WY-183Q Third Quarter 2018
Competitive Oil and Gas Lease Sale
BLM Wyoming - Wind River/Bighorn Basin District

Environmental Assessment
DOI-BLM-WY-R000-2018-0001-EA

Wind River/Bighorn Basin District
101 South 23rd Street
Worland, Wyoming 82401
307-347-5100
307-347-5228 fax
The BLM’s multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.
# Table of Contents

**DOI-BLM-WY-R000-2018-0001-EA**

Table of Contents .................................................................................................................. 3  
List of Tables: .......................................................................................................................... 4  
List of Figures: .......................................................................................................................... 4  
List of Attachments: .................................................................................................................. 4  

1. **Introduction** .................................................................................................................. 1-1  
   1.1 Introduction ..................................................................................................................... 1-1  
   1.2 Background ................................................................................................................... 1-2  
   1.3 Purpose and Need .......................................................................................................... 1-4  
   1.4 Decision to be Made ..................................................................................................... 1-4  
   1.5 Conformance with BLM Land Use Plans ..................................................................... 1-5  
   1.6 Relationship to Statutes, Regulations, or Other Plans ............................................... 1-5  
   1.7 Identification of Issues and Scoping ........................................................................... 1-6

2. **Description of Alternatives, Including Proposed Action** ........................................ 2-1  
   2.1 Introduction .................................................................................................................. 2-1  
   2.2 No Action Alternative .................................................................................................. 2-1  
   2.3 Proposed Action Alternative ....................................................................................... 2-1  
   2.4 Alternatives Considered and Eliminated from Further Analysis ............................. 2-1

3. **Affected Environment and Environmental Effects** .................................................. 3-1  
   3.1 Introduction .................................................................................................................. 3-1  
   3.2 General Analysis Assumptions and Data Limitations ................................................. 3-1  
   3.3 General Setting .......................................................................................................... 3-2  
   3.4 Resources Considered and Eliminated From Further Analysis ............................... 3-2  
   3.4.1 RMP Special Designations .................................................................................... 3-2  
   3.4.2 Lands with Wilderness Characteristics .................................................................. 3-2  
   3.4.3 Livestock Grazing Management ............................................................................ 3-2  
   3.4.4 Wilderness and Wilderness Study Areas ............................................................... 3-3  
   3.4.5 Wild and Scenic Rivers ......................................................................................... 3-3  
   3.4.6 Socioeconomics, Environmental Justice, and Public Health and Safety ............ 3-3  
   3.4.7 Split Estate .............................................................................................................. 3-3  
   3.5 No Action Alternative .................................................................................................. 3-4  
   3.5.1 Common to all Resources ...................................................................................... 3-4  
   3.6 Proposed Action .......................................................................................................... 3-4  
   3.6.1 Common to all Resources ...................................................................................... 3-4  
   3.7 Resources Brought Forward for Analysis .................................................................. 3-5  
   3.7.1 Air Resources .......................................................................................................... 3-5  
   3.7.2 Paleontology & Geology ......................................................................................... 3-31  
   3.7.3 Soils ....................................................................................................................... 3-31  
   3.7.4 Water .................................................................................................................... 3-31  
   3.7.5 Master Leasing Plan Analysis Areas ....................................................................... 3-32  
   3.7.6 Vegetation, Including Invasive Species and T&E Species ..................................... 3-33  
   3.7.7 Wildlife & Fish ....................................................................................................... 3-33
3.7.8 Greater Sage-Grouse .................................................................................. 3-34
3.7.9 Cultural Resources .................................................................................. 3-36
3.7.10 Visual Resource Management (VRM) .................................................. 3-36
3.7.11 Recreation .................................................................................................. 3-37
3.7.12 Historic Resources, Including Regional Historic Trails and Early Highways .... 3-37
3.7.13 Areas of Critical Environmental Concern (ACEC) .................................. 3-38

4. Consultation and Coordination .................................................................. 4-1
5. References ........................................................................................................ 5-1

List of Tables:
Table 1-1 Parcel and Acreage Summary .......................................................... 1-2
Table 1-2 Parcels With Surface Ownership Other Than BLM ....................... 1-2
Table 3-1 Air Quality Monitoring Sites within the WR/BBD ......................... 3-7
Table 3-2 Summary of Ambient Air Quality Standards for Criteria Pollutants .... 3-8
Table 3-3 Primary Standards and Representative Concentrations .................. 3-9
Table 3-4 Basin, WY Annual CASTNET concentrations (μg/m3)...................... 3-13
Table 3-5 Indirect Cumulative GHG Emissions; ........................................... 3-25
Table 3-6 MLP Parcels ..................................................................................... 3-32
Table 3-7 BLM Wyoming Stipulation Code & WR/BBD Management Decisions ... 3-35
Table 3-8 WR/BBD Parcels Identified With GSG Habitat ............................... 3-35
Table 4-1 Interdisciplinary Team ..................................................................... 4-1

List of Figures:
Figure 3-1 January 2010-July 2017 “Basin” Wyoming ..................................... 3-11
Figure 3-2 North Absaroka annual IMPROVE visibility (2002-2016) .............. 3-12
Figure 3-3 Cloud Peak annual IMPROVE visibility (2003-2014) .................... 3-12
Figure 3-4 Current (1961-1990) Total Annual Precipitation (millimeters) ....... 3-15
Figure 3-5 Current (1961-1990) Mean Annual Temperature (°C) .................. 3-16
Figure 3-6 Long-term Temperature (top) and Precipitation (bottom) Trends .... 3-19
Figure 3-7 Examples of Impacts Associated with Global Average Temperature Change ... 3-20
Figure 3-8 Methane and Fossil Fuel Emissions ................................................. 3-29

List of Attachments:
Attachment 1 Parcel Descriptions with Stipulations
Attachment 1-A Charts and Code Index of Stipulations Applied to Parcels
Attachment 2 Public Comments and BLM Response
1. Introduction

1.1 Introduction

This Environmental Assessment (EA) for the Wind River /Bighorn Basin District (WR/BBD) portion of the Bureau of Land Management (BLM) Wyoming State Office (WSO) quarterly competitive oil and gas lease sale has been prepared for the parcels nominated and considered for the Third Quarter 2018 Competitive Oil and Gas Lease Sale; sale number WY-183Q. Parcels evaluated in this EA are within the BLM’s WR/BBD, which includes the Lander Field Office (LFO), the Worland Field Office (WFO), and the Cody Field Office (CYFO). The WR/BBD currently participates in the sales for the First and Third Quarters of each year.

Pursuant to 40 CFR § 1508.28 and § 1502.21, this EA tiers to and incorporates by reference the information and analysis contained in the Environmental Impact Statements (EIS), Records of Decisions (ROD) and Approved Resource Management Plans (RMP) for the Lander Field Office (LFO 2014), the Worland Field Office (WFO 2015), and the Cody Field Office (CYFO 2015). The FEIS for each Field Office analyzed the impacts of oil and gas development on lands open to leasing including impacts to other resource values. Stipulations to be applied to leases are located in LFO Appendix I., WFO Appendix B., and CYFO Appendix B.

This EA serves to verify conformance with the approved Land Use Plans and disclose the affected environment, the anticipated impacts, and proposed mitigation of impacts. The EA provides evidence for determining whether to prepare an environmental impact statement (EIS) or to support a “Finding of No Significant Impact” (FONSI). An EIS would be prepared for the project if the decision maker determines that this project has significant impacts not already disclosed and analyzed in other NEPA documents, such as RMP EISs, based upon the analysis in the EA. A FONSI documents the reasons why implementation of the selected alternative would not result in “significant” environmental impacts (effects). The RMP EISs have already evaluated potentially significant impacts arising from the BLM’s land use planning decisions. Therefore, in accord with 43 CFR § 46.140(c), the BLM anticipates a “finding of no new significant impacts” (FONNSI). When a FONNSI statement is reached, a Decision Record (DR) may be signed approving the selected alternative, which could be the proposed action, another alternative, or a combination thereof.

Parcel and Acreage Summary

The mineral estate for the parcels shown in Attachment 1 was designated through the RMPs as being open to federal oil and gas leasing with appropriate stipulations to be applied. In total, 22 parcels containing 29,627.04 federal mineral acres, located within the field offices in the WR/BBD, were nominated through “Expressions of Interest” for the Third Quarter 2018 Competitive Oil and Gas Lease Sale.

No parcels were nominated in the Cody Field Office; two parcels were nominated in the Worland Field Office; and twenty parcels were nominated in the Lander Field Office. There were no deletions or deferrals of parcels in whole or in part.
Eight Lander parcels (or portions of parcels), encompassing 8,140.39 acres, are located, in whole or in part, within Designated Development Areas: “The Approved RMP designates three Designated Development Areas for development incorporating almost all lands with moderate to high oil and gas potential. …..Potential for future mineral development is primarily limited to lands in the Designated Development Areas which do not conflict with important cultural resources, viewseshed, or greater sage-grouse habitat.”

Of the 29,627.04 of federal mineral estate nominated, 1106.24 acres are fee surface; 120.00 acres are State of Wyoming; and 28,400.80 are managed by the BLM. This EA will analyze and discuss the acreage as the mineral estate of 29,627.04 acres.

<table>
<thead>
<tr>
<th>Office</th>
<th>Parcel Number</th>
<th>Parcel Acres</th>
<th>Fee Surface Acres</th>
<th>State Surface Acres</th>
<th>BLM Surface Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFO WY-183Q-102</td>
<td>880.800</td>
<td>120.000</td>
<td>760.800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFO WY-183Q-103</td>
<td>1,360.000</td>
<td>240.000</td>
<td>1,120.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFO WY-183Q-104</td>
<td>1,280.000</td>
<td>160.000</td>
<td>1,000.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFO WY-183Q-105</td>
<td>2,046.850</td>
<td>360.000</td>
<td>1,686.850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFO WY-183Q-106</td>
<td>433.600</td>
<td>197.810</td>
<td>235.790</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WFO WY-183Q-121</td>
<td>683.760</td>
<td>28.430</td>
<td>655.330</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total by Surface</td>
<td>1,106.240</td>
<td>120.00</td>
<td>5,609.240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total by Mineral Estate</td>
<td>6,835.480</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.2 Background

The Mineral Leasing Act of 1920, as amended [30 U.S.C. § 181 et seq.], and the Mineral Leasing Act for Acquired Lands of 1947, as amended, give the BLM responsibility for oil and gas leasing on about 700 million acres of BLM, national forest, and other federal lands, as well as State and private surface lands where mineral rights have been retained by the federal government. The BLM works to ensure that mineral resources are developed in an environmentally responsible manner.
The Secretary of the Interior has broad authority and discretion under the Mineral Leasing Act (MLA) to administer oil and gas leasing and lease operations. Since at least 1936, the granting clause of all oil and gas leases has expressly identified that lessees are subject to regulations and orders “now and hereafter promulgated” as put forward in the General Land Office Circular 1386 of May 7, 1936. This allows the BLM to issue orders for compliance with environmental provisions of current oil and gas operating regulations, onshore orders, notices to lessees, and other issued orders of the authorized officer.

43 CFR 3162.5-1(a) states: “The operator shall conduct operations in a manner which protects the mineral resources, other natural resources, and environmental quality. In that respect, the operator shall comply with the pertinent orders of the authorized officer and other standards and procedures as set forth in the applicable laws, regulations, lease terms and conditions, and the approved drilling plan or subsequent operations plan. Before approving any Application for Permit to Drill submitted pursuant to §3162.3-1 of this title, or other plan requiring environmental review, the authorized officer shall prepare an environmental record of review or an environmental assessment, as appropriate. These environmental documents will be used in determining whether or not an environmental impact statement is required and in determining any appropriate terms and conditions of approval of the submitted plan.”

In accordance with H-1624-1 – Planning for Fluid Mineral Resources Rel. 1-1749, 1/28/2013: The Federal Government retains certain rights when issuing an oil and gas lease. While the BLM may not unilaterally add a new stipulation to an existing lease that it has already issued, the BLM can subject development of existing leases to reasonable conditions, as necessary, through the application of Conditions of Approval at the time of permitting. The new constraints must be in conformance with the applicable land use plan and not in conflict with rights granted to the holder under the lease. The Interior Board of Land Appeals has made clear that, when making a decision regarding discrete surface-disturbing oil and gas development activities following site-specific environmental review, the BLM has the authority to impose reasonable protective measures not otherwise provided for in lease stipulations, to minimize adverse impacts on other resource values. See 30 U.S.C. §226(g); 43 CFR 3101.1-2. See also Yates Petroleum Corp., 176 IBLA 144 (2008); National Wildlife Federation, 169 IBLA 146, 164 (2006).

