U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

October 2019

Buffalo Field Office

Final Supplemental Environmental Impact Statement and Proposed Resource Management Plan Amendment

Estimated agency total costs associated with developing and producing this EIS: $511,000

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Buffalo Field Office
1425 Fort Street,
Buffalo, Wyoming 82834
www.blm.gov/wy/

Dear Reader:

Enclosed is the Proposed Resource Management Plan Amendment (RMPA)/Final Supplemental Environmental Impact Statement (FSEIS). The Proposed RMPA/FSEIS was prepared by the Bureau of Land Management (BLM) in consultation with various government agencies and organizations, taking into account public comments received during this planning effort. The purpose of the Proposed RMPA is to amend the 2015 Buffalo Field Office RMP to provide additional land use planning-level analysis specifically regarding coal, oil, and gas and to determine lands to be made available for coal leasing in the Buffalo Field Office. The need for action is to respond to a United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. v. BLM*). The Proposed RMPA would replace decisions for coal resource leasing availability in the 2015 Buffalo Field Office RMP/Record of Decision.

Pursuant to BLM's planning regulations at 43 CFR 1610.5-2, any person who participated in the planning process for this Proposed RMPA and has an interest which is or may be adversely affected by the planning decisions may protest approval of the planning decisions contained therein. The Proposed RMPA/FSEIS is open for a 30-day protest period beginning October 4, 2019.

The regulations specify the required elements of your protest. Take care to document all relevant facts. As much as possible, reference or cite the planning documents or available planning records (e.g. meeting minutes or summaries, correspondence, etc.).

Instructions for filing a protest with the Director of the BLM regarding the Proposed RMP Amendment and Final EIS may be found online at https://www.blm.gov/programs/planning-and-nepa/public-participation/filing-a-plan-protest and at 43 CFR 1610.5-2. All protests must be in writing and mailed to the appropriate address, as set forth below, or submitted electronically through the BLM ePlanning project website. Protests submitted electronically by any means other than the ePlanning project website protest section will be invalid unless a protest is also submitted in hard copy. Protests submitted by fax will also be invalid unless also submitted either through ePlanning project website protest section or in hard copy.

All protests must be in writing and mailed to one of the following addresses:

Regular Mail:	Overnight Delivery:
Director (210) Attn: Protest Coordinator P.O. Box 71383 Washington, D.C. 20024-1383	Director (210) Attn: Protest Coordinator 20 M Street SE, Room 2134LM Washington, D.C. 20003

All protests must be received on or before November 4, 2019.

Before including your address, phone number, email address, or other personal identifying information in your protest, be advised that your entire protest – including your personal identifying information – may be made publicly available at any time. While you can ask us in your protest to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

The BLM Director will make every attempt to promptly render a decision on each protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior on each protest. Responses to protest issues will be compiled and formalized in a Director's Protest Resolution Report made available following issuance of the decisions. Upon resolution of all land use plan protests, the BLM will issue a Record of Decision (ROD). The ROD will be available to all parties at https://go.usa.gov/xP6S3.

Sincerely,

Todd D. Yeager
Buffalo Field Manager
Bureau of Land Management

Draft Supplemental Environmental Impact Statement and Potential Resource Management Plan Amendment Buffalo Field Office, Wyoming

Responsible Agency:	United States Department of the Interior Bureau of Land Management	
Type of Action:	Administrative (X)	Legislative ( )
Document Status:	Draft ( )	Final (X)

Abstract: This final supplemental environmental impact statement (SEIS) and potential Resource Management Plan Amendment (RMPA) augments analysis for the 2015 Buffalo Field Office Approved Resource Management Plan (RMP). In it, the Bureau of Land Management Buffalo Field Office analyzed a new reduced coal alternative, supplemented the analysis of coal, oil, and gas downstream emissions, and provided justification for the time horizons chosen for analyzing global warming potential. The potential RMPA is limited to amending the coal leasing availability decision from the 2015 Approved RMP.

The Bureau of Land Management is the lead agency for this final SEIS/RMPA, with 12 cooperating agencies initially participating in the plan development: the Campbell County Commission, Johnson County Commission, Sheridan County Commission, Campbell County Conservation District, Wyoming State Historic Preservation Office, Wyoming Office of the Governor, Wyoming Department of Agriculture, Wyoming Department of Environmental Quality, Wyoming Game and Fish Department, United States Environmental Protection Agency (EPA) Region 8, the Office of Surface Mining, Reclamation, and Enforcement, and the United States Fish and Wildlife Service.

In this final SEIS/RMPA the BLM analyzed two alternatives. Alternative A, the no action alternative, continues management decision for coal leasing availability, with updated data on which the 2015 Proposed RMP/Final EIS was based, and an updated reasonably foreseeable development scenario. Alternative B would modify the management decision for coal leasing availability under the 2015 Proposed RMP/Final EIS, with an updated economic analysis and coal screens. Planning issues addressed leasable minerals, greenhouse gases, climate change, biological resources, and economics.

The BLM Field Manager recommends a modified Alternative B as the Proposed RMP Amendment for allocating BLM administered coal within the Buffalo Field Office. BLM added 39,784 acres as acceptable for further consideration for leasing to Alternative B. This will ensure flexibility for mining in the most efficient manner such as providing options for locating infrastructure in a manner that promotes the sensible use of the resource. The additional acreage was analyzed within the Alternative A CDPA.

For further information, contact:

Mr. Thomas Bills
1425 Fort Street
Buffalo, Wyoming 82834
307-684-1133

Email: tbills@blm.gov
ePlanning website: https://go.usa.gov/xP6S3

This page intentionally left blank.

TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES

APPENDICES

This page intentionally left blank.

ACRONYMS AND ABBREVIATIONS

	Full Phrase
AEO	Annual Energy Outlook
AVBs	attitudes, values, and beliefs
BCF	billion cubic feet
BFO	Buffalo Field Office
BLM	United States Department of the Interior, Bureau of Land Management
BNSF	Burlington Northern Santa Fe
CBNG	coalbed natural gas
CDPA	coal development potential area
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DEQ	Department of Environmental Quality (Wyoming)
DOI	United States Department of the Interior
EIA	United States Energy Information Administration
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
GHGs	greenhouse gases
GHGRP	Greenhouse Gas Reporting Program
GHMA	General Habitat Management Area
GIS	Geographic Information System
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
MMst	million short tons
MMT	million metric tons
Mtoe	million tons of oil equivalent
NCA	Fourth National Climate Assessment
NEMS	National Energy Modeling System
NEPA	National Environmental Policy Act
N_2O	nitrogen oxide
NOA	Notice of Availability
NOI	Notice of Intent
NRHP	National Register of Historic Places
ONRR	United States Office of Natural Resource Revenue

PHMA	Priority Habitat Management Area
PRB	Powder River Basin
RCP	Representative Concentration Pathways
RFD	reasonably foreseeable development
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROW	right-of-way
SCC	social cost of carbon
SCM	social cost of methane
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Office
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
US	United States
WGFD	Wyoming Game and Fish Department

Executive Summary

ES.1 Introduction

The US Department of the Interior (DOI), Bureau of Land Management (BLM) has prepared this supplemental environmental impact statement (SEIS) and potential resource management plan amendment (RMPA) for the BLM Buffalo Field Office (BFO). It was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA); Council on Environmental Quality regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508); BLM NEPA regulations (43 CFR 46); the Federal Land Policy and Management Act (FLPMA) of 1976 (43 US Code [USC] 1701 et seq.); requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008a); and the BLM's Land Use Planning Handbook, H-1601-1 (BLM 2005a).

The BLM prepared this SEIS/RMPA to respond to the US District Court for the District of Montana court order (*Western Organization of Resource Councils et al. v. BLM*). The District Court deemed inadequate the decisions related to the amount of coal available for leasing and the direct, indirect, and cumulative impacts from fossil fuel development in the 2015 Proposed RMP/Final EIS and Record of Decision (ROD). It ordered the BLM to complete a remedial NEPA analysis for the RMP. Through this SEIS/RMPA, the BLM will analyze an alternative that would decrease the amount of coal available for leasing, would consider climate change impacts of coal leasing, and would conduct new coal screening. It also would analyze the environmental consequences of downstream fossil fuel combustion,[1] including global warming potential over 20-year and 100-year time horizons.

The approved SEIS/RMPA could amend the 2015 Proposed RMP/Final EIS, as amended, concerning the coal allocation decisions. Information about the SEIS/RMPA can be obtained on the project website, https://go.usa.gov/xP6S3. The BFO completed the 2015 Proposed RMP/Final EIS in September 2015; they amended it in 2019, based on Greater Sage-Grouse management revisions. It provides management guidance and direction for approximately 800,000 acres of BLM-administered surface land and 4.7-million acres of BLM-administered mineral estate in Campbell, Johnson, and Sheridan Counties in north-central Wyoming. BLM management applies only to public lands, meaning those lands where the BLM has management responsibility for either the surface or the subsurface estate. The decision area is BLM-administered federal coal in the BFO. This is approximately 4.7 million acres of subsurface federal mineral coal estate for which the BLM has the authority to determine availability. **Figure ES-1** is a map of the decision area.

ES.2 Purpose of and Need for the Resource Management Plan Amendment

The purpose of this SEIS is to provide additional analysis for land use planning specifically regarding analysis for coal, oil, and gas in the BFO and to determine the lands to be made available for coal leasing. To support analysis in the SEIS/RMPA and subsequent decision-making, the BLM has conducted new coal screening, in accordance with 43 CFR 3420.1-4.

This SEIS/RMPA is needed in order to accomplish the following:

- Consider an alternative that would reduce the amount of recoverable coal and consider climate change impacts, in order to make a reasoned decision on the amount of recoverable coal made available

[1] Combustion of coal, oil, or gas at a location different from the place of production or development.

- Supplement the analysis of the environmental consequences of downstream combustion of coal, oil, and gas open to development
- Justify the time horizon of the estimated global warming potential impacts—that is, 20-year or 100-year—and acknowledge the evolving science in this area

ES.3 SCOPING

The formal scoping period began with publication of the Notice of Intent (NOI) in the *Federal Register* on November 28, 2018. The BLM provided the NOI for public consideration at a public scoping meeting in Gillette, Wyoming, on December 19, 2018. The BLM posted it on the BFO SEIS/RMPA project website, https://go.usa.gov/xP6S3. The period during which the public could submit scoping comments ended December 28, 2018.

The BFO received 37 unique submissions, with 278 comments, categorized into eight issue categories. Most comments received were for resource-specific issues-coal, oil and gas, air quality and climate change and economic issues, best available information/baseline data, and the range of alternatives. Detailed information can be found in the scoping report on the BFO SEIS/RMPA ePlanning website, https://go.usa.gov/xP6S3.

The BLM engaged with federal, tribal, state, and local governments as part of this SEIS/RMPA. The BLM sent letters to eligible agencies and tribes inviting them to be cooperating agencies and to assist with the document. In the tribal letters the BLM also asked if the tribes wanted to initiate formal government-to-government consultation. The BLM held a cooperating agency meeting before the public scoping meeting, which took place on December 19, 2018.

ES.4 ISSUES

Table 2-2 in the Buffalo Field Office Supplemental EIS and RMPA Scoping Report (BLM 2019) shows the number of comments by specific resource or resource use. Approximately 33 percent of the resources and resource use comments were related to climate change, 14 percent were related to oil and gas, and 12 percent were related to the social cost of carbon.

ES.5 PLANNING CRITERIA

Planning criteria guide development of the SEIS by defining the decision space. In 40 CFR 1610.4-2(b), the government states that the "Planning criteria will generally be based upon applicable law, Director and State Director guidance, the results of public participation, and coordination with any cooperating agencies and other Federal agencies, State and local governments, and federally recognized Indian tribes."

