is reflected in BLM's role in permitting of exploration and development of Federal mineral estate by private industry. The requirement to act in consideration of an Expression of Interest (EOI) is an integral part of the BLM's oil and gas program under authority of the Mineral Leasing Act of 1920 as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976, the National Materials and Minerals Policy, Research and Development Act of 1980, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. Thus, the BLM's need is to respond to the EOI and determine whether the parcel should be leased and under what stipulations, and whether the parcel or parts of the parcel should be deferred.

The decision to be made is whether to sell and oil and gas lease on the lease parcel identified, and, if so, identify stipulations that would be included with the specific lease parcel at the time of lease sale.

1.3 Conformance with Land Use Plan(s)

This EA is tiered to and conforms with the information and analysis contained in the North Dakota RMP (April 1988) as amended, and its associated Environmental Impact Statement (EIS), the governing land use plan for the NDFO. An electronic copy of the North Dakota RMP and its associated EIS can be located via the internet on the BLM home page, www.blm.gov/mt. On the home page, locate the heading titled "Montana/Dakotas," then select "What We Do", then click on the "Planning" link.

A more complete description of activities and impacts related to oil and gas leasing, development, production, etc. can be found at pages 9-10 in Chapter 2 of the RMP/EIS.

Analysis of the 1 parcel is documented in this EA, and was conducted by NDFO resource specialists who relied on professional knowledge of the areas involved, review of current databases, file information, and site visits to ensure that appropriate stipulations were recommended for a specific parcel.

Offering the parcel for sale and issuing the lease would not be in conflict with any local, county, or state laws or plans.

1.4 Public Scoping and Identification of Issues

Public scoping for this project was conducted through a 15-day scoping period advertised on the BLM Montana State Office website and posted on the NDFO website National Environmental Policy Act (NEPA) notification log. Scoping was initiated on August 15, 2017. Comments were received through August 29, 2017.

The BLM coordinates with North Dakota Game and Fish Department (NDGF), and the United States Fish and Wildlife Service (USFWS) to manage wildlife habitat because BLM management decisions can affect wildlife populations which depend on the habitat. The BLM manages habitat on BLM lands, while NDGF is responsible for managing wildlife species populations. The USFWS 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 is to be implemented early in the planning process.

Coordination with NDGF and USFWS was conducted for the 1 lease parcel being reviewed. BLM has coordinated with NDGF and USFWS in the completion of this EA in order to prepare analysis, identify protective measures, and apply stipulations associated with these parcels being analyzed.

The BLM consults with the State Historic Preservation Office (SHPO) and Native Americans under Section 106 of the National Historic Preservation Act (NHPA). BLM sent letters to the SHPO, Tribal Presidents and the Tribal Historical Preservation Officers (THPOs) or other cultural contacts for the following: Crow Creek Sioux Tribe; the Crow Tribe; Flandreau Santee Sioux; Fort Belknap Indian Community; Fort Peck Assiniboine and Sioux Tribes; Lower Brule Sioux; Lower Sioux Indian Community; Northern Cheyenne; Oglala Sioux Tribe; Rosebud Sioux; Santee Sioux Tribe; Sisseton-Wahpeton Oyate; Spirit Lake Tribe; Standing Rock Sioux Tribe; Three Affiliated Tribes – Mandan, Hidatsa, and Arikara Nation; Turtle Mountain Band of Chippewa; and the Yankton Sioux Tribe at the beginning of the 15 day scoping period informing them of the potential for the 1 parcel to be leased and inviting them to submit issues and concerns BLM should consider in the environmental analysis. In addition to scoping letters, THPOs also received file search results from the preliminary review of parcels conducted by BLM. The BLM sent a second letter with a copy of the EA to the tribes informing them about the 30 day public comment period for the EA and solicit any information BLM should consider before making a decision whether to offer any or all of the nominated parcels for sale.

Site specific resource concerns were identified by the BLM through the preliminary review process conducted prior to a 15-day public scoping period. Lease stipulations (as required by Title 43 Code of Federal Regulations 3131.3) were added as necessary to each parcel as identified by the BLM to address site specific resource concerns.

Refer to Section 5.2 of this EA for a more complete summary of the scoping comments received.

On September 30, 2017, the EA, along with an unsigned Finding of No Significant Impact (FONSI), were made available for a 30-day public comment period. Notification letters were distributed to external entities, local agencies, and tribes to explain that an EA and the

unsigned FONSI were available for review and comment. Tribes also received a copy of the EA and unsigned FONSI for their review.

1.5 Identified Relevant Issues and Resources

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

The issues carried forward through analysis in this EA include:

- air resources;
- climate change and greenhouse gas emissions;
- soil resources
- economics;
- social conditions and environmental justice
- cultural resources;
- lands and realty conflicts
- fluid minerals
- Native American Religious Concerns
- paleontological resources;
- water resources;
- recreation and visual resources;
- vegetation;
- conservation of riparian and aquatic wildlife and water resources
- special status species;

1.6 Resources Considered but Eliminated from Further Analysis

The BLM considered other issues, listed below, but decided not to analyze those in further detail. The aspects of the existing environment that the BLM determined to not be present or not potentially impacted by this project include:

- coal;
- locatable minerals;
- salable minerals;
- forest and woodland resources
- lands with wilderness characteristics;
- livestock grazing
- cave and karst resources;
- wild and scenic rivers; and
- wilderness study areas.

The EA contains no further discussion of these issues.

2.0 Description of Alternatives, Including Proposed Action

2.1 Alternative A - No Action

The No Action Alternative provides a baseline for comparison of the alternatives. This alternative describes the existing conditions and continuing trends. 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 not be offered for sale.

The No Action Alternative would exclude 1 lease parcel, covering 120 surveyed Federal mineral acres (0 surveyed BLM administered surface and 120 State surface acres), from the competitive oil and gas lease sale (Appendix D). 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 Alternative would be to offer 1 lease parcel of Federal minerals for oil and gas leasing, covering 120 surveyed Federal mineral acres (0 surveyed BLM administered surface and 120 surveyed State surface), in conformance with the existing land use planning decisions. Parcel number, size, and detailed locations and associated stipulations are listed in Appendix A. Maps (Appendix D) indicate the detailed location of each parcel.

2.3 Additional Considerations for Alternatives

For split-estate lease parcels, the BLM provided courtesy notification to private landowners that the Federal oil and gas estate under their surface would be included in this lease sale. In the event of activity on such split estate lease 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.

The terms and conditions of the standard federal lease and federal regulations would apply to the parcel offered for sale in the Proposed Action. Stipulations shown in Appendix A would be included with the identified parcel offered for sale. Standard operating procedures for oil and gas development include measures to protect the environment and resources such as groundwater, air, wildlife, cultural resource concerns, and others as mentioned in the 1988 RMP on pages 7 through 22. Lease stipulations would be attached to the parcels to address site-specific concerns or new information not previously identified in the land use planning process. Once sold, the lease purchaser would have the right to use as much of the leased lands as is reasonably necessary to explore and drill for all of the oil and gas within the lease boundaries, subject to the stipulations attached to the lease (43 CFR 3101.1-4). Conditions of Approval (COAs) would be attached to permits issued to explore and develop the parcels to address site-specific concerns or new information. Standard operating procedures, best management practices (BMPs), COAs, and lease stipulations can change over time to meet RMP objectives, resource needs or land use compatibility.

A Federal oil and gas lease would be issued for a 10-year period and would remain valid for as long thereafter as oil or gas is produced in paying quantities, required payments are made and lease operations are conducted in compliance with regulations and approved permits. If a lessee fails to produce oil and gas by the end of the initial 10-year period, does not make annual rental payments, or does not comply with the terms and conditions of the lease, the BLM would

terminate the lease. The lessee can relinquish the lease. The oil and gas resources could be offered for sale at a future lease sale. Drilling of wells on a lease would not be permitted until the lessee or operator secures approval of a drilling permit and a surface use plan as specified in 43 CFR 3162.

2.4 Alternatives Considered but Eliminated

No other alternative considerations were suggested by the ID Team or others during public scoping.

3.0 Affected Environment

3.1 Introduction

This chapter describes the existing conditions and issue-related elements of the human environment (i.e., the physical, biological, social, and economic values and resources) within the analysis area, which includes the 1 nominated parcel in McKenzie County (Map 1), that could be affected by implementation of the alternatives described in Chapter 2.

Unless otherwise stated, resource analysis in this chapter, and Chapter 4, will be described in approximate acres due to the scaling and precision parameters associated with the Geographic Information System (GIS), in addition to being referenced to a different land survey.

The lease parcel is located in western North Dakota, which is located in the Northern Mixed Grass Prairie, known for its high diversity of vegetation types and topography. Vegetation is comprised of both tall and short grass as well as both warm and cool season grasses. A variety of grass-like plants, forbs, shrubs, and trees also add to the vegetation diversity of this rangeland type. The public lands are rich in natural resources, such as wildlife and livestock forage, minerals, cultural resources, paleontological resources, recreation opportunities, and watershed values.

Western North Dakota is comprised of gently rolling hills, buttes, badlands, wetlands, riparian areas, and river breaks. Lands in North Dakota are primarily privately owned and are mainly utilized for agricultural uses. Lands that are not restricted by topography or soil constraints generally have been cultivated for crop production. Lands that have limitations from crop production are generally rangelands or pasture lands. Rangelands and pasture lands can be native, but can also be improved or rehabilitated croplands. Rehabilitated croplands are usually evident due to their near monoculture of introduced cool season grasses such as crested wheatgrass or smooth brome.

Temperatures throughout North Dakota fluctuate widely on an annual, seasonal, and daily basis. Annual mean temperatures range from 37°F in the northeast to about 43°F in the southwest. Temperature extremes can range from below -40°F to over 110°F. Average July temperature is about 69°F, and average January temperature is 10°F. Average annual precipitation varies from 13 inches in the northwest to about 20 inches in the east with up to 70 percent of the precipitation falling as rain between May and July. Precipitation is mainly derived from air masses originating from the Gulf of Mexico. Winters are long and cold with snow accumulations from November or December through March. Windy conditions are common due to the greatly

fluctuating temperatures and lack of physical barriers. Prevailing winds are from the north-northwest at an average speed of 12 miles per hour (mph). Winds of 25-30 mph will often last for six hours and can last as long as 15 hours. Winds in excess of 30 mph have lasted more than six hours. Severe weather may occur almost any time during the year. Blizzards are a common occurrence during winter and early spring. High winds and hail frequently occur in connection with summer thunderstorms (NDFO RMP, 1988).

3.2 Air Resources

Air resources include air quality, air quality related values (AQRVs), and climate. As part of the planning and decision making process, BLM considers and analyzes the potential effects of BLM and BLM-authorized activities on air resources. Air resource impacts are affected by pollutant emissions and emission characteristics, atmospheric chemistry, dispersion meteorology, and terrain. AQRVs include effects on soil and water, such as sulfur and nitrogen deposition and lake acidification, and aesthetic effects, such as visibility.

3.2.1 Air Quality

Ambient air quality in a given location may be characterized by comparing the concentration of various pollutants in the ambient air with the standards set by federal and state agencies. Under the authority of the Clean Air Act (CAA), the EPA has established nationwide air quality standards, known as the National Ambient Air Quality Standards (NAAQS) for six air pollutants. The standards set maximum allowable atmospheric concentration of these six criteria pollutants. The primary standards were established to protect the public health within an adequate margin of safety; the secondary standards were established to protect the public welfare from any known or anticipated adverse effects of a pollutant. Pollutants for which standards have been set include carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 10 or 2.5 microns in aerodynamic diameter (PM10 and PM2.5), ozone (O3), sulfur dioxide (SO2), and lead.

Two additional pollutants of concern, nitrogen oxides (NOx) and volatile organic compounds (VOCs) are also regulated because they contribute to the formation of ozone in the atmosphere; however, no NAAQS have been established for these pollutants. Additionally, greenhouse gases (GHGs) became regulated pollutants on January 2, 2011 because of their contribution to global climate change effects. Many air quality permitting and regulation activities are delegated to the North Dakota Department of Health (NDDOH), which has also set state ambient air quality standards. NDDOH has also established permitting and registration requirements as well as emission standards for equipment involved in oil and gas development.

The EPA air quality index (AQI) is an index used for reporting daily air quality to the public (https://www.airnow.gov/). The AQI index is one way to generally evaluate how clean or polluted an area's air is and whether associated health effects might be a concern. The EPA calculates a daily AQI based on local air monitoring data. Air monitoring data and daily AQIs are available for several counties surrounding the proposed area for leasing. The following terms help interpret the AQI information:

- Good – The AQI value is between 0 and 50. Air quality is considered satisfactory and air pollution poses little or no risk.

- Moderate – The AQI is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- Unhealthy for Sensitive Groups – When AQI values are between 101 and 150, members of "sensitive groups" may experience health effects. These groups are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- Unhealthy – The AQI is between 151 and 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- Very Unhealthy – The AQI is between 201 and 300. This index level would trigger a health alert signifying that everyone may experience more serious health effects.
- Hazardous – The AQI is above 300. This level would trigger a health warning of emergency conditions. The entire population is more likely to be affected.

AQI data show air quality is good near and within the analysis area and that there is little risk to the general public from poor air quality (Table 3.2.1). Based on available data for the most recent 3-year period (2014-2016) for Billings, Dunn, McKenzie, and Williams, at least 86% percent of the days were rated "good" over the three-year period.

Table 3.2.1 Air Quality Index Data 2014-2016

County	Days in Period	Days Rated Good	% Days Rated Good	Days Rated Moderate	Days Rated not healthy[1]
Billings	1096	1036	95%	56	4
Dunn	1093	1015	93%	66	12
McKenzie	1096	1031	94%	57	8
Williams	1096	948	86%	122	26

[1] includes days rated unhealthy for sensitive groups, unhealthy, and very unhealthy
Source: EPA Air Data https://www.epa.gov/outdoor-air-quality-data (EPA 2016)

The area managed by the North Dakota Field Office where the parcels for this lease sale are proposed, is in compliance with all NAAQS. Maximum concentrations of air pollutants measured within or near the analysis area are summarized in Table 3.2.2. Data is shown as a percentage of the NAAQS and is based on monitoring data available for 2014 through 2016. Data are not provided for CO and lead, which are typically not pollutants of concern associated with oil and gas leasing. Oil and gas development can result in emissions that affect ambient concentrations of particulate matter, ozone, and nitrogen oxides from construction and production activities and in some fields, concentrations of sulfur dioxide can be affected. Hazardous air pollutants (HAPs) may also be emitted from oil and gas operations, including well drilling, well completion, and venting. However, no ambient standards have been established for HAPs associated with oil and gas development in this area and ambient monitoring data is not available.

Ozone concentrations above the NAAQS have been measured in Utah and Wyoming in areas with considerable oil and gas activity, however, only moderate ozone concentrations have been measured in North Dakota's oil and gas development areas. Based on 2014-2016 data from monitors located within or near the analysis area, ozone concentrations are approximately 80 percent of the ozone NAAQS. Measured concentrations of NO_2, PM_{10}, $PM_{2.5}$, and SO_2 are well below the NAAQS in the analysis area.

Table 3.2.2. Air Monitoring Values within the Analysis Area 2014 -2016

Pollutant	National Ambient Air Quality Standards	North Dakota Ambient Air Quality Standards	units	Averaging Time / Form	Station	Monitored Concentration	% of NAAQS/ MAAQS
O_3	0.07	0.075	ppm	8-hour 3 yr. ave. of 4th high daily max.	TRNP-N	0.06	82%
					TRNP-S	0.06	83%
					Sidney MT	0.05	76%
NO_2	100	100	ppb	1-hour 3 yr. ave. of 98th %tile of daily max	TRNP-N	11.7	12%
					TRNP-S	--	--
					Sidney MT	11.3	11%
	53	53	ppb	Annual annual mean	TRNP-N	3.6	7%
					TRNP-S	--	--
					Sidney MT	3.1	6%
PM_{10}	150	150	ug/m^3	24 hour max. over 3 years	TRNP-N	57	38%
					TRNP-S	--	--
					Sidney MT	138	92%
$PM_{2.5}$	35	35	ug/m^3	24 hour 3 yr. ave. of 98th percentile	TRNP-N	17.2	49%
					TRNP-S	15.4	44%
					Sidney MT	24.5	70%
	12	12	ug/m^3	Annual 3 yr. ave. of annual mean	TRNP-N	2.81	23%
					TRNP-S	4.34	36%
					Sidney MT	7.00	58%
SO_2	75	50	ppb	1-hour 3 yr. ave. of 99th percentile daily max.	TRNP-N	6.5	9%
					TRNP-S	4.6	6%
					Sidney MT	4.3	6%

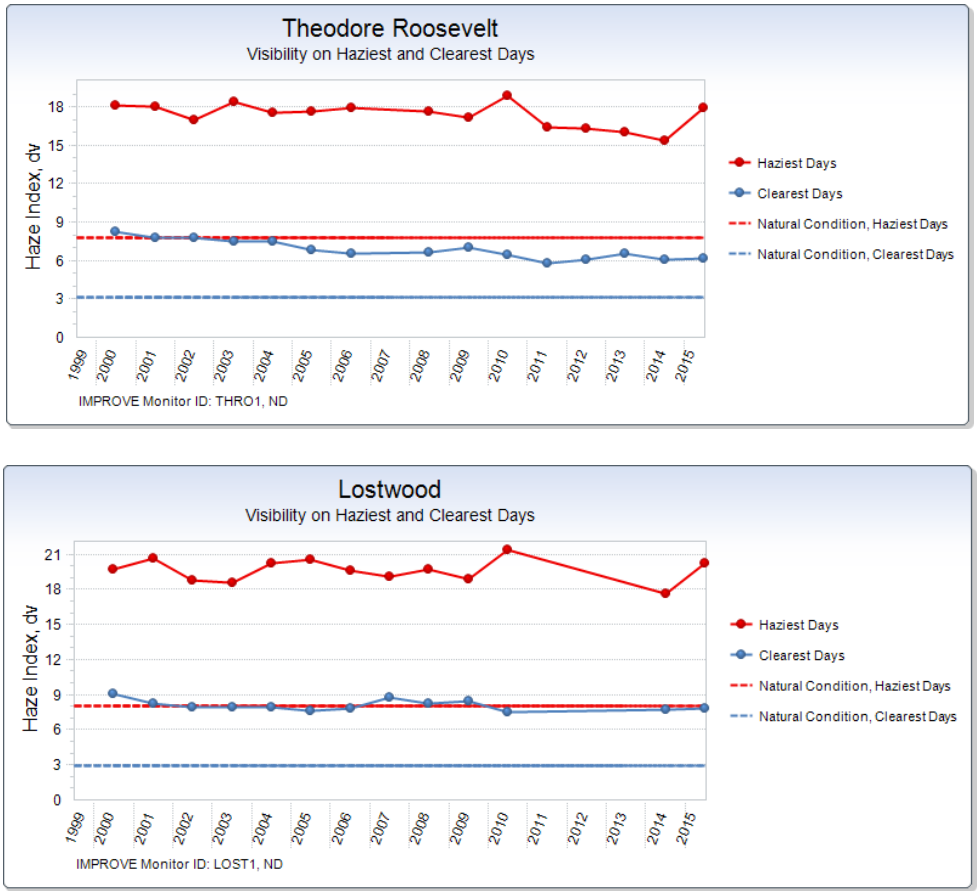
[a] Representative concentrations are based on data from the Theodore Roosevelt National Park – North Unit monitoring station, Theodore Roosevelt National Park – Painted Canyon monitoring station, and the Sidney station in Richland County, Montana.
Source: EPA Air Data https://www.epa.gov/outdoor-air-quality-data (EPA, 2016a)

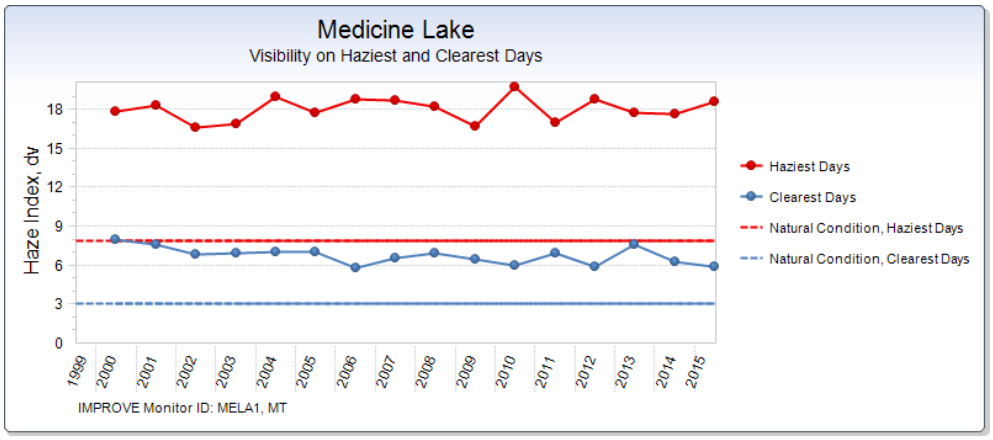
Air resources also include visibility, which can be assessed in terms of the distance that a person can distinguish a large dark object on the horizon and is measured as the standard visual range in miles. Because visibility at any one location is highly variable throughout the year, it is characterized by three groupings: the clearest 20% days, average 20% days, and haziest 20% days. Visibility degradation is primarily due to anthropogenic sulfate, nitrate, and particulate emissions and due to wildfires. Air pollutants affecting visibility can be transported hundreds of miles.