The No Surface Occupancy (NSO) is reserved for use in fluid mineral land use planning and allocation decisions and lease stipulations; an NSO stipulation generally is only applied to a lease at the time of lease issuance (in rare circumstances, with agreement by the record title owner(s), the BLM may modify the lease terms of an existing lease to add, remove, or change lease stipulations). An NSO stipulation prohibits the physical presence of oil and gas operations and associated facilities in a specified area to protect sensitive surface resource values. For example, construction of permanent (or long-term placement of) structures or other facilities for any purpose would be prohibited in an NSO area, unless an exception, waiver, or modification is granted by the BLM. For an in-depth discussion of NSO, please refer to the Worland and Cody RMPs “Appendix F. Wyoming Bureau of Land Management Mitigation Guidelines for Surface-Disturbing and Disruptive Activities”, part F.3.5. No Surface Occupancy Guideline. In part:

The No Surface Occupancy Mitigation Guideline is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the
only alternative to “no development” or “no leasing.” The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

As required by 43 CFR § 3120.1-2, the BLM WSO conducts a quarterly competitive oil and gas lease sales to sell available oil and gas leases. Interested parties file Expressions of Interest (EOIs) to nominate parcels for leasing by the BLM. Complete information on the competitive lease sale notices & results process is available on line at: https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing

In the process of preparing a lease sale, the BLM WSO sends a draft parcel list to each District Office administering the nominated parcels. District and field office staff review the parcels to:

- verify the legal descriptions of the parcels and verify the parcels are in areas open to leasing;
- remove from further analysis any parcel in an area which is closed to leasing;
- ensure conformance with the approved RMPs by applying appropriate stipulations and lease notices to each parcel;
- determine if new information has become available since the approval of the RMP, which might change any analysis;
- conduct consultations, including consultation with the Wyoming Game and Fish Department (WGFD) and, as necessary, other Federal Agencies, State and Local Agencies, Community Stakeholders, Tribes, and others.

Staffs conduct field visits of the nominated parcels as necessary to validate existing data or gather new information in order to make an informed leasing recommendation. Additional information obtained after the publication of the Nominated Competitive Lease Sale may result in withdrawal of certain parcels prior to the lease sale. The BLM State Director retains the authority to withdraw parcels prior to sale.

1.3 Purpose and Need

It is the policy of the BLM as derived from various laws, including the Mineral Leasing Act of 1920, as amended and the Federal Land Policy and Management Act of 1976 (FLPMA) to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs. Continued sale and issuance of lease parcels would allow for continued production of oil and gas from public lands and reserves. Oil and gas leasing provides the opportunity to expand existing areas of production, and to locate previously undiscovered oil and gas resources to help meet the United States energy demands.

The need is established by the Federal Onshore Oil & Gas Leasing Reform Act of 1987 (FOOGLRA), the Federal Land Policy Management Act, and Mineral Leasing Act of 1920, as amended, to respond to Expressions of Interest.

1.4 Decision to be Made
Through this process, the BLM Authorized Officer will decide whether or not to offer and lease the nominated parcels in the Third Quarter Competitive Oil and Gas Lease Sale, and if offered for lease, under what terms and conditions.

1.5 Conformance with BLM Land Use Plans

The Lander and Worland RMPs identified the parcels nominated for the lease sale as available for leasing. All parcels for the Competitive Oil and Gas Lease Sale are in conformance with the existing land use plans as required by 43 CFR 1610.5. The RMPs identify leasing stipulations for application to the parcels. As authorized in 43 CFR § 3101.1-3, all parcels are subject standardized Lease Notice 1, 2, and 3; one unnumbered Lease Stipulation; and standardized Lease Stipulations 1, 2 and 3. As identified in the WFO RMP, all leases in that planning area are subject to Lease Notice 1041.

If a decision maker determines a resource requires mitigation in the form of new lease stipulations or that the lands should be closed to leasing, generally the RMP must first be updated or amended.

1.6 Relationship to Statutes, Regulations, or Other Plans

The proposed action and alternatives are consistent with other plans, programs, and policies of affiliated Tribes, other federal agencies, state, and local governments to the extent practical, including but not limited to the following:

- The National Environmental Policy Act [42 U.S.C. 4321 et seq.]
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Protection of Historic Properties (36 CFR § 800)
• Native American Trust Resource Policy standards are presented in the Department of the Interior Comprehensive Trust Management Plan dated March 28, 2003

1.7 Identification of Issues and Scoping

Scoping: A press release is submitted to the local newspapers for publication and other media outlets announcing the availability of the EA and Sale Notice, which is posted on the BLM leasing website for public review and comment. If the BLM owns the mineral estate within split estate lands, the BLM notifies the surface owner (as identified by the party submitting the EOI) of the lease nomination and provides a second notification that the EA is available for review and comment. The BLM sends a final notification if/when the parcel is listed in the Sale Notice. A listing of parcels to be offered at the auction will be posted by the BLM WSO in the public room at least 90 days before the auction is held.

All substantive comments on the EA are addressed in Attachment 3 of the EA. Substantive comments may cause a change to the EA, and are so noted in Attachment 3.

Issues: The Council on Environmental Quality (CEQ) regulations state: “NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail” (40 CFR § 1500.1(b)).

40 CFR § 1500.4(g) directs that the scoping process should be used “not only to identify significant environmental issues deserving of study but also to deemphasize insignificant issues narrowing the scope of the EIS process accordingly.” Significant issues directly influence the initiation, development, and technical design of the proposal; are disclosed in the analysis; and were used to develop alternatives to the proposed action. Issues are significant because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (BLM 2008).

Non-significant issues are identified as those:
1) outside the scope of the proposed action;
2) already decided by law, regulation, or other higher level decision;
3) unrelated to the decision to be made; or
4) conjectural and not supported by scientific or factual evidence.

CEQ NEPA regulations explain this delineation in 40 CFR § 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (40 CFR § 1506.3)…”
2. Description of Alternatives, Including Proposed Action

2.1 Introduction

Chapter 2 provides a description of each alternative to be analyzed in detail, a brief description of alternatives that were considered but not analyzed in detail, and a brief summary of the environmental effects of the proposed action and alternatives.

2.2 No Action Alternative

The No Action Alternative would mean that the Expressions of Interest to lease, the parcel nominations, would be denied or rejected at this time, and the parcels would not be offered for lease at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. The lease parcel could be nominated in future sales.

2.3 Proposed Action Alternative

The Proposed Action would offer for lease 22 parcels nominated through an EOI in the WR/BBD, covering 29,627.04 mineral estate acres, with stipulations required by the respective RMP. Attachment 1 to this EA identifies the parcels proposed for leasing with applicable lease stipulations.

In conformance with regulations in 43 CFR § 3120.2-1, sold oil and gas leases would be issued for a ten-year period and would continue for as long thereafter as oil and gas is produced in paying quantities. If a lessee fails to produce oil and gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, the lease would terminate.

2.4 Alternatives Considered and Eliminated from Further Analysis

Offering Subject to standard Lease Terms and Conditions

Offering all nominated parcels with only the lease terms and conditions on the lease form was considered as a means to reduce constraints to oil and gas development on public lands. Such an alternative is not in conformance with the approved RMPs where the applicable RMP prescribes stipulations in accordance with FLMPA’s Section 102(a)(8) mandate to manage the public lands to protect resource values. Therefore, this alternative was not analyzed in detail.

No other alternatives to the proposed action were identified that would meet the purpose and need of the proposed action.
3. Affected Environment and Environmental Effects

3.1 Introduction

This chapter characterizes the environment and environmental effects, resources, and uses that have the potential to be affected by the proposed action, followed by a comparative analysis of the direct, indirect and cumulative impacts of the alternatives. Aspects of the affected environment described in this section focus on relevant major resources and issues to determine if a significant impact may occur. Only those aspects of the affected environment that are potentially impacted are described in detail.

CEQ defines cumulative effects as:

*The impact on the environment which results from the incremental impact of the action when added or other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7)*

Absent a definitive development proposal, it is not possible to conduct a more specific impact and/or cumulative effects analysis than what has already been conducted in the preparation of the applicable RMP FEISs. The BLM cannot reasonably determine at the leasing stage whether or not a nominated parcel will actually be leased, or if leased, whether or not the lease would be explored or developed or at what intensity development may occur. Additional NEPA documentation would be prepared at the time an APD(s) or field development proposal is submitted, including cumulative impacts from past and reasonably foreseeable future actions if necessary.

There are approximately 847 active, producible, serviceable federal wells in the LFO and approximately 2,598 active, producible, or serviceable federal wells combined in the WFO and CYFO.

3.2 General Analysis Assumptions and Data Limitations

Direct effects of leasing are the creation of valid existing rights, and the revenue generated by the lease sale receipts. The residual effects of leasing would only occur if or when the leases were developed. Such development requires additional analysis and decision making although the BLM’s subsequent decisions could not conflict with the valid rights afforded by the lease. The level of development that might occur as an outcome leasing is not reasonably certain at the time of leasing. The BLM has determined that any further estimation of development extent and intensity for these leases at this time is too speculative to be analyzed as part of this EA. The BLM has determined that the RMP resource protections provide adequate consideration of resource values and the potential for adverse impacts to be evaluated at the leasing stage.

Existing data are used to determine resource presence on each parcel. Resource presence may change after this analysis and prior to development. Site specific surveys and data gathering would occur prior to lease development, and conditions of approval may be added as necessary to protect resources.
3.3 General Setting

The WR/BBD includes three Field Offices in Lander, Worland, and Cody, Wyoming, each with unique resource values and landscapes.

The LFO planning area encompasses 6.6 million acres in central Wyoming and includes most of Fremont County, the southwest corner of Natrona County, and small portions of Carbon, Sweetwater and Hot Springs counties. Of the 6.6 million acres, 2.4 million acres are public lands managed by the BLM and approximately 2.7 million acres of federal mineral estate. Approximately 2.2 million acres of the planning area are within the Wind River Indian Reservation (WRIR). The BLM has a fiduciary trust responsibility for the management of minerals on the WRIR, however, the BLM does not make land management decisions for the WRIR, and duties associated with trust responsibilities are performed independent of the provisions of the Lander RMP.

The WFO encompasses 3.4 million acres. This area includes Big Horn, Hot Springs, Washakie, and Park counties. The WFO manages over 2 million acres of public land and 2.7 million acres of federal mineral estate.

The CYFO encompasses 2.2 million acres of the Big Horn Basin in north central Wyoming, includes portions of Park and Big Horn counties, and is bordered by the Shoshone and Bighorn National Forests. CYFO manages 1.1 million acres of public land and 1.5 million acres of federal mineral estate within this area.

3.4 Resources Considered and Eliminated From Further Analysis

The BLM has determined that the recent analysis of the following resources in the FEIS was thorough and adequate and that no new circumstances or data has been identified that would be of the magnitude to require additional analysis. The BLM will revise these sections if additional substantial data and information is provided that was not included in the RMP FEIS. Parcels offered for sale are subject to the stipulations shown in Attachment 1 and summarized in Attachment 1A.

3.4.1 RMP Special Designations

No parcels were nominated within areas closed to oil and gas leasing. Parcels nominated within ACECs are discussed in section 3.7.13.

3.4.2 Lands with Wilderness Characteristics

No parcels were nominated in areas with lands with wilderness characteristics.

3.4.3 Livestock Grazing Management

At the leasing stage, there are no identified new impacts to livestock grazing.
3.4.4  Wilderness and Wilderness Study Areas

Wilderness Study Areas (WSAs) are managed to maintain their suitability as wilderness, and are closed to oil and gas leasing. No parcels were nominated within Wilderness Study Areas.

3.4.5  Wild and Scenic Rivers

There are no designated Wild and Scenic Rivers in the District. No parcels were nominated which include waterways that have been found eligible for Wild and Scenic Rivers designation.

3.4.6  Socioeconomics, Environmental Justice, and Public Health and Safety

The Approved RMPs balance the need for development of renewable and non-renewable energy resources with resource protections. The decisions in the RMPs will facilitate development and support economic opportunities within the planning areas and the State of Wyoming.

Executive Order 12898 of February 1994, requires federal agencies to assess projects to ensure there is no disproportionately high or adverse environmental, health, or safety impacts on minority and low income populations. Using U.S. Census Bureau 2016 population estimates for race and Hispanic origin (U.S. Census Bureau 2017a), no minority populations in Big Horn or Washakie Counties met the criteria of being 50 percent or more of the total population, nor did either county have any minority populations five percentage points greater than the State of Wyoming. However, U.S. Census Bureau Small Area Income and Poverty 2016 estimates (U.S. Census Bureau 2017b), revealed that these counties had a higher percent of population (all ages) in poverty than the State of Wyoming. While this may indicate that environmental justice populations exist in the counties where parcels would be offered for leasing, the action of leasing federal minerals would not have disproportionately adverse effects on these community members.