Planning criteria represent the overarching factors used to resolve issues and develop alternatives. The planning criteria considered in the development of this document are as follows:

- Addresses BLM-administered surface lands and subsurface mineral estate
- Supplements the 2015 Proposed RMP/Final EIS by providing additional analysis in response to a US District Court order
- Uses a collaborative and multi-jurisdictional approach to determine the desired future condition of public lands
- Complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy
- Recognizes valid existing rights
- Does not change existing planning decisions that are still valid

Decision Area

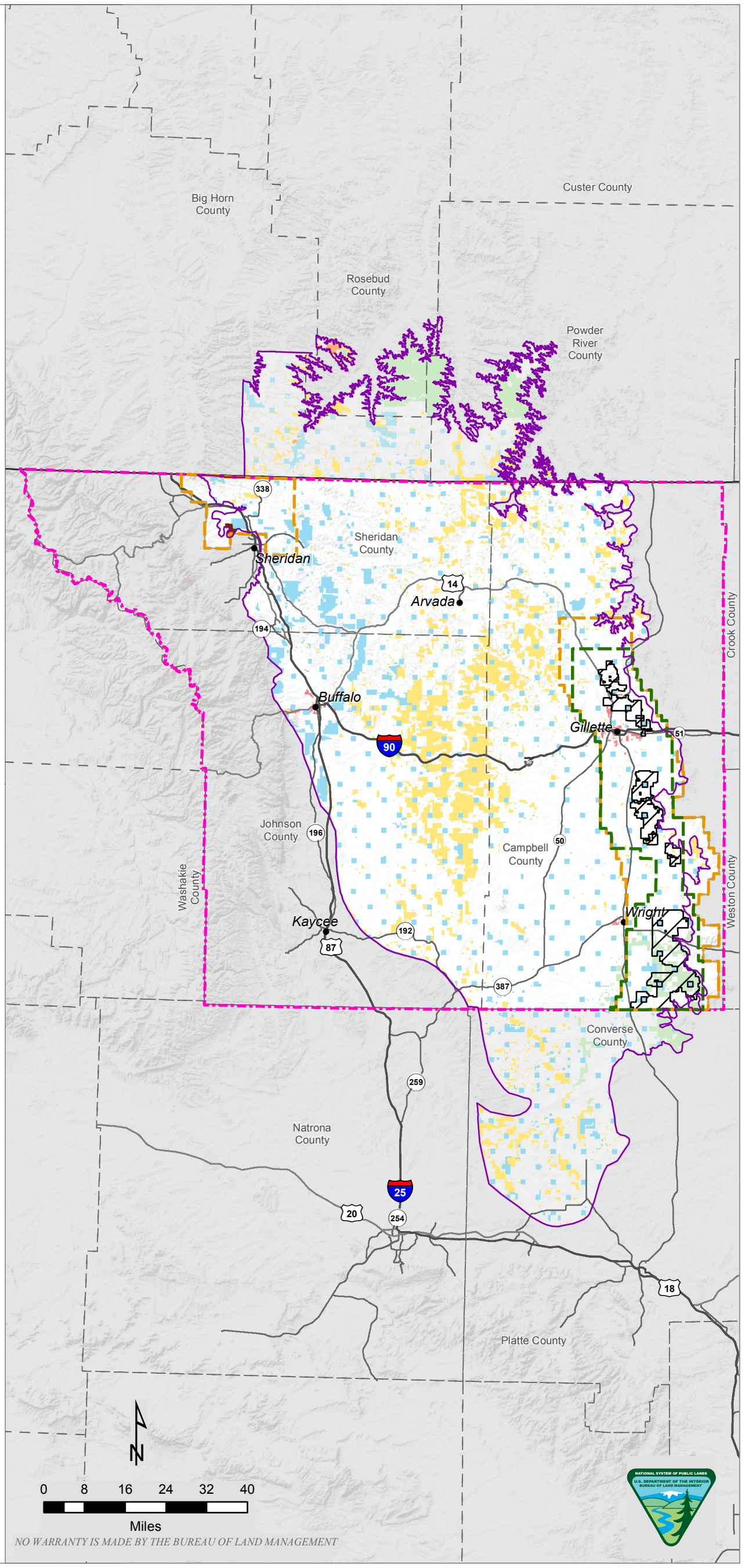
Powder River Basin coal region
Buffalo Field Office
Alternative A CDPA
Alternative B CDPA
RFD area
Forest Service National Grasslands
Bureau of Land Management
Other federal
Local government
State
Private

Surface Administration in the Alternative A CDPA

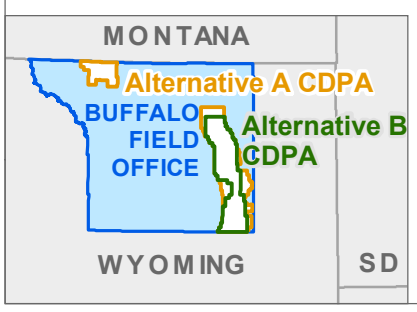
Campbell County	Acres
Bureau of Land Management (BLM)	24,693
Local Government	5,366
National Grasslands	66,855
Private	658,497
State	50,181
Sheridan County	**Acres**
Bureau of Land Management (BLM)	3,953
Department of Defense	2,837
Local Government	745
Private	138,066
State	17,909

Surface Administration in the Alternative B CDPA

Campbell County	Acres
Bureau of Land Management (BLM)	4,963
Local Government	5,367
National Grasslands	51,712
Private	498,523
State	35,731



Source: BLM GIS 2019



This page intentionally left blank.

ES.6 MANAGEMENT ALTERNATIVES

Planning challenges identified through public scoping and the court order helped the ID Team identify key planning issues to be addressed in the SEIS/RMPA. Based on internal and external scoping, the BLM identified and developed two alternatives. **Table ES-1**, below, shows a comparison of alternatives.

The BLM updated the resource data for Alternative A (the No Action Alternative), conducted new screening for Alternative B (**Appendix A**), and updated the reasonably foreseeable development scenario (**Appendix B**) for both alternatives.

Table ES-1
Alternatives Summary and Coal Acceptability for Leasing

Alternative	Acres Acceptable
Alternative A: No Action Alternative	686,896
Alternative B	455,467
Proposed Plan	495,251

Source: BLM GIS 2019

ES.6.1 Alternative A: No Action Alternative

For Alternative A, the BLM brought forward all management decisions that prevented coal development in the 2015 Proposed RMP/Final EIS. In addition, the BLM used information from the 2001 coal screening process (see Appendix D of the 2001 RMP Update, BLM 2001), the coal development potential area (CDPA), and updated data to determine a baseline for coal availability.

ES.6.2 Alternative B

Under Alternative B, the BLM updated all the coal screens. The BLM refined the CDPA, based on coal quality and stripping ratios (cost to produce) and current economic forecasts, to reduce the overall area acceptable for further consideration for coal leasing (**Table ES-1**).

ES.6.3 Proposed Plan

The BLM Field Manager recommends a modified Alternative B as the Proposed RMP Amendment for allocating BLM administered coal within the Buffalo Field Office. BLM added 39,784 acres to Alternative B to ensure flexibility for mining in the most efficient manner such as providing options for locating infrastructure in a manner that promotes the sensible use of the resource. The overall acreage acceptable for leasing under the Proposed Plan is 495,251 acres which is less than Alternative A. The additional acreage was analyzed within the Alternative A CDPA.

ES.7 ENVIRONMENTAL CONSEQUENCES

The purpose of the environmental consequences analysis in this SEIS/RMPA is to determine the potential for significant impacts of the federal action on lands considered acceptable for further consideration for coal leasing. The Council on Environmental Quality regulations for implementing NEPA state that the human environment is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 CFR 1508.14). The federal action is the BLM's selection of an alternative that the BLM BFO will base future land use actions related to coal leasing availability.

This SEIS/RMPA is in response to the US District Court's court order. Resources eliminated from impacts analysis are included in **Table 1-3** of **Chapter 1**; resources carried forward for analysis are included in **Chapter 3**. It objectively evaluates the likely direct, indirect, and cumulative impacts on the human and

natural environment in terms of environmental, social, and economic consequences that are projected to occur from implementing the alternatives. A summary of impacts for each resource is in **Table ES-2**.

Table ES-2
Impacts Summary for Resources Carried Forward

Resources Brought Forward for Analysis	Impacts Common to all Alternatives
Air resources, including Greenhouse Gas and Climate Change	• Production, transportation, and downstream combustion of federal coal would produce an estimated 398.9 million metric tons of carbon dioxide equivalents (MMT CO_2e) annually based on 20-year global warming potentials. This represents approximately 6.2 percent of national emissions and 0.77 percent of global emissions. For the 100-year global warming potential, emissions are estimated at 368.2 MMT CO_2e annually. This represents approximately 5.7 percent of national emissions and 0.71 percent of global emissions. • Production and downstream combustion of federal oil and federal conventional and coalbed natural gas would produce an estimated 3.2 MMT CO_2e annually for the 20-year global warming potential. This represents approximately 0.048 percent of national emissions and 0.0006 percent of global emissions. For the 100-year global warming potential, emissions are estimated at 2.9 MMT CO_2e annually. This represents approximately 0.044 percent of national emissions and 0.0005 percent of global emissions. • Cumulative annual average emissions (federal and nonfederal sources and other major sources in the planning area) would be 555.8 MMT CO_2e and 535.6 MMT CO_2e, respectively, using the 20-year and 100-year time horizon global warming potentials. Cumulative annual average emissions over the plan period would be between approximately 1.8 percent and 0.7 percent of global emissions under different future global representative concentration scenarios and would contribute, in part, to climate change impacts.
Economic considerations	• Attitudes, values, and beliefs tied to local economic opportunities and employment would continue to be supported by coal development. They would continue to manifest in civic pride and community cohesion. Based on recent production volumes per worker at the 12 coal mines, federal coal production projected in the RFD is forecast to support 3,413 coal jobs and $391.3 million in direct labor income on annual average over the next 20 years. The indirect and induced employment stimulated by production in the coal industry is projected to support another 5,300 jobs and $343.5 million in labor income across Campbell, Converse, Crook, Johnson, Natrona, Sheridan and Weston Counties. • Extraction of coal under the RFD would continue to support local attitudes, values, and beliefs associated with mineral revenues and funding for public services. Revenues levied by, and disbursed to, state and local governments would continue to fund infrastructure and public services, which supports quality of life locally and throughout the state. Leasing and production of federal coal in the BFO is projected to generate millions of dollars of federal, state, and local government revenues each year. • The satisfaction and well-being of people with attitudes, values, and beliefs, tied with the quality of biological and physical resources, could be affected by the coal development on wildlife, water, and GHG emissions.

Resources Brought Forward for Analysis	Impacts Common to all Alternatives
Biological resources (Unsuitability Criteria #9, 11, 12, 14, and 15)	• There is no critical habitat or habitat of essential value for threatened or endangered species. If there were potential for federally listed species in a coal project site, appropriate surveys for them and their suitable habitat would made. If any were identified, the BLM would begin ESA Section 7 consultation. This would ensure that coal mining would not jeopardize threatened and endangered species at the project level. • Site-specific surveys for each lease area and appropriate perimeters would be part of the mine permitting process if the tracts are leased. This would include appropriate surveys for BLM special status species, coordination with state and federal wildlife agencies, and creation of a mining plan, which could include site-specific mitigation and habitat restoration.

Source: BLM GIS 2019

This page intentionally left blank.

Chapter 1. Purpose and Need

In accordance with the National Environmental Policy Act of 1969, as amended (NEPA), and the Federal Land Policy and Management Act of 1976, as amended (FLPMA), the Bureau of Land Management (BLM) Wyoming Buffalo Field Office (BFO) prepared this supplemental environmental impact statement (SEIS) and potential resource management plan amendment (RMPA) for the 2015 BFO Approved Resource Management Plan (RMP). This SEIS/RMPA is in response to a United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. v. BLM [CV 16-21-GF-BMM]*).

This SEIS/RMPA is prepared in accordance with the NEPA; Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508); Department of Interior NEPA regulations (43 CFR 46); and the requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008). The Record of Decision for the SEIS/RMPA will be signed by November 29, 2019, in accordance with the US District Court's order.

1.1 Purpose of and Need

The purpose of this SEIS/RMPA is to provide additional analysis for land use planning, specifically for analyzing coal, oil, and gas in the BFO and to determine the lands to be made available for coal leasing. To support this analysis and subsequent decision-making, the BLM has conducted new coal screening, in accordance with 43 CFR 3420.1–4.

This SEIS/RMPA is needed for the following reasons:

- Consider an alternative that would reduce the amount of recoverable coal and consider climate change impacts, in order to make a reasoned decision on the amount of recoverable coal made available
- Supplement the analysis of the environmental consequences of downstream combustion[1] emissions of coal, oil, and gas open to development
- Justify the time horizon of the estimated global warming potential impacts—for example, 20-year or 100-year—and acknowledge the evolving science in this area

1.2 Description of the Decision Area

The BFO administers approximately 800,000 acres of surface lands and 4.7-million acres of subsurface federal mineral estate in Campbell, Johnson, and Sheridan Counties in north-central Wyoming. The decision area is BLM-administered federal coal in the BFO. This includes approximately 4.7 million acres of subsurface federal mineral coal estate for which the BLM has the authority to determine its availability (**Figure 1-1**).

1.3 Scoping Issues

The BFO SEIS/RMPA public scoping process began on November 28, 2018, with publication of the Notice of Intent (NOI) in the *Federal Register* (FR) (83 FR 61167); it ended on December 28, 2018. On December 19 the BFO conducted a public scoping meeting in Gillette, Wyoming; six people attended. The BLM announced the meeting through the NOI in the *Federal Register*, the BLM project website

[1] Combustion of coal, oil, or gas at a location different from the place of production or development.

(https://eplanning.blm.gov), and news releases. The BFO has provided public access to BFO SEIS/RMPA-related information on its ePlanning website, https://go.usa.gov/xP6S3.