Figure 3.2.2 illustrates visibility trends based on air monitoring data from the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. Monitoring data from three

Class I areas near the proposed parcel is presented for Theodore Roosevelt National Park, Lostwood Wilderness Area, and Medicine Lake Wilderness Area (IMPROVE, 2017). Visibility data is shown in terms of visibility on the haziest days annually and on the clearest days annually as measured by the haze index. The haze index has a unit of measure called deciview (dv) and a one unit change in deciview may be noticeable under certain conditions. Higher deciview values correspond to hazier conditions. The data show a slight improvement in visibility at Theodore Roosevelt National Park since 2000 however, recent decreases in visibility are evident. There is no improvement in visibility at Lostwood and only a slight improvement in visibility on the clearest days at Medicine Lake.

Figure 3.2.2 Visibility Trends in Nearby Class I Areas



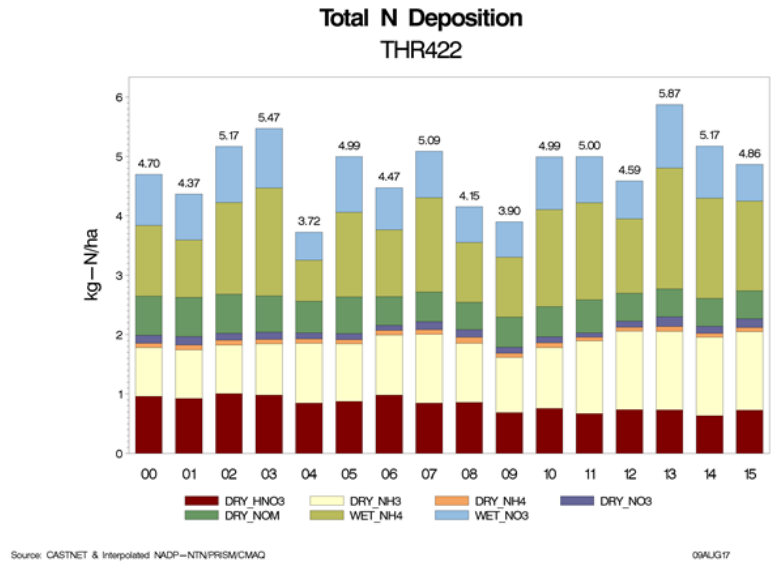


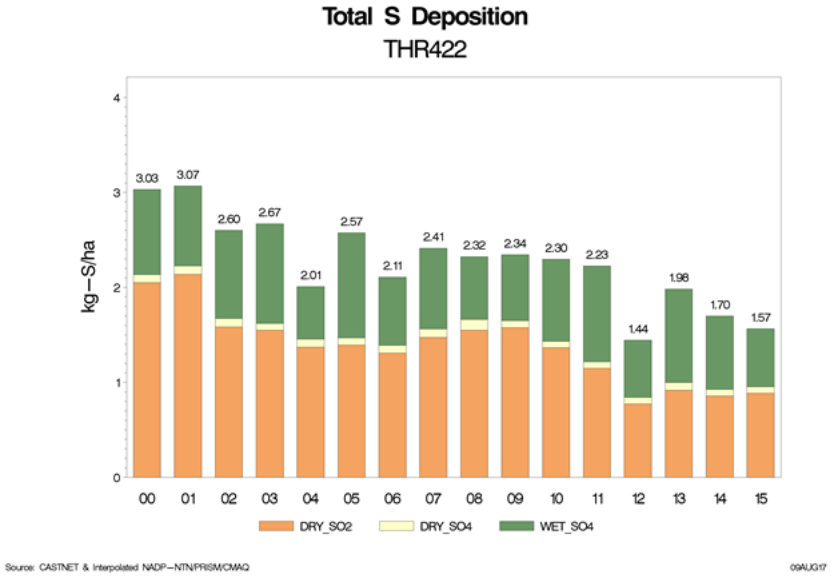
Atmospheric deposition occurs when gaseous and particulate air pollutants are deposited on the ground, water bodies or vegetation. The pollutants may settle as dust or be washed from the atmosphere in rain, fog, or snow. Deposition is the process by which pollutants are removed from the atmosphere via mechanical and chemical processes. When air pollutants such as sulfur and nitrogen are deposited into ecosystems, they may cause acidification, or enrichment of soils and surface waters. Atmospheric nitrogen and sulfur deposition may affect water chemistry, resulting in impacts to aquatic vegetation, invertebrate communities, amphibians, and fish. Deposition can also cause chemical changes in soils that alter soil microorganisms, plants, and trees. Although nitrogen is an essential plant nutrient, excess nitrogen from atmospheric deposition can stress ecosystems by favoring some plant species and inhibiting the growth of others.

These processes are measured via two distinct methodologies, i.e. wet deposition and dry deposition monitors. The National Atmospheric Deposition Program (NADP) is a cooperative effort among many agencies and universities that uses various precipitation chemistry monitoring networks to measure wet deposition and study its effects on the environment. The Clean Air Status and Trends Network (CASTNET) is a national monitoring network designed to measure dry atmospheric deposition, and to provide data to assess trends in air quality and ecological effects due to changes in air pollutant emissions. CASTNET provides long-term monitoring of air quality in rural areas to determine trends in regional atmospheric nitrogen, sulfur, and ozone concentrations and deposition fluxes of sulfur and nitrogen pollutants.

There are two deposition monitoring sites located within or near the analysis area for the proposed parcel. The monitoring site at Theodore Roosevelt National Park is a co-located CASTNET and NADP site and includes both wet and dry deposition. Data from the Theodore Roosevelt National Park site shows an increase in total wet and dry nitrogen deposition over the period from 2000-2015 while total wet and dry sulfur deposition has decreased (Figure 3.2.3). Similar trends are evident in wet deposition data from the Clancy site (NADP, 2017).

Figure 3.2.3 Total Nitrogen and Sulfur Wet and Dry Deposition at Glacier national Park (2000-2015)





3.2.2 Climate Change

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years such as temperature and precipitation. Climate change includes both historic and predicted climate shifts that are beyond normal weather variations.

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 persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use” (IPCC, 2013). Climate change and climate

science are discussed in detail in the climate change Supplementary Information Report for Montana, North Dakota, and South Dakota, Bureau of Land Management (Climate Change SIR, 2010).

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC, 2013). The global average surface temperature has increased approximately 1.5°F from 1880 to 2012 (IPCC, 2013). 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).

In North Dakota, annual average temperatures have been steadily increasing between 1901 and 2016 from 40.1°F to 44.4°F statewide. Statewide precipitation has increased slightly from the mean of 17.55 inches during that timeframe but regional precipitation has become wetter in some areas and drier in others (NOAA, 2017). Table 3.3.3 shows annual changes in temperature and precipitation per decade in regions near the location of the proposed parcel.

Table 3.3.3 Annual Climate Trends in North Dakota (1901-2015)

Region	Annual Mean Temperature Change (°F/decade)	Precipitation Change (inches/decade)
Northwest ND	+0.3	+0.13
West central ND	+0.3	+0.10
Southwest ND	+0.3	+0.09

Source: *NOAA National Centers for Environmental Information, https://www.ncdc.noaa.gov/cag/*

Earth's atmosphere has a natural greenhouse effect wherein naturally occurring gases such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (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 caused, in part, by 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. The buildup of GHGs such as CO_2, CH_4, N_2O, and other less common gases 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 CO_2 and methane) from fossil fuel development, large wildfires, 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 may last 50 to 200 years in the atmosphere while methane has an average atmospheric lifetime of 12 years (Climate Change SIR, 2010). Based on the global warming potentials put forth in EPA regulations (40 Code of Regulations Part 98 revised November 29, 2013), companies must report GHG emissions using global warming potentials of 1 for CO_2, 25 for methane (CH_4), and 298 for nitrous oxide (N_2O). The BLM uses these global warming potentials to provide consistent comparisons with federal GHG emission inventories.

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 EPA identifies western North Dakota as part of the Great Plains region. The following summary characterizes potential changes identified by the EPA (USEPA, 2016) that are expected to occur at the regional scale, where the Proposed Action and its alternatives are to occur.

- 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 patterns 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 lodge pole 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 (USGCRP, 2009, as cited by Climate Change SIR, 2010). Climate changes include warming temperatures throughout the year and the arrival of spring an average of 10 days to 2 weeks earlier through much of the U.S. compared to 20 years ago. Multiple bird species now migrate north earlier in the year.

- Fires, insect epidemics, disease pathogens, and invasive weed species have increased and these trends are likely to continue. Changes in timing of precipitation and earlier runoff would increase fire risks.
- Insect epidemics and the amount of damage that they may inflict have also been on the rise. The combination of higher temperatures and dry conditions have increases insect populations such as pine beetles, which have killed trees on millions of acres in western U.S. and Canada. Warmer winters allow beetles to survive the cold season, which would normally limit populations; while concurrently, drought weakens trees, making them more susceptible to mortality due to insect attack.

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

- Temperature increases in North Dakota are predicted to be between 3 to 5°F at the mid-21st century. As the mean temperature rises, more heat waves are predicted to occur.
- Precipitation is expected to increase during winter and spring, decrease slightly in summer, and remain relatively unchanged in the fall.
- For the western portion of the state, annual median runoff is expected to decrease between 2 and 5 percent while runoff in the northeastern part of the state would increase by 5-10 percent.
- Crop yields may increase in North Dakota, associated with predicted temperature increases.
- North Dakota's Prairie Pothole wetlands are expected to decline in quality, due to their shallow depths and rapid evaporation rates. Shrinking wetlands may lead to decreases in waterfowl populations.
- 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 the western portion of North Dakota, based on a 1°C global average temperature increase, to be 393 percent.

While long-range regional changes might occur within this analysis area, it is not possible to predict precisely when they could occur.

3.3 Soil Resources

The soil-forming factors (climate, parent material, topography, biota, and age) are variable across the planning area, which results in soils with diverse physical, chemical, and biotic properties. Important properties of naturally functioning soil systems include biotic activity, diversity, and productivity; water capture, storage, and release; nutrient storage and cycling; contaminant filtration, buffering, degradation, immobilization, and detoxification; and biotic system habitat.

The lease parcel is located within McKenzie County. The acreage of the lease parcel comprises less than 1 percent of the county. There are no areas considered prime farmlands occurring within the lease parcel. The lease parcel is located within 1 watersheds [HUC 8 (Hydrological Unit Code); subbasins]: the Lower Little Missouri (HUC 10110205). The acreage of the lease parcel comprise less than 0.1 percent of the watershed. Soils within the parcel are mostly Boxwell-Kremlin loams, Kirby-Scairt Complex, Lonna-Cabbart silt loams, and Badland-Cabbart complex.

Parcel soils are generally developed from residuum weathered mudstone, channery residuum weathered from porcellanite, silty and clayey residuum weathered from shale and siltstone, loamy residuum weathered from siltstone and mudstone, silty alluvium and colluvium, and shale and siltstone. Ecological sites are typically Loamy (R058CY080ND), Very Shallow (R058CY083ND), Thin Claypan (R058CY081ND), Shallow Loamy (R058CY086ND), Limy Residual (R058CY079ND), and Non-Site (R058CY999ND). Terrain is hillslopes, knobs, ridges, hills, and alluvial fans. Soils are well drained to excessively drained. The soils in the project area are susceptible to water erosion.

3.4 Water Resources

3.4.1 Surface Water

Surface water resources across the NDFO are present as lakes, reservoirs, rivers, streams, wetlands, and springs. Water resources are essential to the residents of eastern Montana to support agriculture, public water supplies, industry, and recreation. Water resources and riparian areas are crucial to the survival of many BLM-sensitive fish, reptiles, birds, and amphibians.

Perennial streams retain water year-round and have variable flow regimes. Intermittent streams flow during the part of the year when they receive sufficient water from springs, groundwater, or surface sources such as snowmelt or storm events. Ephemeral streams flow only in direct response to precipitation. Intermittent and ephemeral streams play an important role in the hydrologic function of the ecosystems within the lease parcels by transporting water, sediment, nutrients, and debris and providing connectivity within a watershed. They filter sediment, dissipate energy from snowmelt and storm water runoff, facilitate infiltration, and recharge groundwater (Levick et al. 2008). The pools of intermittent streams retain water in the summer months, supporting riparian vegetation and providing water resources for wildlife and livestock.

Stream morphology is influenced by a number of factors including: stream flow regime, geology, soils, vegetation type, climate, and land use history. Stream conditions reflect a number of historic and current impacts, ranging from agriculture to mining. Surficial geology is generally represented by Tertiary sandstones, siltstones, and shales, with some alluvium and glacial till which tends to form fine grain soils (loams to clays), that are highly erosive. Streambeds consist typically of sand and silt, with few bedrock channels. Stream morphology is highly influenced by the presence and type of riparian vegetation because streambeds and stream banks generally lack control features (e.g., rocks, cobbles, bedrock).

The lease parcel is located within 1 watersheds [HUC 8 (Hydrological Unit Code); sub-basins]:

- Lower Little Missouri (HUC 10110205).

The acreage of the lease parcel comprises less than 0.1 percent of the watershed (USGS 2009).

Any beneficial use of produced water requires water rights to be issued by the North Dakota State Water Commission as established by law. Water used for oil well development may come from several different sources. It may be purchased from municipalities under certain

conditions, appropriated from a surface water source under a new appropriation or by making changes to an existing water right, or by extracting groundwater from either a permitted or exempt well.

3.4.2 Groundwater

The quality and availability of groundwater varies greatly across the region. Residents in western North Dakota commonly get their ground water from aquifers consisting of unconsolidated, alluvial valley-fill materials, glacial outwash, or consolidated sedimentary rock formations and some coal beds.

Alluvial aquifers within the area generally consist of Quaternary alluvium and undifferentiated Quaternary/Tertiary sediments, which include sand and gravel deposits. Alluvial aquifers occur in terrace deposits, within floodplains, and along the channels of larger streams, tributaries, and rivers, and they are among the most productive sources of groundwater. They are typically 0-40 feet thick. The quality of groundwater from alluvial aquifers is generally good, but can be highly variable [approximately 100 mg/l to 2,800 mg/l TDS, specific conductance (SC) of 500 to 125,000 microsiemens/centimeter (uS/cm), and sodium adsorption ratio (SAR) of 5.0 to 10]. Wells completed in coarse sand and gravel alluvial aquifers can yield as much as 100 gallons per minute (gpm), although the average yield is 15 gpm. Alluvial deposits associated with abandoned river channels or detached terraces are topographically isolated and have limited saturation and yield as much as 20 gpm (Zelt et al. 1999).

Within the analysis area, the primary bedrock aquifers occur in sandstones and lignites of the Tertiary Fort Union Formation (Cenozoic rocks) (including Sentinel Butte, Cannonball, and Bullion Creek Formations) and the sandstones of the Cretaceous Hell Creek and Fox Hills formations (Mesozoic rocks). Wells within the Fort Union formation aquifers are typically 100 to 200 feet deep, but can be up to 1,500 feet in depth. These wells may produce as much as 40 gpm, but yields of 15 gpm are typical. Where aquifers are confined and artesian conditions exist, wells in the Fort Union Formation will generally flow less than 10 gpm. Well depths to the Hell Creek and Fox Hills formation aquifers are highly variable, but typically range from 200 to 1,000 feet in depth. Groundwater yields from these aquifers may be as much as 200 gpm, but are generally less than 100 gpm. Artesian wells within these aquifers may flow as high as 20 gpm (Zelt et al. 1999). Groundwater yields from the deeper Paleozoic Madison formation aquifer can range from 20 to 6,000 gpm, or can be higher, in karst areas. The depth to the Madison formation aquifer in the planning area can exceed 6,000 feet. Due to the extreme depth of this aquifer, it is rarely accessed for water use. Water quality of this aquifer is highly variable and is dependent on depth, bedrock type, recharge rate, and other factors.

3.5 Vegetation Resources

As described in the Introduction to this EA, the lease parcel is located in western North Dakota, which is located in the Northern Mixed Grass Prairie. The Northern Mixed Grass Prairie is known for its diverse vegetation types, soil types, and topography. Vegetation is comprised of both tall and short grass as well as both warm and cool season grasses. A variety of grass-like plants, forbs, shrubs, and trees also add to the vegetation diversity of this rangeland type. Many of these plant species are found in woody draws and riparian/wetland zones.

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, power lines, pipelines, etc.), chemical applications, livestock grazing, farming, and wildlife rehabilitation, prevention, manipulation, and suppression.

3.5.1 Vegetation Communities

The project area supports natural prairie vegetation characterized by western wheatgrass, needleandthread, green needlegrass, blue grama, and threadleaf sedge. Little bluestem and sideoats grama occurring on sloping shallow soils. Big bluestem, sideoats grama, scattered green ash, chokecherry, and western snowberry are important species occurring in swales.

As a whole, the North Dakota landscape is comprised of a mosaic pattern. Settlement and privatization of most of the state has led to this pattern; therefore, large blocks of vegetative communities free of human disturbances are rare.

From the USFWS National Wetland Inventory (NWI) GIS data, the proposed lease parcels contain less than 1 acres of delineated riparian or wetland area. Located primarily along Squaw Creek, the Riparian Wetland type is classified as Freshwater Emergent Wetland and Riverine. [1](USFWS 2009)

Other disturbed vegetation communities include human disturbances or alterations to the landscape. These disturbances include, but are not limited to: infrastructure developments (e.g., roads, powerlines, pipelines, and fences), chemical applications, livestock grazing, farming and ranching, and industrial and commercial facilities. Invasive, non-native grasses such as smooth brome and crested wheatgrass are commonly found on these disturbed areas. For example, smooth brome was planted in many road ditches and has encroached into areas bordering road ditches. This is often true for native prairie sites adjacent to roadways; therefore, these sites often have a smooth brome component due to its ability to spread by creeping rhizomes.

Wildfire prevention, manipulation, and suppression activities are also human alterations on natural processes that have altered vegetation communities in western North Dakota.

Noxious weeds occur randomly in isolated pockets within the study area. No known populations are located within the parcels, but all of North Dakota has the potential for infestation. The following table (Table 3.5.1.1) shows the North Dakota state listed noxious weeds.

Table 3.5.1.1 North Dakota state listed noxious weeds

Common Name	**Scientific Name**
Absinth wormwood	*Artemisia absinthium*
Canada thistle	*Cirsium arvense*
Dalmatian toadflax	*Linaria genistifolia*
Diffuse knapweed	*Centaurea diffusa*
Leafy spurge	*Euphorbia esula*
Musk thistle	*Carduus nutans*
Purple loosestrife	*Lythrum salicaria*

Russian knapweed	*Acroptilon repens*
Saltcedar	*Tamarix ramosissima*
Spotted knapweed	*Centaurea maculosa*

3.6 Special Status Species- Plant and Animal

The wildlife analysis area is entirely located within a landscape component commonly referred to as the "Badlands". This highly dissected landscape was formed by water erosion of the soft silt or clay soil and collapse following lignite coal bed burnings. Badly eroded clay-scoria slopes, buttes, and steep coulees are common. Thickets of small trees and shrubs or woody draws natural occur primarily on north or east facing slopes. Bare hills with scattered Rocky Mountain Juniper, and shortgrass prairie is common. There is zero agricultural associated with this parcel.

3.6.1 Special-Status Species, including Raptors, Migratory Birds, and the North Dakota Species of Conservation Priority

The 2015 *North Dakota State Wildlife Action Plan* identifies 115 species of conservation priority in the state (Dyke et al. 2015). The species consist of birds, amphibians, reptiles, mammals, fish, freshwater mussels, and insects. Each species is given a priority designation based on conservation need. Level I species have a high level of conservation priority or a high rate of occurrence in the state, constituting the core of the species' breeding range, but are at risk rangewide. Level II species have a moderate level of conservation priority or a high level of conservation priority but a substantial level of non-state wildlife grant funding available. Level III species have a moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota. The *North Dakota State Wildlife Action Plan* identifies nine landscape components that encompass the major habitat types of North Dakota: five grassland landscapes (tallgrass prairie, eastern mixed-grass prairie, mixed-grass prairie, western mixed-grass/short-grass prairie, and planted or tame grassland); wetlands and lakes; rivers, streams, and riparian; badlands; and upland forest (Dyke et al. 2015).

Table 3.6.1. BLM Special Status Species and North Dakota Species of Conservation Priority in the Badlands with the potential to occur on the tract.