Oil and gas development, as well as other industrial use such as mining has occurred in the WR/BBD for many decades. Due to the industrial safety programs, standards, and state and federal regulations, offering these parcels is not expected to increase health or safety risks to humans, wildlife, or livestock. There are no identified hazardous or solid waste sites on the parcels addressed in this EA.

Leasing of the parcels analyzed in this EA would present no new or unusual health or safety issues not covered by existing state and federal laws and regulation.

3.4.7  Split Estate

Private surface overlaying federal minerals is commonly referred to as Split Estate, of which the dominate estate is the mineral estate. Of the 29,627.04 acres of federal mineral estate nominated in this lease sale, approximately 1,106.24 surface acres are fee surface, 120.00 surface acres are State of Wyoming lands, and approximately 28,400.80 surface acres managed by the BLM.
Consistent with BLM Wyoming leasing policy, notification letters are sent to private surface owners of split estate parcels at the time of lease nomination, for EA review and opportunity to comment and if/when the split estate lands are listed for lease in the BLM’s Sale Notice. If development should be proposed after leasing, the operator is responsible for complying with the requirements of Onshore Oil and Gas Order No. 1, including the requirement for the lessee or their operator to make a good-faith effort to reach a Surface Access Agreement with the private surface owner. The BLM will generally offer the surface owner the same level of surface protection that the BLM provides on federal surface. Parcels offered for sale are subject to the stipulations shown in Attachment 1, which includes protections on split estate lands under standard Lease Notice 1.

The LFO RMP FEIS discusses split estate lands throughout the document, and in Appendix H. Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities. The BB RMP FEIS discusses split estate lands throughout the document, and Appendix G Federal Oil and Gas Operations on Split-Estate Lands for both the WFO and CYFO RMPs have full discussions of split estate laws, regulations, and BLM policy and procedures. Also reference Appendix F. Wyoming Bureau of Land Management Mitigation Guidelines for Surface-Disturbing and Disruptive Activities.

For more information about split estate lands, references and web links are available at the end of this document, or contact a BLM office.

### 3.5 No Action Alternative

#### 3.5.1 Common to all Resources

Under the No-Action Alternative, lease parcels would not be offered at this time. Due to demand for oil and gas, it would be expected that some of these parcels would be re-nominated in the future, consistent with appropriate land use planning decisions, and might be offered for sale with additional stipulations. There is no way to accurately predict what level of restrictions future leasing might require, but it can be assumed that a substantial portion of the development that would occur under the No-Action Alternative would still be permitted under future leases. Future nominations for leases would be screened for conformance with the Land Use Plan in effect at the time, and the appropriate environmental review would be conducted to determine associated impacts. Effects from leases issued from any future sales would be analyzed in the appropriate environmental documents for those sales.

The Reasonably Foreseeable Development (RFD) scenario projects expected rates of well drilling and the BLM Reservoir Management Group (RMG) has estimated completion rates and production decline curves. Together, those parameters allowed for the projection of future oil and gas production volumes which were then used in the economic impact analysis. Actual economic impacts will vary if actual development or production varies from the projections, or as commodity prices and operation expenses change.

### 3.6 Proposed Action
3.6.1 Common to all Resources

The parcels nominated for the lease sale in the Proposed Action, in conformance with the Land Use Plans, have been identified as available for leasing in each RMP. Under this alternative, application of stipulations to nominated parcels for resource protections is directed by these RMPs. Should the 22 parcels, totaling 29,627.04 acres, be offered and sold, leases would be issued. At the development stage, additional site specific mitigation could be imposed if warranted, and consistent with valid existing lease rights. Under this alternative, revenue is generated through the sale of the lease parcel and subsequent rental.

3.7 Resources Brought Forward for Analysis

No direct impacts to resources are associated with the administrative action of leasing. During parcel reviews, the following resources have been identified as being present in the nominated lease parcel areas, are brought forward for further analysis, and stipulations or protective measures have been applied to the lease parcels as defined in Attachment 1 and Attachment 1A.

3.7.1 Air Resources

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to air resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to air resources, such as dust abatement measures. At the time of a site-specific application, such as an APD, air quality may be evaluated to provide for compliance with applicable Federal or State of Wyoming Department of Environmental Quality (WYDEQ) air quality standards. See the LFO RMP FIES 4.1.1 and 4.9, and the BB RMP FEIS 4.1.1 which contain Air Resources Management Plans (ARMP) which evaluated air quality issues, impacts, and potential mitigations. See the LFO Decisions 1001 – 1008 and Appendix D; and the WFO Decisions 1001 – 1006, and CYFO RMP Decisions 1001 – 1006, and Appendix M. Since the signing of the three RODs, two National Ambient Air Quality Standards (NAAQS) have changed and will continue to change as new data is gathered. There has been no significant change to warrant revisions to the RMP decisions.

Air quality, air quality related values (AQRVs), such as visibility and atmospheric deposition, and climate change are the components of air resources which the BLM must consider and analyze to address the potential effects of authorized activities on air resources as part of the planning and decision making process.

3.7.1.1 Air Quality

Regional air quality is influenced by the interaction of meteorology, climate, the magnitude and spatial distribution of local and regional air pollutant sources, and the chemical properties of emitted air pollutants.
Pollutant concentration can be defined as the mass of pollutants present in a volume of air and is reported in units of micrograms per cubic meter (μg/m³), parts per million (ppm), or parts per billion (ppb). The monitoring and enforcement of air-quality standards is generally administered by the Wyoming Department of Environmental Quality-Air Quality Division (WYDEQ). Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) identify maximum limits for concentrations of criteria air pollutants at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards, and the state of Wyoming has used monitoring and modeling to determine compliance with WAAQS and NAAQS. Concentrations above the WAAQS and NAAQS represent a risk to human health that, by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than federal standards, as allowed by the Clean Air Act (CAA). Currently, the WYDEQ-AQD does not regulate greenhouse gas emissions other than for permitted major stationary sources.

The U.S. Environmental Protection Agency (EPA) establishes air quality standards (NAAQS) for criteria pollutants. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter 2.5 microns or less in diameter (PM2.5), particulate matter 10 microns or less in diameter (PM10), sulfur dioxide (SO₂) and lead (Pb). Air pollutant concentrations greater than the NAAQS would represent a risk to human health.

The counties that lie within the jurisdictional boundaries of the WR/BBD (Park, Big Horn, Washakie, Hot Springs, Fremont, Natrona, Carbon, Sweetwater) are classified as in attainment for all state and national ambient air quality standards as defined in the Clean Air Act. All monitoring sites operated by the WDEQ Air Quality Division (AQD) and the BLM in the WR/BBD, are currently in compliance with the NAAQS and WAAQS.

Various state and federal agencies monitor air pollutant concentrations and visibility throughout Wyoming. Table 3-1 lists the available air quality monitoring sites within the WR/BBD and relevant sites nearby. The WDEQ operates PM10 monitors as part of the State and Local Monitoring Site (SLAMS) network. Other sites include several Interagency Monitoring of Protected Visual Environments (IMPROVE) monitors and BLM administered sites that are part of the Wyoming Air Resource Monitoring System (WARMS). Atmospheric deposition (wet) measurements of ammonium, sulfate, and various metals are taken at the North Absaroka, Thunder Basin, Buffalo and Cloud Peak Sites, which the BLM operates as part of the National Acid Deposition Program (NADP).
### Table 3-1  Air Quality Monitoring Sites within the WR/BBD

<table>
<thead>
<tr>
<th>County</th>
<th>Site Name</th>
<th>Type of Monitor</th>
<th>Parameter</th>
<th>Operating Schedule</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park</td>
<td>Cody</td>
<td>SLAMS</td>
<td>PM10</td>
<td>Jan. 3</td>
<td>-109.073/ 44.532</td>
</tr>
<tr>
<td></td>
<td>North Absaroka (managed by USFS)</td>
<td>IMPROVE</td>
<td>PM2.5, NO3-, Ammonium, Nitric Acid, Sulfate, Sulfur Dioxide &amp; Meteorology</td>
<td>Jan. 3; Hourly Meteorology</td>
<td>-109.382/ 44.745</td>
</tr>
<tr>
<td></td>
<td>Yellowstone National Park – Tower Falls</td>
<td>NADP/NTN</td>
<td>Wet Deposition Ions, Precipitation, pH</td>
<td>Weekly (Ions); Daily (Precip)</td>
<td>-110.42/ 44.917</td>
</tr>
<tr>
<td>Fremont</td>
<td>Lander</td>
<td>SLAMS</td>
<td>PM2.5</td>
<td>Jan. 3</td>
<td>-108.733/ 42.833</td>
</tr>
<tr>
<td></td>
<td>Sinks Canyon</td>
<td>NADP/NTN</td>
<td>Wet Deposition Ions, Precipitation, pH</td>
<td>Weekly (Ions); Daily (Precip)</td>
<td>-108.85/ 42.734</td>
</tr>
<tr>
<td></td>
<td>South Pass City</td>
<td>NADP/NTN</td>
<td>Wet Deposition Ions, Precipitation, pH</td>
<td>Weekly (Ions); Daily (Precip)</td>
<td>-108.832/ 42.494</td>
</tr>
<tr>
<td>Big Horn</td>
<td>Basin</td>
<td>WARMS CASTNet</td>
<td>Ozone, NO3-, Ammonium, Nitric Acid, Sulfate, Sulfur Dioxide &amp; Meteorology</td>
<td>Jan. 7 (Speciated); Hourly (O3, Met)</td>
<td>-108.041/44.28</td>
</tr>
<tr>
<td>Campbell</td>
<td>Thunder Basin</td>
<td>SPM</td>
<td>Ozone, Nitrogen Oxides &amp; Met</td>
<td>Hourly</td>
<td>-105.3/ 44.672</td>
</tr>
<tr>
<td></td>
<td>Thunder Basin</td>
<td>IMPROVE</td>
<td>PM2.5, NO3-, Ammonium, Nitric Acid, Sulfate, Sulfur Dioxide &amp; Meteorology</td>
<td>Jan. 3 (Speciated); Hourly Met.</td>
<td>-105.287/ 44.663</td>
</tr>
<tr>
<td>Johnson</td>
<td>Buffalo</td>
<td>WARMS</td>
<td>PM2.5, NO3-, Ammonium, Nitric Acid, Sulfate, Sulfur Dioxide &amp; Meteorology</td>
<td>Jan. 3 (PM2.5); 1/7 (others); Hourly Met</td>
<td>-106.019/44.144</td>
</tr>
<tr>
<td></td>
<td>Cloud Peak (Monitoring stopped during 2014)</td>
<td>IMPROVE</td>
<td>PM2.5, NO3-, Ammonium, Nitric Acid, Sulfate, Sulfur Dioxide &amp; Meteorology</td>
<td>Jan. 3 (Speciated); Hourly Met</td>
<td>-106.956/44.333</td>
</tr>
</tbody>
</table>

#### 3.7.1.2 Criteria Air Pollutants

Criteria air pollutants are those for which national concentration standards have been established. If the air quality in a geographic area meets the NAAQS, it is designated an attainment area; areas that do not meet the NAAQS are designated nonattainment areas and must develop comprehensive state plans to reduce pollutant concentrations to a safe level. Attainment/nonattainment status is determined separately for each criteria pollutant. Five of the six criteria pollutants for which the EPA has established NAAQs are:

- **Carbon monoxide (CO):** CO is an odorless, colorless gas formed during combustion of any carbon-based fuel, such as during the operation of engines, fireplaces, and furnaces. Because carbon monoxide data are generally collected only in urban areas where automobile traffic levels are high, recent data are often unavailable for rural areas.
- **Nitrogen dioxide (NO\(_2\))**: NO\(_2\) is a highly reactive compound formed at high temperatures during fossil fuel combustion. During combustion, nitrogen monoxide (NO) is released into the air which reacts with oxygen in the atmosphere to form NO\(_2\). NO plus NO\(_2\) forms a mixture of nitrogen gases, collectively called oxides of nitrogen (NOx). NOx emissions can convert to ammonium nitrate particles and nitric acid, which can cause visibility impairment and atmospheric deposition. NOx can contribute to “brown cloud” conditions and ozone formation, and can convert to ammonium (NH\(_4\)), nitrate particles (NO\(_3\)), and nitric acid (HNO\(_3\)). Internal combustion engines are a major source of NOx emissions.

- **Ozone**: Ozone is a gaseous pollutant that is not emitted directly into the atmosphere but is formed in the atmosphere from complex photochemical reactions involving NOx and reactive volatile organic compounds (VOCs). Common sources of VOCs include automotive and heavy equipment emissions, paints and varnishes, oil and gas operations, and wildfires. Ozone is a strong oxidizing chemical that can burn the lungs and eyes and damage plants. Ozone is a severe respiratory irritant at concentrations in excess of the federal standards.