The BFO received 37 unique submissions that included 278 comments in eight issue categories. Most comments were received for the following resource-specific issues: coal, oil and gas, air quality, climate change, economic issues, best available information/baseline data, and the range of alternatives. Detailed information can be found in the scoping report on the BFO SEIS/RMPA ePlanning website.

1.3.1 Issues Identified for Detailed Consideration

During alternatives development, the BLM focused on issues raised by the court and by the public in relation to the court order. A detailed description of the planning issues identified during public scoping can be found in the scoping report on the BFO SEIS/RMPA ePlanning website. **Table 1-1** aligns the planning issues identified for detailed consideration with the resources affected by the issues. **Chapter 3** has a discussion of the issues as it pertains to the identified resources.

Table 1-1
Scoping Issues and the Resource Topics Affected

Issue	Resource Topics Affected
What new information will be referenced in the SEIS?	Air resources (including greenhouse gases and climate change), coal, and economics will all be updated, based on the following: • 2018 minerals production data • US Energy Information Administration (EIA) 2019 forecast • New coal screening • Updated reasonably foreseeable development scenario • Greenhouse gas emissions inventory and downstream combustion emissions The BLM will update resource data for the coal development potential areas (CDPAs)[2]
What are the cumulative impacts of proposed actions for minerals development in the SEIS, and will the BLM prepare additional assessments to analyze these impacts?	The BLM evaluated resources through the coal screening process; see **Appendix A**.
What are the direct and indirect impacts of proposed actions for minerals development in the SEIS?	See **Chapter 3** for impacts analysis for resources carried forward.
Will the Buffalo Field Office SEIS consider a no-leasing alternative? What alternatives will be included in the SEIS?	BLM did consider a no-leasing alternative. See **Chapter 2** for all alternatives considered.
What methods will be used to address downstream impacts of fossil fuel leasing and use? Will any alternatives contain requirements or lease stipulations requiring emission control technologies?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change; see **Chapter 2** for alternatives descriptions.

[2] The Alternative A CDPA is the same as the 2015 Proposed RMP/Final EIS CDPA. The Alternative B CDPA reduces acres acceptable for further consideration for leasing by 34 percent based on the coal screening criteria.

Issue	Resource Topics Affected
Will the BLM quantify downstream combustion emissions for fossil fuels, analyze the impacts of these emissions with available methods under each alternative, and study the extent to which the alternatives (including a no leasing alternative) alter the total amount of downstream greenhouse gas emissions?	See **Chapter 2** for a range of alternatives and **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change.
How will the BLM comply with the FLPMA's multiple-use mandate?	This SEIS supplements the existing RMP, meeting the multiple-use mandate of FLPMA. The BLM considered multiple uses when evaluating Screen 3; see **Appendix A**, Coal Screening Process.
Will the BLM recognize the US Environmental Protection Agency's (USEPA) delegation of air quality regulation to the State of Wyoming in the SEIS?	Yes, BLM recognizes the delegation of air quality regulation to the State. See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change.
Will the BLM change estimates of recoverable reserves near existing mines?	See **Appendix A**, Coal Screening Process.
Will the BLM conduct new coal screening for the planning area?	See **Appendix A**, Coal Screening Process.
How will the BLM consider changed circumstances since the original RMP/EIS?	See **Chapter 2** for alternatives description, **Appendix A**, Coal Screening Process and **Appendix B**, Reasonably Foreseeable Development.
What are the impacts and external costs of mining, transporting, and burning coal?	See **Chapter 3** for impacts analysis for Social and Economic Considerations.
Will the BLM make updates to the reasonably foreseeable development scenario to clarify when limitations on mineral development could occur?	See **Appendix B**, Reasonably Foreseeable Development.
What are the lifecycle emissions for oil and gas development?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
How will the BLM recognize the place of oil and gas development in the multiple-use mandate and the rights of existing oil and gas leases?	The 2015 Proposed RMP/Final EIS made leasing decisions for oil and gas; valid existing rights will be honored during implementation of the plan. Also see **Appendix A**, Coal Screening Process.
What sources of air emissions will be included in the SEIS?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
How do regional emissions compare with federal emissions?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
How will greenhouse gas emissions be quantified and analyzed in the potential actions, in order to avoid regional and national greenhouse gas emissions?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
Will there be a federal emissions baseline?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
Will the BLM update global warming potential data for methane?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.

Issue	Resource Topics Affected
Will the SEIS incorporate the newest National Climate Assessment and other national and state climate literature?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report.
What are the social effects of greenhouse gas emissions that result from fossil fuel extraction and use?	See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change and **Appendix D**, Social and Economic Technical Appendix.
What tools will the BLM use to examine the economic contribution to the region from fossil fuel employment?	See **Chapter 3**, Social and Economic Considerations and **Appendix D**, Economic Technical Appendix.
How will the BLM analyze the impacts of noise on wildlife?	See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report.
How will coal development affect wildlife and aquatic species, and how will the BLM mitigate these impacts?	See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report.
How will management actions in the SEIS affect Greater Sage-Grouse?	See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report, in compliance with Wyoming conservation strategy.

1.3.2 Issues Considered but Not Further Analyzed in this SEIS/RMPA

The issues identified during public scoping (discussed above) shaped the alternatives carried forward in this SEIS/RMPA. The BLM also considered other issues identified during public scoping but did not analyze them further; this is because they fall outside of the BLM's jurisdiction or are beyond the scope of this SEIS/RMPA (**Table 1-2**). A list of these issues and the rationale for not analyzing them further are provided below.

Table 1-2
Scoping Issues not Further Analyzed and the Rationale

Issue	Rationale
Will the BLM resume its programmatic review of the federal coal leasing program?	This is out of scope; the programmatic review of the federal coal leasing program is a process that is separate from this SEIS/RMPA.
Will the BLM update the coal resource task reports?	This is out of scope; the coal resource task reports looked at what coal resources are in the Powder River Basin, and it is a separate process from this SEIS.
How has policy guidance regarding oil and gas leasing changed market conditions?	This is out of scope and was not directed by the court order.
What types of conditions will the BLM use to reduce impacts from oil and gas development on resources in the planning area?	This is out of scope. Fluid mineral mitigation measures were identified in the 2015 Proposed RMP/Final EIS.
How will the BLM analyze potential impacts of hydraulic fracturing in the SEIS/RMPA?	This is out of scope. The court order asked only that, in the SEIS/RMPA, the BLM look at downstream combustion emissions of oil and gas.
Will the SEIS/RMPA analyze the risk of "carbon lock-in"?	This is out of scope. In the 2015 Proposed RMP/Final EIS, the BLM considered all forms of energy development, including coal, oil and gas, geothermal, and renewable energy.
How will toxic air emissions be mitigated?	This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Air quality mitigation measures were identified in the 2015 Proposed RMP/Final EIS. In addition, **Chapter 3** discusses greenhouse gas emissions and climate change.

Issue	Rationale
How will the BLM differentiate air quality management between federal and state agencies?	This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS.
How will air pollution affect regional air quality, and how will the BLM analyze criteria air pollutants?	This is out of scope. An analysis of impacts on air quality in the planning area and emissions of criteria pollutants were adequately addressed in the 2015 Proposed RMP/Final EIS.
What is the impact of fossil fuel extraction and use on public health and safety?	This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS.
How does fossil fuel development affect surface and groundwater resources?	This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS.
What is the projected monetized value of impacts from coal development in the planning area, and how do these relate to the value of the projected coal extraction?	The BLM is not required to do a cost-benefit analysis under NEPA (40 CFR 1502.23). It conducted an economic contribution analysis to analyze the potential economic output of forecasted coal development in the decision area (see **Chapter 3**, Social and Economic Considerations).
Will the BLM analyze effects on the energy market of coal leasing decisions in the planning area? How will the BLM ensure a fair return to taxpayers from federal coal leasing?	This is out of scope. Coal price and quality are comparable across the Powder River Basin (PRB). The mines have sufficient capacity to expand their production to replace any decrease in coal production at a comparable delivered price.
Will the BLM analyze the economic resilience of communities in the planning area?	This is out of scope. The analysis acknowledges the relative importance of the coal industry in the context of the geographic area; however, the economic resilience is not germane to this analysis.
How will the BLM establish future commercial interest in operating on federal lands?	This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Establishing commercial interest on federal lands is not part of the purpose or need for this SEIS.

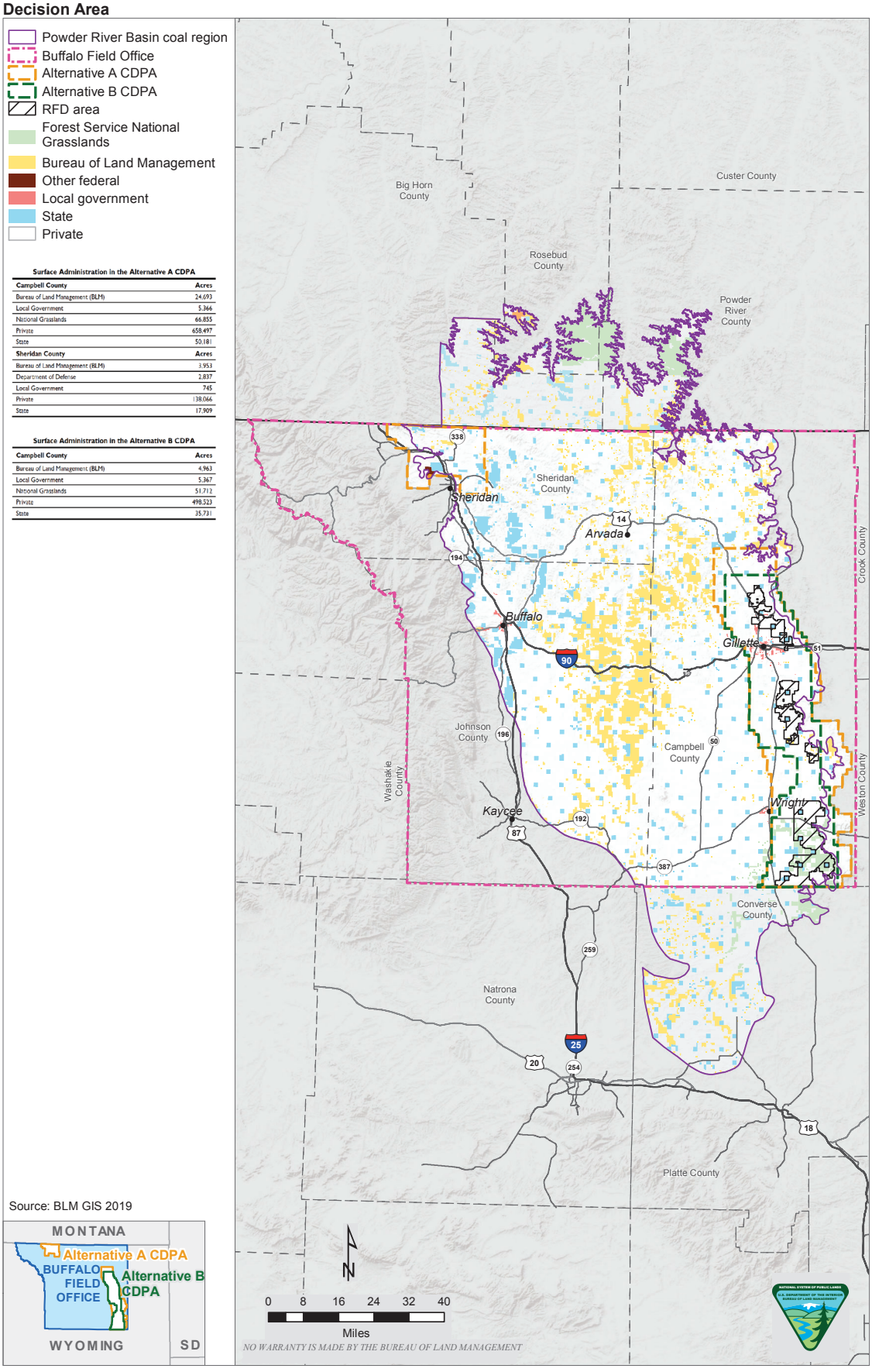
1.3.3 Resource Topics Not Carried Forward for Analysis

Table 1-3 lists the resources eliminated from further analysis and the rationale for their elimination. In some cases, there are no resources in the decision area, so actions proposed in this SEIS/RMPA would not affect any resources. Through the coal screening process, some resources would be removed from the potential for coal development under Alternative B, either because they would be determined unacceptable for further consideration for leasing (Screen 3) or because they would be determined unsuitable for coal development without exception (Screen 2). In other cases, the action alternatives do not propose anything that would change the impacts disclosed in the 2015 Proposed RMP/Final EIS, so those resources were not carried forward for additional analysis.