Common Name (Scientific Name)	Species of Conservation Priority Status	Habitat Association/ Dietary Needs	Potential to Occur on the Tract and the Potential Effects
Mammals			
Black-footed ferret (*Mustela nigripes*)	Level II (federally listed endangered)	Dependent on prairie dogs and their burrows for food and shelter. Requires medium to large active prairie dog towns greater than 198 acres and with more than 20 burrows per 2.5 acres or a complex of towns (two or more towns within 4 miles).	This species is not expected to be found on this tract and would not be affected by the Proposed Action.
Black-tailed prairie dog (*Cynomys ludovicianus*)	Level I	Confined to prairie communities with short vegetation and relatively flat topography; found in colonies.	This species occurs in two distinct population complexes in North Dakota: the Little Missouri National Grasslands complex and the Standing Rock complex, which includes Sioux County and portions of Grant and Morton Counties. . This species has not been documented on the tract.
Northern Long-eared bat (*Myotis septentrionalis*)	Level I	Prefers wooded habitat. Generally roosts in trees under loose bark or within holes. Hibernates within caves and mine shafts.	This species has not been documented on the proposed tract. If development of the tract occurs no trees would be removed during the time of potential occupancy. .
Swift fox (*Vulpes velox*)	Level II	Found in the western grasslands. Prefers large tracts of native prairie, usually grazed. Feeds on small mammals.	The historical range of this species is in McKenzie County. However, its current range is only in extreme southwestern North Dakota (Bowman and Slope Counties). For this reason, this species is unlikely to occur on proposed lease tract.
Reptiles and Amphibians			
Plains spadefoot (*Spea bombifrons*)	Level I	Prefers rather dry, open grasslands with sandy or otherwise loose soil. Typically avoids river bottoms and woodlands. Feeds on invertebrates as an adult. Aestivates for long periods of time.	This species could occur on the proposed lease tract and is susceptible to land disturbance while it is aestivating. If the species occurs on land and the landscape is altered individuals would be displaced.

Table 3.6.1. BLM Special Status Species and North Dakota Species of Conservation Priority in the Badlands with the potential to occur on the tract.

Common Name (Scientific Name)	Species of Conservation Priority Status	Habitat Association/ Dietary Needs	Potential to Occur on the Tract and the Potential Effects
Insects			
Dakota skipper (*Hesperia dacotae*)	Level II (federally listed threatened)	Found in two types of prairies: moist bluestem prairie with three wildflower species [wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zigadenus elegans*)] and mesic upland prairie that is relatively dry and often found on ridges and hillsides. Bluestem grasses and needlegrasses dominate these prairies; purple coneflower (*Echinacea angustifolia*) is typical of high-quality sites that support the skipper.	The primary range of this species is in McKenzie and Dunn Counties. However, the proposed tract lacks sufficient plants associated with the life cycle of the skipper. This species would not be affected by the Proposed Action.
Monarch butterfly (*Danaus plexippus*)	Level I	Typically found in areas with a high number of nectar sources. Prefers native flowers but will use domestic plants. Areas with a higher density of native prairie would be more likely to support the monarch butterfly. Relies exclusively on milkweed in the caterpillar stage.	This species could occur on the proposed tract. If development occurs individuals could be displaced.
Birds			
Baird's sparrow (*Ammodramus bairdii*)	Level I	Occurs in short or mixed grass prairie. Feeds on seeds and insects.	This species could nest and forage on the proposed tract. If tract development occurs individuals could be displaced by the Proposed Action.
Burrowing owl (*Athene cunicularia*)	Level II	Breeds in burrows made by other species, generally in open country where they can view the surrounding area. Feeds on insects.	McKenzie County provides both secondary and primary range for this species. This species could occur on the proposed tract but is highly unlikely.
Chestnut-collared longspur (*Calcarius ornatus*)	Level I	Breeds and forages in mixed-grass prairie. Feeds mainly on insects.	This species could nest and forage on the proposed tract. If development occurs, individuals could be displaced by the Proposed Action.
Ferruginous hawk (*Buteo regalis*)	Level I	Occurs in a variety of open grasslands and shrub communities. Avoids cultivated fields, high elevations, and forest interiors. Nests on cliffs, power poles, or solitary trees.	McKenzie County provides secondary range for this species. There is little potential nesting or foraging habitat on land the proposed tract.
Golden eagle (*Aquila chrysaetos*)	Level II	Occurs in open shrubland and grasslands of shortgrass, mixed-grass, and xeric grasslands. Typically nests on cliffs, trees, or on power poles.	McKenzie County provides both primary and secondary range for this species. There is little potential nesting habitat on the proposed tract, however there is foraging habitat.

Table 3.6.1. BLM Special Status Species and North Dakota Species of Conservation Priority in the Badlands with the potential to occur on the tract.

Common Name (Scientific Name)	Species of Conservation Priority Status	Habitat Association/ Dietary Needs	Potential to Occur on the Tract and the Potential Effects
Loggerhead shrike (*Lanius ludovicianus*)	Level II	Occurs in open habitat with available perches. Primarily feeds on insects but also reptiles, rodents, and small birds.	This species could nest and forage on the proposed lease tract. If development occurs on the tract, individuals could be displaced.
Long-billed curlew (*Numenius americanus*)	Level I	Breeds in grassland habitat. Feeds on small invertebrates found in mud, as well as insects.	McKenzie County provides secondary range for this species. This species could occur on the proposed lease tract.
Sprague's pipit (*Anthus spragueii*)	Level I	Occurs primarily in extensive tracts of native mixed-grass prairie, ungrazed or lightly grazed prairie. Forages primarily on arthropods.	Pipits are not known to be found on the tract, however migrating birds may utilize it during their migration.

Source: Dyke et al. (2015).

Notes: Level I: High level of conservation priority because of declining status either in North Dakota or across their range, or a high rate of occurrence in North Dakota constituting the core of the species breeding range but are at risk rangewide.

Level II: Moderate level of conservation priority, or a high level of conservation priority but a substantial level of non-state wildlife grant funding is available to them.

Level III: Moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota.

3.6.2 Federally Listed Threatened and Endangered Species for McKenzie County ND

Whooping Crane--*Grus Americana* (Endangered)
Dakota Skipper Butterfly-- *Hesperia dacotae* (Threatened)
Northern Long Eared Bat – *Myotis septentrionalis* (Threatened)
Black-Footed Ferret – *Mustela nigripes* (Endangered)
Gray Wolf – *Canus lupis* (Endangered)

The Black-footed Ferret (*Mustela nigripes*) and the Gray Wolf (*Canis lupis*) are not known to occur within the project area. Occasional sightings of wolves have been reported in the state of North Dakota; however no sightings have been reported on or near the proposed action.

3.6.2.1 Whooping Crane

The whooping crane was listed as endangered in the United States in 1970 and in Canada in 1978. North Dakota lies directly in the middle of the major migratory path utilized by the remaining wild bird population. Sightings have been recorded in all the counties within western ND with the exception of McKenzie and Bowman counties. Palustrine wetland and cropland ponds are used during the migration for feeding and roosting. There has not been any recording nesting activity in North Dakota for more than 90 years. Recovery actions to protect and restore whooping cranes are outlined in the 2005 FWS Recovery Plan and can be found at: (http://ecos.fws.gov/docs/recovery_plan/070604_v4.pdf

The proposed parcel is located in 75 percentile of Central Flyway confirmed sightings.

3.6.2.2 Dakota Skipper Butterfly

The Dakota skipper butterfly species may occupy habitat infrequently or seasonally within the analysis area, however, it is not known to occupy any habitat located on the nominated lease parcel. Both Dunn and McKenzie counties have known occupied habitats for Dakota Skipper. Designated critical habitat is approximately 30 miles from the nominated parcel

The Dakota skipper can survive only in undisturbed, tall grass and mix-grass prairie. In the western part of North Dakota, the skipper can be found in ungrazed or lightly grazed native pastures with little bluestem, needle-and-thread, and purple coneflower. Bluestem grass is a favorite plant for breeding and egg deposit while coneflower is a nectaring or food plant for the skipper. Dakota skippers rarely travel more than one-half mile in their entire lifetime.

3.6.2.3 Long Eared Bat

Due to declines caused by white-nose syndrome and continued spread of the disease, the northern long-eared bat was listed as threatened under the Endangered Species Act on April 2, 2015.

The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches but with a wingspan of 9 to 10 inches. Its fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*, which are actually bats noted for their small ears (Myotis means mouse-eared). Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation.

Most records of northern long-eared bats are from winter hibernacula surveys, with more than 780 hibernacula identified within the United States. No known hibernacula are located in North Dakota, due to either no suitable hibernacula present or a lack of survey effort (USFWS 2014).

Northern long-eared bats are not known to occur on the proposed parcel; however, there are documented occurrences near Killdeer, North Dakota. Areas of the Hells Creek Formation could provide cave-like cracks and crevices that potentially could provide suitable habitat for roosting along with loosely barked trees.

3.6.3 Special Status Plant Species

North Dakota does not have any special status plant species.

3.6.4 Migratory Birds and Raptors

Migratory birds and raptors are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703–712) and the Bald and Golden Eagle Protection Act (as amended in 1962). The MBTA prohibits taking or killing migratory birds and destroying their nests or eggs without a permit. The list of protected migratory birds includes raptors. EO 13186 directs federal agencies taking actions that are likely to have a measurable adverse effect on migratory birds to undertake

mitigation measures in support of the MBTA.

Raptors with the potential to occur in the analysis area are the golden eagle, bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), northern goshawk (*Accipiter gentilis*), Cooper's hawk (*A. cooperii*), sharp-shinned hawk (*A. striatus*), ferruginous hawk, and turkey vulture (*Cathartes aura*).

Common passerines (migratory songbirds) with the potential to occur in the analysis area include the chestnut-collared longspur, grasshopper sparrow (*Ammodramus savannarum*), Baird's sparrow (*Ammodramus bairdii*), Le Conte's sparrow (*Ammodramus leconteii*), Brewer's sparrow (*Spizella breweri*), dickcissel (*Spiza americana*), bobolink (*Dolichanyx oryzivorus*), loggerhead shrike, and lark bunting (*Calamospiza melanocorys*).

3.7 Fish and Wildlife

A diversity of wildlife habitat, topography, and vegetation types exists across the analysis area. This diversity across western North Dakota and the analysis area provides habitat for many wildlife species in addition to those previously mentioned.

Current and historic land uses across the proposed lease parcel include grazing, hunting, energy development, among others. Consequently, some areas contain large contiguous blocks of well-functioning habitats, while other areas are composed of small, fragmented patches of native habitats. In some areas, existing anthropogenic disturbance at some frequency has been attributed to reducing habitat suitability for some species of wildlife intolerant to human activities.

Wildlife species and habitat surveys have been conducted throughout the analysis area at various times and for various species. The entire area has not been comprehensively surveyed for all wildlife resources; however, a combination of past surveys provides insight into what species have been documented, and what other species are expected within those habitat types.

3.7.1 Big Game

Big game species in the analysis area include mule deer, white-tailed deer, pronghorn antelope, and potentially bighorn sheep and elk.

White-tailed deer are the most abundant big game species in ND and use the greatest variety of habitats, generally preferring riparian corridors, along creeks and rivers, as well as woody draws and grasslands (NDGF web site). Habitat diversity appears to be a good indicator of intensity of deer use. In mule deer habitats, diversity of vegetation usually followed topographic diversity; thus, rugged topography may be the ultimate factor influencing mule deer use of an area (Mackie et. al, 1998).

Winter range is often part of year-round habitat in western North Dakota for Mule Deer. Winter ranges are typically in areas of rougher topography and are often dominated by shrub species that provide crucial browse during winter months. Escape and thermal cover are also important for maintenance and survival. Thick stands of ponderosa pine and juniper are examples of important escapes and thermal cover used by mule deer in the analysis area while woody draws, shelterbelts and farmsteads provide winter cover for white-tailed deer.

Pronghorn antelope are sparsely distributed across the analysis area with Bowman County being the core area. They are generally associated with grasslands and shrublands, but they will also use agricultural fields. Winter ranges for pronghorn antelope generally occur within sagebrush grasslands with at least greater densities of big sagebrush than the surrounding areas.

Elk are primarily associated with the timbered portion of the breaks and the riparian bottoms along the river corridors. The riparian areas are used in conjunction with the upland areas for forage and security purposes. The riparian bottoms become increasingly important during the drought periods when upland reservoirs become dry.

The potential for big game movements or migrations through western North Dakota are not fully understood. At a local level, it is reasonable to assume big game movements occur at least seasonally. Migration corridors have not been identified through the nominated lease parcel.

3.7.1.2 Other Mammals

Other mammals with the potential to occur in the analysis area include the least chipmunk (*Neotamias minimus*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), plains pocket mouse (*Perognathus flavescens*), prairie vole (*Microtus ochrogaster*), striped skunk (*Mephitis mephitis*), northern raccoon (*Procyon lotor*), and ermine (*Mustela erminea*). coyote (*Canis latrans*), fox (*Vulpes vulpes*), badger (*Taxidea taxus*), whitetail jackrabbit (*Lepus townsendii*) and mountain lion (*Felis concolor*).

3.7.1.3 Game Birds

Common game birds with the potential to occur in and around the proposed lease tract include Hungarian (gray) partridge (*Perdix perdix*), ring-necked pheasant (*Phasianus colchicus*), and the sharp-tailed grouse (*Tympanuchus phasianellus)* and turkey (*Meleagris gallopavo*).

The analysis area provides habitat for sharp-tailed grouse, turkeys, Hungarian partridge, and pheasants.

Sharp-tailed grouse generally prefer prairie grasslands intermixed with shrubs such as chokecherry and buffaloberry. NDGF survey data on sharp-tailed grouse leks are sporadic throughout much of the study area. No known sharp-tailed grouse leks are located on the existing lease parcel.

3.7.1.4 Waterfowl

The nominated parcel is located in southern McKenzie County and is not considered to be in a high use waterfowl area. There are no known wetlands within the project area.

3.8 Cultural Resources

The Bureau of Land Management is responsible for identifying, protecting, managing, and enhancing cultural resources located on public lands, or that may be affected by BLM undertakings on non-Federal lands, in accordance with the National Historic Preservation Act (NHPA) of 1966, as amended. The procedures for compliance with the NHPA are outlined in

regulation under 36 CFR 800. Cultural resources are defined as districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture (36 CFR 60.1). Cultural resources also refer to artifacts, records, remains, and properties of traditional religious and cultural importance to an Indian tribe (36 CFR 800.16(l)(1)).

Cultural resources are evaluated with reference to their eligibility for listing on the National Register of Historic Places (NRHP). Each resource is considered on a case-by-case basis. Common prehistoric resource types in North Dakota include stone circles, stone cairns, rock art, lithic artifacts, pottery remains, earthlodge villages, rock alignments, bone concentrations, eagle-trapping pits, and lithic procurement areas. Common historic site types in North Dakota are material remains of human life or activities over 50 years in age including homesteads, farmsteads, dumps, schools, churches, roads, railroad grades, trails, trading posts, and military forts.

To identify all known cultural resources and historic properties located within the nominated lease parcels, a BLM archaeologist reviewed the most recent data maintained by the North Dakota State Historic Preservation Office (SHPO). The data review included all previously recorded cultural resources within a one-mile radius of the lease parcel. To gather information on resources that may be of religious and cultural significance to Indian tribes, the North Dakota Field Office requested cultural information from the Tribal Historic Preservation Offices of 18 federally recognized Indian tribes in North Dakota, South Dakota, Montana, and Minnesota. Sections 3.8.1 and 3.8.2 summarize the results of the literature review.

3.8.1 Previous Cultural Resource Surveys in Lease Parcels

The previous surveys conducted within the one-mile radius of the Lease Parcel primarily consist of linear surveys with narrow corridors for water pipelines, road reconstruction, and trails. Large block surveys and boundary fence line surveys have been completed for Theodore Roosevelt National Park. Only one linear survey has been completed within the Lease parcel, and consisted of a singular linear survey for the Wolf Trail.

3.8.2 Cultural Resource Types and Numbers inside Lease Parcels

The proposed Lease Parcel is located on State Trust Lands with federal minerals. The parcel is adjacent north of Theodore Roosevelt National Park, and abuts United States Forest Service's Little Missouri National Grasslands to the east. No known cultural resources are located within the Lease Parcel. Within a one mile radius of the Lease Parcel, there are five known archaeological sites and two isolated finds. The known sites are all cultural material scatters, while the two isolated finds are lithics. An isolated find refers to a location with five or fewer artifacts. The following table summarizes the National Register status for all known cultural resources lying within a mile of the Lease Parcel.

SITS #	Site Description	Recorder	NRHP Eligibility
32MZ1820	Cultural material scatter	M. Floodman	Not Eligible
32MZ1819	Lithic Scatter	M. Floodman	Unevaluated
32MZ1821	Cultural Material Scatter	M. Floodman	Unevaluated
32MZ107	Lithic Scatter	L. Frankowski	Not Eligible

SITS #	Site Description	Recorder	NRHP Eligibility
32MZ108	Lithic Scatter	L. Frankowski	Not Eligible
32MZx728	Lithic isolate	H. La Point	Not Eligible
32MZx1059	Lithic Isolate	H. La Point	Not Eligible

3.9 Native American Religious Concerns

The BLM's management of Native American Religious concerns is guided through Manual 8120: *Tribal Consultation Under Cultural Resources Authorities* and Handbook 8120-1: *Guidelines for Conducting Tribal Consultation*. Further guidance for consideration of fluid minerals leasing is contained in BLM Washington Office Instruction Memorandum 2005-003: *Cultural Resources, Tribal Consultation, and Fluid Mineral Leasing*. The 2005 memo notes leasing is considered an undertaking as defined in the National Historic Preservation Act. Generally areas of concern to Native Americans are referred to as "Traditional Cultural Properties" (TCPs) which are defined as cultural properties eligible for the National Register of Historic Places because of its association with cultural practices or beliefs that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community.

The NDFO consulted with 18 federally recognized Indian tribes regarding the sale of the nominated lease parcel. The NDFO sent maps, consultation letters, and cultural resource data to the Tribal Historic Preservation Officer and Chairperson or President of the following tribes: Crow Creek Sioux Tribe; the Crow Tribe; Flandreau Santee Sioux; Fort Belknap Indian Community; Fort Peck Assiniboine and Sioux Tribes; Lower Brule Sioux; Lower Sioux Indian Community; Northern Cheyenne; Oglala Sioux Tribe; Rosebud Sioux; Santee Sioux Tribe; Sisseton-Wahpeton Oyate; Spirit Lake Tribe; Standing Rock Sioux Tribe; Three Affiliated Tribes – Mandan, Hidatsa, and Arikara Nation; Turtle Mountain Band of Chippewa; and the Yankton Sioux Tribe. To date no responses concerning cultural heritage sites have been brought forward by the tribes. The Flandreau Santee Sioux have responded with concerns regarding sensitive wildlife habitats, and its location within the National Grasslands.

3.10 Paleontology

According to Section 6301 of the Paleontological Resource Protection Act of 2009 Omnibus Public Lands Bill, Subtitle D, SEC. 6301, paleontological resources are defined as "any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth" (Paleontological Resource Protection Act of 2009 Omnibus Lands Bill, Subtitle D, SEC. 6301-3612 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 431-433). Paleontological resources contain crucial evidence to unravel the history of life on Earth, and so therefore are valued scientific resources. Paleontological resources do not include archaeological and cultural resources.

The BLM utilizes the Potential Fossil Yield Classification (PFYC) as a planning tool for identifying areas with high potential to yield significant fossils (IM 2016-124). The system consists of ranks ranging from 1 to 5 (low to high) assigned to geological units, with 1 being low potential and 5 being high potential to have significant fossil resources. It should be pointed out that the potential to yield significant fossil resources is never 0. Rock units not typically fossiliferous can in fact contain fossils in unique circumstances.

Table 3.10.1 Potential Fossil Yield Classification (PFYC) Description

PFYC Class	Potential	Description
Class 1	Very Low	Igneous and metamorphic geologic units, or very old deposits not likely to contain recognizable fossils.
Class 2	Low	Geologic units not likely to contain vertebrate fossils or scientifically non-vertebrate fossils such as very young sedimentary deposits.
Class 3	Moderate	Fossiliferous sedimentary geologic units- content varies in significance, abundance and predictable occurrence. Includes some units of unknown potential that should be reviewed.
Class 4	High	Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability.
Class 5	Very High	Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils.

BLM classified geologic formations that have a high Potential Fossil Yield Classification (PFYC) of 3 or higher should be specifically reviewed for paleontological resources. The NDFO has the following classifications on the relevant geologic units:

Sentinel Butte Class 4

All of the 1 parcel includes a geologic unit rated as PFYC 4, indicating a high potential for fossils.

3.11 Visual Resources

The Federal Land Policy and Management Act requires that the BLM consider the scenic values of public land as a resource that merits management and preservation, as determined through the land use planning process. In response to this mandate, the BLM developed the Visual Resource Management (VRM) System, with the primary objective of managing public land in a manner that will protect the quality of scenic (visual) values (Information Bulletin No. 98-135). The VRM System provides guidance relating to the Visual Resource Inventory Process that the BLM implements to inventory scenic values (BLM Handbook 8410-1), as well as assess the potential effects of proposed actions based on the analysis of visual contrast (BLM Handbook 8431-1). Handbook 8410-1 also provides guidance regarding VRM classes, which set management objectives for BLM-administered land.