- **Particulate matter (PM)**: PM is small particles suspended in the air that settle to the ground slowly and may be re-suspended if disturbed. Ambient air particulate matter standards are based on the size of the particle. The two types of particulate matter are:
  - PM\(_{10}\) (particles with diameters less than 10 micrometers): small enough to be inhaled and capable of causing adverse health effects.
  - PM\(_{2.5}\) (particles with diameters less than 2.5 micrometers): small enough to be drawn deeply into the lungs and cause serious health problems. These particles are a primary cause of visibility impairment.

- **Sulfur dioxide (SO\(_2\)) and sulfates (SO\(_4\))**: SO\(_2\) and SO\(_4\) form during combustion from trace levels of sulfur in coal or diesel fuel. SO\(_2\) also participates in chemical reactions and can form sulfates and sulfuric acid in the atmosphere.

The Wyoming DEQ has also established WAAQS, which are state-specific air quality standards for criteria pollutants. The standards and relevant averaging periods are summarized in Table 3-2 Summary of Ambient Air Quality Standards for Criteria Pollutants.

### Table 3-2 Summary of Ambient Air Quality Standards for Criteria Pollutants

<table>
<thead>
<tr>
<th>Pollutant (Units)</th>
<th>Averaging Period</th>
<th>NAAQS</th>
<th>WAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (ppb)</td>
<td>8-hour(^1)</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>NO(_2) (ppb)</td>
<td>1-hour(^2)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Annual(^3)</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>SO(_2) (ppb)</td>
<td>1-hour(^4)</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>CO (ppb)</td>
<td>1-hour(^5)</td>
<td>35,000</td>
<td>35,000</td>
</tr>
<tr>
<td></td>
<td>8-hour(^5)</td>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>PM(_{10}) (µg/m(^3))</td>
<td>24-hour(^6)</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Annual(^3)</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>PM(_{2.5}) (µg/m(^3))</td>
<td>24-hour(^7)</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Annual(^8)</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

µg/m\(^3\) micrograms per cubic meter
CO carbon monoxide
The BLM assessed recent air quality conditions within the WR/BBD boundary by examining data collected by monitors in the area, supplemented by various monitors in neighboring planning areas, as summarized in Table 3-3. The examination of these data indicates that the current air quality for criteria pollutants in the WR/BBD is in compliance with applicable NAAQS and WAAQS. Based on measurements in the area, visibility in the WR/BBD is considered very good.

Table 3-3 Primary Standards and Representative Concentrations
(Air Quality Conditions)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>NAAQS (WAAQS if different)</th>
<th>Representative Concentrations</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>1 hour</td>
<td>35 ppm</td>
<td>0.7 ppm</td>
<td>Jackson, WY Air Quality Monitoring Station. 2016 Design Value. Data source: <a href="https://www.epa.gov/air-trends/air-quality-design-values">https://www.epa.gov/air-trends/air-quality-design-values</a></td>
</tr>
<tr>
<td></td>
<td>8 hour</td>
<td>9 ppm</td>
<td>0.4 ppm</td>
<td></td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO₂)</td>
<td>1 hour</td>
<td>100 ppb</td>
<td>31 ppb</td>
<td>Belle Ayr BA-4 Air Quality Monitoring Station, Campbell County. 2013-2016 Design Value. <a href="https://www.epa.gov/air-trends/air-quality-design-values">https://www.epa.gov/air-trends/air-quality-design-values</a></td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>53 ppb</td>
<td>1 ppb</td>
<td>Spring Creek Air Monitoring Site. 2016 Design Value. Data source: <a href="https://www.epa.gov/air-trends/air-quality-design-values">https://www.epa.gov/air-trends/air-quality-design-values</a></td>
</tr>
<tr>
<td>Ozone</td>
<td>8 hour</td>
<td>0.070 ppm</td>
<td>0.060 ppm</td>
<td>Grand Teton NP Monitoring Site. 2014-2016 Design Value. Data source: <a href="https://www.epa.gov/air-trends/air-quality-design-values">https://www.epa.gov/air-trends/air-quality-design-values</a></td>
</tr>
</tbody>
</table>
### Pollutant Averaging Time NAAQS (WAAQS if different) Representative Concentrations Data Source

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>NAAQS (WAAQS if different)</th>
<th>Representative Concentrations</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>24 hour</td>
<td>150 μg/m³</td>
<td>63 μg/m³</td>
<td>2016 Maximum PM10 concentration at the Campbell County Monitoring Site. Data Source: <a href="http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf">http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf</a></td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>(50 μg/m³)</td>
<td>10 μg/m³</td>
<td>2016 Annual Mean for the Campbell County Monitoring Site. Data Source: <a href="http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf">http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf</a></td>
</tr>
<tr>
<td>PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
<td>24 Hour</td>
<td>35 μg/m³</td>
<td>13 μg/m³</td>
<td>Casper SLAMS Site. 2014-2016 Average Value. Data Source: <a href="http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf">http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/2017_Network_Plan_FIN_AL.pdf</a></td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>12.0 μg/m³</td>
<td>4.6 μg/m³</td>
<td>Casper SLAMS Site. 2014-2016 Average Value. Data Source: <a href="http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/Annual-Network-Plan_2016-Final.pdf">http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Annual%20Network%20Plans/Annual-Network-Plan_2016-Final.pdf</a></td>
</tr>
<tr>
<td>Sulfur Dioxide (SO&lt;sub&gt;2&lt;/sub&gt;)</td>
<td>1 hour</td>
<td>75 ppb</td>
<td>25 ppb</td>
<td>Sinclair Monitoring Station, Casper. 2014-2016 Design Value. Data source: <a href="https://www.epa.gov/air-trends/air-quality-design-values">https://www.epa.gov/air-trends/air-quality-design-values</a></td>
</tr>
</tbody>
</table>

Data Accessed: 12/19/2017

### 3.7.1.3 Ozone

Ozone levels in the area meet the WAAQS and the NAAQS. The BLM-Wyoming Air Resource Monitoring System (WARMS) contains the “Basin” site (the site is located just east of U.S. 16 (State Road 789), approximately 4 miles northwest of the town of Manderson, Wyoming, and 7 miles south of Basin, Wyoming). Figure 3-1 shows ozone data from the “Basin” station from January 2010- July 2017.
Figure 3-1 January 2010-July 2017 “Basin” Wyoming Daily Maximum 8-hour ozone

Reference: [http://www.epa.gov/airdata](http://www.epa.gov/airdata)

3.7.1.4 Visibility

The Clean Air Act includes “as a National Goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas in which impairment results from manmade air pollution.” The CAA gives federal managers the affirmative responsibility, but no regulatory authority, to protect air quality-related values, including visibility, from degradation. A wide variety of pollutants can impact visibility, including PM, NO$_2$, NO$_3$, and SO$_4$. Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances.

Visibility is quantified in terms of the deciview (dv), which is defined as a change in light extinction, with one dv representing the minimal perceptible change in visibility to the human eye, and in terms of the Standard Visible Range (SVR), which is defined as the greatest distance that a standard object can be seen by the unaided eye. Figures 3-2 and 3-3 show annual visibility in deciviews from 2002 to 2016 for the North Absaroka and from 2003 to 2014 for the Cloud Peak Interagency Monitoring of Protected Visual Environments (IMPROVE) sites (monitoring stopped at Cloud Peak during 2014).
Figure 3-2  North Absaroka annual IMPROVE visibility (2002-2016).

Reference: http://views.cira.colostate.edu/fed/AqrvMenu.aspx
(Date Accessed: 12/19/2017)

Figure 3-3  Cloud Peak annual IMPROVE visibility (2003-2014).

Source: Federal Land Manager Environmental Database 2016

Reference: http://views.cira.colostate.edu/fed/AqrvMenu.aspx
3.7.1.5 Basin, Wyoming Clean Air Status and Trends Data (CASTNET)

CASTNET is a long-term, rural monitoring network used to assess the environmental results due to emission reduction programs and pollutant impacts to sensitive ecosystems and vegetation. CASTNET measures ambient concentrations of sulfur and nitrogen species as well as rural ozone concentrations. Results from CASTNET are used to report on geographic patterns and temporal trends in acidic pollutants, deposition and regional ozone concentrations. CASTNET is the only network in the US that provides a consistent, long-term data record of acidic dry deposition fluxes.

During 2013, the BLM upgraded the Basin, WY site to become part of CASTNET. Ammonia data collection started in 2015. Annual concentration data from the Basin site is listed in Table 3-4.

Table 3-4  Basin, WY Annual CASTNET concentrations (μg/m3)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sulfur Dioxide</th>
<th>Particulate Sulfate</th>
<th>Particulate Nitric Acid</th>
<th>Total Nitrate</th>
<th>Particulate Ammonium</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>0.988</td>
<td>0.714</td>
<td>0.412</td>
<td>1.081</td>
<td>0.416</td>
</tr>
<tr>
<td>2014</td>
<td>0.941</td>
<td>0.678</td>
<td>0.354</td>
<td>0.87</td>
<td>0.369</td>
</tr>
<tr>
<td>2015</td>
<td>1.115</td>
<td>0.689</td>
<td>0.365</td>
<td>0.905</td>
<td>0.366</td>
</tr>
<tr>
<td>2016</td>
<td>1.056</td>
<td>0.576</td>
<td>0.0354</td>
<td>0.813</td>
<td>0.288</td>
</tr>
<tr>
<td>2017</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Reference: [https://java.epa.gov/castnet/clearsession.do](https://java.epa.gov/castnet/clearsession.do)  
(Date Accessed: 12/19/2017)

3.7.1.6 Climate and Greenhouse Gas Emissions

The climate in the planning area is designated as a combination of Intermountain Semi-Desert and Southern Rocky Mountain Steppe. Summers are generally short and hot and winters long and cold. Precipitation has historically been low, though greater at higher elevations, and distributed across the year, with the exception of the drier summer months. Wind speeds are variable but strong, which helps disperse airborne pollutants.

“Climate change” refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer. “Global warming” refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change. Climate is both a driving force and limiting factor for ecological, biological, and hydrological processes, and has great potential to influence resource management.
It is accepted within the scientific community that global temperatures have risen at an increased rate and the likely cause is gases that trap heat in the atmosphere, referred to as greenhouse gases (GHG). The IPCC (2007) concluded that “warming of the climate system is unequivocal” and “most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations.” Extensive research and development efforts are underway in the field of carbon capture and sequestration (CCS) technology, which could help direct management strategies in the future. The IPCC has identified a target worldwide “carbon budget” to estimate the amount of CO₂ the world can emit while still having a likely chance of limiting global temperature rise to 2°C above pre-industrial levels. The international community estimates this budget to be 1 trillion tonnes of carbon (IPCC, 2016).

CEQ’s first Annual Report in 1970 referenced climate change, indicating that “[m]an may be changing his weather.” It is now well established that rising global atmospheric GHG emission concentrations are significantly affecting the Earth’s climate. These conclusions are built upon a scientific record that has been created with substantial contributions from the United States Global Change Research Program (USGCRP).¹ Studies have projected the effects of increasing GHGs on many resources normally discussed in the NEPA process, including water availability, ocean acidity, sea-level rise, ecosystem functions, energy production, agriculture and food security, air quality and human health.

Specific modeling and/or assessments of the potential effects for the State of Wyoming currently do not exist; however, there are downscaled models that have been applied for the area such as a Rapid Ecoregional Assessment (REA) and the 2014 National Climate Assessment (GCRP, 2014).

Recently, the USGS completed the Wyoming Basin Rapid Ecoregional Assessment (USGS, 2015) and presented the results of the climate change analysis for this ecoregion. The analysis provided estimates of expected changes in environmental factors (e.g., precipitation, temperature, etc.) based on information derived from multiple global change models (GCM). The analysis used data for a current or baseline period (1961 to 1990) and provided a series of expected patterns for specific future time periods (e.g., 2046 – 2060).

The general precipitation pattern is presented in Figure 3-4. The general annual average precipitation pattern for the Wyoming Basin ecoregion shows increasing precipitation from the northwest to the southeast, with the Grand Teton and Yellowstone areas receiving the most rainfall and the mid-basin areas (including the Bighorn Basin and parts of Southeast Wyoming) receiving the least.

The mean annual temperature for existing climate pattern in the Wyoming Basin is presented in Figure 3-5. The historical data indicate that the Bighorn Basin area of the Wyoming Basin is generally warmer than the rest of the ecoregion.
The REA for the Wyoming Basin shows that all GCMs expect increased warming by 2030 and further warming by 2060. There was disagreement on the expected changes in precipitation.
amongst the models but the analysis did indicate an overall expectation for the future of wetter winters and drier summers.