Table 1-3
Resources Eliminated from Further Analysis and the Rationale

Resource	Rationale
Prime and unique farmlands	This resource does not exist in the CDPAs.
Water resources – municipal watersheds and National Resource Waters	These resources do not exist in the CDPAs.
Fish and wildlife not brought forward under Coal Screens 2 or 3	No change in impacts from the 2015 Proposed RMP/Final EIS.
Wild horses and burros	This resource does not exist in the CDPAs.
Wildland fire management	No change in impacts from 2015 Proposed RMP/Final EIS.
Wilderness areas	This resource does not exist in the CDPAs.
Forest and woodland products	No commercial forest or woodland communities are in the CDPAs.
Travel and transportation management	No change in impacts from the 2015 Proposed RMP/Final EIS.
Recreation	No change in impacts from the 2015 Proposed RMP/Final EIS.
Special Recreation Management Areas	Excluded, based on Screen 3 multiple use conflicts.
Areas of Critical Environmental Concerns	Excluded, based on Screen 3 multiple use conflicts.
Lands and realty land tenure decisions	No change in impacts from the 2015 Proposed RMP/Final EIS.
Livestock grazing	No change in impacts from the 2015 Proposed RMP/Final EIS.
Leasable minerals; coal	No change in impacts from the 2015 Proposed RMP/Final EIS. Analysis required from the court order is in Chapter 3.
Leasable minerals: fluids	No change in impacts from the 2015 Proposed RMP/Final EIS. Analysis required from the court order is included under air resources.
Locatable minerals	This resource use does not occur in the CDPAs.
Mineral materials	No change in impacts from the 2015 Proposed RMP/Final EIS.
Nonenergy leasable minerals	This resource use does not occur in the CDPAs.
Renewable energy	This resource use does not occur in the CDPAs.
National Trails	This resource does not exist in the CDPAs.
Wild and Scenic Rivers	This resource does not exist in the CDPAs.
Backcountry Byways	This resource does not exist in the CDPAs.
Wilderness Study Areas	This resource does not exist in the CDPAs.
Environmental justice	No change in impacts from the 2015 Proposed RMP/Final EIS.

Figure 1-1
Decision Area



Surface Administration in the Alternative A CDPA

Campbell County	Acres
Bureau of Land Management (BLM)	24,693
Local Government	5,366
National Grasslands	66,855
Private	658,497
State	50,181
Sheridan County	**Acres**
Bureau of Land Management (BLM)	3,953
Department of Defense	2,837
Local Government	745
Private	138,066
State	17,909

Surface Administration in the Alternative B CDPA

Campbell County	Acres
Bureau of Land Management (BLM)	4,963
Local Government	5,367
National Grasslands	51,712
Private	498,523
State	35,731

Source: BLM GIS 2019

This page intentionally left blank.

1.4 PLANNING CRITERIA AND REGULATORY CONSTRAINTS

1.4.1 Planning Criteria

Planning criteria guide development of the SEIS/RMPA by defining the decision space. 43 CFR 1610.4–2(b) states that the "Planning criteria will generally be based upon applicable law, Director and State Director guidance, the results of public participation, and coordination with any cooperating agencies and other Federal agencies, State and local governments, and federally recognized Indian tribes."

Planning criteria represent the overarching factors used to resolve issues and to develop alternatives. The planning criteria considered in the development of this document are as follows:

- The SEIS/RMPA complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy.
- Lands covered in the SEIS/RMPA will be federal lands, including split estate, managed by the BLM. No decisions will be made relative to non-BLM-administered lands.
- In the SEIS/RMPA, the BLM makes land use planning decisions to determine lands acceptable for further consideration for coal leasing.
- In the SEIS/RMPA, the BLM uses a collaborative and multi-jurisdictional approach to determine the desired future condition of public lands.
- Decisions in the plan will be compatible with existing plans and policies of adjacent local, state, federal, and tribal agencies, as long as the decisions are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands.
- The SEIS/RMPA recognizes valid existing rights.
- The SEIS/RMPA does not change existing planning decisions that are still valid.

This is not intended to be a full EIS/RMP revision; rather, it is to provide additional analysis for land use planning as it pertains to air quality, climate change, coal, oil, gas, and economics and to make plan-level decisions for availability of coal resources, consistent with the US District Court's order. Due to the limited focus of planning, the BLM did not address decisions that would normally be considered in a full RMP revision.

1.4.2 Regulatory Constraints

Coal Screening Process

The BLM's authority to manage BFO coal resources comes from the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Land of 1947, as amended, and FLPMA. Regulations developed from these statutes and FLPMA are found in 43 CFR 3000 and 3400; these regulations guide the BLM's coal program management, setting requirements for land use planning, leasing, and post lease maintenance.

Coal planning regulations in 43 CFR 3420.1–4 require the BLM to identify federal lands acceptable for further consideration for leasing. These lands are analyzed in the land use planning process. The four coal screens are applied as follows:

1. Identification of coal with development potential—Lands determined to have development potential are considered acceptable for further consideration for leasing and are applied to the remaining coal screens. Lands determined to not have development potential are eliminated from further consideration from leasing.
2. Application of unsuitability criteria—Lands with coal potential are assessed with procedures outlined in 43 CFR 3461. Lands in the coal potential area may be eliminated from further consideration from

leasing if they are determined to be unsuitable without stipulation or exception. In accordance with 43 CFR 3461.2-1 and based on additional site-specific surveys or change resource conditions, the BLM could change the unsuitability determination of a given tract at the activity planning stage.

3. Multiple use conflict analysis—43 CFR 3420.1-4e(3) states that "multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing, to protect resource values of a locally important or unique nature not included in the unsuitability criteria." Lands in the coal potential area may be eliminated from further consideration for leasing where multiple uses conflict.
4. Surface owner consultation—This screen requires the BLM to consult with qualified surface owners whose land overlies federal coal with development potential. The BLM asks the owners for their preference for or against offering the coal deposits under their land for lease. Lands within the coal potential area may be eliminated from further consideration for leasing, based on the preference of the qualified surface owner.

Federal lands determined to be acceptable for further consideration for leasing through coal screening in the BFO are the subject of this SEIS/RMPA analysis; results of the coal screening process are in **Appendix A**.

Coal and Mineral Leasing Management Specific Laws, Regulations, and Policies

The BLM has several laws, regulations, and policies that guide its management of federal coal resources, as follows:

- The Mineral Leasing Act of 1920, as amended
- The Mineral Leasing Act for Acquired Land of 1947, as amended
- Federal Coal Leasing Amendments Act of 1976
- FLPMA
- Surface Mining Control and Reclamation Act of 1977
- 43 CFR 3000 and 3400

Relationship to Other Federal Laws, Regulations, Policies, and Programs

The following federal and state laws and applicable regulations, policies, and actions affect the alternatives analyzed in the SEIS/RMPA:

- NEPA
- Clean Air Act
- Energy Policy Act of 2005
- Clean Water Act

See the BFO 2015 Proposed RMP/Final EIS for the full list of additional laws, regulations, policies, and programs that are relevant to this analysis.

FLPMA is the primary authority for the BLM's management of public lands. It provides the policy by which the BLM manages resources on BLM-administered lands and mineral estate. The BFO will make decisions for coal leasing availability under this SEIS/RMPA; the BLM is required to follow the mandates of FLPMA when making those decisions.

The land use decisions made in this SEIS/RMPA require analysis under NEPA. The BFO will analyze the impacts of the coal leasing decisions on the other resources identified in the decision area, including greenhouse gas emissions, climate change, economics, and the other resources identified in **Table 1-1**.

1.5 COLLABORATION

The BLM is engaging in ongoing collaboration with federal, tribal, state, and local governments as part of this SEIS/RMPA. This collaboration includes continuing to engage Native American tribes for government-to-government consultation, the participation of cooperating agencies, and consultation with regulatory agencies, as required by law. **Appendix E**, Consultation and Coordination, provides more information about the involvement of these stakeholders.

1.6 RELATIONSHIP TO STATE AND LOCAL PLANS

The BLM has considered plans of other state, local, and federal agencies that are relevant in the development of this SEIS/RMPA. The BLM was consistent with these plans, as required by the consistency provisions of FLPMA (43 USC 1712[c][9]) and the BLM's planning regulations at 43 CFR 1610.3-2. The plans considered during this supplemental analysis are consistent with and listed in the 2015 Proposed RMP/Final EIS (*Section 1.4.4*, pp. 15 and 16).

1.7 CHANGES BETWEEN THE DRAFT RMP AMENDMENT/SUPPLEMENTAL EIS AND THE PROPOSED RMP AMENDMENT/FINAL EIS

As a result of public, stakeholder, and cooperating agency input and its internal review of the May 17, 2019, Draft RMPA/SEIS, the BLM has developed this Proposed RMPA/Final SEIS for managing BLM-administered public lands in the decision area. The Proposed Plan is a modified version of the Preferred Alternative (Alternative B) in the Draft RMPA/SEIS. Other factors contributed to the development of the Proposed Plan, such as updated best available information and special expertise provided by cooperating agencies and the public.

When developing the Proposed Plan Amendment/Final SEIS, the BLM focused on addressing public comments, while continuing to meet its legal and regulatory mandates. Appendix I contains a summary of the public comment process and contains the BLM's responses to the comments received on the 2019 Draft RMP Amendment/SEIS. Based on public comments, some of the Proposed Plan text was corrected or reworded for clarification of purpose and intent.

Changes in this Proposed RMP Amendment/Final SEIS from the 2019 Draft RMPA/SEIS are as follows:

- Clarifications to better explain the analysis method and environmental consequences
- Addition of Appendix I, which describes the comments and BLM's responses on the Draft RMP Amendment/SEIS
- Updates, corrections, and clarifications to Social and Economic Considerations and Air Resources, including Greenhouse Gases and Climate Change
- Identified the Proposed Plan and added Figure 2-3
- Included screening results on the additional acreage added into the Proposed Plan (see Appendix A)
- Additional references cited in the document
- Minor corrections, such as typographical errors and figure updates

This page intentionally left blank.

Chapter 2. Alternatives

2.1 INTRODUCTION

The BLM considered two alternatives in this SEIS/RMPA. They were developed in coordination with cooperating agencies, interested stakeholders (including private landowners and city, county, and state governments) and from comments received from the general public during the public scoping period.

2.2 ALTERNATIVES DEVELOPMENT

The SEIS/RMPA alternatives focus solely on coal leasing in response to the federal district court's order in *Western Organization of Resource Councils v. Bureau of Land Management, Civil Action No. 4:2016cv00021* (D. Mont. 2017) (hereinafter, order). The range of alternatives meets the purpose and need for the SEIS/RMPA and responds to issues raised during scoping (see **Chapter 1**, **Section 1.3**, p. 1-2 and BLM Buffalo Field Office RMP SEIS Scoping Report, BLM 2019a). In addition, the BLM refined alternatives by updating the coal screening (**Appendix A**) and revising the reasonably foreseeable development (RFD) scenario (**Appendix B**). The alternatives are described in detail in **Sections 2.2.1** and **2.2.2**.

A summary of lands acceptable for further consideration for coal leasing and development for the alternatives is provided in **Tables 2-1**, **2-2**, **2-3**, and **2-4**.

2.2.1 Alternative A: No Action Alternative

For Alternative A, the BLM brought forward all management decisions that prevented coal development in the 2015 Proposed RMP/Final EIS. In addition, the BLM used information from the 2001 coal screening process (2001 RMP update, Appendix D; BLM 2001), updated resource data where applicable, and determined a baseline for coal acceptability for further consideration for leasing.

Figure 2-1 shows the coal acceptability geospatial results, based on the 2001 coal screening process, along with volume. **Table 2-1** depicts the coal screening results; **Table 2-2** depicts the overall coal acceptability results for Alternative A.

Table 2-1
Coal Screening Results for Alternative A

Coal Screening Criteria[1]	Total
CDPA (acres)	720,033[2]
Unsuitable for all methods of coal mining without exception (acres)	30,735[2]
Multiple use screen (acres)	2,402[2]
Acceptable to coal leasing	686,896
Unsuitable for all or certain stipulated methods of coal mining with exception (acres)	65,497[2]
Landowners contacted	569
Total Volume (billion tons)	**73.66**

Source: BLM GIS 2019

[1] See 2015 RMP Appendix D for full coal screening results.

[2] Coal potential includes federal coal, excluding areas where the Forest Service manages the surface. It also includes existing lease actions and areas already mined but outside of existing leases.

Table 2-2
Coal Acceptability Results for Alternative A[1]

Location[2]	Acceptable (Acres)	Unacceptable (Acres)
Campbell County	618,742	27,993
Sheridan County	68,154	5,144
Total	**686,896**	**33,137**

Source: BLM GIS 2019
[1]Total volume: 73.66 billion tons
[2] Inside the CDPA

Alternative A represents high coal economic development potential before the rise of natural gas and renewable energy. Higher development potential allows for access to lower quality, deeper coal reserves and a larger CDPA.