Primary factors considered for the inventory of scenic values are scenic quality, sensitivity level rating units, and distance zones (DZ), collectively referred to as the "VRI". These three factors are combined to develop Visual Resource Inventory (VRI) classes, which represent the scenic values of BLM-managed land. The management of inventoried scenic values is evaluated during

the land use planning process and VRM classes (I-IV) are assigned to all BLM administered lands.

The assignment of VRM classes is based on the consideration of: (1) inventoried scenic values (i.e., the VRI and VRI classes), (2) other land use and resource allocations within a given field office or management unit, and (3) public needs and national priorities for federal land. VRM assignments are land use plan decisions that guide future land management actions. It is important to note that VRM class assignments do not have to be consistent with inventoried scenic values (i.e., VRI classes) and should reflect a balance between the protection of visual values and other uses of BLM land to meet public demand or national priorities.

VRM classifications are only applied to BLM surface, as such; the affected environment for visual resources consists of approximately 0 acres of BLM-administered surface in the analysis area.

A Class II VRM area classification means that the character of the landscape has unique combinations of visual features such as land, vegetation, and water. The existing character of the landscape should be retained. Activities or modifications of the environment should not be evident or attract the attention of the casual observer. Changes caused by management activities must repeat the basic element of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

A Class III VRM area classification means the level of change to the character of the landscape should be moderate. Changes caused by management activities should not dominate the view of the casual observer and should not detract from the existing landscape features. Any changes made should repeat the basic elements found in the natural landscape such as form, line, color and texture.

A Class IV VRM area classification means that the characteristic landscape can provide for major modification of the landscape. The level of change in the basic landscape can be high. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

The NDFO does not currently have Visual Resource Classifications established for any lands found within the analysis area. While the NDFO did not assign VRM classifications in the current RMP, the RMP approved a general objective to maintain visual qualities wherever possible and included the following management actions:

- Consider impacts to the visible landscape during all phases of land use planning.
- Ensure that the high visual qualities of the National Park Service Units are considered in cooperation with the NPS when a specified mineral lease or developmental action is proposed that potentially affects existing visual qualities.

The lease parcel is located bordering the North Unit of Theodore Roosevelt National Park.

3.12 Recreation and Travel Management

The BLM only manages recreational opportunities and experiences on BLM-administered surface. The affected environment consists of approximately 0 acres of BLM-administered

surface.

The approximately 120 acres proposed for lease consist of one tract of North Dakota Department of Trust Lands managed surface. The types of limited public use on the lease parcels could be characterized as casual dispersed recreational activities including hiking, hunting, and wildlife viewing. Benefits and experiences enjoyed by recreational users include opportunities for solitude, spending time with families, enhancing leisure time, improving sports skills, enjoying nature and physical exercise.

3.13 Lands and Realty

The analysis area consists of one parcel that includes 120 surveyed surface acres, all which are in Non-Federal (State) ownership, having been conveyed from the United States to the State of North Dakota in 1952. The BLM does not manage any easements or rights-of-way on the private surface.

The minerals remain in Federal (public) ownership. The BLM has previously leased the minerals from 1953-1958 under NDBLM 0 027919 and again from 1958-1961 under NDM 0 029932.

3.14 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 NDFO

The USFS manages large areas of land within the boundaries of the NDFO that contain federal oil and gas lease acreage. Currently, there are 1,782 federal oil and gas leases covering approximately 847,877 acres in the State of North Dakota. Existing production activity holds approximately 70 percent of this lease acreage (1,335 leases; total of 596,119 acres). Approximately 75 percent of this federal oil and gas lease acreage is within the boundaries of the USFS Little Missouri National Grasslands (991 leases; 638,832 acres).

Information regarding the numbers and status of wells on federal, private/State, and Indian lands within the external boundary of the NDFO is displayed in Table 3.14.1. Numbers of townships, lease acres within those townships, and development activity for all jurisdictions are summarized in Table 3.14.2.

Exploration and development activities would only occur after a lease is issued and the appropriate permit is approved. Exploration and development proposals would require completion of a separate environmental document to analyze specific proposals and site-specific resource concerns before BLM approved the appropriate permit.

Table 3.14.1 Existing Development Activity

	FEDERAL WELLS	PRIVATE AND STATE WELLS	INDIAN WELLS
Drilling Well(s)	299	249	152
Producing Gas Well(s)	94	26	0
Producing Oil Well(s)	1818	10819	1178
Water Injection Well(s)	199	831	0
Shut-in Well(s)	52	777	9
Temporarily Abandoned Well(s)	65	381	4

Table 3.14.2 Oil and Gas Leasing and Existing Development within Townships Containing Lease Parcels

	McKenzie
Townships	T148NR99W
Number of Townships Containing Lease Parcels	1
Total Acres Within Applicable Township(s)	22,854
Total Acres of Federal O&G In Township(s)	4,143
Total Federal Acreage (Percent of Township(s))	18.1%
Current Federal O&G Acres Leased In Township(s)	3,143
Total Acres of Leased O&G (Percent of Township(s))	13.8%
Proposed Acres To Be Leased	120
Percent of Township(s) / Percent of Federal	.5 / 2.9%
Acres Leased Federal O&G Minerals Suspended	0
Percent of Township(s)	0%
Total Acres In County	1,831,469
Total Federal O&G In County	504,980
Federal Percent Per County	27.6%
Tract Percent of County	.006%
Tract Percent of Federal O&G In County	.02%

	McKenzie
Townships	T148NR99W
Federal Wells Per Township(s)	5 OIL 1 DRG
Private and State Wells Per Township(s)	17 OIL 3 P&A 1 TA
Indian Wells Per Township(s)	0

Table 3.14.3 Oil and Gas Leasing and Existing Development Abbreviations Key

Acronym	Description
OIL	All wells which produce oil.
DRG	All wells drilling.
P&A	All wells plugged and abandoned.
TA	Temporarily Abandoned wells.

3.15 Social Conditions and Environmental Justice

Currently oil and gas leasing and production are taking place on public and private lands within and around McKenzie County. Interest in oil and gas development in this region has significantly increased over the last five years because of the Bakken formation which extends from the Williston Basin in western North Dakota to northeastern Montana. The parcel proposed for leasing is in McKenzie County, North Dakota. Social conditions will focus on this county since the parcel offered for lease is in this county and social impacts would likely be felt most within this county.

3.15.1 Population and Demographics

Population and demographic changes are instrumental to understanding a community, since they may drive many of the other community changes brought upon by federal resource management actions. Demographic changes such as large age cohort sizes or residential mobility can affect the local institutions and social context (Burdge 1983; Finsterbusch 1980). A community with an older cohort age (say 65 and older) may need different community services available to meet the 'senior' market. Population changes due to in- or out-migration can affect local community ties and social relationships. A federal management action that affects local communities' populations or demographics can have impacts that ripple

throughout the social and economic contexts. For example, an action that can bring in a large workforce can have immediate impacts upon the housing availability, school enrollment, employment changes and income; and the magnitude of these impacts are often dependent upon changing community population and demographics. Understanding the past and current trends occurring in a community provides a baseline for future impact analyses.

McKenzie County had an estimated 2016 population of 12,621 residents which was a substantial increase (a 98.1% increase) from the 2010 Census population of 6,360 residents, however it is a decrease of 171 residents from the 2015 population estimate (U.S. Census Bureau 2017a). In comparison, the State of North Dakota only had a 12.7% increase in residents statewide from 2010 to 2016 and saw a small increase in population between 2015 and 2016 (U.S. Census Bureau 2017a). The population estimates are of residents which means that many individuals associated with a transient workforce, which often accompanies oil and gas development projects, are likely not counted.

In-migration was the largest factor for the substantial increase in population from 2010 to 2016 in McKenzie County with 86.1 percent of the cumulative population change associated with migration (U.S. Census Bureau 2017b). The Bakken area, including McKenzie County, has seen an influx of people moving to that area due to the economic opportunities associated with energy development (Raimi and Newell 2016, North Dakota Workforce Intelligence Network 2017). The core Bakken oil and gas producing counties population growth year-to-year from 2006-2015 was greater, and at times considerably greater, than the population growth to North Dakota statewide as well as to non-oil counties in North Dakota as determined by North Dakota Workforce Intelligence Network (2017, p. 30). As noted above, McKenzie County saw a decrease in population from 2015 to 2016 and this was due to out-migration (U.S. Census Bureau 2017b). In rural communities, large in-migration or out-migration can be a concern in terms of infrastructure and public service needs, housing availability, and community relationships (see for example Burby and Bell 1978; Murdock and Leistritz 1979; Greider, Krannich and Berry 1991; Bohnenkamp et. al. 2011; Farren 2014; Weber, Geigle and Barkdull 2014).

Changes in population can influence the age structure of the local communities and the county as a whole. McKenzie County has seen a decreasing trend in the median age of residents from 2010 to 2016 with a median age of 37.9 and 30.8 respectively (U.S. Census Bureau 2017a). This downward trend could be the result of in-migration of a younger population which would be consistent with increasing energy development. These estimates are for residents and do not necessarily include the population of a transient workforce.

3.15.2 Quality of Life

Quality of Life (QOL) is an integral aspect of understanding a community and its people. The components of this outline help to provide a basis for which QOL can be discussed. QOL is what brings pleasure and happiness to life-it can include “feeling a part of the community where you live; knowing where you stand in relationship to other people; having a sense that you and people in your community have control over the decisions that affect your future;….living without undue fear of crime or personal attack…” (Branch et al. 1982). The components of QOL can differ amongst individuals, however generally many components relate to income,

employment and job satisfaction, affordable housing, health, food, culture, leisure, and amenities. Understanding these components can then help provide a sense of the QOL available in the impact area.

Farming and ranching has been and continues to be a long-standing influence on local business, culture, and social activities in the area. Based upon the 2012 Census of Agriculture (the most recent) there were 574 farms and 1,064,191 acres of land in farms in McKenzie County, a decrease from the 585 farms and 1,076,656 acres of land in farms in the 2007 Census of Agriculture (NASS 2014). Forty percent of the land in farms in McKenzie County was in cropland, 56 percent was pastureland and the remainder used for other uses in 2012 (NASS 2014). The top crop items in terms of acres in 2012 were wheat for grain, forage (hay, haylage, grass silage, etc.) and barley for grain while top livestock in terms of numbers was cattle and calves, colony of bees, and horses and ponies (NASS 2014). This information helps highlight the agricultural nature of the five counties.

Past research on social impacts associated with energy development shows that social well-being often decreased during a boom, but then tended to increase once the boom is over. A comparative and longitudinal study conducted in Delta, Vernal, and Tremonton, Utah, and Evanston, Wyoming, addressed issues of social well-being in boomtowns (Brown and others, 2005; Brown and others, 1989; Greider and Krannich, 1983; Hunter and others, 2002; Smith and others, 2001). With the exception of Tremonton, each of these communities experienced a boom during the late 1970s and early 1980s. Delta's boom resulted after the construction of a power plant while the booms in Evanston and Vernal were primarily related to oil and gas development. At least four surveys were conducted in these communities from 1975 to 1995. Several indicators of social well-being were examined, including perceived social integration, relationships with neighbors, trust of community residents and community satisfaction. Delta and Evanston showed similar patterns associated with these indicators. During the peak boom years, residents experienced diminished perceived social integration, relationships with neighbors, trust of residents, and community satisfaction. Interestingly, Brown and others (2005) pointed out that the greatest declines in community satisfaction in Delta occurred just before the largest population increase of the 20 year study period, indicating that changes in population cannot alone account for shifts in community satisfaction and social integration. Nonetheless, by 1995, the levels of these indicators had returned to or exceeded pre-boom levels.

These type of changes to quality of life have been noticed in the Bakkan area. A 2011 study highlights several of the changes that have been seen across the Bakken oil counties and the impacts to quality of life (Bohnenkamp et. al. 2011). For example, the study highlights that the familiarity of residents with other residents and the safety often felt in small rural communities has shifted to in-migration of new people and safety concerns resulting from not knowing these people. There has also been an increasing division being seen between the "haves" and the "have-nots" including between long-time residents and a general increase in the cost of living. Additionally, housing availability is very limited and this causes housing prices to be high compared to similar rural areas in North Dakota and Montana outside the influence of the Bakken oil boom. Many people live in man camps (similar to college dormitories), commute relatively long distances to work, or live in what otherwise may be considered substandard housing. The study also highlights concerns over housing prices and values increasing and the

changing of the population. While there is an in-migration of people for oil field jobs, there has also been an out-migration of long-time residents due to not being able to afford the rising housing costs (Bohnenkamp et. al. 2011).

The oil boom of the early 2000s in North Dakota associated with oil and gas exploration, development, and production from the Bakken formation limited housing availability, increased traffic, increased pressure on existing infrastructure, and generally affected the quality of life for long-time residents as well as new residents attracted to the area by the oil boom. Traffic associated with the Bakken oil boom is currently an issue. Increased truck traffic hauling heavy equipment, fracking fluids, and water as well as increased traffic associated with oil workers and increased populations cause more traffic congestion, increase commuting times, and affect public safety. The Bakken boom has also increased infrastructure pressure. Demand for better roads, upgrades to waste water treatment, increased police protection, more hospital and school services, and other public services is apparent in many communities (Bohnenkamp et. al. 2011; Weber, Geigle, and Barkdull 2014; Newell and Raimi 2015; Krupnick and Echarte 2017; Zachary and Ratledge 2017).

3.15.3 Environmental Justice

Executive Order 12898 (Feb. 11, 1994), Federal Actions to Address Environmental Justice in Minority and Low-Income Populations states "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" Analysis requires the identification of minority populations and low-income populations that may be affected by any of the alternatives.

The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes that may experience common conditions of environmental exposure or effects associated with a plan or project. It is important to note that minority populations, low-income populations, or Tribes may experience common effects from a project even if they do not reside in the immediate study area. EO 12898 requires Federal agencies to ensure opportunities for effective public participation by potentially affected low-income populations, minority populations, or Indian tribes. These populations are considered to be potential "environmental justice populations" of concern that should be addressed throughout the planning effort.

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

Low-income populations are determined by the U.S. Census Bureau based upon poverty thresholds developed every year. Poverty thresholds are set by the U.S. Census Bureau. CEQ guidance does not provide specific criteria for determining low-income populations as it does for minority

populations, so for this project we will use the same criteria as is being used for minority populations (50 percent or greater of the population or a population that is "meaningfully greater"). We identify low-income population and minority population percentages that are "meaningfully greater" as at least five percentage points higher than for the State of North Dakota.

Minority populations are identified using the U.S. Census Population Estimates program which provides estimates for the resident population by age, sex, race, and Hispanic origin at the national, state and county scales. Total minority population refers to that part of the total population which is not classified as *Non-Hispanic White Only* by the U.S. Census Bureau. By using this definition of minority population, the percentage is inclusive of Hispanics and multiple race categories and any other minority single race categories. This definition is most inclusive of populations that may be considered as a minority population under EO 12898.

Data for the identification of low-income populations is from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE). The SAIPE program annually produces single year poverty estimates for states, counties, and school districts. The U.S. Census Bureau suggests using SAIPE data for poverty estimates for counties or school districts, especially for areas with populations of 65,000 or less (U.S. Census Bureau, 2016a). Estimates from SAIPE and the Population Estimates program are used in federal funding allocations. Note that the most current SAIPE data is for 2015 whereas the minority population data from the Population Estimates program is for 2016.

Based upon the U.S. Census population estimates for 2016, McKenzie County does have identified minority environmental justice populations due to the percent of American Indians/Alaska Natives and the percent of the population that is in the total minority category (Table 3.15.1). Based upon the criteria discussed above, McKenzie County did not have an identified low-income/poverty environmental justice population in 2015 (Table 3.15.1). Sections 1.4 and 3.9 provides information on the Tribes consulted and the Flandreau Santee Sioux have responded with concerns regarding sensitive wildlife habitats and the parcel's location. Please see Sections 1.4 and 5.2 for the discussion of public outreach efforts.

Table 3.15.1. Percent Minority Populations in 2016 and Percent Poverty Population in 2015 for McKenzie County (ND) and State of North Dakota.

Geography	Total Population[1]	Race Alone[1]				% Two or More Races[1]	% Hispanic[1]	% total minority[2]	Poverty Percent, All Ages[3]
		% Black or African American	% American Indian and Alaska Native	% Asian	% Native Hawaiian and Other Pacific Islander				
North Dakota	757,952	2.9%	5.5%	1.5%	0.1%	2.1%	3.6%	15.0%	10.7%
5% points greater:	--	7.9%	10.5%	6.5%	5.1%	7.1%	8.6%	20.0%	15.7%
McKenzie County	12,621	1.6%	11.9%	1.0%	0.0%	2.6%	7.8%	22.7%	8.4%

[1]Source: U.S. Census Bureau, 2017c.

[2]The term "total minority population" refers to the part of the total population which is not classified by the race/ethnicity category Non-Hispanic White Alone by the U.S. Census Bureau. This definition is most inclusive of populations that may be considered as a minority population under EO 12898.

[3]Source: U.S. Census Bureau, 2016b.

3.16 Economics

Western North Dakota as a whole has experienced tremendous growth over the last decade as oil development of the Bakken formation has intensified. As discussed in Section 3.14, oil and gas leasing and production are taking place on public and private lands within and around McKenzie County. The parcel proposed for leasing is in McKenzie County, North Dakota. Economic conditions will focus on this county since the parcel offered for lease is in this county and impacts would likely be felt most within this county.

3.16.1 Local Economy

According to IMPLAN data for the year 2015 (the most current), economic activity in McKenzie County included 13,629 jobs (full- and part-time) (IMPLAN 2016). Total local personal income (including non-labor income) exceeded $1.1 billion, and the average household income was $173,165 (IMPLAN 2016). The largest employing industries, based upon percent of total employment, in McKenzie County were construction (19.5%), mining including oil and gas (14.9%), transportation and warehousing (13.7%), and government employment (13.2%); combined, these industry sectors total over 61 percent of total employment in the county (IMPLAN 2016). Jobs in the agriculture and retail trade industries comprised 10.8 percent of the total employment while accommodations/food service and wholesale trade comprised 8.2 percent in McKenzie County in 2015 (IMPLAN 2016). Given the growth in oil and gas development in the area, the industries with the most jobs makes sense. Construction is needed for new housing and commercial spaces as well as contributing to other infrastructure development for oil and gas development and production. Transportation is also a key component for continued oil and gas development and production to ensure the movement of oil and gas from the wells to processing facilities and then to market (Bangsund and Hodur 2017). Accommodations/food service, retail trade and wholesale trade are needed in order to provide the goods and services to the residents, businesses and visitors to the area. The historical rural agricultural nature of McKenzie County still contributes to the local culture and economy. Although farm employment has stayed relatively the same in 2015 as it was in 2010, due to the growth of jobs in other industries, the percent of total employment attributed to farm employment has decreased considerably from a high of almost eleven percent in 2010 to five percent in 2015 (Bureau of Economic Analysis 2016).

3.16.2 Leasing

Mineral rights can be owned by private individuals, corporations, Indian tribes, or by local, State, or Federal Governments. Typically companies specializing in the development and extraction of oil and gas lease the mineral rights for a particular parcel from the owner of the mineral rights. Federal oil and gas leases are generally issued for 10 years unless drilling activities result in one or more producing wells. Once production has begun on a Federal lease, the lease is considered to be held by production and the lessee is required to make royalty payments to the Federal Government. The extent to which leasing federal minerals administered by the BLM affects local communities depends on the number of acres leased, the number of wells drilled, and the amount of oil and gas produced by these wells. Information in Table 3.14.2 indicates that within the township that contains the parcel being offered in this lease sale 3,143 acres of federal oil and gas acres is currently leased and there are 5 federal oil wells and 17 private and state wells.

Leasing mineral rights for the development of Federal minerals generates public revenue through the bonus bids paid at competitive lease auctions and annual rents collected on leased parcels not held by production. Nominated parcels approved for oil and gas leasing are offered by the BLM at a minimum bid rate of $2.00 per acre at the competitive lease sale. In addition to bonus bids, lessees are required to pay rent annually until production begins on the leased parcel, or until the lease expires. These rent payments are equal to $1.50 an acre for the first five years and $2.00 an acre for the second five years of the lease. Additionally, Federal oil and gas production is subject to production taxes or royalties. The Federal oil and gas royalties on production from public domain minerals equal 12.5 percent of the value of production (43 CFR 3103.3.1).

A portion of the revenues collected by the Federal government is distributed to the state and counties. The amount that is distributed is determined by the federal authority under which the Federal minerals are being managed. Forty-nine percent of Federal revenue associated with from oil and gas from public domain lands are distributed to the state. Twenty-five percent of royalties and revenues associated with oil and gas development from Bankhead-Jones lands are distributed to counties of production. Distribution of federal royalties and leasing revenues to the state for oil and gas development on other federal acquired lands differs based upon the authority associated with those lands. Generally the federal revenue associated with oil and gas leasing and development that is received by the state and counties help fund traditional county functions such as schools, roads and other infrastructure, emergency services and administration. Specifically, the state of North Dakota distributes half of these revenues to school districts across the state (ND state code 15.1-27-25) while the other half is returned to the counties where the rental revenue was generated.