Based primarily on the scientific assessments of the USGCRP, the National Research Council, and the Intergovernmental Panel on Climate Change (IPCC), in 2009 the Environmental Protection Agency (EPA) issued a finding that the changes in our climate caused by elevated concentrations of greenhouse gases in the atmosphere are reasonably anticipated to endanger the public health and public welfare of current and future generations.

GHGs are composed of molecules that absorb and reradiate infrared electromagnetic radiation. When present in the atmosphere the gas contributes to the greenhouse effect. Some GHGs such as CO₂ occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The primary GHGs that enter the atmosphere as a result of anthropogenic activities include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Fluorinated gases are powerful GHGs that are emitted from a variety of industrial processes including production of refrigeration/cooling systems, foams and aerosols. Fluorinated gases are not primary to the activities authorized by the BLM and will not be discussed further in this document.

GHGs are often presented using the unit of Metric Tons of CO₂ equivalent (MT CO₂e) or Million Metric Tons (MMT CO₂e), a metric to express the impact of each different greenhouse gas in terms of the amount of CO₂ making it possible to express greenhouse gases as a single number. For example, 1 ton of methane would be equal to 25 tons of CO₂ equivalent, because it has a global warming potential (GWP) 25 times that of CO₂. As defined by USEPA, the GWP provides “ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of CO₂.” The GWP of greenhouse gas is used to compare global impacts of different gases and used specifically to measure how much energy the emissions of one ton of gas will absorb over a given period of time (e.g. 100 years), relative to the emissions of one ton of CO₂. The GWP accounts for the intensity of each GHG’s heat trapping effect and its longevity in the atmosphere. The GWP provides a method to quantify the cumulative effects of multiple GHGs released into the atmosphere by calculating carbon dioxide equivalent for the GHGs.

- Carbon dioxide (CO₂), by definition, has a GWP of 1 regardless of the time period used because it is the gas being used as the reference. CO₂ remains in the climate system for a very long time; CO₂ emissions cause increases in the atmospheric concentrations of CO₂ that will last thousands of years (USEPA, 2016h).
- Methane (CH₄) is estimated to have a GWP of 28-36 times that of CO₂ over 100 years. CH₄ emitted today lasts about a decade on average, which is much less time than CO₂. But CH₄ also absorbs much more energy than CO₂. The net effect of the shorter lifetime and higher energy absorption is reflected in the GWP. The methane GWP also accounts for some indirect effects, such as the fact that methane is a precursor to ozone, and ozone is in itself a greenhouse gas (USEPA, 2016h).
Nitrous Oxide (N$_2$O) has a GWP of 265-298 times that of CO$_2$ for a 100-year timescale. N$_2$O emitted today remains in the atmosphere for more than 100 years, on average (USEPA, 2016h). Table 3-3 contains GHGs regulated by USEPA and global warming potentials.

The Center for Climate Strategies (CCS) prepared the Wyoming Greenhouse Gas Inventory and Reference Case Projection 1990-2020 (Inventory) for the WDEQ through an effort of the Western Regional Air Partnership (WRAP). This inventory report presents a preliminary draft GHG emissions inventory and forecast from 1990 to 2020 for Wyoming. This report provides an initial comprehensive understanding of Wyoming’s current and possible future GHG emissions. The information presented provides the state with a starting point for revising the initial estimates as improvements to data sources and assumptions are identified.

The CCS inventory report discloses that activities in Wyoming accounted for approximately 56 million metric tons (MMt) of gross carbon dioxide equivalent (CO$_2$e) emissions in 2005, an amount equal to 0.8% of total U.S. gross GHG emissions. These emission estimates focus on activities in Wyoming and are consumption-based; they exclude emissions associated with electricity that is exported from the state. Wyoming’s gross GHG emissions increased 25% from 1990 to 2005, while national emissions rose by only 16% from 1990 to 2004. Annual sequestration (removal) of GHG emissions due to forestry and other land-uses in Wyoming are estimated at 36 MMtCO$_2$e in 2005. Wyoming’s per capita emission rate is more than four times greater than the national average of 25 MtCO$_2$e/yr. This large difference between national and state per capita emissions occurs in most of the sectors – Wyoming’s emission per capita significantly exceed national emissions per capita for the following sectors: electricity, industrial, fossil fuel production, transportation, industrial process and agriculture. The reasons for the higher per capita intensity in Wyoming are varied but include the state’s strong fossil fuel production industry and other industries with high fossil fuel consumption intensity, large agriculture industry, large distances, and low population base. Between 1990 and 2005, per capita emissions in Wyoming have increased, mostly due to increased activity in the fossil fuel industry, while national per capita emissions have changed relatively little.

Globally, anthropogenic carbon emissions reached about 7,000,000,000 MT per year in 2000 and an estimated 9,170,000,000 Mt per year in 2010 (Boden, Marland, & Andres, 2013). Oil and gas production contributes to GHGs such as CO$_2$ and methane. Natural gas systems were the largest anthropogenic source category of CH$_4$ emissions in the United States in 2014 with 176.1 MMt CO$_2$ e of CH$_4$ emitted into the atmosphere. Those emissions have decreased by 30.6 MMt CO$_2$ e (14.8 percent) since 1990 (USEPA, 2016).

Global mean surface temperatures have increased nearly 1.8°F from 1890 to 2006. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970 alone. Temperatures in western Wyoming are expected to increase by 0.25 to 0.40 degrees Fahrenheit per decade while temperatures in surrounding locations in Utah, Wyoming, and Colorado are expected to increase by 0.40 to 1.2 degrees Fahrenheit per decade with the largest decrease expected in southwestern Wyoming.
Precipitation across western Wyoming is expected to decrease by 0.1 to 0.6 inches per decade with the largest decrease expected in southwestern Wyoming.

Figure 3-6  Long-term Temperature (top) and Precipitation (bottom) Trends in the United States from NOAA Climate Prediction Center

http://www.cpc.noaa.gov

Figure 3-7 below, taken from the IPCC’s Fourth Assessment Report, indicates varying responses of the natural world to increasing temperatures as a result of increasing global temperatures.
Figure 3-7 Examples of Impacts Associated with Global Average Temperature Change (Impacts will vary by extent of adaptation, rate of temperature change and socio-economic pathway).

A number of the existing authorized activities within the Cody, Worland, and Lander Field Offices generate GHG emissions. Oil and gas development activities can generate CO₂ and NH₄ (during processing). Carbon dioxide emissions result from the use of combustion engines for OHV and other recreational activities. Wildland fires also are a source of CO₂ and other GHG emissions, and livestock grazing is a potential source of methane. Other activities in the Lander, Cody, Worland, and Rawlins Field Office areas with the potential to contribute to climate change include soil erosion from disturbed areas and fugitive dust from roads, which have the potential to darken snow-covered surfaces and cause faster snow melt.

This EA includes a qualitative and quantitative analysis of possible greenhouse gas emissions that could occur as a result of reasonably foreseeable oil and gas development associated with the parcels being offered for lease. Additional information about potential emissions may also be available and evaluated as part of subsequent site-specific reviews at the APD stage.

The air emissions projections within the ARMPA for oil and gas development were calculated using the latest emissions data estimates from the Buffalo and Lander Environment Impact Statements (EIS) (BLM 2010). There can be limitations associated with a quantitative approach given the uncertainties regarding the number, nature, and specific location of future sources and activities. The estimated emissions in the ARMPA were determined using the following assumptions:

DOI-BLM-WY-R000-2018-0001-EA 3-20
• Emissions from BLM-administered activities for both construction and operations are calculated for year 2020 and year 2031. Year 2020 was chosen because construction emissions would be at its peak during that year due to peak well construction at each location. Year 2031 was chosen because operational emissions would be at the highest level, while construction emissions would be at the lowest; and
• Appropriate RDFs (ARMPA, Appendix B) will be applied; the ARMPA analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

It should be noted that for both of the assumptions that the pace and timing of mineral development activities is dependent on a variety of factors outside the management decisions made by the BLM. These include national and international energy demand and prices, production factors within the planning area, and individual strategic choices made by operators.

The administrative act of offering any of these parcels and the subsequent issuing of leases would have no direct impacts to air quality. Any potential effects to air quality would occur if and when the leases were developed. Any proposed development project would be subject to additional analysis of possible air effects before approval. The analysis may include air quality modeling for the activity in accordance with the National BLM, EPA and NPS Air Quality Memorandum of Understanding (MOU). Over the last 10 years, the development on federal oil and gas mineral estate in the WR/BBD has resulted in approximately 191 wells drilled and completed for production (approximately 148 federal in LFO, 13 in CYFO and 30 in WFO). These wells would incrementally contribute a small percentage of the total emissions (including GHGs) from oil and gas activities in Wyoming.

Potential impacts of development could include increased airborne particulates associated with the construction of new well pads, pipelines, or roads, exhaust emissions from drilling and completion equipment/activities, compressors, vehicles, and dehydration and separation facilities, as well as releases of GHG and volatile organic compounds during many of these activities. The following sources of emissions are anticipated during oil and gas development should the leases be sold and development proposed: combustion engines (i.e. fossil fuel fired internal combustion engines used to supply electrical or hydraulic power for hydraulic fracturing to drive the pumps and rigs used to drill the well, drill out the hydraulic stage plugs and run the production tubing in the well; generators to power drill rigs, pumps and other equipment; compressors used to increase the pressure of the oil or gas for transport and use; tailpipe emissions from vehicles transporting equipment to the site), venting (i.e. fuel storage tanks vents and pressure control equipment), mobile emissions (i.e. vehicles bringing equipment, personnel or supplies to the location), fugitive sources (i.e. Pneumatic valves tank leaks, dust). A number of pollutants associated with the combustion of fossil fuels are anticipated to be released during drilling/completion operations include: CO, NOx, SOx, PM, CO2, CH4 and N2O. Venting may release VOCs/HAPs, H2S, and CH4. The amount of increased emissions cannot be quantified at this time since it is unknown how many wells or what type (oil, gas or both) may be proposed for development, the types of equipment needed if a well were to be put into production (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company. The degree of impact will also vary according to the characteristics of the geologic formations from which production occurs.
During the completion phase, principal pollutants emitted are VOCs, HAPs, particulate matter, and NO\textsubscript{2}. VOCs and NO\textsubscript{x} contribute to the formation of ozone. During well completion, injected fracturing fluids, formation fluids, and reservoir gas are flowed back to the surface. The flowback of formation fluids and reservoir gas will include additional VOCs and methane, along with hazardous air pollutants such as benzene, ethylbenzene, and n-hexane. Pollution also may be emitted from other processes and equipment during production and transportation of oil and gas from the well to a processing facility.

The Reasonably Forseeable Development (RFD) for all three FOs in the WR/BBD was updated during the recent planning efforts for Lander (2014) and the Big Horn Basin (2015) and cumulatively covers nearly 7 million federal fluid mineral acres in the WR/BBD. This RFD projects a total of 3100 total wells in the Bighorn Basin and 3400 total wells in the LFO could be developed during the life of the plans. Development density (i.e., wells per square mile) and number of wells installed annually depend on a number of variables including market trends, technology available (vertical, directional, or horizontal), the geology of the hydrocarbon-bearing zone, and the application of Controlled Surface Use and No Surface Occupancy stipulations. As a result, the number of wells that could potentially be put into production under a full field development scenario as a result of offering the leases is unknown. Current APD permitting trends within the field offices confirm that the RFD assumptions are accurate.

Coal-bed natural gas (CBNG) production does not currently exist within the WR/BBD; a total of 14 CBM wells have been installed in the Lander FO; all but one were plugged without producing in economical quantities. Although the RFDs for both the Lander and Bighorn Basin RMPs assumes a CBNG development rate of up to 15 wells per year, there is no active or proposed CBNG development in the Field Offices; therefore, there are no expected emissions although they are included in the estimation of greenhouse gas emissions as the geologic potential still remains.

3.7.1.7 Visibility and Deposition

Visibility impacts resulting from oil and gas development are assessed at the project proposal stage utilizing approved methodologies developed by Federal Land Managers responsible for Federal Class I and wilderness areas and wildlife refuges. The Federal Land Managers’ Air Quality Related Values Work Group (FLAG 2010) guidance provides a quantitative method for assessing and analyzing impacts to Class I and sensitive Class II areas. Since the methodology requires development of an emissions inventory and the location where the development will occur, FLAG analysis cannot be completed at the leasing stage since development scenarios are not reasonably foreseeable. As noted in chapter 3 however, the number of days experiencing visibility impairment have decreased over time.

Dry deposition of Nitrates and Sulfates can lead to acidification and eutrophication of high altitude water bodies. Statistically significant downward trends in both of these parameters have occurred at
NO2 is a red-brown gas formed during operation of internal combustion engines. Such engines emit a mixture of nitrogen gases, collectively called nitrogen oxides (NOx). NO2 can contribute to brown cloud conditions, and can react with other nitrogen compounds to form ammonium nitrate particles and nitric acid, which can cause visibility impairment and acid rain. Microbiological activity in soil can be a natural source of nitrogen compounds.