2.2.2 Alternative B

Starting with the Alternative A CDPA, the BLM reduced the CDPA boundary by applying lower strip ratios and retaining higher quality coal (see **Appendix A** for the details). The biggest change from the Alternative A CDPA is the exclusion of Sheridan County, based on changes in economic forecast since 2001 (see Appendix B Reasonably Foreseeable Development for more details). **Figure 2-2** shows the Alternative B CDPA; it represents a 34 percent reduction in coal acceptability, compared with the Alternative A CDPA. Using updated data, the BLM also evaluated lands for the unsuitability criteria, the multiple land use decisions, and consultation with qualified surface owner screens. See **Appendix A** for results of the evaluations.

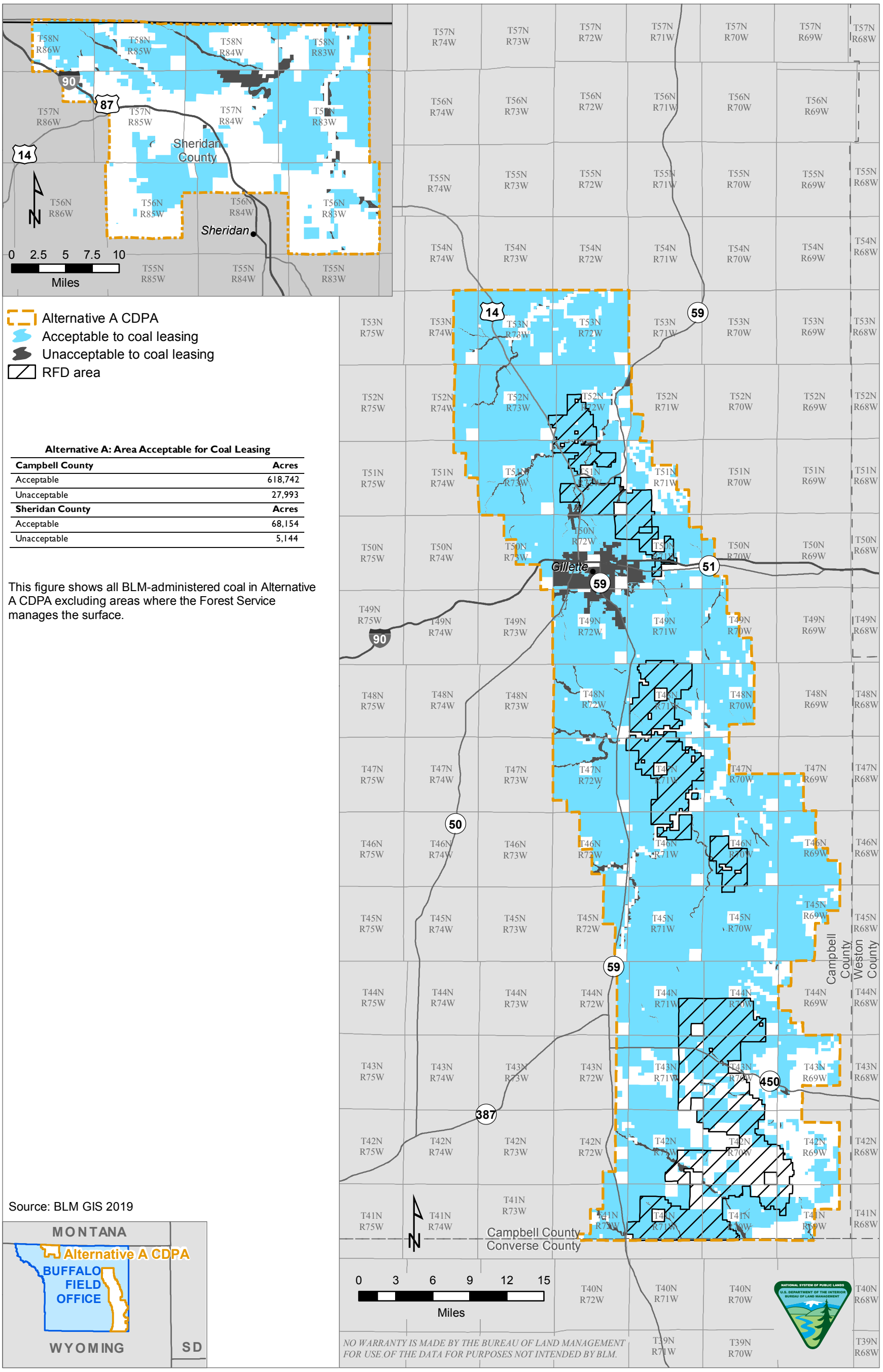
Figure 2-2 shows the coal acceptability geospatial results of the four-step coal screening process for Alternative B, along with volume. **Table 2-3** depicts the coal screening results; **Table 2-4** depicts the overall coal acceptability results for Alternative B.

Table 2-3
Coal Screening Results for Alternative B

Coal Screening Criteria[1]	Total
Coal potential (acres)	481,139[2]
Unsuitable for all methods of coal mining without exception (acres) [2]	24,791[2]
Multiple use screen (acres) [2]	881[2]
Acceptable to coal leasing	455,467
Unsuitable for all or certain stipulated methods of coal mining with exception (acres) [2]	34,826[2]
Landowners Contacted and evaluated	372
Total volume (billion tons)	**52.24**

Source: BLM GIS 2019
[1] See **Appendix A** for full coal screening results.
[2] Coal potential includes federal coal, excluding areas where the Forest Service manages the surface. It also includes existing lease actions and areas already mined but outside of existing leases.

Figure 2-1
Alternative A, No Action



Alternative A: Area Acceptable for Coal Leasing

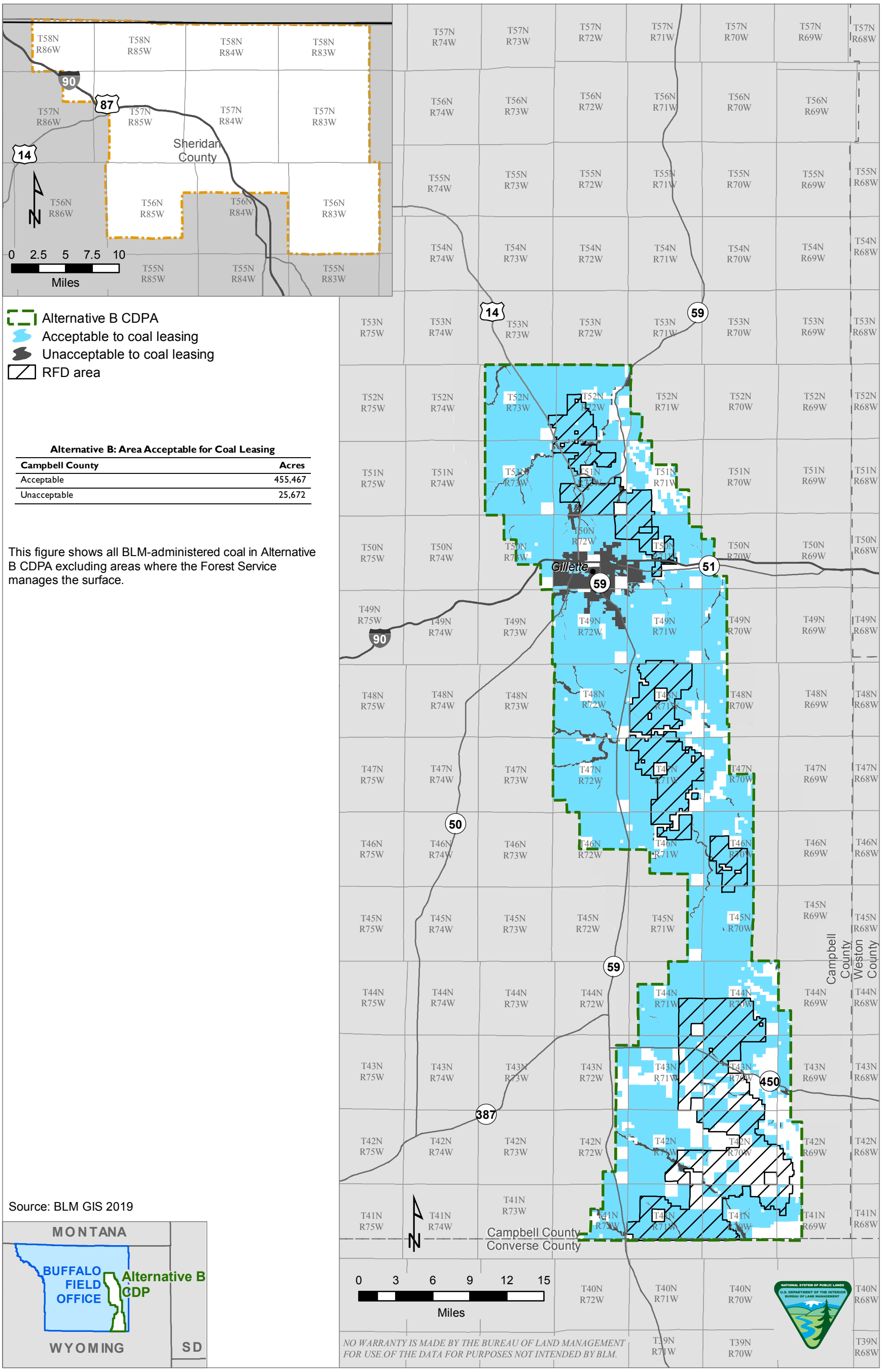
Campbell County	**Acres**
Acceptable	618,742
Unacceptable	27,993
Sheridan County	**Acres**
Acceptable	68,154
Unacceptable	5,144

This figure shows all BLM-administered coal in Alternative A CDPA excluding areas where the Forest Service manages the surface.

Source: BLM GIS 2019

This page intentionally left blank.

Figure 2-2
Alternative B



Alternative B: Area Acceptable for Coal Leasing

Campbell County	Acres
Acceptable	455,467
Unacceptable	25,672

This figure shows all BLM-administered coal in Alternative B CDPA excluding areas where the Forest Service manages the surface.

Source: BLM GIS 2019

This page intentionally left blank.

Table 2-4
Coal Acceptability Results for Alternative B and the Proposed Plan[1]

Location[2]	Acceptable (Acres)	Unacceptable (Acres)
Campbell County	455,467 for the Alternative B/495,251 for the Proposed Plan	25,672 for the Alternative B/26,735 for the Proposed Plan
Sheridan County	0	0
Total	**455,467** for the Alternative B/**495,251** for the Proposed Plan	**25,672** for the Alternative B /**26,735** for the Proposed Plan

Source: BLM GIS 2019
[1] Total volume: 52.2 tons
[2] Inside the CDPA

2.2.3 Reasonably Foreseeable Development

In the 2015 Proposed RMP/Final EIS, the BLM identified the 2009 coal production, which was when coal production peaked. Current assumptions, data, and projections for coal development are lower than identified in the 2015 document. The BLM developed an updated RFD scenario (see **Appendix B**) for this SEIS/RMPA that applies to both alternatives. On average, about 213 million tons of federal coal will be mined from the CDPA each year, totaling 4.2 billion tons of federal coal over the life of the SEIS/RMPA. An estimated 36,620 acres (based on current lease applications) would be disturbed over the life of the SEIS/RMPA.

2.2.4 Rationale for Identifying a Proposed Plan Amendment

BLM regulations, at 43 CFR, Subpart 1610, requires the BLM to identify its Proposed RMPA in the Final Supplemental EIS. The BLM crafted the Proposed RMP Amendment from the two alternatives in the Draft RMP Amendment/Supplemental EIS.

The BLM Field Manager recommends a modified Alternative B as the Proposed RMP Amendment for allocating BLM administered coal within the Buffalo Field Office. The Proposed RMP Amendment addresses the planning issues, within the parameters of the planning criteria. It also achieves the purpose and need for amending the 2015 RMP, complies with the court order ruling, and the addition to Alterative B best represents what was supported by the Wyoming Governor's Office and Campbell County.

The Proposed RMP Amendment allows for the conservation of resources while still providing for the expansion of existing mines and associated infrastructure and provides an opportunity for future new uses of coal, such as carbon fiber development. BLM added 39,784 acres to Alternative B to ensure flexibility for mining in the most efficient manner such as providing options for locating infrastructure in a manner that promotes the sensible use of the resource (see **Figure 2-3**). The additional acreage was analyzed within the Alternative A CDPA. While geologic conditions indicate that this area is unlikely to be mined using current technology, the Governor's Office requested that this area be included for the reasons previously described.

The Proposed RMPA does not represent a final BLM decision. The BLM planning process requires a 30-day public protest period and 60-day governor's consistency review period before a ROD and RMP Amendment can be signed. Only then do the actions presented in the Final Supplemental EIS become final decisions.

2.2.5 Alternatives Considered but Eliminated from Further Study

NEPA requires federal agencies to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any that were not developed in detail (40 CFR1502.14). Through

their comments on the proposed action, the public suggested alternative methods for achieving the purpose and need.

No Leasing Alternative

During scoping, several commenters suggested analyzing a no leasing of future coal alternative. The BLM considered the suggestion of closing the decision area to any future leasing of federal coal resources, even in areas where there are no identified resource conflicts; however, the BLM did not bring it forward for further analysis.