In addition to annual rents, federal oil and gas leases can generate a one-time lease “bonus” bid. The minimum competitive lease bid is $2.00 per acre; however, parcels in North Dakota often command bonus bids much higher. This is especially true for bonus bids in McKenzie County in recent years. Since January 2014 bonus bids have ranged from a low of $500 per acre to a high of $19,000 per acre with an overall average of $11,475 per acre.

Typically, federal oil and gas leases expire after 10 years unless the parcel contains one or more producing wells or is incorporated into an existing field through a communitization agreement. Once the leased parcel becomes associated with oil or gas production, the parcel is said to be held by production (HBP) at which time, annual rent on the land ceases and royalties are assessed at 12.5% of the value of production begin.

3.17 Special Designations

3.17.1 Theodore Roosevelt National Park

Theodore Roosevelt National Park (TRNP) is located in three units in western North Dakota encompassing more than 70,000 acres, and receives nearly 600,000 visitors each year. TRNP is managed to protect and interpret the ecosystem and cultural resources of the area. TRNP was established to memorialize Theodore Roosevelt for his contributions to conservation; conserve the scenery, natural, and cultural resources; and provide for the benefit and use of the public. The National Park Service TRNP General Management Plan guides management, use, and development of TRNP. The nominated lease parcel is located adjacent to Theodore Roosevelt

National Park, just north of Theodore Roosevelt Wilderness and the Buckhorn Trail. The types of public use at Theodore Roosevelt National Park include hiking, bicycling, kayaking/canoeing, cross-country skiing, snowshoeing, fishing, horseback riding, camping, and wildlife viewing. Benefits and experiences enjoyed by recreational users include opportunities for solitude, spending time with families, enhancing leisure time, improving sports skills, enjoying nature and physical exercise.

TRNP is also included in the North Dakota Industrial Commission Area of Interest, specifically two miles surrounding the park's exterior boundaries. Any application for a permit within the area of interest will comply with NDIC-pp 2.02 through NDIC-PP 2.04. Based on this policy the NDIC will post a notice with non-confidential permit application information allowing for public comments regarding such issues as access road and well location, reclamation plans and timing, noise, traffic, and visual impact mitigation. The NDIC may consider the comments for the purposes of attaching conditions to any permit pursuant to NDAC 43-02-02, 43- 02-02.2, 43-02-02.3, 43-02-02.4, 43-02-03 and 43-02-05 to mitigate impacts. The nominated lease parcel is located adjacent to the North Unit of the TRNP within two miles of the exterior boundary.

4.0 Environmental Impacts

4.1 General Impact Analysis Assumptions and Reasonably Foreseeable Development Scenario

This analysis is tiered to the final environmental impact statement (EIS) for the NDFO RMP. The analysis contained within that RMP/FEIS remains adequate. The RMP determined which areas are available for oil and gas leasing and under what conditions those leases are to be offered and sold.

This section organizes the resources as identified in Chapter 1.0, Section 1.5, Identified Relevant Issues and Resources, and compares the general current conditions to impacts between the alternatives. Mitigation and Best Management Practices described in Appendix C would apply to all alternatives and have been incorporated into the analysis as a means to reduce or eliminate adverse environmental impacts.

The act of leasing parcels would not directly impact the resources. The only direct impacts of leasing are creation of valid existing rights and revenue generated by the lease sale receipts.

Potential future impacts would result from any future developments if and when BLM receives an application for permit to drill (APD).

Upon receipt of an APD, the BLM would initiate a site-specific NEPA analysis with public review opportunities to analyze and disclose site-specific impacts of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of BMPs documented in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (USDI and USDA 2007), also known as the "Gold Book." The

BLM could also identify APD COAs, based on site-specific analysis that could include moving the well location, restrict timing of the project, or require other reasonable measures to minimize adverse impacts (43 CFR 3101.1-2 Surface use rights; Lease Form 3100-11, Section 6) to protect sensitive resources, and to ensure compliance with laws, regulations, and land use plans.

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

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

Reasonable Foreseeable Development

The RFD for this EA is based on information contained in the RFD developed in 2009 and revised in 2011 for the NDFO RMP. The RFD prepared for the NDFO RMP contains the number of possible oil and gas wells that could be drilled and produced in the NDFO area and used to analyze the possible number of wells drilled for the 1 nominated parcels. These well numbers are only an estimate based on historical drilling and geologic data.

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

Analysis Assumptions for Alternative B

The following assumptions are from the RFD developed for the NDFO RMP revision. The BLM administers approximately 324,269 acres of federal minerals (for fluid minerals) within the NDFO. The RFD forecasts and maps the oil and gas development potential in the North Dakota planning area.

A version of this map is reproduced with this EA as Map 4.1.1. For the RFD, very high potential forecasts more than 20 well pads per township; high potential forecasts 10 to 20 well pads per township; moderate potential forecasts two to 10 well pads per township; low potential forecasts one to two well pads per township; and very low potential forecasts less than one well per township over the life of the plan.

A coalbed natural gas (CBNG) play is assumed in the planning area in the Williston Basin. Pilot projects would contain 16 to 25 wells. A total of 150 wells are forecasted allowing for some exploration activity and preliminary development.

Directional and horizontal drilling has, in the past several years, become important in the planning area. Drilling depths (measured depth) are from 4,413 to 21,727 feet for oil wells and 4,173 to 19,954 feet for gas wells. However, most of the oil wells have a measured depth of between 13,000 and 16,000 feet, and the measured depths of gas wells are typically within the 13,000 to 16,000 foot range.

The majority of the oil and gas wells in the planning area have historically been drilled vertically. However, of the 2,983 wells spud in the planning area between January 1998 and December 2007, only 787 were vertical wells. Vertical well depths in North Dakota range from a few hundred feet in the northeast part of the study area to over 15,000 feet in the central Williston Basin. Disturbance projections from the RFD are presented in Tables 4.1.1 and 4.1.2. Measured depths in the southwest part of the state range from 1,300 feet to 9,500 feet.

Map 4.1.1 RFD Scenario for Development Potential

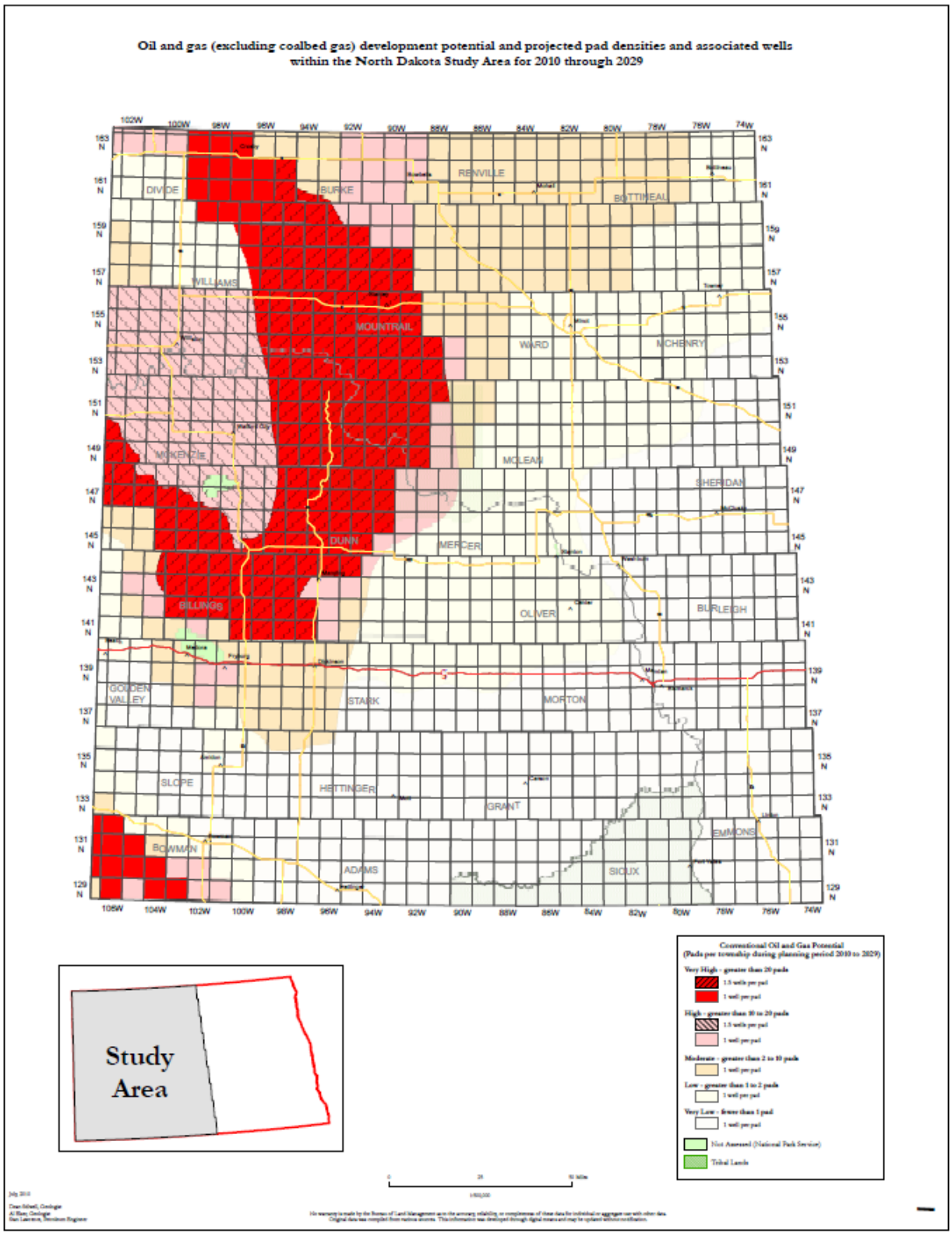


Table 4.1.1 Disturbance Associated With Existing Well Pads and Projected Active Well Pads for the Baseline Scenario (Short-Term Disturbance)

Well Pads			**Acres of Surface Disturbance**			
Type	**Total**	**BLM Managed**	**Access Roads**	**Well Pad**	**Total**	**BLM Managed**
New Exploratory and Development Coalbed Gas Well Pads (2010-2029)	150	7	0.6	0.5	165	8
New Exploratory and Development Gas Well Pads (2010-2029)	315	34	0.6	0.5	347	40
New Exploratory and Development Oil Well Pads; 1.5 wells/pad (2010-2029)	3,691	402	2.9	4.2	26,206	2,945
New Exploratory and Development Oil Well Pads 1.0 wells/pad (2010-2029)	2,609	284	2.9	4	18,002	2,023
Total New Exploratory and Development Well Pads	***6,765***	***727***			***44,720***	***5,017***
Existing Active Gas Well Pads (as of August 2010)	211	121	0.3	0.25	116	71
Existing Active Oil Well Pads (as of August 2010)	6,760	851	1.5	1.75	21,970	2,857
Total Existing and Projected Well Pads	***6,971***	***972***			***22,086***	***2,928***
Total Well Pads	**13,736**	**1,699**	**Total Short-Term Disturbance**		**66,806**	**7,945**

Table 4.1.2 Disturbance Associated With Existing Well Pads and Projected Producing Well Pads for the Baseline Scenario (Long-Term Disturbance)

Well Pads			**Acres of Surface Disturbance**			
Type	Total	BLM Managed	Access Roads	Well Pad	Total	BLM Managed
New Producing Coalbed Gas Well Pads (2010-2029)	135	6	0.3	0.25	74	4
New Producing Gas Well Pads (2010-2029)	293	21	0.3	0.25	161	12
New Producing Oil Well Pads; 1.5 wells/pad (2010-2029)	3,248	353	1.5	1.75	10,556	1,186
New Producing Oil Well Pads; 1.0 wells/pad (2010-2029)	2,035	221	1.5	1.75	6,614	743
Total New Producing Well Pads	*5,711*	*602*			*17,405*	*1,945*
Existing Active Gas Well Pads (as of August 2010)[1]	203	116	0.3	0.25	111	68
Existing Active Oil Well Pads (as of August 2010)[1]	5,881	740	1.5	1.75	19,114	2,486
Total Existing and Projected Well Pads	*6,084*	*857*			*19,225*	*2,554*
Total Well Pads	11,795	1458	Total Long-Term Disturbance		36,631	4,499
[1]minus abandonments during August 2010-December 2029 period						

New oil and gas wells projected to be drilled in the NDFO RFD from 2010 through 2029 total as many as 8,460 in the planning area. Up to 150 of these wells could be coalbed gas wells. Of the other remaining wells (those drilled in areas of very high, high or moderate potential areas) the majority are projected to be drilled in and around existing fields in the deeper portion of the Williston Basin and along the Cedar Creek anticline. Those wells drilled in areas of low or very

low potential are projected for areas generally not proven productive by historical drilling, but which still may contain hydrocarbons based on U.S. Geological Survey assessment data. The BLM component of oil and conventional gas activity within the RFD is expected to be approximately 11.4 percent of all activity.

No surface disturbance would occur as a result of issuing leases. For analysis purposes, the potential number of acres disturbed by exploration and development activities is shown in Tables 4.1.1 and 4.1.2. The potential acres of disturbance reflect acres typically disturbed by construction, drilling, and production activities, including infrastructure installation throughout the NDFO. Typical exploration and development activities and associated acres of disturbance were used as assumptions for analysis purposes in the EA. (Note: The assumptions were not applied to the No Action Alternative because the lease parcels would not be offered for lease; therefore, no wells would be drilled or produced on the lease parcels, and no surface disturbance would occur on those lands from exploration and development activities).

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 (40 CFR 1508.7). 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.

Past, present, or reasonably foreseeable future actions that have or could affect the same components of the environment as the Proposed Action in project area include mineral exploration and development, 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 a majority of the total land ownership in the project area.

4.2 Alternative A (No Action Alternative)

4.2.1 Direct and Indirect Impacts Common to All Resources

Under Alternative A, the 1 parcel, covering 120 surveyed Federal mineral acres (0 BLM administered surface and 120 surveyed State owned surface), would not be offered for competitive oil and gas lease sale. Under this alternative, the State and private minerals could still be leased in surrounding areas. Surface management would remain the same and ongoing oil and gas development would continue on surrounding Federal, private, and State leases.

There would not be new impacts from oil and gas exploration or production activities on the Federal lease parcel at this time. No additional natural gas or crude oil would enter the public markets, and no royalties or revenues would accrue to the Federal or State treasuries from the parcel lands.

4.3 Alternative B (Proposed Action)

Under Alternative B, the 1 lease parcel of Federal minerals for oil and gas leasing, covering 120 surveyed Federal mineral acres (0 surveyed BLM administered surface and 120 surveyed State surface) would be offered for competitive oil and gas lease sale. No parcel would be deferred.

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

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

For the purposes of this EA and based on the location of the parcel in the Williston Basin, any future development activity that would occur would probably be oil production. As defined under section 4.1, 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. Short-term disturbance would be 2.9 acres for access roads and flow lines and four acres per well pad. Long-term disturbance would be 1.5 acres for access roads and 1.75 acres per well pad. Many of the parcels would probably require the formation of a communitization agreement (CA) to facilitate development. A CA provides for the pooling of federal and/or Indian lands, with other lands, when separate tracts under such federal and Indian lands cannot be independently developed and operated in conformity with an established well-spacing program. Actual well drilling and surface disturbance activity may occur on fee or state lands, not on the federal lease parcels.

Cumulative Impacts Common to All Resources

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

4.3.1 Air Resources

4.3.1.1 Air Quality

Leasing the subject parcel would have no direct impacts on air quality. Any potential effects on air quality would occur if and when the lease is developed for oil and gas activities. The following paragraphs discuss the type of air emissions that could be expected from future oil and gas development as a result of the proposed lease sale including quantified estimates of potential downstream emissions of greenhouse gases (GHG) emissions and the possible relationship to climate change.

It is important to note that at the leasing stage, there is a high degree of speculation and uncertainty with regard to the amount of air pollutant emissions (including GHGs) that could occur since specific design details are not yet known. Therefore, the BLM may conduct additional analysis for air quality at the APD stage if development is proposed in the future. In addition, Lease Notice (LN 14-18) would be applied to the parcel included in this proposed lease sale for conservation of air resources.

When a development project is proposed, an emissions inventory is typically compiled to determine the magnitude of potential impacts to air quality and the pollutants of concern from the project. The type of petroleum product, depth of geologic play, drilling and completion methodology, equipment and vehicle make, model, engine size, project acreage, and construction plans are among several variables required to generate meaningful emissions estimates. These factors determine the intensity, duration, and characteristics of associated pollutants. Specifically, information needed to reasonably and more accurately quantify emissions associated with well exploration and production activities include:

- The number, type, and duration of equipment needed to construct/reclaim, drill and complete (e.g., scrapers, drill rigs, completions, supply trucks, compressor, and production facilities);
- The technologies which may be employed by a given company for drilling any new wells to reduce emissions (e.g. Selective Catalytic Reduction [SCR] on diesel powered drill rigs, natural gas fired drill rig engines, the use of “green” completion technology, and multi-stage flare stacks);
- Area of disturbance for each type of activity (e.g. roads, pads, pipelines, electrical lines, and compressor station);
- Compression per well (sales and field booster), or average horsepower for each type of compressor, if needed;
- Onsite gas and liquids treatment and storage equipment; and
- The number and type of facilities utilized for production operations.

These sources have the potential to release air pollutant emissions that contribute to ozone and haze formation or contribute to increased global concentration of GHGs. Air pollutants such as VOCs and HAPs may be emitted from venting, flaring, and equipment leaks. Combustion of fuels in vehicles, generators, engines, and compressors may release CO, NOx, PM_{10}, $PM_{2.5}$, SO_2, VOCs, HAPs and GHGs.

Table **4.3.1.1** shows a very course estimate of air emissions that could be emitted from wells associated with the potential RFD for this lease sale proposal. Calculations are based on typical

development and production scenarios within the Williston basin. The emissions estimates are provided to assess the magnitude of potential emissions and their potential impacts to air quality and do not reflect actual emissions from the lease sale.

Table 4.3.1.1 Estimated Air Emissions from Well Development and Production

County	# of wells	PM_{10}		$PM_{2.5}$		NOx		SOx	
	oil	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)
McKenzie	7	0.74	5.16	0.11	0.76	1.68	11.79	0.172	1.20
Total Estimated Emissions:			***5***		***1***		***12***		***1***

County	# of wells	CO		VOC		HAPs		GHGs (CO_{2eq})	
	oil	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)	Emission Factor[1] (tons/well)	Estimated Emissions (tons/yr)
McKenzie	7	1.14	7.99	16.13	112.91	0.11	0.79	686	4805.42
Total Estimated Emissions:			***8***		***113***		***1***		***4805***

The estimated annual emissions of criteria pollutants, VOCs, and HAPs from potential development on the proposed partial are minor and are unlikely to result in direct impacts to air quality associated with oil and gas development such as ozone formation or visibility degradation. However, in combination with nearby oil and gas sources and regional major sources of air pollutants, impacts to air quality and air quality related values could be measurable. The proposed parcel is located on the border of the north unit of the Theodore Roosevelt National Park. This area has shown evidence of being impacted by regional oil and gas development. In a recent study entitled *Oil and Gas Impacts on Air Quality in Federal Lands in the Bakken region: an overview of the Bakken Air Quality Study and First Results* (Prenni, 2016) researchers concluded that "…data from the study, along with long-term monitoring data, suggest that while power plants are still an important emissions source in the region, emissions from oil and gas activities are impacting ambient concentrations of nitrogen oxides and black carbon and may dominate recent observed trends in pollutant concentrations at some of the study sites. (Theodore Roosevelt National Park – north unit)…the data shown thus far suggest that emissions from oil and gas activities are impacting air quality in the region, raising ambient concentrations of VOCs, NOx , and EC (elemental carbon)."

4.3.1.2 Climate Change

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

emissions from parcel development has been provided, it is currently not possible to know with certainty the net impacts from lease parcel development on climate.

On January 2, 2011, the EPA began regulating GHG emissions under the Clean Air Act from mobile and stationary sources of air pollution because of their contribution to global climate change. While the leasing action itself would not generate any direct or indirect GHG emissions, the BLM recognizes that the reasonably foreseeable consequence of leasing may be oil and gas development, and that such development could result in an increase in GHG emissions due to the post production or "downstream" uses of the petroleum products produced from these parcels. For this EA, the BLM used readily available scientific information and reasonable assumptions about product end use to estimate potential downstream emissions attributable to this lease sale. It should be noted at the outset that the BLM does not exercise control over the specific end use of the oil and gas produced from any individual federal lease and has no authority to direct or regulate the end use of the produced products. As a result, the BLM can only provide an estimate of potential GHG emissions by assuming that all produced products would eventually be combusted. The uncertainty about end uses is in addition to the uncertainty with regard to the actual levels of development and production that may occur at any given well.

Table **4.3.1.2** shows an estimate of potential downstream GHG emissions using reasonable projections and assumptions. In this analysis it was assumed that 100% of oil and associated gas produced from the parcels included in this EA would be attributed to fossil fuel combustion within the United States for residential heating and electricity. Average oil and gas production rates for each county were obtained from the North Dakota RFD and State of North Dakota Division of Mineral Resources.