SO2 forms during combustion from trace levels of sulfur in coal or diesel fuel. It can react with ammonium to form ammonium sulfate ([NH4]2SO4) and with water vapor to form sulfuric acid (H2SO4), which can cause visibility impairment and acid rain. Emissions from volcanoes are natural sources of SO2. Anthropogenic sources include refineries and power plants.

Sulfur and nitrogen compounds that can be deposited on terrestrial and aquatic ecosystems include nitric acid (HNO3), nitrate (NO3-), ammonium (NH4+), and sulfate (SO4--). Nitric acid (HNO3) and nitrate (NO3-) are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NOx); and sulfate (SO4--) is formed in the atmosphere from industrial emission of sulfur dioxide (SO2). Deposition of HNO3, NO3- and SO4-- can adversely affect plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs (ancient carvings and/or engravings on rock surfaces). Ammonium (NH4+) is volatilized from animal feedlots and from soils following fertilization of crops. Deposition of NH4+ can affect terrestrial and aquatic vegetation via soil nitrogen balance and aqueous nitrogen chemistry. While this type of deposition may be beneficial as a fertilizer, it can adversely affect plant growth stages such as budding, leafing development maturation and reproduction.

3.7.1.8 Greenhouse Gas Emissions and Climate Change

The administrative act of leasing all or part of 22 parcels covering 29,627.04 acres would not result in any direct, indirect, or add to cumulative GHG emissions. Nevertheless, the BLM recognizes that GHG emissions are a potential effect of the subsequent fluid mineral exploration and/or development of any leases that are issued. Oil and gas activities may lead to the installation and production of new wells, which may consequently produce an increase in GHG emissions. The primary sources of GHG emissions include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO2 in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors;
- Fugitive CH4 – CH4 that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH4 emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their CH4 emissions to the USEPA; and
- Combustion of produced oil and gas – it is expected that future operations would produce marketable quantities of oil and/or gas. Combustion of the oil and/or gas would release CO2 into the atmosphere. Fossil fuel combustion is the largest source of global CO2.
In recent years, many states, tribes, and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The U.S. EPA provides links to statewide GHG emissions inventories (USEPA, 2015c). Guidelines for estimating project-specific GHG emissions are available (URS Corporation, 2010), but some additional data, including the projected volume of oil or natural gas produced for an average well, number of wells (as well as other factors described in Section 3.7.1. Air Quality) were used to provide GHG estimates.

Wyoming’s total GHG emissions are expected to continue to grow to 69 MMtCO2e by 2020, 56% above 1990 levels. As shown in Figure 3-6 (from the CCS inventory report), demand for electricity is projected to be the largest contributor to future emissions growth, followed by emissions associated with transportation. Although GHG emissions from fossil fuel production had the greatest increase by sector in the period 1990 to 2005, the growth from this sector is projected to decline due to decreased carbon dioxide emissions from venting at processing plants. Additional capture of fugitive emissions will likely result in further reductions in emissions at all points in the production and refining processes for oil and gas products.

3.7.1.9 Direct Emissions

The Petroleum Association of Wyoming’s website (http://www.pawyo.org/facts-figures.pdf) reports that in 2014, there were 35,258 active gas and oil wells in the state, 43 operational gas processing plants, 6 oil refineries, and over 38,600 miles of crude oil, gas, and petroleum product pipelines located across all land ownership patterns in the state. There are significant uncertainties associated with estimates of Wyoming’s GHG emissions from this sector. This is compounded by the fact that there are no regulatory requirements to track CO2 or CH4 emissions.

However, as reported by the Wyoming GHG Inventory and Reference Case Projection CCS, Spring 2007, emissions from the fossil fuel sector grew 101% from 1990 to 2005 and are projected to increase by a further 10% between 2005 and 2020 (if economic incentives remain). The natural gas industry is the major contributor to both GHG emissions and emissions growth, with CH4 emissions from coal mining second in terms of overall contribution. That said, it is worth noting that a significant portion of the emissions attributed to the natural gas industry are due to vented gas from processing plants, many of which are used for injection in enhanced oil recovery operations. Additionally, many technological advances in emission control technology have been implemented by the oil and gas industry to reduce emission levels.

The average number of oil and gas wells drilled annually in the WR/BBD and probable GHG emission levels, when compared to the total GHG emission estimates from the total number of federal oil and gas wells in the state, represent an incremental contribution to the total regional and global GHG emission levels. For additional information on projected emissions of GHGs, please see Lander FEIS pages 593-629 and the Bighorn Basin FEIS pages 4-23 through. As analyzed in the WR/BBD RMP EIS’, total CO2e emissions for the full RFD in Lander (expected maximum year of associated emissions) is projected to be, in million metric tonnes (MMt), 1.11 CO2e and 0.91 MMt in the Bighorn Basin, assuming that all wells projected under the RFD are drilled and producing, and that there are no controls on the waste stream.
The lands proposed for lease as part of the sale under consideration are within the Lander, Cody and Worland field offices and only represent a portion of the area covered by the RFD. The 22 proposed parcels containing approximately 29,627.04 acres represents 1.793% of the total mineral estate acreage in the WR/BBD RFDs. Assuming these lands are leased and developed to the full potential, as projected by the RFD for the RMPs, development to the full RFD in the LFO would produce a total of 1.11 MMt of CO2e per year; the Cody and Worland FOs are projected to produce a total of 0.16 MMt of CO2e per year. Direct GHG emissions resulting from any future development of these parcels is within the projections identified in the FEIS’ and includes all emissions generated from construction through the production of the wells and are based on the year 2018 estimates. As explained above those represent peak emissions values as 2018 is estimated to be the peak period for well development.

Any incremental contribution to global GHG gases cannot be translated into incremental effects on climate change globally, regionally, or in the area of these site-specific actions. As oil and gas and natural gas production technology continues to improve in the future, it may be feasible to further reduce GHG emissions.

3.7.1.10 Indirect Emissions

Table 3-5 Indirect Cumulative GHG Emissions;
assumes 100% Combustion (metric tons CO2)

<table>
<thead>
<tr>
<th>Year</th>
<th>Gas (MCF)</th>
<th>Oil (BBLs)</th>
<th>Year</th>
<th>Gas (CO2)</th>
<th>Oil (CO2)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>29,200,000</td>
<td>2,300,000</td>
<td>2016</td>
<td>1,597,736.40</td>
<td>989,000.00</td>
<td>2,586,736.40</td>
</tr>
<tr>
<td>2017</td>
<td>31,300,000</td>
<td>2,300,000</td>
<td>2017</td>
<td>1,712,642.10</td>
<td>989,000.00</td>
<td>2,701,642.10</td>
</tr>
<tr>
<td>2018</td>
<td>36,000,000</td>
<td>3,000,000</td>
<td>2018</td>
<td>1,969,812.00</td>
<td>1,290,000.00</td>
<td>3,259,812.00</td>
</tr>
<tr>
<td>2019</td>
<td>40,800,000</td>
<td>3,400,000</td>
<td>2019</td>
<td>2,232,453.60</td>
<td>1,462,000.00</td>
<td>3,694,453.60</td>
</tr>
<tr>
<td>2020</td>
<td>47,000,000</td>
<td>3,800,000</td>
<td>2020</td>
<td>2,571,699.00</td>
<td>1,634,000.00</td>
<td>4,205,699.00</td>
</tr>
</tbody>
</table>

Total: 10,084,343.10 6,364,000.00 16,448,343.10

Emission Factor Source: EPA GHG Equivalencies Calculator
Information on production of oil and gas was provided by the BLM’s RMG and BLM field and district office staff to support analysis within the RMP FEIS. The information was used to develop total oil and gas production estimates by year for each alternative and each field office or planning unit, including the number of wells drilled each year by alternative for each field office or planning unit (from the RFD), the percent of wells that were oil versus gas, the percent of wells completed, production decline curves for oil and gas wells, and estimates of cross production from both oil and gas wells.

As discussed in Appendix 25, Economic Impact Analysis Methodology, from the BHB RMP FEIS, and Appendix L from the LRMP FEIS, total production was calculated based on information contained within the RFDs. See Tables 4-10 through 4-15 from the BHB FEIS and tables L.2, L.3 and L.4 from the LRMP FEIS for specific estimates. Using the above production projections, and utilizing the EPA GHG Equivalences Calculator, assuming 100% combustion of the produced fluids, estimate indirect emissions are shown in Table 3-5.

3.7.1.11 Emission Estimate Uncertainties

Although this EA presents quantified estimates of potential direct and indirect GHG emissions associated with the potential for oil and gas development, there is significant uncertainty in GHG emission estimates due to various unknowns with regard to actual production, how produced substances are used, how regulation of the various GHG parameters by the delegated agencies is applied, and whether any Best Available Control Technologies are utilized at the upstream or downstream activity location(s) and the reader is cautioned that, while based on the best available data, these estimates are highly speculative. For example, the Reasonably Foreseeable Development (RFD) reports prepared for the relevant land-use plans disclose variable rates of success over time for wells drilled in these planning areas. Based on both historical and current information, the rate of success for wells being productive, range from a low of 13% to upwards of 90% depending upon where you are within the individual field offices, the formations being targeted, price indexes, and technological advances. Where discussed in the RFD reports, success rates are expected to decline due to future exploration of unconventional resources “From the early 1990’s to present, activity has focused almost entirely on very low risk development drilling in and around known field areas, which helped to improve the overall success rate. More future exploratory drilling will be required to discover new resources in the Planning Area and to determine whether its potential coalbed natural gas resource is economic to produce. Since the risk of failure is higher for these types of activities, the success rates could decline slightly in the future” [See Bighorn (2014), pages 24 - 27, and Lander RFD (2006), pages 12-15].

3.7.1.12 Oil and Gas Product End Use Uncertainty
The direct and indirect emission estimates above provide an estimate of the full potential for GHGs released into the atmosphere from initial wellsite construction, well drilling and completion, production, and end use. A rough estimate was possible using full field and unconstrained potential well development prepared for the ARMPA EIS. With respect to the rough estimates of indirect CO2 emissions, it should be noted that it is difficult to discern with certainty what end uses for the fuels extracted from a particular leasehold are reasonably foreseeable. For instance, some end uses of fossil fuels extracted from federal leases include: refining for transportation fuels, fuel oils for heating and electricity generation, or production of asphalt and road oil. They may also be used in the chemical industry, for the manufacture of medicines and everyday household items, plastics, military defense and for the manufacture of synthetic materials. 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 significant uncertainty with regard to the actual levels of development and production that may occur at any given well.

3.7.1.13 Climate Change Impacts

The following bullet points summarize potential changes identified by the EPA that are expected to occur at the regional scale, where the proposed action and its alternatives are to take place. The EPA identifies this area as part of the Mountain West and Great Plains region:

- 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 lodgepole pine forests, and increase the susceptibility to fire. Grasslands and rangelands could expand into previously forested areas.
- Ecosystems would be stressed and wildlife such as the mountain lion, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

Other impacts could include:
- Increased particulate matter in the air as drier, less vegetated soils experience wind erosion.
- Shifts in vegetative communities which could threaten plant and wildlife species.
- Changes in the timing and quantity of snowmelt which could affect both aquatic species and agricultural needs. Projected and documented broad-scale changes within ecosystems of the U.S. are summarized in the Climate Change SIR (2010). Some key aspects include:
Large-scale shifts have already occurred in the ranges of species and the timing of the seasons and animal migrations. These shifts are likely to continue (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 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.

The Rapid Ecological Assessment for the Wyoming Basin also provides projections of future climatic changes, while cautioning that reasonably foreseeable changes in climate will vary due to natural inter-annual and decadal variability, uncertainty about future greenhouse gas emissions, and the range of uncertainties in the existing global climate models. The authors also recognize that there are differences among climate models in how they represent climate processes and therefore produce different climate projections for a given time period and location even when the same future emissions scenario drives the simulation. Global temperatures, however, are expected to increase (Intergovernmental Panel on Climate Change, 2013) such that warmer temperatures in the future can be expected, although the magnitude and consequences of warming is uncertain, but note that summers are projected to warm more than winters (an increase of 4.5 °F versus 3.5 °F) (fig. 5.1 in Lukas and others, 2014) while no statistically significant changes in precipitation are noted, winters may be wetter and summers likely drier. Despite the lack of statistically significant projected changes in precipitation, the temperature increase alone could increase evaporation and plant water demand; thus, even without a decrease in precipitation, water availability for ecosystems could decrease if precipitation remains about average (Carr, 2016).
Figure 3-8  Methane and Fossil Fuel Emissions

3.7.1.14  Mitigation

The BLM holds regulatory jurisdiction over portions of natural gas and petroleum systems, identified in the EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks document. Exercise of this regulatory jurisdiction has led to development of “Best Management Practices (BMPs)” designed to reduce emissions from field production and operations. Analysis and approval of future development on the lease parcels may include applicable BMPs as Conditions of Approval (COAs) in order to reduce or mitigate GHG emissions, if necessary and within the authority of the BLM to administer. Additional measures developed at the project development stage may be incorporated as applicant-committed measures by the project proponent, added to necessary State of Wyoming air quality permits, or as COAs in the approved APD or with a programmatic EIS.