According to the BLM Land Use Planning Handbook H-1601-1, Appendix C, the primary land use plan level decision to be made regarding coal is identifying areas that are acceptable for further consideration for coal leasing and those that are not. The process undertaken in order to make these land use plan allocations is directed by the CFR. In order to make the land use plan-level allocations regarding coal, the BLM is required to go through the coal screening process outlined in 43 CFR 3420 et. seq., versus applying a blanket no leasing alternative. During this coal screening process, the BLM analyzed all relevant resources when considering what areas to make acceptable for further consideration for coal leasing.

Making the entire decision area unacceptable for further consideration for coal leasing would not meet the BLM's multiple use mandate under FLPMA, the leasing requirements under the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2. Coal development is an authorized use of public lands and meets the BLM's multiple use objectives.

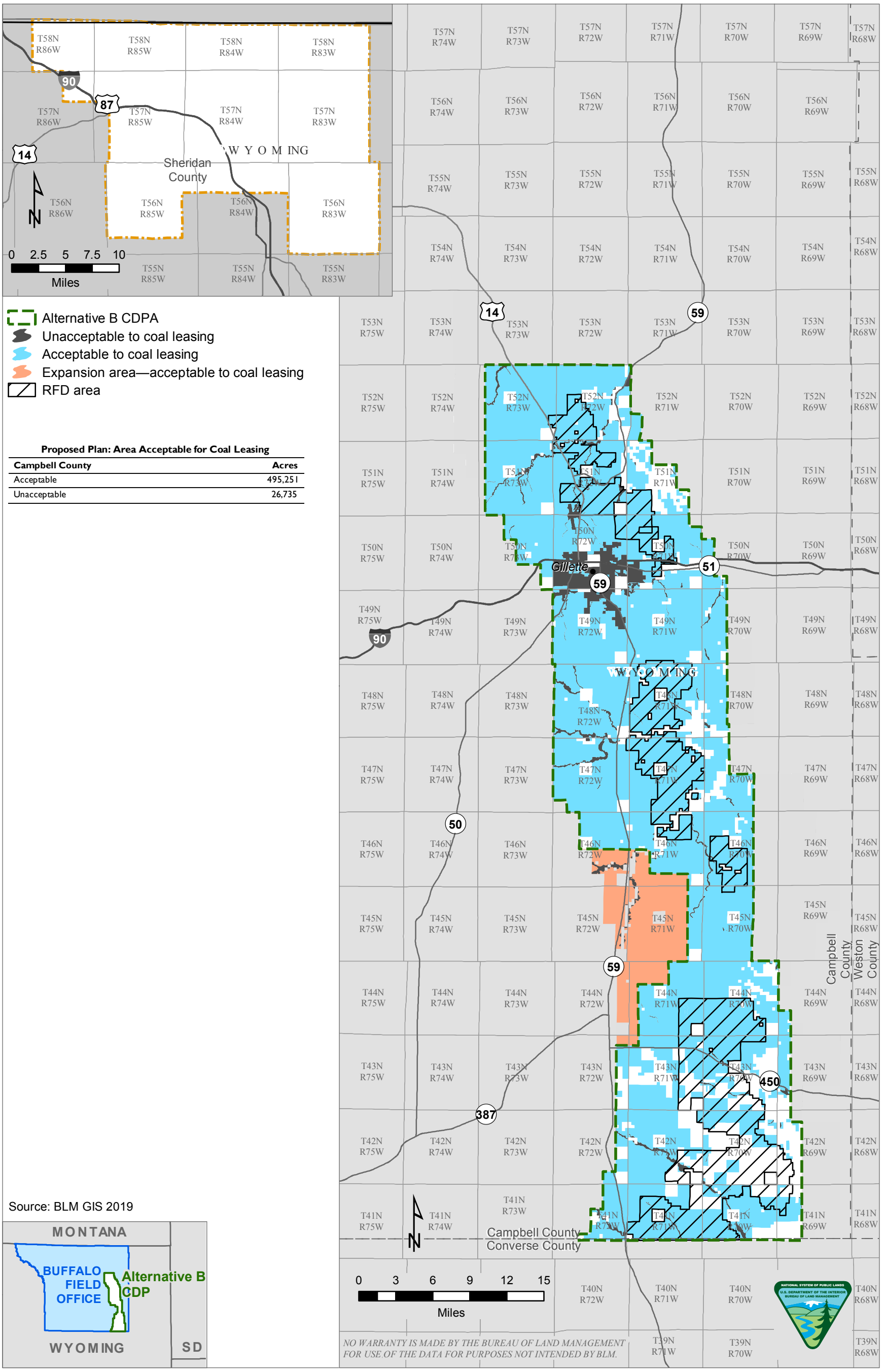
Reduced Emissions Alternative

The BLM considered reducing air emissions, as a nexus for climate change, under the multiple-use coal screen. Previous coal development in the BFO and emission inventories for the 2015 Proposed RMP/Final EIS complied with the State of Wyoming and National Ambient Air Quality Standards. Past production and the 2015 Proposed RMP/Final EIS modeling, which used 2009 production levels (417.8 million metric tons), were considerably higher than the 2018 production levels (293.4 million metric tons) and the US Energy Information Administration (EIA 2019) forecast analyzed in this SEIS/RMPA.

Since the 2015 Proposed RMP/Final EIS emissions met the State and Federal air quality standards, and the reasonably foreseeable development scenario for this SEIS/RMPA was lower than the 2015 data, the BLM considered an alternative that would reduce air emissions by limiting leasing to only areas immediately adjacent to the existing coal mines. This was done in order to consider the consolidation of the infrastructure used in the mining and transportation of the coal. However, the BFO determined that the supporting infrastructure is already consolidated and highly interconnected in the eastern half of Campbell County. In addition, it is highly unlikely, in eastern Campbell County, that a new coal mine would start and new infrastructure would be constructed within the next 20 years.

Because of these factors, this alternative was dismissed. The mines and the associated infrastructure in the BFO are highly consolidated, well developed, and interconnected so that some areas not immediately adjacent to, but between the mines, might be needed for future leasing. This was also not considered a feasible alternative because it could not be implemented without disrupting existing mining operations.

Figure 2-3
Proposed Plan



Source: BLM GIS 2019

This page intentionally left blank.

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the existing biological, physical, and socioeconomic characteristics of the Alternative A CDPA, including human uses that could be affected. It also evaluates the impacts of implementing the proposed alternatives. The 2015 Proposed RMP/Final EIS described the baseline conditions in the Alternative A CDPA (BLM 2015). Because that document described the baseline conditions in detail, this chapter incorporates those conditions by reference and provides descriptions of those resources that have new or updated information. **Chapter 1** of this SEIS/RMPA includes a list of those resources considered but eliminated from further analysis.

3.2 Methods and Assumptions

3.2.1 Analytical Assumptions

The BLM made several assumptions to facilitate the analysis of potential effects and ensure that our analysis adhered to the court order. For most resources, it applied assumptions identified in the 2015 Proposed RMP/Final EIS.

What follows are general assumptions that apply to all resources:

- Planning issues identified in **Chapter 1** and the US District Court's opinion and order provide the focus for the scope of effects analyzed in this chapter.
- The life of the SEIS/RMPA is 20 years.
- The SEIS analysis area does not include the entire planning areas from the 2015 Proposed RMP/Final EIS. The analysis area for indirect effects associated with coal leasing is limited to the CDPA for each alternative (**Figure 3-1**). The RFD area is the analysis area for the indirect effects associated with coal mining during the planning period. It includes current leases, leases by application, and 141,762 acres (16.26 billion tons) of BLM-administered coal in Campbell County.
- Surface disturbance is estimated for all alternatives at 36,620 acres associated with federal coal in the RFD area (**Figure 3-1** and **Appendix B**).
- The geographical area of analysis for most resources is the Alternative A CDPA.
- There are no active lease actions or mines in Sheridan County; therefore, no effects are anticipated from coal development there.
- There are 4.9 billion tons of coal forecast for development in Campbell County over the 20-year planning period (see **Appendix B**); 4.2 billion tons are BLM-administered coal reserves.
- No new mine starts were analyzed. This is because new mine starts will require a separate EIS, due to the infrastructure requirement. At such time, the BLM would evaluate if an RMP amendment is required.
- The analysis includes surface mines and surface disturbance. There are no underground mines in the BFO.
- Mining will occur in the RFD area, and development is expected to move outward, to the west (**Figure 3-1**).

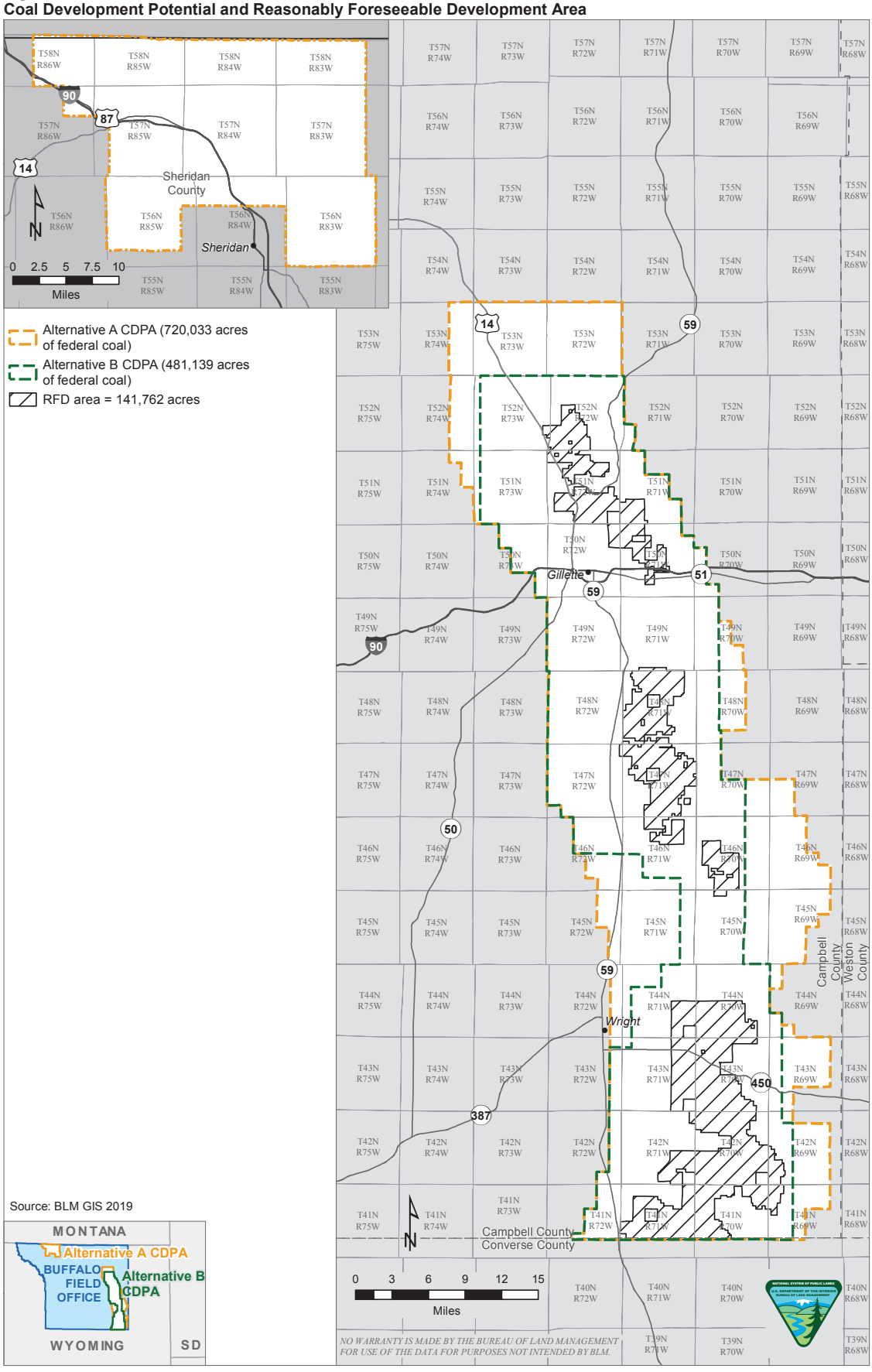
- An average of 19 to 20 years production are remaining on current leases, with fewer remaining reserves for the central and southern mines.
- Resources will be affected in proportion to the percent of resources in the RFD area.
- The BLM updated baseline data from the 2015 Proposed RMP/Final EIS where new information was available.
- The 2019 Greater Sage-Grouse amendment updates BLM Greater Sage-Grouse management to be more consistent with the State of Wyoming's Greater Sage-Grouse management policy (EO 2015-4; State of Wyoming 2015).
- Direct effects are caused by the planning decision to determine areas as acceptable or unacceptable for consideration for coal leasing.
- Indirect effects will be the result of foreseeable actions, including leasing and mining.
- Indirect effects from coal leasing and mining will be similar for all resources, as identified in the Wright Coal Lease Applications FEIS (BLM/WY/PL-10/022+1320; BLM 2010) and the South Gillette Area Coal Lease Applications FEIS (BLM/WY/PL-09/029+1320; BLM 2009). These FEISs are available on ePlanning.
- Reclamation standards for coal mining are outlined in the Surface Mining Control and Reclamation Act of 1977 and will apply to any surface mining activities.