Table 4.3.1.2 Estimated Downstream GHG Emissions Due to Fossil Fuel Combustion

County	# of wells estimated for July Leasing EA		Ave oil prod. Rate (BBL/day/ well)	Ave. gas prod. Rate (MCF/day/ well)	CO_2 Combustion emission factor (g/MMBTU)	CH_4 Combustion emission factor (g/MMBTU)	N_2O Combustion emission factor (g/MMBTU)	CO_2 Emissions (metric tons)	CH_4 Emissions (metric tons)	N_2O Emissions (metric tons)	CO_2eq Million Metric Tons/Year (MMTY)
	oil	gas									
McKenzie	7	0	33	-	74,000	10	0.6	36,188	4.89	0.29	0.0364
Mckenzie	0	7	0	49	53,060	1	0.1	6,809	0.128	0.013	0.007
											0.0432

References: https://www.eia.gov/oiaf/1605/coefficients.html#tbl3 , https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf

The total projected increase in downstream GHG emissions is estimated to be 0.04 million metric tons (MMT) per year of carbon dioxide equivalents (CO2eq) if the lease parcels are sold and developed and if the number of wells projected in the RFD produce oil and gas at a production rate similar to other wells in the associated fields. Lastly, the estimated downstream GHG emissions increase is based on 100% of the estimated production and associated gas being combusted for residential use. According to the USEPA, this estimated quantity represents approximately 0.001% of total U.S. GHG emissions reported in 2015 and 0.12% of North Dakota GHG emissions reported in 2015, and this quantity represents approximately 8.5% of the reported GHG emissions in McKenzie county (https://ghgdata.epa. gov/ghgp/main.do). The estimated quantity of GHG emissions from the combustion of fossil fuels that could be produced from the proposed lease sale parcels is approximately equivalent to the GHG emissions from

9,254 cars or the CO_2 emissions from the energy used in 4,666 homes (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator).

At this time, the BLM is disclosing the likelihood and potential magnitude of downstream GHG emissions but is not able to disclose potential impacts to climate change from the estimated downstream GHG emissions related to the proposed lease sale. The inconsistency in results of scientific models used to predict climate change at the global scale, coupled with the lack of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level. It is therefore beyond the scope of existing science to relate a specific source of GHG emission 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 GHG emissions resulting from a particular activity might have on the environment. Analysis of impacts at this leasing stage would be speculative and would be not be based "reasonable projections and assumptions".

4.3.1.3 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. The North Dakota Resource Management Plan and Environmental Impact Statement, July 1987 includes the following measures for the protection of air resources:

- Flaring must be approved in writing by the BLM District Manager and be in compliance with all other provisions of Notice to Lessee-4A (NTL-4A),
- Gas may be vented or flared during emergencies, well evaluation, or initial production tests for a time period of up to 30 days or the production of 50
- Should air quality date from research projects, specific environmental documents, or ongoing monitoring indicate unacceptable air quality resulting from flaring, newly completed oil and gas wells will be reviewed to determine the feasibility of hook-up to a gas gathering system.

In addition, Lease Notice (LN 14-18) would be applied to all parcels included in this proposed lease sale for conservation of air resources. The lease notice states, "The lessee/operator is given notice that prior to project-specific approval, additional air resource analyses may be required in order to comply with the NEPA, FLPMA, and/or other applicable laws and regulations. Analyses may include equipment and operations information, emission inventory development, dispersion modeling or photochemical grid modeling for air quality and/or air quality related value impact analysis, and/or emission control determinations. These analyses may result in the imposition of additional project-specific control measures to protect air resources. One or more of the following measures could be imposed at the development/APD stage if additional analysis showed the potential for significant impacts to air quality:

- Emission control equipment with minimum 95 percent volatile organic compound (VOC) control efficiency on petroleum storage tank batteries;

- Low-emitting drill rig engines, such as Tier 4 diesel engines or natural gas or electric drill rig engines;
- Gas or electric turbines for compression rather than internal combustion engines;
- Replacement of older internal combustion engines with low-emitting engines that meet EPA New Source Performance Standards;
- Water or chemical suppressant application and reduced speed limits to control fugitive dust emissions;
- Multi-well pads to reduce surface disturbance and traffic;
- Replacement of diesel-fired pump jack engines with electrified engines;
- Reinjection of waste gas into no-producing wells or other underground formations; and
- Forward looking infrared (FLIR) technology to detect fugitive VOC and methane emissions and repair leaking equipment quickly,
- Additional technologies for reducing methane emissions as recommended by EPA's natural gas STAR program.

Any oil and gas operations on the subject lease parcel would also be required to comply with air emission control measures required by the state of North Dakota Industrial Commission (NDIC), NDDOH, and EPA. As of June 1, 2014, the North Dakota Industrial Commission (NDIC) adopted a new policy, which was revised on September 24, 2015, Order 24665, for reducing gas flaring. This requirement is for all wells which will be drilled in the Bakken, Three Forks, and Three Forks/Bakken or Sanish Pools. The policy requires that a Gas Capture Plan (GCP) must accompany all APDs submitted to NDIC. The GCP has various requirements that must be met by prior to approval of an APD. These plans aim to ensure that all options for capturing gas are fully evaluated before a well is drilled.

4.3.2 Soil Resources

Surface use activities associated with oil and gas exploration and development could cause surface disturbances. Such acts result in reduced ground cover, soil mixing, compaction, or removal, exposing soils to accelerated erosion by wind and water, resulting in the irretrievable loss of topsoil and nutrients and potentially resulting in mass movement or sedimentation. Surface disturbances also change soil structure, heterogeneity (variable characteristics), temperature regimes, nutrient cycling, biotic richness, and diversity. Along with this, mixed soils have decreased bulk density, and altered porosity, infiltration, air-water relationships, salt content, and pH (Perrow and Davy, 2003; Bainbridge 2007). Soil compaction results in increased bulk density, and reduced porosity, infiltration, moisture, air, nutrient cycling, productivity, and biotic activity (Logan 2001; 2003; 2007). Altering such characteristics reduces the soil system's ability to withstand future disturbances (e.g., wildfire, drought, high precipitation events, etc.). The probability and magnitude of these effects are dependent upon local site characteristics (e.g., reclamation suitability), climatic events, and the specific mitigation applied to the project.

Measures would be taken to reduce, avoid, or minimize potential impacts to soil resources from exploration and development activities. Prior to authorization, proposed actions would be evaluated on a case-by-case basis and would be subject to mitigation measures in order to maintain the soil system. Mitigation could include avoiding areas poorly suited to reclamation,

limiting the total area of disturbance, rapid reclamation, erosion/sediment control, soil salvage, decompaction, revegetation, weed control, slope stabilization, surface roughening, and fencing. Areas poorly suited to reclamation would require unconventional and/or site-specific reclamation measures.

4.3.3 Water Resources

No impacts to water resources would occur as a result of offering leases for sale. The magnitude of the impacts to water resources would be dependent on the specific activity, season, proximity to waterbodies, location in the watershed, upland and riparian vegetation condition, effectiveness of mitigation, and the time until reclamation success. Surface disturbance impacts typically are localized, short-term, and occur from the time of implementation through vegetation reestablishment. As acres of surface-disturbance increase within a watershed, so would the potential impacts on water resources.

Oil and gas exploration and development of a lease parcel could cause the removal of vegetation, soil compaction, and soil disturbance in uplands within the watershed, floodplains of streams and rivers, waterbodies, and riparian and wetland areas. The potential impacts from these activities would be accelerated erosion, increased overland flow, decreased infiltration, increased water temperature, channelization, and water quality degradation associated with increased sedimentation, turbidity, nutrients, metals, and other pollutants. Erosion potential could be further increased in the long term by soil compaction and low permeability surfacing (e.g., roads and well pads) which increases the energy and amount of overland flow and decreases infiltration, which in turn changes flow characteristics, reduces groundwater recharge, and increases sedimentation and erosion.

In the event of exploration or development, measures would be taken to reduce, avoid, or minimize potential impacts to water resources including application of appropriate mitigation (Appendix C). Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control non-native species, and expedite rapid reclamation (including interim reclamation) would maintain water resources.

Methods to reduce erosion and sedimentation could include: reducing surface disturbance acres; installing and maintaining adequate erosion control; proper road design, road surfacing, and culvert design; road/infrastructure maintenance; use of low water crossings; and use of isolated or bore crossing methods for waterbodies and floodplains. In addition, applying mitigation to maintain adequate, undisturbed, vegetated buffer zones around waterbodies and floodplains could reduce sedimentation and maintain water quality. Site-specific mitigation and reclamation measures would be described in the COAs.

Groundwater

Spills or produced fluids could have long-term impacts to surface and ground water resources. Oil and gas exploration/development could potentially contaminate aquifers with salts, drilling fluids, fluids and gases from other formations, detergents, solvents, hydrocarbons, metals, and nutrients; change vertical and horizontal aquifer permeability; and increase hydrologic communication with adjacent aquifers (EPA 2004). Groundwater

removal could result in a depletion of flow in nearby streams and springs if the aquifer is hydraulically connected to such features. Typically, produced water from conventional oil and gas wells is from a depth below useable aquifers or coal seams (FSEIS 2008).

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

Known water bearing zones in the lease area are protected by drilling requirements and, with proper practices, contamination of ground water resources is highly unlikely. Onshore Order #2 requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, and casing along with cement is extended well beyond fresh-water zones to insure that drilling fluids remain within the well bore and do not enter groundwater. Appropriate well completion, the use of Spill Prevention Plans, and Underground Injection Control regulations would mitigate groundwater impacts.

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

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

4.3.4 Vegetation Resources

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

Impacts to vegetation depend on the vegetation type/community, soil community and the

topography of the lease parcels. Disturbance to vegetation is of concern because protection of soil resources, maintenance of water quality, conservation of wildlife habitat, and livestock production capabilities could be diminished or lost over the long-term through direct loss of vegetation (including direct loss of both plant communities and specific plant species).

Other direct impacts, such as invasive species invasion, could result in loss of desirable vegetation. Invasive species and noxious weeds could also reduce livestock grazing forage, wildlife habitat quality, and native species diversity. In addition, invasive species are well known for changing fire regimes.

Additionally, surface disturbing activities directly affect vegetation by destroying habitat, churning soils, impacting biological crusts, disrupting seed banks, burying individual plants, and generating sites for competitive species. Other vegetation impacts could also be caused from soil erosion and result 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 affected.

Fugitive dust generated by construction activities and travel along dirt roads could affect nearby plants by depressing photosynthesis, disrupting pollination, and reducing reproductive success. Oil, fuel, wastewater or other chemical spills could contaminate soils as to render them temporarily unsuitable for plant growth until cleanup measures were fully implemented. If cleanup measures were less successful, longer term vegetation damage could be expected.

Oil and gas development activity could reduce BLM's ability to manage livestock grazing while meeting or progressing towards meeting the Standards of Rangeland Health. Development and associated disturbances could reduce available forage or alter livestock distribution leading to overgrazing or other localized excess grazing impacts. Construction of roads, especially in areas of rough topography could cause significant changes in livestock movement and fragment suitable habitat for some plant communities.

4.3.5 Riparian-Wetland Habitats

Leasing the parcels would have no direct impacts on riparian-wetland habitats. Any potential effects on riparian-wetland habitats from sale of lease parcels would occur at the time the leases are developed. The exploration and development of oil and gas within uplands or adjacent to riparian-wetland areas could reduce riparian/wetland functionality by changing native plant productivity, composition, richness, and diversity; accelerating erosion; increasing sedimentation; and changing hydrologic characteristics. Impacts that reduce the functioning condition of riparian and wetland areas would impair the ability of riparian/wetland areas to reduce nonpoint source pollution (MDEQ 2007) and provide other ecosystem benefits. The magnitude of these effects would be dependent on the specific activity, season, proximity to riparian-wetland areas, location in the watershed, upland and riparian-wetland vegetation condition, mitigation applied, and the time until reclamation success. Erosion increases typically are localized, short term, and occur from implementation through vegetation reestablishment. As acres of surface-disturbance increase within a watershed, so would the effects on riparian-wetland resources.

Stipulations addressing steep slopes, waterbodies, streams, 100-year floodplains of the Yellowstone and Missouri Rivers, riparian areas, and wetlands would minimize potential impacts and would be included with the lease when necessary (refer to Appendix A). In the event of exploration or development, site-specific mitigation measures would be identified which would avoid or minimize potential impacts to riparian-wetland areas at the APD stage. Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, maintain biodiversity, maintain vegetated buffer zones, and expedite rapid reclamation (including interim reclamation) would maintain riparian/wetland resources.

4.3.6 Special Status Species

The use of standard lease terms and stipulations on the nominated parcel (refer to Appendix A) would minimize, but not preclude impacts to wildlife. Oil and gas development which results in surface disturbance could directly and indirectly impact terrestrial wildlife species. These impacts could include loss or reduction in suitability of habitat, improved habitat for undesirable (non-native) competitors, species or community shift to species or communities more tolerant of disturbances, nest abandonment, mortalities resulting from collisions with vehicles and power lines, electrocutions from power lines, barriers to species migration, habitat fragmentation, increased predation, habitat avoidance, and displacement of wildlife species resulting from human presence. The scale, location, and pace of development, combined with implementation of mitigation measures and the specific tolerance of the species to human disturbance all influence the severity of impacts to wildlife species and habitats, including Threatened, Endangered, Candidate, Proposed, and other special status species.

4.3.7 Wildlife

Although there is no direct, indirect or cumulative impacts to wildlife resources associated with the offering of the proposed parcel. Lease holders will be subject to further NEPA analysis at the project level once an APD or NOS is submitted for a proposed action. It is reasonable to assume based on the RFD the nominated parcel would be developed in the future and potential impacts are discussed below.

Whooping Crane

The nominated parcel occurs in the whooping crane migratory corridor through central and western North Dakota. BLM has determined that the act of issuing leases within the whooping crane migration corridor will not affect the whooping crane. The nominated parcel lacks any roosting or feeding habitat so it is extremely unlikely that whooping cranes would utilize the parcel. However, impacts to whooping cranes are possible from oil and gas development activities associated with the parcel that may be permitted pending future BLM decision-making and NEPA analysis. At this time, stipulations are limited to protect any known whooping crane migration staging areas.

Therefore, if development of the lease is associated with known whooping crane feeding/staging/resting areas is proposed and an effect determination is made, BLM would work with the USFWS pursuant to section 7(a)(2) of ESA, if warranted. An outcome of the consultation process may be that conditions of approval are attached to the permit or the permit

may not be approved. Other BMP's would also be developed through consultation, including minimizing disturbance, adherence to Avian Powerline Interaction Committee (APLIC) guidelines, and others as deemed appropriate.

Dakota Skipper Butterfly
BLM has determined the act of issuing a lease on the nominated parcel within McKenzie County will not affect the skipper due to the lack of native prairies and associated plants needed for the survival of the species. In addition no Dakota Skipper habitat is associated with the proposed action so there will be no effect to any designated critical habitat. At this time, stipulations are limited to protect any known skipper habitats.

If development of these leases in known skipper areas is proposed, BLM would work with the USFWS pursuant to section 7(a)(2) of ESA if warranted. An outcome of the consultation process may be that conditions of approval are attached to the permit or the permit may not be approved. Other BMP's would also be developed through consultation, including minimizing disturbance, adherence to conservation plans and others as deemed appropriate.

Long Eared Bat
Northern long-eared bats are not known to occur on the proposed lease parcel; however, there are documented occurrences near Killdeer, North Dakota. Areas of the Hells Creek Formation in the badlands of western ND could provide cave-like cracks and crevices that may provide suitable winter hibernacula. Trees with a DBH greater than 3 inches may provide potential summer roosting habitat.

The leasing action will have no effect on the Long Eared Bat, however with further inventories suitable and or potentially suitable habitat maybe identified in western North Dakota. Therefore should wildlife inventories reveal habitat and the presents of the myotis at the APD stage of development consultation with USFWS would be initiated. Conditions of Approval would be applied for the protection of habitat to ensure there would be no measurable direct negative effect to the Long Eared Bat.

Impacts from the Proposed Action on general wildlife species encountered in the analysis area could consist of any number of acres depending on the development proposed by the future lease holder. Surface disturbance could result in the direct loss of habitat elements such as groundcover and trees, which could cause a decrease in available forage and cover for certain species (e.g., birds) and an increase in predation on small mammal species. Effects on wildlife from human activity and noise during construction and drilling operations could consist of stressors such as auditory and visual disturbances to individual wildlife present in or near the tract. Some individuals would likely leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat-use patterns. Vehicle use associated with construction and drilling operations could result in an increased risk of vehicle-animal collisions and general displacement of individual animals.

General wildlife species' population viability (e.g., squirrels, raccoons, and foxes) is unlikely to be affected because of the relatively small percentage of surface disturbance in the analysis area and the ability of individuals to move into adjacent habitat as needed to avoid the disturbance.

Impacts to macroinvertebrates, mollusks, and amphibians would be similar to those described

above. No fish would be impacted by the Proposed Action.

Impacts to big-game species would be the same as those described above for general wildlife. In addition mule deer, elk and white-tailed deer along with pronghorn antelope could be displaced by construction activities, subsequent drilling activities along with production. Human activity and noise would cause some individual game species to leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat-use patterns. Added stress could occur from physiological excitement as a result of foreign activities and could result in food intake disruptions as well as an extra expenditure of calories to avoid disturbance. This added stress could reduce energy stores at the expense of growth and reproduction thus resulting in a lower population level. In addition, overall habitat change could cause individuals to select suboptimal habitats.

Impacts to migratory birds and raptors (and on game birds) from the Proposed Action, if developed, could consist of those described for general wildlife. More specifically, impacts to migratory birds could include a loss of habitat due to vegetation removal. Impacts could also include the displacement of individual birds, the abandonment of nests during breeding seasons because of human activity and noise, a temporary relocation of prey from the parcel because of these factors, and potential mortality from vehicular collisions.

Impacts on North Dakota species of conservation priority from the Proposed Action would be the same as those described for general wildlife, including habitat disturbance and removal, injury or mortality, and exposure to human activity and noise.

Short- and long-term impacts to all wildlife would be minimized through interim and final reclamation, which would return the tract to approximate pre-development condition.

4.3.8 Cultural Resources

The transfer, lease, or sale of property can only affect significant cultural, scientific, or historic resources when the transfer out of Federal ownership or control occurs without adequate and legally enforceable restrictions or conditions. The purchaser of a lease is entitled to develop the parcel consistent with lease stipulations, but must have an approved Application for Permit to Drill (APD), including a plan of operations, before ground disturbing activities can begin. Leasing the parcel will have no direct or indirect impacts on cultural resources because the BLM will not approve any ground disturbing activities that may affect such properties or resources until it completes its obligations under applicable requirements of the National Historic Preservation Act and other authorities (Lease Stipulation 16-1).

Any potential effects from the sale of leases would occur at the time the leases are developed and the drilling of federally owned minerals requires an Application for a Permit to Drill (APD). When an APD is received, the North Dakota Field Office defines the area of potential effects (APE) and assesses the proposed undertaking's effect on cultural resources and historic properties as per Section 106 of the National Historic Preservation Act (NHPA). NHPA requires the BLM to identify historic properties within the APE and make a "reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey" (36 CFR 800.5(b)). If cultural resources are identified within the APE, the BLM will evaluate the resource's significance and determine if the resource is eligible for listing on the National Register of Historic Places. If a historic property will be adversely affected by the proposed undertaking, the BLM and consulting parties will develop appropriate mitigations measures.

The potential impacts of approving an APD are caused by the surface disturbing activities associated with exploration and development. The act of drilling a well, and the construction of a well pad, have the potential to alter the characteristics of a significant cultural or historic property by causing destruction, damage or alterations that diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. The permitted surface disturbing activities can also impact a historic property by introducing visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

The approval of an APD can indirectly impact a significant cultural resource or historic property by approving a project that increases soil erosion or causes change in traffic patterns which increase the likelihood of looting and vandalism. Climate change can also have an effect on cultural resources by changing the frequency and severity of natural events, such as heavy rain and wildfires (Agee 1993; Maslin 2004). For example, severe storms can increase the likelihood of flooding and soil erosion which expose and displace scientific data. Wildfires can affect the morphology of artifacts through fracturing and discoloration, which can reduce an artifact's ability to render information about the past (Winthrop 2004). Wildfires can also destroy organic materials such as bone, wood, and pollen that provide information about past environments and subsistence.

Under the BLM proposed Alternative B, one lease parcel totaling 120 acres would be offered with RMP lease stipulations and /or lease notices as necessary for competitive oil and gas lease sale and lease issuance (Appendix A). No known cultural heritage sites are located within the parcel acreage, and only seven resources are known within a one mile radius.

Though no known historic properties are located within a one-mile radius of the Lease Parcel, development of the lease has the potential to introduce visual, atmospheric, and audible elements that could adversely affect the eligibility of sites identified in the future.