Such mitigation measures may include, but are not limited to:
- Flare hydrocarbon and gases at high temperatures in order to reduce emissions of incomplete combustion through the use of multi-chamber combustors;
- Water dirt roads during periods of high use in order to reduce fugitive dust emissions;
- Require that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored;
- Installation of liquids gathering facilities or central production facilities to reduce the total number of sources and minimize truck traffic;
- Use of natural gas fired or electric drill rig engines;
- The use of selective catalytic reducers and low-sulfur fuel for diesel-fired drill rig engines; and,
- Flaring of hydrocarbon gases at high temperatures in order to reduce emissions of incomplete combustion;
- Protecting frac sand from wind erosion;
- Implementation of directional and horizontal drilling technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores;
- Performing interim reclamation to reclaim areas of the pad not required for production facilities and to reduce the amount of dust from the pads.

Additionally, the BLM encourages oil and gas natural gas companies to adopt proven cost-effective technologies and practices that improve operation efficiency and reduce natural gas emissions to reduce the ultimate impact from the emissions.

In October 2012, the EPA promulgated air quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs during gas completions. Mitigation includes a process known as “Green Completion” in which the recovered products are sent through a series of aboveground, closed, separators which then negates the need for flowing back into surface pits as the product is then immediately sent to gas lines and the fluids are transferred to onsite tanks. Green completions have been required by the WDEQ for many years in the Upper Green River Basin and will be required throughout the state of WY by 2015.

EPA Inventory data show that adoption by industry of the BMPs proposed by the EPA Natural Gas Energy Star program has reduced emissions from oil and gas exploration and development. The three WR/BBD FOs will continue to work with industry to facilitate the use of the relevant BMPs for operations proposed on federal mineral leases where such mitigation is consistent with agency policy and determined necessary through the NEPA process.

The Proposed Action Alternative would make approximately 29,627.04 acres of federal mineral estate available for lease sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting air resources.
3.7.2 Paleontology & Geology

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to paleontological resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval including pre-disturbance surveys and construction monitoring; see the LFO RMP Decisions 5053-5064 and Appendix H; the BB RMP FEIS Section 4.5.2. and Appendix F. BLM WO IM 2016-124 Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands (IM 2016-124) including attachments provides additional relevant information.

The Proposed Action Alternative would make approximately 29,627.04 acres of federal mineral estate available for lease sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting vertebrate and scientifically significant paleontological resources.

Parcels offered for sale are subject to standard Lease Stipulation No. 1 and one unnumbered Special Lease Stipulation, protecting historic properties and/or resources, plus the stipulations and/or special lease notice shown in Attachment 1, which may include restrictions on surface use or occupancy within designated “very high” or “high” potential fossil yield classification areas for the protection of fossil resources.

3.7.3 Soils

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to soil resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to the soil. See the LFO RMP Decisions 1009 – 1025; WFO RMP Decisions 1007 – 1023, and CYFO RMP Decisions 1007 – 1023 and Appendix F.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action Alternative would allow mineral development to occur while protecting soil resources.

Parcels offered for lease sale are subject to the stipulations shown in Attachment 1, which includes stipulations and restrictions on slope and limited reclamation potential soils, and standard Lease Notice 1.

3.7.4 Water

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to water resources but subsequent development, if it were to occur, could result in
impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to the water related resources. See the LFO Decisions 1009 – 1025 and 4053, and Appendices B, E, and H.; and the WFO RMP Decisions 1024 – 1042, and 4055, and CYFO Decisions 1024 – 1042 and 4056, and Appendix F.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action Alternative would allow for mineral development to occur while protecting water resources. No parcels were nominated which affect sole source aquifers or public water supply areas in the WR/BBD.

Parcels offered for lease sale are subject to the stipulations shown in Attachment 1, for the protection of perennial surface waters, riparian-wetland areas, and playas, water, and disturbance within 500 feet perennial surface water. Further protections are implemented through standard Lease Notice 1.

3.7.5 Master Leasing Plan Analysis Areas

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. WO IM 2010-117, Oil and Gas Leasing Reform, Master Leasing Plan (MLP) analysis was conducted in the WR/BBD RMPs as a tool to facilitate resource protection while allowing for oil and gas development. The analysis resulted in MLP determinations for each field office. See WFO RMP Decisions 2033 – 2042. As described in Section 4.2.5.2 of the BB FEIS; the inclusion of the MLP determinations place additional stipulations on oil and gas-related surface disturbances in the analysis areas for the protection of big game, recreation, geologic features, and Limited Reclamation Potential (LRP) soils.

One parcel in the WFO Fifteen Mile Master Leasing Plan (MLP), WY-183Q-121 totaling 683.660 acres, is nominated for lease sale for oil and gas development. Referencing management decision 2038, even though the 551.297 acres portion within the MLP is less than 640 acres, offering the 551.297 acres will protect the federal mineral estate from drainage, or make the acreage available to commit to a future unit or communitization agreement. These non-contiguous portions within the MLP are joined by oil and gas lease WYW176339, and another parcel was offered for sale in the competitive oil and gas sale on August 1, 2017.

Table 3-6 MLP Parcels

<table>
<thead>
<tr>
<th>Parcel Number</th>
<th>EOI Parcel Acreage</th>
<th>Inside MLP</th>
<th>Outside MLP</th>
<th>Minimum Parcel</th>
</tr>
</thead>
<tbody>
<tr>
<td>WY-183Q-121</td>
<td>683.660</td>
<td>551.297</td>
<td>132.363</td>
<td>640.000</td>
</tr>
</tbody>
</table>

The Proposed Action Alternative would make approximately 29,627.04 acres of federal mineral estate available for lease sale, with approximately 551.297 acres in the MLP. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting resources identified in the MLPs.
Parcels offered for sale are subject to the stipulations shown in Attachment 1, which includes the protection of big game, vegetation, recreation, geologic features, LRP soils, cultural and visual resources, and standard Lease Notice 1.

3.7.6 Vegetation, Including Invasive Species and T&E Species

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to vegetation resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to vegetation, including invasive species and T&E species. See LFO Decisions in Tables 2.1 – 2.13; and WFO and CYFO Decisions in Tables 3.8 – 3.11 and Appendix B.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting or mitigating vegetation, including invasive species and T&E species, resources.

Parcels offered for sale are subject to the stipulations shown in Attachment 1, which includes the protection of perennial surface waters, riparian-wetland areas, playas, water, and disturbance within 500 feet perennial surface water. Further protections are implemented through standard Lease Notice 1 and standard Lease Stipulation No. 2.

3.7.7 Wildlife & Fish

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to wildlife, special status wildlife, fish, birds, or wild horse habitat resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to wildlife and/or fish. See LFO RMP Decision Tables 2.14 – 2.16 and Appendices H, I and J; and WFO Decisions Tables 3.12 - 3.14, and Appendices B, F, K, and N.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting wildlife, special status wildlife, birds, or mammals resources and habitat.

Parcels offered for sale are subject to the stipulations shown in Attachment 1, with protections for wildlife, special status wildlife, fish, and birds. The lease sale includes some parcels that are open to oil and gas leasing subject to an NSO or CSU stipulation for the protection of habitat or life cycle for pygmy rabbits, mountain plover, fish spawning, raptors, and big game crucial winter range. Further protections are implemented through standard Lease Notice 1 and standard Lease Stipulation No. 2.
3.7.8 Greater Sage-Grouse

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to greater sage grouse resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to sage-grouse habitat.

The greater sage-grouse is a BLM sensitive species that is ubiquitous in the WR/BBD. The FEIS’ discuss in detail the management concerns regarding greater sage-grouse throughout the documents. The LUPs in BLM Wyoming direct the priority for leasing of fluid mineral resources to be outside of sage-grouse habitat areas. If leasing occurs in sage-grouse habitat areas, all leasing is consistent with stipulations developed during land use planning, which may include No Surface Occupancy (NSO) and timing limitations for surface disturbing activities.

See the LFO RMP FEIS Sections 4.4.9 and 3.2.4 which describes the current conditions in the analysis areas and analyzed likely future potential effects of development in relation to sage-grouse habitat, and what protections might need to be implemented. The FEIS also evaluated protective measures that were incorporated in the RMP Decisions found in Table 2.1. 4000 Biological Resources, Special Status Species, Decisions 4102 – 4120. Also reference LFO ROD Appendix M. Greater Sage-Grouse Conservation Objectives Final Report Consistency Review, and Appendix M.1. Conservation Objectives.

See the BB RMP FEIS Sections 4.4.9 and 3.2.5 describe the current conditions in the analysis areas and analyzed likely future potential effects of development in relation to sage-grouse habitat, and what protections might need to be implemented. The FEIS also evaluated protective measures that were incorporated in the RMP Decisions found in Table 3.13. 4000 Biological Resources, Special Status Species, Greater Sage-Grouse, WFO Decisions 4087 – 4115, and CYFO Decisions 4088 – 4116. For both WFO and CYFO, also reference Chapter 2 Approved Resource Management Plan for Greater Sage-Grouse Habitat, and Appendix D. Greater Sage-Grouse Habitat Management Strategy.

The leases in core or priority habitat will be offered subject to the appropriate sage-grouse protective stipulations. These include seasonal timing limitations protecting breeding and nesting areas and other prescriptions within PHMAs. Required design features and best management practices are applied to limit the adverse impacts of oil and gas development on greater sage-grouse.

The table below identifies the parcel stipulation codes as used for BLM Wyoming lease sales; see Attachment 1 and the lease sale booklet. Please refer to Attachment 1A for the full stipulation language. As a reminder, the Lander Approved RMP uses the core area strategy, and does not use the terms PHMA or GHMA.
Table 3-7  BLM Wyoming Stipulation Code & WR/BBD Management Decisions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WY_SW_NSO_GHMAL</td>
<td>Lek Protections</td>
<td>4104</td>
<td>4106</td>
<td>4107</td>
</tr>
<tr>
<td>WY_SW_NSO_PHMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WY_SW_TLS_GHMAL</td>
<td>Timing Limitation</td>
<td>4105</td>
<td>4107</td>
<td>4108</td>
</tr>
<tr>
<td>WY_SW_TLS_PHMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WY_SW_TLS_PHMAWCA</td>
<td>Winter Concentration Areas</td>
<td>4108</td>
<td>4108</td>
<td>4109</td>
</tr>
<tr>
<td>WY_SW_CSU_PHMA</td>
<td>Requires DDCT</td>
<td>4109</td>
<td>4109</td>
<td>4110</td>
</tr>
</tbody>
</table>

The table below summarizes the parcels in the Third Quarter 2018 Competitive Oil and Gas Lease Sale with sage-grouse habitats and stipulations applied to the parcels. PHMA, GHMA, Core, and Non-Core are all illustrated together.

Table 3-8  WR/BBD Parcels Identified With GSG Habitat

<table>
<thead>
<tr>
<th>WY-183Q-</th>
<th>Office</th>
<th>Parcel Acres</th>
<th>GSG Acres</th>
<th>% of Parcel With GSG</th>
<th>WY_SW_NSO_PHMAL</th>
<th>WY_SW_TLS_PHMAL</th>
<th>WY_SW_TLS_GHMA</th>
<th>WY_SW_TLS_PHMAWCA</th>
<th>WY_SW_CSU_PHMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>LFO</td>
<td>1,360.000</td>
<td>1,360.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>104</td>
<td>LFO</td>
<td>1,280.000</td>
<td>1,280.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>105</td>
<td>LFO</td>
<td>2,046.850</td>
<td>2,046.850</td>
<td>100.00%</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>LFO</td>
<td>2,552.080</td>
<td>2,552.080</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>108</td>
<td>LFO</td>
<td>1,275.870</td>
<td>1,275.870</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>109</td>
<td>LFO</td>
<td>1,277.020</td>
<td>1,277.020</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>110</td>
<td>LFO</td>
<td>2,559.040</td>
<td>2,559.040</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>111</td>
<td>LFO</td>
<td>640.000</td>
<td>640.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>116</td>
<td>LFO</td>
<td>2,560.000</td>
<td>2,560.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>117</td>
<td>LFO</td>
<td>2,321.240</td>
<td>2,321.240</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>118</td>
<td>LFO</td>
<td>2,560.000</td>
<td>2,560.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>119</td>
<td>LFO</td>
<td>1,400.000</td>
<td>1,400.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>120</td>
<td>LFO</td>
<td>1,560.000</td>
<td>1,560.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>122</td>
<td>LFO</td>
<td>280.000</td>
<td>280.000</td>
<td>100.00%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>115</td>
<td>WFO</td>
<td>150.470</td>
<td>150.470</td>
<td>100.00%</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>23,822.570</td>
<td>23,822.570</td>
<td>100.00%</td>
<td>6</td>
<td>11</td>
<td>4</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale, of which 23,822.57 acres, or 80.41%, is within sage-grouse habitat areas. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to only occur under the stipulations for the protection of sage-grouse habitats.
The leases in core or priority habitat will be offered subject to the appropriate sage-grouse protective stipulations. These include seasonal timing limitations protecting breeding and nesting areas and other prescriptions within PHMAs. Applicable required design features and best management practices are applied to limit the adverse impacts of oil and gas development on greater sage-grouse.