3.3 RESOURCES ELIMINATED FROM FURTHER ANALYSIS

During the initial stages of planning for this SEIS/RMPA, the BLM identified four categories of resources/resource uses that fall under its NEPA handbook requirements:

1. Resources that do not fall within the Alternative A CDPA and are therefore dismissed from further analysis (see **Chapter 1** of this SEIS/RMPA)
2. Resources that are in the Alternative A CDPA but that were dismissed because they were determined to be unsuitable, without exception, for coal development, according to the unsuitability criteria, or because they conflicted in the multiple use coal screen, in accordance with 43 CFR 3420.1–4 (see **Chapter 1** of this SEIS/RMPA)
3. Resources in the Alternative A CDPA are acceptable for further consideration for leasing; impacts on these resources would be the same as identified in the 2015 Proposed RMP/Final EIS, but they would take place only in the Alternative A CDPA (see **Table 3-1**, below)
4. Resources that would have different impacts, based on the RFD, coal screening analysis, and updated data; areas analyzed in detail in **Sections 3.5.1** through **3.5.3** of this SEIS/RMPA are air resources including greenhouse gases (GHGs) and climate change, economic considerations, and biological resources

Figure 3-1
Coal Development Potential and Reasonably Foreseeable Development Area



This page intentionally left blank.

Table 3-1
SEIS/RMPA Resources with the Same Indirect and Cumulative Impacts Identified in the 2015 Proposed RMP/Final EIS and Indirect Impacts in the 2011 Wright FEIS (BLM 2010)[1]

Resource	Resource Indicator	Alternative A CDPA (acres)			Alternative B CDPA (acres)
		Sheridan County	Campbell County	Total	Campbell County Only
Soils See Section 4.1.3 of the 2015 RMP/Final EIS (BLM 2015) See Section 3.8.2 of the Wright FEIS (BLM 2010)	Severe erosion (wind and water)	25,400	89,660	115,060	46,600
	Slopes greater than 25 percent	6,960	12,270	20,230	6,290
	Poor reclamation suitability	39,260	262,840	302,100	171,740
	Low reclamation potential	11,263	71,445	82,208	35,439
Water Resources See Section 4.1.4 of the 2015 RMP/Final EIS (BLM 2015) See Sections 3.5.1.2 and 3.5.2.2 of the Wright FEIS (BLM 2010)	Surface waters	4,130	26,220	30,350	21,170
	Alluvial valley floors	3,500	14,627	18,127	12,202
	Groundwater wells	152	1,076	1,228	1,009
Vegetation See Sections 4.4.1, 4.4.2, 4.4.3, and 4.4.4 of the 2015 RMP/Final EIS (BLM 2015). See Section 3.9.2 of the Wright FEIS (BLM 2010).	Agricultural	1,290	530	1,820	520
	Barren	790	10,730	11,520	8,820
	Short-grass prairie	19,220	273,790	293,010	209,740
	Mixed-grass prairie	32,010	73,340	105,350	58,140
	Sagebrush	15,120	280,080	295,200	199,000
	Riparian	210	380	590	340
	Conifer forest	960	3,690	4,650	1,400
	Wet meadow	2,290	2,370	4,660	2,200
	Water	100	1,060	1,160	990
	Other/no record	0	770	770	0
Cultural Resources See Section 4.5.1 of the 2015 RMP/Final EIS (BLM 2015) See Section 3.12.2 of the Wright FEIS (BLM 2010)	Known resources	231	3,516	3,747	2,573
	Eligible for listing on the NRHP	7	439	446	290
	Not eligible for listing on the NRHP	113	2460	2573	2054
	Not evaluated	111	344	455	229
	Known Native American features	25	416	441	277
Paleontological Resources See Section 4.5.2 of the 2015 RMP/Final EIS (BLM 2015) See Section 3.3.3.2 of the Wright FEIS (BLM 2010)	PFYC Class 2 Areas	2,050	15,790	17,840	12,940
	PFYC Class 3 Areas	44,090	193,900	237,990	98,280
	PFYC Class 3A Areas	27,070	437,050	464,120	369,920

Resource	Resource Indicator	Alternative A CDPA (acres)			Alternative B CDPA (acres)
		Sheridan County	Campbell County	Total	Campbell County Only
Visual Resources	VRM Class II	1,820	250	2,070	210
See Section 4.5.3 of the 2015 RMP/Final EIS (BLM 2015)	VRM Class III	1,690	1,900	3,590	140
See Section 3.13.2 of the Wright FEIS (BLM 2010)	VRM Class IV	440	22,700	23,140	4,610
Lands and Realty	Rights-of-way (ROW) Linear	19	237	256	117
See Section 4.6.2 of the 2015 RMP/Final EIS (BLM 2015)	ROW – Non-linear	0	280	280	204
See Section 3.11.2 of the Wright FEIS (BLM 2010)	Agency Roads	0	18	46	12
	Buildings	403	17,608	18,011	17,244
	Cemeteries	0	315	315	315
	Cities	0	13,289	13,289	13,290
	County Roads	337	2,383	2,720	2,033
	Interstates	166	467	633	466
	State Highways	86	855	941	773
	US Highways	98	415	513	339
	Agency Roads	0	18	18	12

Sources: BLM GIS 2019; WGFD GIS Data 2018; BLM 2019 memorandum to Tom Bills, BLM BFO from GL "Buck" Damone III, Lead Archaeologist, Buffalo Field Office, February 12.

[1] Calculations include current lease actions and areas already mined outside of current leases.

3.4 CUMULATIVE IMPACTS

3.4.1 Cumulative Analysis Method

Cumulative impacts are those impacts on the environment that result from implementing either of the alternatives, in combination with other actions outside the scope of this SEIS/RMPA. CEQ (1997) regulations require a cumulative impact analysis because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation; it must be determined by considering the likely result of that action, in conjunction with many other actions.

3.4.2 Past, Present, and Reasonably Foreseeable Future Actions

Evaluating potential impacts includes considering incremental impacts that could occur from the alternatives, as well as impacts from past, present, and reasonably foreseeable future actions (RFFAs). The RFFA area is fully contained in the area determined acceptable for further consideration for leasing in the 2015 Proposed RMP/Final EIS. See Appendix G of that document for a list of reasonably foreseeable actions in the RFFA. In addition, the Miles City Field Office Coal Leasing Final SEIS and Proposed Plan Amendment is included in this cumulative effects analysis.

3.5 RESOURCES BROUGHT FORWARD FOR ANALYSIS

3.5.1 Air Resources, including Greenhouse Gases and Climate Change

The BLM air resources analysis for the Buffalo Proposed RMP/Final EIS (BLM 2015) included air quality, air quality-related values, such as visibility and deposition, and greenhouse gases and climate change. The air analysis for this SEIS evaluated the potential impacts from management actions being considered in response

to the court order issued by the US District Court (case CV16-21-GF-BMM), as amended on March 26, 2018. The air quality and air quality related values analyses contained in the 2015 Proposed RMP/Final EIS were upheld and were not the subject of the court order; therefore, the air resources analysis here responds to the court order's direction provided under Claim 3 and Claim 5 and focuses on the greenhouse gases and climate change.

Affected Environment

This section incorporates by reference the affected environment described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–324). More recent information as it pertains to the decisions for this SEIS/RMPA is included below.

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use" (IPCC 2013).

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC 2013). The global average surface temperature has increased approximately 1.5 degrees Fahrenheit (°F) from 1880 to 2012 (IPCC 2013). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere, which is the lowest layer of earth's atmosphere, ranging from 4 to 12 miles above the surface. The troposphere is where all the weather phenomena we experience on a daily basis occurs.

Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Although largely invisible to the short wavelength incoming solar radiation that heats the earth's surface, GHGs absorb a portion of the outgoing long wavelength infrared heat radiated back from the surface; this prevents it from escaping into space. As a result, the buildup of GHGs, such as carbon dioxide, methane, and nitrous oxide, since the start of the Industrial Revolution has increased the global mean temperature and begun to alter the earth's climate in complex ways.

This section analyzes the three main GHGs (carbon dioxide [CO_2], nitrous oxide [N_2O], and methane [CH_4]) associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. These issues are identified in **Chapter 1**, Purpose and Need, and in **Table 1-1**, Scoping Issues and the Resource Topics Affected. The court order requires the BLM to supplement the 2015 Proposed RMP/Final EIS analysis to evaluate the environmental consequences of the downstream combustion of coal, oil, and gas open to potential development (claim #3), to justify the use of global warming potential (GWP) time horizons, and to explain the evolving science in this area (claim #5).

The method the BLM used to supplement the GHG and climate change analysis accordingly is described below. **Section 2.2**, Alternatives Development, addresses coal screening and consideration of climate

change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in this RMP (claim #1).

Different GHGs have different atmospheric lifetimes; some, such as methane, react in the atmosphere relatively quickly, on the order of 12 years (see EPA 2018a), whereas others, such as carbon dioxide typically last for hundreds of years or longer. GHGs also vary with respect to the amount of outgoing radiation absorbed by each gas molecule, relative to the amount of incoming radiation it allows to pass through, that is, its level of radiative forcing. A molecule of nitrous oxide is far more effective at absorbing outgoing radiation than a molecule of CO_2.

The impact of a given GHG species on global warming depends both on its radiative forcing and how long it lasts in the atmosphere. Climate scientists have calculated a GWP for each GHG that accounts for these effects. GWPs are calculated for each GHG species for a specified time interval, typically 20 or 100 years. By definition, the GWP for CO_2 is assigned a value of 1, and GWPs for other gases are defined relative to CO_2. In technical terms, GWP is the time-integrated direct (and potentially indirect) radiative forcing of an amount of a GHG species released instantaneously into the atmosphere, relative to that of an equal amount of CO_2.

GWP values allow for direct comparison of the impacts of emissions of different GHGs. In particular, emissions of mixtures of different GHGs are typically summarized in terms of their CO_2 equivalent (CO_2e) emissions, defined as the weighted sum of the emissions of each GHG, where the weights are the GWPs. For example, emissions of the three most significant GHGs associated with fossil fuel combustion (CO_2, CH_4, and N_2O) are summarized as:

$$CO_2e\ (MMT/yr) = CO_2(MMT/yr) + GWP_{CH4} \times CH_4(MMT/yr) + GWP_{N2O} \times N_2O(MMT/yr)$$

where MMT stands for million metric tons.

Because the GWP of a given GHG depends in part on the atmospheric lifetime of the GHG, GWP values depend on the time interval for which they are estimated. The GWP for a relatively short-lived GHG, such as CH_4, is larger over a short period, say, 20 years, compared with a much longer period, such as 100 years. This is because most of the CH_4 will have reacted away well before 100 years have passed. Conversely, long-lived GHGs have a 20-year GWP that is lower than the 100-year GWP. This is because the time integrated radiative forcing is less (relative to CO_2) over the shorter time interval.

As a result of various complex feedbacks in the earth-atmosphere system, GWPs can only be roughly estimated; according to the IPCC (2013), GWPs have a large uncertainty: plus or minus (±) 30 percent and ±39 percent for the 20-year and 100-year CH_4 GWPs, respectively, and ±21 percent and ±29 percent for the 20-year and 100-year N_2O GWPs, respectively. Estimates of GWPs have been updated over the years as the models used to calculate them have been refined. The updated estimates also reflect the changing composition of the atmosphere, which affects the GWP of each additional ton of GHG emissions.

GWPs have been calculated for several GHGs over different time horizons, including 20 years, 100 years, and 500 years. The choice of time horizon depends on the type of application and policy context; hence, no single time horizon is optimal for all policy goals. The United Nations Framework Convention on Climate

Change and its Kyoto Protocol[1] adopted the 100-year GWP, which is used widely as the default metric. The US Environmental Protection Agency (EPA) uses the 100-year time horizon in its annual GHG inventories.

For this SEIS/RMPA, the BLM reports CO_2e emissions using GWPs for the 100-year time horizon. This was done for consistency with the EPA's inventory. It also reports CO_2e emissions using GWPs for the 20-year time horizon to more clearly estimate the relative impacts of shorter lived GHGs, such as CH_4, over the 20-year life of the RMP. More information on specific GWPs and time horizons used for this SEIS/RMPA analysis is in the section below on *Direct and Indirect Impacts*, *Analysis Methods*.