Mitigation of Surface Disturbance

To ensure that the sale of lease parcels NDM102757-T retains adequate and legally enforceable restrictions and conditions, it is recommended that sale includes Lease Notice 14-2 and Cultural Resource Stipulation CR 16-1. See Appendix A for the Lease Parcel Summary Table and Appendix B for description of Lease Stipulations. In addition to specific lease stipulations, it is recommended that the BLM embraces the spirit of the North Dakota State Historical Society's recommendation, by ensuring that the area of potential effects is surveyed for cultural resources before the approval of any ground disturbance (ND SHPO Ref 17-1347).

As per Cultural Resource Stipulation CR 16-1, the BLM may require modification to exploration or development proposals to protect cultural resources. In most situations, direct impacts to cultural resources can be avoided by project redesign and/or the relocation of the surface disturbing activities (e.g., roads, well pads and pipelines, etc.). It should be noted that BLM, in consultation with the participants defined in 36 CFR 800.2, has discretional control over mitigation measures imposed on a project. Although a lessee has a right to develop a lease, BLM may require specific mitigation measures, including but not limited to, site avoidance,

excavation, or data recovery. Mitigation measures would be developed on a site-specific basis and in consultation with the participants defined in 36 CFR 800.2.

4.3.9 Native American Religious Concerns

The transfer, lease, or sale of property can only affect areas of religious or cultural significance to Indian tribes when the transfer out of Federal ownership or control occurs without adequate and legally enforceable restrictions or conditions. The purchaser of a lease is entitled to develop the parcel consistent with lease stipulations, but must have an approved Application for Permit to Drill (APD), including a plan of operations, before ground disturbing activities can begin. Leasing the parcels would have no direct or indirect impacts on areas of religious or cultural importance, would not interfere with the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act (AIRFA) or EO 13007, and would not prevent Indian tribes from visiting sacred sites or prevent possession of sacred objects.

The potential impacts of approving an APD are caused by the surface disturbing activities associated with exploration and development. The drilling of a well and the construction of an oil well pad have the potential to negatively affect properties of religious or cultural significance. In addition, the introduction of a well pad and the hazards associated with oil extraction may interfere with the performance of traditional ceremonies and rituals pursuant to the AIRFA. The construction of an oil well pad may also limit access to sacred sites or prevent possession of sacred objects.

The approval of an APD can indirectly impact properties of religious or cultural significance by approving a project that increases soil erosion or causes change in traffic patterns which increase the likelihood of looting and vandalism.

Under the BLM proposed Alternative B, one lease parcel totaling 120 acres would be offered with RMP lease stipulations and /or lease notices as necessary for competitive oil and gas lease sale and lease issuance (Appendix A).

To ensure that the sale of lease parcels NDM102757-T retains adequate and legally enforceable restrictions and conditions, it is recommended that Lease Notice 14-2 and Cultural Resource Stipulation CR 16-1 be applied to the parcel. See Appendix A for the Lease Parcel Summary Table and Appendix B for description of Lease Stipulations. In addition to specific Lease Stipulations, it is recommended that the BLM complies with the State Historical Society's recommendation that the lease parcels be surveyed for cultural resources prior to ground disturbance (ND SHPO Ref 17-1347).

As per Lease Notice 14-14, the BLM may require the operator to implement specific measures to reduce impacts of oil and gas operations on historic properties, including properties of traditional religious and cultural importance to an Indian tribe (36 CFR 800.16(l)(1)). These measures may include, but are not limited to, project design, location, painting and camouflage. To ensure that visual impacts are considered, it is recommended at the APD stage, that a viewshed analysis be conducted and that measures are employed to mitigate the introduction of visual elements prior to the approval of any APD.

In addition, the application of Cultural Resources Lease Stipulation 16-1 ensures that BLM's obligations under NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, and other statutes as applicable will be met. As per Cultural Resource Stipulation CR 16-1, the BLM may require modification to exploration or development proposals to protect cultural resources. In most situations, direct impacts to cultural resources, including properties of traditional religious and cultural importance to an Indian tribe, will be avoided by project redesign and/or relocating the surface disturbing activities (e.g., roads, well pads and pipelines, etc.). It should be noted that BLM, in consultation with the participants defined in 36 CFR 800.2, has discretional control over mitigation measures imposed on a project. Though a lessee has a right to develop a lease, BLM may require specific mitigation measures, including but not limited to, site avoidance, excavation, or data recovery. Mitigation measures would be developed on a site-specific basis and in consultation with the participants defined in 36 CFR 800.2.

Lastly, when there is a reasonable indication of tribal concerns in the area in question based on previous correspondence or discussions with tribal governments, published ethnographic studies, or other credible known information, BLM Washington Office Instruction Memorandum 2005-003 requires that additional consultation occurs at the APD stage on a case-by-case basis.

4.3.10 Paleontology

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

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

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

The application of lease terms, including the paleontological no surface occupancy stipulation (NSO 11-12), and the paleontological lease notices (LN 14-3 and LN 14-12) at leasing, provides protection to paleontological resources during development. The paleontological lease notice LN 14-12 is applied to those lease parcels that fall within geological units with a PFYC Class of 3 or higher, requiring professional assessment, which may include a field survey, prior to surface disturbance. The results of the assessment and survey by a BLM-permitted paleontologist will serve as the basis for a mitigation plan during development. If the inventory resulted in the identification of paleontological resources, mitigation measures such as avoidance or salvage might be indicated.

Specific mitigation measures could include, but are not limited to, site avoidance, salvage of discovered resources, professional monitoring, and the adoption of an Unanticipated Resource Discovery Plan. Avoidance of paleontological properties would be a best management practice. However, should a paleontological locality be unavoidable, significant fossil resources must be mitigated (salvaged) prior to implementation of a project. Depending upon the rock unit involved professional monitoring by a BLM-permitted paleontologist may be required during ground disturbing activities. Also, during surface disturbance significant fossil resources could be discovered in areas that had not been surveyed prior to disturbance. Those resources must also be reported and professionally mitigated, so to limit delays in the project an approved Unanticipated Resource Discovery Plan should be developed that outlines the steps to take in the event fossils are discovered. These mitigation measures and contingencies would be determined when site specific development proposals are received.

In order to protect paleontological resources, the parcel is recommended to have the Paleontological lease notice 14-12 applied per guidance identified in IM 2016-124 and MT-2016-042. No parcels are recommended for the no surface occupancy lease stipulation (NSO 11-12) based upon paleontological resources.

4.3.11 Visual Resources

The issuance of leases would not directly impact Visual Resources. Any potential impacts from the sale of leases could occur at the time the leases are developed. Development of a lease parcel could result in some level of modification to the existing landscape at the time of development.

Short-term impacts are those that would affect visual resources for fewer than five years; long-term impacts would affect visual resources for more than five years. The potential direct adverse impacts to visual resources would include the visual contrasts created by construction equipment, pipelines, well pads, temporary and permanent access roads, and other forms of infrastructure associated with exploration and development. Drilling rigs and equipment, vehicles, development infrastructure, and surface disturbance would impact an area's scenic quality and appearance of naturalness with form, color, and linear contrasts.

While VRM classifications are not assigned in the current Resource Management Plan and are only applied to BLM surface, new oil and gas development would implement, as appropriate for the site, BMP's to maintain visual qualities where possible. This includes, but would not be limited to, proper site selection, reduction of visibility, minimizing disturbance selecting color(s)/color schemes that blend with the background and reclaiming areas that are not in active use. Repetition of form, line, color and texture when designing projects would reduce contrasts between landscape and development.

Oil and gas development and production as described in the proposed action may be within line-of-sight from points within Theodore Roosevelt National Park. Development may cause potential impacts to the National Park and visitors. Impacts could include reduction or alteration of current viewsheds and dark night skies. Impacts would be minimized by implementing BMPs to maintain visual qualities where possible. Potential BMPs could include but would not be limited to, limiting lighting to that needed for safety, use of best available technology to reduce

artificial sky glow, light only where and when needed, use shielded lights to direct light downward, use of warm light (avoid blue/white light), and avoid unnecessary flaring of gas. The use of visual screens or enclosed combustion chambers could be evaluated to minimize impacts of flaring if flaring is requested and approved. Layout of development could take into consideration topography and vegetation as visual shield to minimize impacts.

The application of standard lease stipulation 16-3 would be sufficient at the leasing stage to notify operators that additional measures may be necessary to reduce visual impacts from future development.

4.3.12 Recreation and Travel Management

The issuance of leases would have no direct impacts on recreation and travel management. Any potential impacts from the sale of leases could occur at the time the leases are developed.

Recreation indirect impacts could exist where oil and gas development and recreational user conflicts could occur. More specifically, in areas of high oil and gas development potential, there could be user conflicts between motorized recreationists (OHV activities), hunting, target shooting, camping, fishing, river use, picnicking, and winter activities (e.g., snowmobiling) and associated oil and gas activities. These impacts could exist in both the short-term (exploration and construction phases of oil and gas development) and in the long-term (producing wells, maintenance of facilities, etc.). Oil and gas wells, equipment, and facilities could affect the general solitude (space and noise) and scenic value of the area.

Areas frequented by recreationists, where there is other land use activities occurring, in addition to oil and gas development, the public could perceive these areas as inaccessible or unavailable because of the existing facilities. As oil and gas development occurs, new routes are created which often attract recreationists seeking additional or new areas to explore for motorized recreational opportunities. Motorized recreational opportunities could be enhanced through the additional opportunities to explore; however, user conflicts and public safety issues could result from the use of the new travel routes. The creation of routes from oil and gas activities could lead to a proliferation of user-created motorized routes, resulting in adverse impacts to the scenic qualities of the area and increased level of surface disturbance.

Foreseeable changes in recreation use levels would be an increase on the demand for recreational use of public land. Increases could be expected in, but not limited to, hunting, fishing, hiking, camping, wildlife viewing, and dispersed recreational uses. This could increase the incidence of conflict between recreationists involved in motorized activities and non-motorized activities.

4.3.13 Fluid Minerals

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

Hydraulic fracturing (known as “fracking” in the oil and gas industry) is a process that uses high pressure pumps to develop pressure at the bottom of a well to crack the hydrocarbon formation. This aids extraction of oil and gas deposits that might be left behind by conventional oil and gas drilling and pumping technology. Hydraulic fracturing (HF) is a 60-year-old process that is now

being used more commonly as a result of advanced technology. Wells are often treated during completion to improve the recovery of hydrocarbons by increasing the rate and volume of hydrocarbons moving from the natural oil and gas reservoir into the wellbore. These processes are known as well-stimulation treatments, which create new fluid passageways in the producing formation or remove blockages within existing passageways. They include fracturing, acidizing, and other mechanical and chemical treatments often used in combination. The results from different treatments are additive and complement each other. This makes it possible to introduce fluids carrying sand, walnut hulls, or other small particles of material into the newly created crevices to keep the fractures open when the pressure is relieved. This process increases the flow rate and volume of reservoir fluids that move from the producing formation into the wellbore. The fracking fluid is typically more than 99 percent water and sand, with small amounts of readily available chemical additives used to control the chemical and mechanical properties of the water and sand mixture.

North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division, is responsible for the **e**nforcement of laws, rules, and regulations dealing with conservation of oil and gas. In the North Dakota Century Code, (effective April 1, 2012) NDCC 38-08-04, chapter 43-02-03, it states the commission, its agents, representatives, and employees are charged with the duty and obligation of enforcing all rules and statutes of North Dakota relating to the conservation of oil and gas.

Regarding HF stimulation, at chapter 43-02-03-27.1 there is a detailed discussion of HF stimulation performed through a frac string run inside the intermediate casing string. It outlines the depth at which the frac string must stung or run, pressurization and monitoring during frac operations; pressure relief valves on the treating line to limit the volume of flowback fluid; diversion lines from intermediate casings to a pit or containment vessel in case of frac string failure; remote operated frac valve between the treating line and the wellhead; posting on fracfocus chemical disclosure registry website.

The chapter continues with a discussion of HF stimulation performed through an intermediate casing string and gives criteria when a frac string must by run inside the intermediate casing. It details the maximum treating pressure; depth for verification of wall thickness of the intermediate casing and visual inspection with photographs of the top joint of the intermediate casing and wellhead flange; depth for verification of cementing of the intermediate casing; depth, duration, and criteria of pressure testing; criteria when a wellhead and blowout preventer system must be used; pressure relief valves on the treating line to limit the volume of flowback fluid; diversions lines from intermediate casings to a pit or containment vessel in case of frac string failure; remote operated frac valve between the treating line and the wellhead; posting on fracfocus chemical disclosure registry website.

Finally, the chapter discusses the measuring the pressure in the intermediate casing-surface casing annulus. If the pressure exceeds three hundred fifty pounds per square inch, the owner or operator notifies the director as soon as practicable following the incident.

To ensure that HF is conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance on Federal

public lands. Operators must submit Applications for Permit to Drill (APDs) to the agency. Prior to approving an APD, the BLM identifies all potential subsurface formations that will be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures.

Once the geologic analysis is completed, the BLM reviews the company's proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist and all known or anticipated zones with potential risks.

Before HF takes place, (in accordance with State of North Dakota law) all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface. The cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation. If the fracturing of the well is considered to be a "non-routine" fracture for the area, the BLM will always be onsite during those operations as well as when abnormal conditions develop during the drilling or completion of a well.

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 such as no surface occupancy 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 such as timing limitations and controlled surface use stipulations may result in similar but reduced impacts and delays in operations and uncertainty on the part of operators regarding restrictions.

Under the Proposed Action, the lease parcel area would be recommended for oil and gas leasing at this time. 100 percent of the areas would be offered for lease subject to major constraints. No parcels would be offered for lease subject only to standard terms and conditions.

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.

4.3.14 Social Conditions and Environmental Justice

Leasing the parcels would have minimal to no direct or indirect impacts on social conditions and environmental justice populations. Any potential direct, indirect and cumulative effects from the sale of leases would occur at the time the leases are developed. The pace and scale of oil and gas development can be of concern to local communities. Rapid development can drive important social changes due to the influx of people to these areas who find employment in the oil and gas industry and ancillary service industries. Rapid population growth for unprepared communities can cause stress on community resources such as educational infrastructure, roads and utilities, emergency services, and community cohesion. This type of growth can also increase housing costs and the overall cost of living (Bohnenkamp et. al. 2011). Although oil and gas development already occurs in McKenzie County, additional leasing and subsequent development could

continue the stress on community services and impact people living near or using the area in the vicinity of the lease. Oil and gas exploration, drilling, or production, would potentially inconvenience these people through increased traffic and traffic delays, noise, and visual impacts. These impacts would be particularly noticeable in rural areas in which oil and gas development has not occurred previously. The level of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, the length of time and season in which these activities occurred, and other factors. Additional concerns with additional development and production is the creation of new access roads which could potentially allow increased public access and exposure of private property to vandalism. Increased oil and gas development can also increase funding availability for school districts and county infrastructure needs such as road improvements and maintenance and provide job opportunities.

The location and proximity of the lease parcel to Theodore Roosevelt National Park has been a concern brought up during scoping. Development of the lease parcel would likely impact visitors and recreation enthusiasts using the area or visiting Theodore Roosevelt National Park by affecting solitude, scenic beauty, and potentially increase recreation related conflicts. These impacts are discussed in Sections 4.3.14 and 4.3.15. Impacts may also occur to other approved uses to the lease area surface lands such as grazing.

Executive Order 12898 requires the analysis of disproportionately high and adverse human health effects and environmental effects on environmental justice populations. Environmental effects may include "ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment" (page 26; CEQ, 1997). As discussed previously, McKenzie County met the criteria for having an environmental justice population based upon American Indian/Native American residents in the county. Adverse effects to historical and current cultural and traditional uses and values in this area are correlated to the amount of surface-disturbing or other disruptive activities allowed under this alternative. Please refer to Sections 4.3.8 Cultural Resources and 4.3.9 Native American Religious Concerns for the discussion of these potential impacts associated with this alternative. The BLM has considered all input from persons or groups regardless of age, income status, race, or other social or economic characteristics. The outreach and public involvement activities for this effort, including the consultation of tribes, are described in Sections 1.4 and 5.2.

4.3.15 Economics

The collection of revenues would result from leasing the parcels proposed under Alternative B. Revenues generated by leasing Federal minerals are the bonus bids paid at the competitive lease auction and annual rents collected on leased parcels not held by production. These revenues are collected by the Federal government which then distributes a portion of the revenues collected to the state and counties. The amount that is distributed is determined by the federal authority under which the Federal minerals are being managed. Forty-nine percent of Federal revenue associated with oil and gas from public domain lands are distributed to the state.

Federal leasing revenue estimates (lease rent and bonus bids) are initially based upon the number of acres being offered, however it is unknown whether the parcel proposed will be sold. Due to energy market volatility and the dynamics of the oil and gas industry the BLM cannot predict the

exact effects of this action, as there are no guarantees that the lease will receive bids, and that the leased parcel will be developed or that if developed the parcel will produce any fluid minerals. Given this uncertainty, revenue estimates are calculated under the assumption that the entire parcel of 120 acres is sold. To estimate annual federal rent revenue it was assumed that rent would be collected during the full term of the leases (10 years) since it is unknown if and when the lease will be held by production, terminated, or relinquished. This calculation of rent revenue provides the maximum amount of annual federal rent revenue that may be collected. Average annual federal rent revenue for the first five years of the lease term for this parcel would be $180 and for the second five years it would be $240. Revenue from the bonus bid, calculated using the minimum rate of $2.00 per acre would result in $240 in federal revenue. Given that parcels in McKenzie County often have bonus bids much larger than $2.00 per acre, potential revenue based upon the average bonus bid ($11,475) as discussed in Section 3.16, would result in approximately $1.4 million in revenue. Given the numerous uncertainties mentioned above, only potential federal revenue is calculated and discussed.

Potential future oil and gas development will also have economic impacts. The magnitude of these types of economic effects is based upon the level and pace of development which is unknown at this time. Additionally, it should be noted that oil and gas development in McKenzie County may generate economic activity in other areas since several specialized materials and services are unavailable in the county and operators may be headquartered elsewhere. Recent research by Bangsund and Hodur (2017) indicate that in 2015 in North Dakota the gross expenditures for exploring, drilling, and completing a well was approximately $6.9 million per well, however only $3.3 million of this is captured within the North Dakota economy.

Economic activity, measured in jobs and labor income, associated with oil and gas development stems from payments to counties associated with the leasing and rent of Federal minerals, royalty payments associated with production of Federal oil and gas, and from expenditures associated with drilling, completion, production, and associated activities. Although the pace and rate of development is unknown, one can estimate general economic impacts based upon recent research. The recent study by Bangsund and Hodur (2017) that examined the petroleum industry's economic effects to North Dakota in 2015 concluded that "[b]ased on active wells in the state, the overall economic effect (direct and secondary impacts from all segments of the industry) per well (averaged for all producing wells) would be about $2.4 million annually" (p. 31).

4.3.16 Special Designations

Theodore Roosevelt National Park

There are no impacts from offering the parcel for lease to the Theodore Roosevelt National Park visitors. Future oil and gas development and production may potentially impact Theodore Roosevelt National Park and its visitors. Impacts could include reduction of current viewsheds, dark night skies, and soundscape. Visual impacts are fully described in section 4.3.11 of this EA.

The application of standard lease stipulation 16-3 would be sufficient at the leasing stage to notify operators that additional measures may be necessary to reduce impacts from future development. In addition to the potential BMPs for reducing visual impacts described in section 4.3.11, BMPs that could be used reduce noise include using best available technology such as

multi-cylinder pumps, sound reducing mufflers, and placement of exhaust systems to direct noise away from sound sensitive areas.

5.0 Consultation and Coordination

5.1 Persons, Agencies, and Organizations Consulted

The BLM consults with Native Americans under Section 106 of the National Historic Preservation Act (NHPA). A packet that included a formal cover letter, an official list and maps of the lease parcels, and Class I site and survey information for each lease parcel were sent certified mail to the tribal historic preservation officer (THPO) and tribal chairmen/president for each of the following tribes: Crow Creek Sioux Tribe; the Crow Tribe; Flandreau Santee Sioux; Fort Belknap Indian Community; Fort Peck Assiniboine and Sioux Tribes; Lower Brule Sioux; Lower Sioux Indian Community; Northern Cheyenne; Oglala Sioux Tribe; Rosebud Sioux; Santee Sioux Tribe; Sisseton-Wahpeton Oyate; Spirit Lake Tribe; Standing Rock Sioux Tribe; Three Affiliated Tribes – Mandan, Hidatsa, and Arikara Nation; Turtle Mountain Band of Chippewa; and the Yankton Sioux Tribe. The BLM will send a second letter to the tribes informing them about the 30 day public comment period for the EA and soliciting any information BLM should consider before making a decision whether to offer any or all of the parcels for sale.

5.2 Summary of Public Participation

5.2.1 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 August 15, 2017. 14 scoping responses were received during the scoping period that ended on August 29, 2017. Additionally, we received numerous responses after the scoping period ended.