Parcels offered for sale are subject to the stipulations shown in Attachment 1, for protection of sage-grouse habitat, and all leases have the added protection of standard Lease Notice 3. The disturbance density & cap stipulation WY_SW_CSU_PHMA (LFO 4109, WFO 4109, and CYFO 4110), notifies the potential bidder, in part, ‘This lease does not guarantee the lessee the right to occupy the surface of the lease for the purpose of producing oil and natural gas within Greater Sage-Grouse designated PHMA (Core only).’

### 3.7.9 Cultural Resources

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to cultural resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis and the BLM’s Section 106 (of NHPA) process for site-specific undertakings may require conditions of approval to mitigate adverse impacts to cultural related resources. Tribal consultation is conducted on a case-by-case basis. See the LFO Decision 5001 - 5052, and Appendices C and H; and the WFO Decisions 5001 – 2025, and CYFO Decisions 5001 – 5023, and Appendices B, and F.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting cultural resources.

To reduce potential impacts to known cultural sites, management actions in the RMPs apply avoidance of surface-disturbing activities, and protect the foreground of important cultural sites where setting is an important aspect of the integrity of the site. Parcels offered for sale are subject to the stipulations shown in Attachment 1, including stipulations to protect Sacred, Spiritual, and/or Traditional Cultural Properties (TCP), and common to all leases is the unnumbered Special Lease Stipulation, and Lease Stipulation No. 2.

### 3.7.10 Visual Resource Management (VRM)

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to visual resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to visual resources. See the LFO Decisions 5065 – 5070; and WFO Decisions 5046 – 5054, and CYFO Decisions 5044 – 5052.
The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting VRM and recreational resources.

Parcels offered for sale are subject to the stipulations shown in Attachment 1, which include protection of VRM Class I and II areas.

3.7.11 Recreation

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to recreation resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to recreation related resources. See WFO Decision 6065, specifically the Badlands Special Recreation Management Area (SRMA) and the Tour de Badlands Recreation Management Zone (RMZ), and Appendix J.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting recreational resources.

Parcels offered for lease sale are subject to the stipulations and lease notices shown in Attachment 1, for the protection of recreational settings.

3.7.12 Historic Resources, Including Regional Historic Trails and Early Highways

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to trails or historic resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to trails or historic related resources. See the LFO Decisions 5014 – 5021, and 7001 - 7029; and the WFO RMP Decisions 7042 – 7045, and CYFO RMP Decisions 7092 – 7099. The RMPs apply avoidance of surface disturbing activities, screening projects behind natural features, innovative redesign or camouflaging of projects, and using existing disturbances for placements to protect the settings of Historic Trails.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale, which includes parcels within designated trails areas. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting trail resources.

Seven parcels were nominated in LFO which are within two miles of Regional Historic Trails and Early Highways, or National Historic Trails, or the Continental Divide National Scenic Trail.
Parcels offered for sale are subject to the stipulations shown in Attachment 1, which includes protections of Heritage Resources (Cultural Resources) up to 2 miles from Regional Historic Trails and Early Highways or National Historic Trails; stipulations to protect the setting of the trails; and protections in standard Lease Notice 2 and standard Lease Stipulation 1.

3.7.13 Areas of Critical Environmental Concern (ACEC)

The Proposed Action Alternative would offer 22 parcels, totaling 29,627.04 acres, for lease sale for potential oil and gas development. The administrative act of leasing does not result in direct impacts to ACEC resources but subsequent development, if it were to occur, could result in impacts. NEPA analysis of site-specific actions may require conditions of approval to mitigate adverse impacts to ACEC related resources. See the LFO Decisions 4045, 7117, 7120, for the South Pass Historical Landscape ACEC. The South Pass Historic Landscape Area ACEC is open to oil and gas leasing with a no surface occupancy stipulation, and other resource protection measures.

The Proposed Action Alternative would offer 29,627.04 acres of federal mineral estate available at the Third Quarter 2018 Competitive Oil and Gas Lease Sale, of which approximately 280.00 acres are identified within ACECs and available for lease sale. None of these lands would be offered at this time under the No Action Alternative. The Proposed Action alternative would allow mineral development to occur while protecting ACEC resources.

Parcels offered for sale are subject to the stipulations shown in Attachment 1, which includes protecting the relevant and important ACEC values, such as wildlife and viewshed, with a no surface occupancy stipulation, and other resource protection measures.
4. Consultation and Coordination

- Where federal minerals have been nominated for leasing underlying private surface, the private land owners have been notified, consistent with Washington Office Instruction Memorandum (IM) 2009-184, IM 2010-117, and BLM Handbook H-3120-1.
- Tribal consultation is conducted as directed in BLM Handbook H-8120-1.
- The BLM coordinates with the Wyoming Game and Fish Department.
- When parcels are located within Bureau of Reclamation (BOR), the lands are reviewed by BOR.
- A BLM interdisciplinary team reviewed all parcels in accordance with Washington Office Instruction Memorandum 2010-117. Table 4-1 lists the members of the BLM interdisciplinary team.

### Table 4-1 Interdisciplinary Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>BLM Office</th>
<th>Responsible for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rita Allen</td>
<td>WR/BBD District Resource Advisor</td>
<td>WR/BBD</td>
<td>All: Project Manager &amp; Preparer</td>
</tr>
<tr>
<td>Travis Bargsten</td>
<td>Physical Scientist</td>
<td>WSO</td>
<td>Reviewer</td>
</tr>
<tr>
<td>Ryan McCammon</td>
<td>Physical Scientist, Air Quality</td>
<td>WSO</td>
<td>Air Quality &amp; Climate Change</td>
</tr>
<tr>
<td>Debra Larsen</td>
<td>Land Law Examiner</td>
<td>LFO</td>
<td>LFO Core Team Lead</td>
</tr>
<tr>
<td>Tim Vosburgh</td>
<td>Wildlife Biologist</td>
<td>LFO</td>
<td>Wildlife, T&amp;E and Sensitive Species, Site Visits</td>
</tr>
<tr>
<td>Karina Bryan</td>
<td>Archaeologist</td>
<td>LFO</td>
<td>Cultural and Paleontological Resources</td>
</tr>
<tr>
<td>Ryan McCammon</td>
<td>Physical Scientist</td>
<td>WSO</td>
<td>Air Quality &amp; Climate Change</td>
</tr>
<tr>
<td>Debra Larsen</td>
<td>Land Law Examiner</td>
<td>LFO</td>
<td>LFO Core Team Lead</td>
</tr>
<tr>
<td>Tim Vosburgh</td>
<td>Wildlife Biologist</td>
<td>LFO</td>
<td>Wildlife, T&amp;E and Sensitive Species, Site Visits</td>
</tr>
<tr>
<td>Karina Bryan</td>
<td>Archaeologist</td>
<td>LFO</td>
<td>Cultural and Paleontological Resources</td>
</tr>
<tr>
<td>Jared Oakleaf</td>
<td>Outdoor Recreation Planner</td>
<td>LFO</td>
<td>Recreation/VRM/Wilderness</td>
</tr>
<tr>
<td>Sarah Wempen</td>
<td>GIS Specialist</td>
<td>LFO</td>
<td>GIS, Site Visits, Review</td>
</tr>
<tr>
<td>Kristin Yannone</td>
<td>Planning &amp; Environmental Coordinator</td>
<td>LFO</td>
<td>Review</td>
</tr>
<tr>
<td>Holly Elliott</td>
<td>Planning &amp; Environmental Coordinator</td>
<td>WFO</td>
<td>WFO Core Team Lead; Review</td>
</tr>
<tr>
<td>Darci Stafford</td>
<td>Natural Resource Specialist</td>
<td>WFO</td>
<td>Site Visits</td>
</tr>
<tr>
<td>Ted Igleheart</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Tim Stephens</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Marit Bovee</td>
<td>Archaeologist</td>
<td>WFO</td>
<td>Cultural and Paleontological Resources</td>
</tr>
<tr>
<td>Hanna Fortney</td>
<td>Outdoor Recreation Planner</td>
<td>WFO</td>
<td>Recreation/VRM/Wilderness</td>
</tr>
<tr>
<td>Karen Hepp</td>
<td>Range Management Specialist</td>
<td>WFO</td>
<td>T&amp;E Plants</td>
</tr>
<tr>
<td>Holly Elliott</td>
<td>Planning &amp; Environmental Coordinator</td>
<td>WFO</td>
<td>WFO Core Team Lead; Review</td>
</tr>
<tr>
<td>Darci Stafford</td>
<td>Natural Resource Specialist</td>
<td>WFO</td>
<td>Site Visits</td>
</tr>
<tr>
<td>Ted Igleheart</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Tim Stephens</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Marit Bovee</td>
<td>Archaeologist</td>
<td>WFO</td>
<td>Cultural and Paleontological Resources</td>
</tr>
<tr>
<td>Hanna Fortney</td>
<td>Outdoor Recreation Planner</td>
<td>WFO</td>
<td>Recreation/VRM/Wilderness</td>
</tr>
<tr>
<td>Karen Hepp</td>
<td>Range Management Specialist</td>
<td>WFO</td>
<td>T&amp;E Plants</td>
</tr>
<tr>
<td>Holly Elliott</td>
<td>Planning &amp; Environmental Coordinator</td>
<td>WFO</td>
<td>WFO Core Team Lead; Review</td>
</tr>
<tr>
<td>Darci Stafford</td>
<td>Natural Resource Specialist</td>
<td>WFO</td>
<td>Site Visits</td>
</tr>
<tr>
<td>Ted Igleheart</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Tim Stephens</td>
<td>Wildlife Biologist</td>
<td>WFO</td>
<td>Wildlife/T&amp;E</td>
</tr>
<tr>
<td>Marit Bovee</td>
<td>Archaeologist</td>
<td>WFO</td>
<td>Cultural and Paleontological Resources</td>
</tr>
<tr>
<td>Hanna Fortney</td>
<td>Outdoor Recreation Planner</td>
<td>WFO</td>
<td>Recreation/VRM/Wilderness</td>
</tr>
<tr>
<td>Karen Hepp</td>
<td>Range Management Specialist</td>
<td>WFO</td>
<td>T&amp;E Plants</td>
</tr>
</tbody>
</table>
5. References

Code of Federal Regulations

40 Code of Federal Regulations (CFR), Protection of Environment
https://www.gpo.gov/

43 CFR, Public Lands: Interior
https://www.gpo.gov/

Resource Management Plans (RMP)

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=28453

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=28453

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=28453

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=19107

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=19107
https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=19107

https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=137386

Manuals and Handbooks


Instruction Memorandum

BLM 2016. Instruction Memorandum No. WO-2016-124, Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands  
https://www.blm.gov/policy/im-2016-124

https://www.blm.gov/policy/im-2010-117


BLM 2009, Washington Office Instruction Memorandum 2009-184, Courtesy Notification of Surface Owners When Split Estate Lands are Included in an Oil and Gas Notice of Competitive Lease Sale  

Additional References

BLM Competitive Oil & Gas Leasing  

2018 Wyoming BLM Competitive Oil & Gas Leasing Environmental Assessment Documents  
https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=125997


http://www.glorecords.blm.gov/default.aspx


https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG_Executive_Order.pdf

**Socioeconomics, Environmental Justice, and Public Health and Safety**

2017, December 20, Website: US Census Bureau
http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

2017, December 20, Website: US Census Bureau

**Air Quality, Climate, and Greenhouse Gas Emissions**

2017 Federal Land Manager Environmental Database
http://views.cira.colostate.edu/fed/AqrvMenu.aspx
http://views.cira.colostate.edu/fed/AqrvMenu.aspx

EPA 2016 AirData website
http://www.epa.gov/airdata