The scoping responses expressed concerns about the leasing the parcel and the impacts to Theodore Roosevelt National Park. Specific concerns included impacts leasing would have on air quality, viewshed, dark night skies, and soundscape. It was recommend that an alternative be considered that does not lease the parcel (this is included as the No Action Alternative). The BLM received several comments supporting leasing as well. One such comment stated concerns with limitation of marketability of the minerals due to an incomplete unit, and placing limitations on non-federal land is not fair to private landowners. We received a response from the State Historical Society of ND recommending cultural surveys on the parcel prior to ground disturbance, notification of landowners of the project, and that surface disturbance be kept at least two miles from TRNP. It was mentioned that the location is within the NDIC Areas of Interest and the NDIC policy should apply. We also received comments from the North Dakota Game and Fish Department with recommendations on mitigating wildlife concerns for the parcel, specifically regarding protection of golden eagle nesting habitat. North Dakota Department of Trust Lands provide comments expressing that any proposed well on Trust Lands would require an Oil and Gas Easement subject to review and approval by the Board of University and School Lands. The ND Department of Trust also provided comments from North Dakota Game and Fish Department, ND State Historical Society, and ND Geological Survey. The comments from ND Game and Fish Dept. and ND State Historical Society were similar to what our office received from those offices. Comments from ND Geological Society mention

there are no known paleontological localities in section 18, but there are Paleocene rocks exposed that could contain fossils. If any are encountered the BLM should contact their office to discuss removal.

5.2.2 Public Comment Period

On September 30, 2017, the EA, along with an unsigned Finding of No Significant Impact (FONSI), were made available for a 30-day public comment period. Notification letters were distributed to external entities, local agencies, and tribes to explain that an EA and the unsigned FONSI were available for review and comment. Tribes also received a copy of the EA and unsigned FONSI for their review.

After the 30-day protest period, but before lease issuance, the BLM will issue a signed Finding of No Significant Impact and Decision Record for this EA. This information, along with other updates and Lease Sale Notice information, can be found on the Montana/Dakotas BLM website https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/montana-dakotas. Current and updated information about our EAs, potential Lease Sale Notices, and corresponding information pertaining to this sale can be found at the link referenced above.

5.3 List of Preparers

Table 20. List of Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Melissa Hovey	Air Specialist	Air Resources
Tim Zachmeier	Wildlife Biologist	Wildlife
Annette Neubert	Archaeologist	Cultural Resources
Annette Neubert	Archeologist	Native American Religious Concerns
Allen Ollila	Petroleum Engineer	Fluid Minerals/RFD
Corinne Walter	Natural Resource Specialist	GIS
Carmen Drieling	Rangeland Management	Livestock Grazing
Greg Liggett	Paleontologist	Paleontology
Paul Kelley	Natural Resource Specialist	EA lead/Forestry/Soils/Hydrology/ Recreation / Vegetation/VRM/Travel Management
Jessica Montag	Social Analyst	Economic Conditions, Social Conditions and Environmental Justice

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APPENDIX A – Description of Lease Parcel and Lease Stipulations

APPENDIX A				
PARCEL NUMBER	**PARCEL DESCRIPTION**	**PROPOSED FOR LEASING ALTERNATIVE B**	**PROPOSED FOR LEASING IF EA INCLUDES ALTERNATIVE C**	**PROPOSED FOR DEFERRAL/NO LEASING**
NDM 102757-T	T. 148 N, R. 99 W, 5TH PM, ND SEC. 18 NW1/4SE1/4, S1/2SE1/4; MCKENZIE COUNTY 120.00 AC PD	**CR 16-1 (**ALL LANDS) **CSU 12-5** (ALL LANDS) **LN 14-2** (ALL LANDS) **LN 14-12** (ALL LANDS) **LN 14-18** (ALL LANDS) **NSO-38** (ALL LANDS) **STD 16-3** (ALL LANDS) **TES 16-2** (ALL LANDS) **TL 13-24** (ALL LANDS)		

Appendix B – North Dakota Field Office Stipulation Descriptions

Stipulation Number	Stipulation Name/Brief Description
CR 16-1	**CULTURAL RESOURCES LEASE STIPULATION** This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities.
CSU 12-5	**CONTROLLED SURFACE USE STIPULATION** Surface occupancy or use is subject to the following special operating constraint: No disturbance of riparian areas of wetlands, intermittent, ephemeral, or perennial streams and rivers would be allowed except for essential road and utility crossings.
LN 14-2	**CULTURAL RESOURCES** The Surface Management Agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. This notice would be consistent with the present Montana State Office guidance for cultural resource protection related to oil and gas operations (NTL-MSO-85-1).
LN 14-12	**LEASE NOTICE PALEONTOLOGICAL RESOURCE INVENTORY REQUIREMENT** This lease has been identified as being located within geologic units rated as being moderate to very high potential for containing significant paleontological resources. The locations meet the criteria for Class 3, 4 and/or 5 as set forth in the Potential Fossil Yield Classification System, WO IM 2008-009, Attachment 2-2. The BLM is responsible for assuring that the leased lands are examined to determine if paleontological resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in WO IM 2008-009 dated October 15, 2007, and WO IM 2009-011 dated October 10, 2008. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or project proponent shall contact the BLM to determine if a paleontological resource inventory is required. If an inventory is required, the lessee or project proponent will complete the inventory subject to the following: • the project proponent must engage the services of a qualified paleontologist, acceptable to the BLM, to conduct the inventory. • the project proponent will, at a minimum, inventory a 10-acre area or larger to incorporate possible project relocation which may result from environmental or other resource considerations. • paleontological inventory may identify resources that may require mitigation to the satisfaction of the BLM as directed by WO IM 2009-011.
LN 14-18	**AIR RESOURCE ANALYSIS** The lessee/operator is given notice that prior to project-specific approval, additional air resource analyses may be required in order to comply with the NEPA, FLPMA, and/or other applicable laws and regulations. Analyses may include equipment and operations information, emission inventory development, dispersion modeling or photochemical grid modeling for air quality and/or air quality related value impact analysis, and/or emission control determinations. These analyses may result in the imposition of additional project-specific control measures to protect air resources.

Stipulation Number	Stipulation Name/Brief Description
NSO 11-38	**GOLDEN EAGLE NESTS** No surface occupancy or use is allowed within one-half mile of Golden Eagle nests known to have been occupied at least once within the seven previous years.
Standard 16-3	**STANDARD LEASE STIPULATION** **ESTHETICS--**To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the Federal Surface Managing Agency (SMA). **EROSION CONTROL**--Surface-disturbing activities may be prohibited during muddy and/or wet soil periods. **CONTROLLED OR LIMITED SURFACE USE STIPULATION** --This stipulation may be modified, consistent with land use documents, when specifically approved in writing by the Bureau of Land Management (BLM) with concurrence of the SMA. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the SMA for more specific locations and information regarding the restrictive nature of this stipulation. The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled, or **if absolutely necessary**, excluded. Use or occupancy will be restricted only when the BLM and/or the SMA demonstrates the restriction necessary for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells. After the SMA has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the Agency will furnish further data on any special areas which may include: • 100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate federally-owned or controlled roads and recreation trails. • 500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams: 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies. • 500 feet from grouse strutting grounds. Special care to avoid nesting areas associated with strutting grounds will be necessary during the period from March 1, to June 30. One-fourth mile from identified essential habitat of state and federal sensitive species. Crucial wildlife winter ranges during the period from December 1 to May 15, and in elk calving areas during the period from May 1 to June 30. • 300 feet from occupied buildings, developed recreational areas, undeveloped recreational areas receiving concentrated public use and sites eligible for or designated as National Register sites. • Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive off-road vehicle designations. • On slopes over 30 percent or 20 percent on extremely erodible or slumping soils. **APPLICATIONS FOR PERMIT TO DRILL (APDs)**--The appropriate BLM field offices are responsible for the receipt, processing, and approval of APDs. The APDs are to be submitted by oil and gas operators pursuant to the requirements found in Onshore Oil and Gas Order No. 1 -- Approval of Operations on Onshore Federal and Indian Oil and Gas Leases (Circular No. 2538). Additional requirements for the conduct of oil and gas operations can be found in the Code of Federal Regulations Title 43, Part 3160. Copies of Onshore Oil and Gas Order No. 1, and pertinent regulations, can be obtained from the BLM field offices in which

Stipulation Number	Stipulation Name/Brief Description
	the operations are proposed. Early coordination with these offices on proposals is encouraged. **CULTURAL AND PALEONTOLOGICAL RESOURCES**--The SMA is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the SMA, shall: • Contact the appropriate SMA to determine if a site-specific cultural resource inventory is required. If an inventory is required, then: • Engage the services of a cultural resource specialist acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted. • Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as testing salvage and recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited. The operator shall immediately bring to the attention of the SMA any cultural or paleontological resources discovered as a result of approved operations under this lease, and not disturb such discoveries until directed to proceed by the SMA. **ENDANGERED OR THREATENED SPECIES**--The SMA is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats. The lessee/operator may, unless notified by the authorized officer of the SMA that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resources specialist approved by the SMA. An acceptable report must be provided to the SMA identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.
TES 16-2	**ENDANGERED SPECIES ACT SECTION 7 CONSULTATION STIPULATION** The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered or other special status species. BLM may recommend modifications to exploration and development, and require modifications to or disapprove proposed activity that is likely to result in jeopardy to proposed or listed threatened or endangered species or designated or proposed critical habitat.
TL 13-24	**GOLDEN EAGLE PREVIOUSLY OCCUPIED NESTS** No surface use is allowed within one-half mile of occupied Golden Eagle nests known to be occupied at least once within the seven previous years during the following time period: February 15 to July 15. The stipulation does not apply to the operation and maintenance of production facilities.

Appendix C - Mitigation and Best Management Practices

This appendix contains in-depth information for mitigation and best management practices (BMPs) and in the planning area. Information includes:

- mitigation guidelines and objectives;
- best management practices (BMPs) for protection of resources; and
- guidelines for specific activities associated with oil and gas development.

Mitigation Guidelines

The following Mitigation Guidelines are a compilation of practices employed by the BLM Montana/Dakotas to mitigate impacts from various activities. They can be included as stipulations, conditions of approval, best management practices and design features. The guidelines are designed to protect resources such as soil, water, air, vegetation, wildlife habitat, and cultural and historic properties. The guidelines apply to many resources and are derived from many laws. This appendix is not comprehensive and is intended to be used as a guide for appropriate project planning, design and implementation.

Mitigation employs measures that have been developed to reduce environmental impacts associated with certain types of activities. BMPs are mitigation measures designed to reduce undesirable impacts to the environment. Incorporation of mitigation can typically result in a more efficient environmental review process, increased operating efficiency, reduced reclamation and fewer environmental impacts.

Additional descriptions of mitigation, and BMPs related to oil and gas lease activities can be found in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development-The Gold Book, and online at http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices.html. Offering the parcels for sale and issuing leases would not be in conflict with any local, county, or state laws or plans.

Mitigation Objectives

1. Avoidance or relocation would be the preferred strategy for reducing adverse impacts.

2. Surface-disturbing effects of operations would be minimized and the reclamation potential of the site would be maintained through design, construction, and other practices or techniques.

3. Impacts to air resources, air quality related values, and atmospheric greenhouse gas (GHG) concentrations would be reduced.

4. Impacts to soil, vegetation and water resources would be reduced. Sources of groundwater and surface water contamination would be eliminated.

5. Impacts to cultural and historic properties would be reduced or eliminated.

Mitigation Guidelines for Specific Resources

Air Quality, Greenhouse Gas Emissions and Climate Change

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 would also be required as COAs 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:

- flaring or incinerating hydrocarbon gases at high temperatures to reduce emissions of incomplete combustion;
- emission control equipment of a minimum 95 percent efficiency on all condensate storage batteries;
- 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 VOCs);
- gas or electric turbines rather than internal combustions engines for compressors;
- NO_x emission controls for all new and replaced internal combustion oil and gas field engines;
- water dirt and gravel roads during periods of high use and control speed limits to reduce fugitive dust emissions;
- 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-located 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;

- 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 NO_x and ozone.

More specific to reducing GHG emissions, Section 6 of the Climate Change SIR identifies and describes in detail commonly used technologies to reduce methane emissions from natural gas, coal bed natural gas, and oil production operations. Technologies discussed in the Climate Change SIR and as summarized below in Table 18 (reproduced from Table 6-2 in Climate Change SIR) display common methane emission technologies reported under the EPA Natural Gas STAR Program and associated emission reduction, cost, maintenance and payback data.

Table 18. 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

Table 18. 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)
Valves					
Test and repair pressure safety valves	170	NR	$0.1K – $1K	3 – 10 yr	NR
Inspect and repair compressor station blowdown valves	2,000	<$1K	$0.1K – $1K	0 – 1 yr	NR
Compressors					
Install electric compressors	40 – 16,000	>$10K	>$1K	>10 yr	NR
Replace centrifugal compressor wet seals with dry seals	45,120	$324K	Negligible	10 mo	$7
Flare Installation	2,000	>$10K	>$1K	None	NR

Source: Multiple EPA Natural Gas STAR Program documents. Individual documents are referenced in 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 emission reductions that might be feasible, the BLM estimated GHG emission reductions based on the RFD for the Field Office. The emission reductions technologies and practices are identified as mitigation measures that could be imposed during development. Furthermore, the EPA is expected to promulgate new Federal air quality regulations that would require GHG emission reductions from many oil and gas sources.

Soil Resources

Measures would be taken to reduce, avoid, or minimize potential impacts to soil resources from exploration and development activities. Prior to authorization, proposed actions would be evaluated on a case-by-case basis and would be subject to mitigation measures in order to maintain the soil system. Mitigation would include avoiding areas poorly suited to reclamation, limiting the total area of disturbance, rapid reclamation, erosion/sediment control, soil salvage,

de-compaction, re-vegetation, weed control, slope stabilization, surface roughening, and fencing.

Conducting oil and gas development with the following BMPs would enhance soil resilience and reduce soil system fragmentation, accelerated wind and water erosion, and the total area of surface disturbance with the following:

- Utilizing plans of development;
- Removing vegetation in the smallest area possible;
- Co-locating infrastructure;
- Using a single trench for utilities and piping;
- Employing multiple completions per well bore and directional drilling;
- Closed-loop drilling or other pit-less methods;
- Ensuring reclamation of all new roads at the end of the life of the well;
- Preventing degradation of the watershed from produced water;
- Designing impoundments or water disposal methods to minimize impacts to soil; and
- Initiating interim reclamation within 25 days of drilling the well.

Water Resources

Stipulations addressing steep slopes, waterbodies, streams, 100-year floodplains of major rivers, and riparian areas would minimize potential impacts and would be included with the lease when necessary (Appendix A). In the event of exploration or development, measures would be taken to reduce, avoid, or minimize potential impacts to water resources including application of appropriate mitigation. Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, and expedite rapid reclamation (including interim reclamation) would maintain water resources.

Methods to reduce erosion and sedimentation could include reducing the area of surface disturbance; installing and maintaining adequate erosion control; proper road design, road surfacing, and culvert design; road/infrastructure maintenance; use of low water crossings; and use of isolated or bore crossing methods for waterbodies and floodplains. In addition, applying mitigation to maintain adequate, undisturbed, vegetated buffer zones around water bodies and floodplains could reduce sedimentation and maintain water quality. Appropriate well completion, the implementation of Spill Prevention Plans, and Underground Injection Control regulations would mitigate groundwater impacts. Site-specific mitigation and reclamation measures would be described in the COAs.

Vegetation Resources

Mitigation would be addressed at the site specific APD stage of exploration and development. If needed, COAs would potentially include, but not limited to, re-vegetation with desirable plant species, soil enhancement practices, direct live haul of soil material for seed bank re-vegetation, reduction of livestock grazing, fencing of reclaimed areas, and the use of seeding strategies consisting of native grasses, forbs, and shrubs. In areas infested with noxious weeds, weed management plans with special conditions would be required.

Riparian-Wetland Habitats

Stipulations addressing steep slopes, waterbodies, streams, 100-year floodplains of major rivers, and riparian areas would minimize potential impacts and would be included with the lease when necessary (Appendix A). In the event of exploration or development, site-specific mitigation measures would be identified which would avoid or minimize potential impacts to riparian-wetland areas at the APD stage. Mitigation measures that minimize the total area of disturbance, control wind and water erosion, reduce soil compaction, maintain vegetative cover, control nonnative species, maintain biodiversity, maintain vegetated buffer zones, and expedite rapid reclamation (including interim reclamation) would maintain riparian-wetland resources.

Special Status Plant Species

Stipulations applied to wildlife resources, steep slopes, water bodies, streams, 100-year floodplains of major rivers, riparian areas, and wetlands would likely also provide protections for special status plant species. Proposed development would be analyzed on a site-specific basis prior to approval of oil and gas exploration or development activities at the APD stage**.** Mitigation would also be addressed at the site-specific APD stage. Surveys to determine the existence of federally listed species could occur on BLM-administered surface or minerals prior to approval of exploration and development activities at the APD stage.

Wildlife

Threatened, Endangered and Candidate Species

Other Special Status Species

Other Fish and Wildlife

Measures would be taken to prevent, minimize, or mitigate impacts to fish and wildlife animal species from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could include rapid re-vegetation, project relocation, or pre-disturbance wildlife species surveying. If oil and gas development is proposed in suitable habitat for threatened or endangered species, consultation with the USFWS would occur to determine if additional terms and conditions would need to be applied.

Cultural Resources

Application of standard lease terms, stipulations, and cultural lease notices provide mechanisms to protect vulnerable significant cultural resource values on these lease parcels (Appendix A). The inclusion of these requirements at the leasing stage provide notification to the lessee that potentially valuable cultural resources are or are likely to be present on the lease parcels and potential mitigation measures may be required. The application and implementation of these stipulations and lease notices at the development stage would provide the necessary measures to

protect cultural resources.

Specific mitigation measures, include but are not limited to, site avoidance, excavation or data recovery would have to be determined when site-specific development proposals are received. Most surface-disturbing situations for cultural resources would be avoided by project redesign or relocation. Unavoidable, significant properties would be site-specifically mitigated with concurrence with the State Historic Preservation Office prior to implementation of a project.

Native American Religious Concerns
Mitigation would be the same as Cultural Resources above. For those parcels where no inventory data is available or where no information is available for TCPs, BLM would apply the cultural lease notice (CR 16-1). Any sites in question would be revisited and reevaluated for National Register eligibility prior to any surface disturbance.

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

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

Visual Resources
All new oil and gas development could implement, as appropriate for the site, BLM BMPs for VRM, regardless of the VRM class. This includes, but would not be limited to, proper site selection, reduction of visibility, minimizing disturbance, selecting color(s)/color schemes that blend with the background and reclaiming areas that are not in active use. Repetition of form, line, color and texture when designing projects would reduce contrasts between landscape and development. Wherever practical, no new development would be allowed on ridges or mountain tops. Overall, the goal would be to not reduce the visual qualities or scenic value that currently exists.

Forest and Woodland Resources

Measures could be taken to prevent, minimize, or mitigate impacts to forest and woodland resources from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. The road construction and maintenance BMPs outlined in the Gold Book are designed to protect water quality and forest soils. Other mitigation measures could include the artificial planting of bare root or containerized nursery stock seedlings, and removal of severed forest and woodland vegetative material.

Livestock Grazing
Measures would be taken to prevent, minimize, or mitigate impacts to livestock grazing from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project could be subject to mitigation measures. Mitigation could potentially include controlling livestock movement by maintaining fence line integrity, fencing of facilities, re-vegetation of disturbed sites, and fugitive dust control.

Recreation and Travel Management
Additional measures could be taken to minimize, avoid, or mitigate impacts to recreation from oil and gas exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation measures could potentially include, but are not limited to, reclamation of industrial routes/areas when no longer needed, fencing of facilities, and installing signs along roads.

Lands and Realty
Measures would be taken to avoid disturbance to or impacts to existing rights-of-way, in the event of any oil and gas exploration and development activities. Any new "off-lease" or third party rights-of-way required across federal surface for exploration and/or development of lease parcels would be subject to lands and realty stipulations to protect other resources as determined by environmental analyses.

Special Designations
National Historic and Scenic Trails
Areas of Critical Environmental Concern (ACECs)

For any congressionally designated component of the National Historic Trail (NHT) system, BLM would apply the same kind of analysis that is applied to determining an effect to a property eligible for the National Register of Historic Places. That process includes determining whether an undertaking would have an adverse effect on the historic nature of the NHT by altering, directly or indirectly, any of the characteristics of the historic nature of the NHT in a manner that would diminish the integrity of the Trail's location, setting, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by an undertaking that may occur later in time, be farther removed in distance or be cumulative.

Examples of adverse effects on NHTs include, but are not limited to change of the character of the Trail's historic nature or physical features within Trail's corridor setting that contribute to diminishing the Trail's historic significance; and the introduction of visual, atmospheric or audible elements that diminish the integrity of the Trail's historic significance. If it is

determined that an undertaking within the viewshed of the NHT would have an adverse effect on the historic character of the Trail where the integrity of the setting is a contributing element of the historic character of the Trail, then surface occupancy or use and surface disturbance would be restricted.

Prior to surface disturbance, occupancy or use a mitigation plan (Plan) would need to be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator may not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan or approved it with conditions. The Plan would need to demonstrate to the authorized officer's satisfaction that the infrastructure will either not be visible or will result in a weak contrast rating and would not have an adverse effect on the setting of the historic character of a National Historic Trail.

Appendix D – Parcel Maps