Physical Manifestations of Climate Change

Warming of the earth's climate since the Industrial Revolution has been observed to coincide with widespread effects throughout the earth-atmosphere system, including reductions in extent and duration of polar sea ice and mountain winter snowpack, rising sea levels, increases in mean nighttime minimum temperatures, shifts in historical rainfall patterns, and changes in the frequency, severity, and duration of extreme weather events. These effects in turn have affected natural and human systems, regardless of cause, implicating the sensitivity of natural and human systems to changing climate (IPCC 2013).

The potential effects of climate change, as reported in the Northwestern Plains Rapid Ecoregional Assessment and the Third National Climate Assessment (NCA; published in 2014), were described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–321). The Fourth NCA was published in November 2018. It was written to help inform decision-makers, utility and natural resource managers, public health officials, emergency planners, and other stakeholders by providing a thorough examination of the effects of climate change in the United States (USGCRP 2016). The National Oceanic and Atmospheric Administration summarizes some of the key findings of the report by stating that the US is increasingly vulnerable to climate change and, while societal responses to climate change have expanded, they are not yet at the scale needed to avoid substantial impacts (NOAA 2018). Compared with previous reports, the Fourth NCA provides greater detail on regional scales. This is because impacts and adaptation tend to be realized at a more local level.

As reported in the Fourth NCA, climate model projections show a warmer future in the northern Great Plains (Montana, Wyoming, North Dakota, South Dakota, and Nebraska), with conditions becoming consistently warmer in 2 to 3 decades and temperatures rising steadily toward the middle of the century, irrespective of the climate scenario modeled. The Fourth NCA relies on recent climate modeling scenarios, developed by the integrated assessment modeling community and known as the representative concentration pathways (RCP). The lower scenario assumes lower emissions and concentrations of GHGs and aerosols and projects a lower change in radiative forcing by 2100. The higher scenario assumes a continued dependence on fossil fuels and higher GHG emissions and concentrations; it projects a larger change in radiative forcing by 2100.

For the Northern Great Plains, the Fourth NCA reports that temperature increases of 2°F to 4°F projected by 2050 under the lower scenario are expected to increase the occurrence of both drought and heat waves; these projected trends would be greater under the higher scenario. The probability for more hot days, with maximum temperatures above 90°F, is expected to increase. There are projected to be many fewer cool days, with minimum temperatures less than 28°F, which will decrease by 30 days or more per year by mid-century.

[1] https://unfccc.int

The amount, distribution, and variability of annual precipitation are anticipated to change, with increases in winter and spring precipitation of 10 to 30 percent by the end of this century and a decrease in the amount of precipitation falling as snow under a higher scenario. Summer precipitation is expected to vary across the northern Great Plains, ranging from no change under a lower scenario to 10 to 20 percent reductions under a higher scenario. Further, the frequency of heavy precipitation events is projected to increase by about 50 percent in the frequency of 2-day heavy rainfall events by 2050 under the higher scenario. The amount falling in single day heavy events is projected to increase by 8 to 10 percent by mid-century, depending on the scenario. While there is high confidence in future increases in temperature, uncertainties exist as to the degree of precipitation variability from year to year and within season (Conant et al. 2018).

Greenhouse Gas Emissions in Context

GHG emissions are reported at a number of spatial scales, including globally, nationally, and at the state level. In addition to these scales (described under *Direct and Indirect Impacts*, *Analysis Methods* for the emission scales used for this analysis), GHG emissions from fossil fuels produced on federal lands and emissions reported in the three planning area counties are described below. A comparison of GHG emissions at differing scales provides context against which to compare emissions from a specific action, such as that evaluated in this SEIS/RMPA.

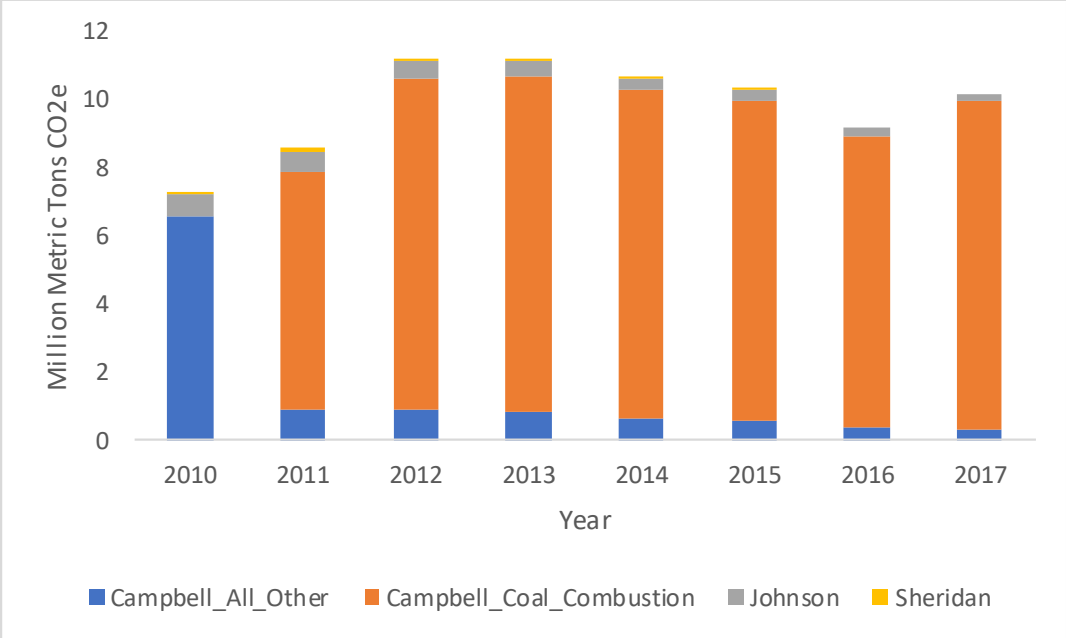
The US Geological Survey (2018) published a report on GHG emissions from extraction and use of fossil fuels produced on federal lands and GHG sinks (carbon storage by terrestrial ecosystems) on federal lands in the US. In 2014, nationwide emissions from oil, gas, and coal extracted from federal lands were 1,279.0 million metric tons (MMT) CO_2e of carbon dioxide, 47.6 MMT CO_2e of methane, and 5.5 MMT CO_2e of nitrous oxide, based on 100-year GWPs. GHG emissions from production occurring in Wyoming and combustion, which primarily occurs outside of Wyoming, of fossil fuels produced on federal lands in Wyoming were 727.7 MMT CO_2e of carbon dioxide (this is 57 percent of total carbon dioxide emissions from all states and offshore areas combined) and 13.1 MMT CO_2e of methane (this is 28 percent of total methane emissions from all states and offshore areas combined) (USGS 2018). Wyoming had the highest percentage of carbon dioxide and methane emissions from fuels produced on federal lands of all states and offshore regions (USGS 2018).

In 2014, carbon storage by terrestrial ecosystems on federal lands in the conterminous United States (not including Alaska and Hawaii) was 83,600 MMT CO_2e. Soils stored 63 percent of carbon, with vegetation and dead organic matter storing 26 percent and 11 percent, respectively. Between 2005 and 2014, the annual rate of net carbon uptake by terrestrial ecosystems in the conterminous US ranged from a sink (sequestration) of 475 MMT tons of CO_2e per year to a source (emission) of 51 MMT CO_2e per year. This was due to such factors as changes in climate and weather, land use, land cover change, and wildfire frequency. Terrestrial ecosystems on federal lands sequestered an average of 195 MMT CO_2e per year nationally between 2005 and 2014. In Wyoming, the annual average sequestration over the 10-year period was 10 MMT CO_2e. The 2014 net emissions of GHG for federal lands in Wyoming were 701.5 MMT CO_2e per year, indicating that more GHGs were emitted than were sequestered. This was the largest net emissions of any state by a factor of 10 (USGS 2018).

In its facility level information on greenhouse gases tool (FLIGHT), the EPA (2018b) reports annual GHG emissions from facilities emitting more than 25,000 metric tons of CO_2e that are subject to the EPA's Greenhouse Gas Reporting Program (GHGRP) under 40 CFR Part 98. This includes emissions from most large stationary sources of GHGs (smaller emitters are not required to report) and emissions from most end uses of fossil fuels. Nationally, the GHGRP accounts for 85 to 90 percent of total GHG emissions in the

EPA's *Inventory of US Greenhouse Gas Emissions and* Sinks.[2] While CH_4 emissions from underground coal mines are included in the GHGRP, emissions from coal strip mines are not. GHG emissions reported under GHGRP by facilities in the three planning area counties for 2010 to 2017 are shown in **Figure 3-2**. Nearly all of the reported emissions for Campbell County are from coal-fired power plants, while all of the reported emissions in Johnson County are from petroleum and natural gas systems. Reported emissions in Sheridan County are negligible, compared with Campbell and Johnson Counties.

Figure 3-2. GHG Emissions in the Three Planning Area Counties (EPA 2018b)



Note: Coal combustion not reported separately for Campbell County in 2010; values for Johnson and Sheridan counties are totals over all reporting sources; emissions totals exclude Onshore Oil and Gas Production, Onshore Oil and Gas Gathering and Boosting, Onshore Gas Transmission Pipelines, Natural Gas Local Distribution Companies and Use of Electrical Equipment. Source: EPA FLIGHT database.

Direct and Indirect Impacts

Analysis Methods

This section analyzes the three main GHGs—carbon dioxide, nitrous oxide, and methane—associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. Details of the method used to supplement the GHG and climate change analysis with regard to claim #3 and claim #5 of the court's decision are described below. Coal screening and consideration of climate change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in the SEIS/RMP (claim #1) is addressed in **Section 2.2**, Alternatives Development.

Coal. Emissions of GHGs are quantified for the estimated future production, transportation, and downstream combustion of federal coal developed within the planning area over the life of the plan. GHG

[2] https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/data_explorer_flight.html

emissions for coal production on federal lands are calculated from the default coal methane emissions factor for surface mines in EPA's *State Inventory and Projection Tool*[3] for Wyoming and the BLM RFD forecast for 2019–2038 (**Appendix B**).

Transportation emissions are estimated for the transport of produced coal via rail using diesel locomotives. An average one-way train haul distance of 1,115 miles was assumed and emissions were calculated using the RFD-predicted annual tons of coal and two one-way trips per ton of coal. The production-weighted average train haul distance in miles was estimated by using 2017 coal transport data for the Powder River Basin, Wyoming, obtained from the US Energy Information Administration (EIA) Coal Data Browser (EIA 2019a). Locomotive fuel consumption rates and GHG emission factors used to calculate GHG coal transportation emissions are developed for trains hauling coal and the return trip hauling empty cars. To account for the reduced load on the return trip, when the coal cars are typically empty, fuel consumption is estimated at 21.8 percent of the outbound (loaded) fuel consumption, based on the ratio of the total weight of the unloaded train to that of the loaded train (AAR 2018; BNSF 2019; Union Pacific 2019).

The calculations for trains hauling coal are based on emission factors developed from the Burlington Northern Santa Fe (BNSF) Railway and EPA. BNSF developed a fuel efficiency factor for diesel locomotives of 849 ton-miles per gallon in its 2017 Corporate Responsibility and Sustainability Report (BNSF 2017). The EPA provided emission factors for diesel locomotives of 20.9 pounds per gallon for CO_2, 0.0018 pounds per gallon for CH_4, and 0.0006 pounds per gallon for N_2O, as presented in the Greenhouse Gas Inventory Guidance, Direct Emissions from Mobile Combustion Sources (EPA 2016).

Downstream emissions from federal coal combustion are determined as per claim #3 using GHG emissions factors for stationary combustion of sub-bituminous coal from the EPA Emission Factors for Greenhouse Gas Inventories (EPA 2018c). The emission factors used for CO_2, CH_4, and N_2O are 1,676 kilograms per short ton, 190 kilograms per short ton, and 28 kilograms per short ton, respectively.

The GHG emissions for production, transportation, and downstream combustion are the same under Alternative A (No Action Alternative) and Alternative B (the action alternative). This is because the same RFD is used in both alternatives.

GHG emissions are adjusted to use GWP values based on both 20- and 100-year time horizons to calculate carbon dioxide equivalents (see **Table 3-2** for a description of the GWPs and scientific relevance of these two time horizons). The 100-year GWPs were selected so that emissions reported here can be directly compared with emissions inventories compiled by the EPA (2019a), which use these same GWPs, and to evaluate the relative long-term effect of emissions. The 20-year GWPs were selected to better evaluate near-term impacts of methane emissions over the life of the SEIS/RMP (see discussion under *Affected Environment*, above). The EPA's national inventories do not include carbon-climate feedbacks or CO_2 from methane oxidation. GWPs for other time horizons are not commonly used in the climate change community.

Other emissions weighting metrics, such as the global temperature change potential (IPCC 2013), are not commonly used for reporting GHG emissions. Evaluations of the relative importance of emissions of short-lived GHG species relative to CO_2 are sensitive to the particular metric used, which should be carefully selected to match the specific policy question being addressed.

[3] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

Table 3-2
GWPs for 100-Year and 20-Year Time Horizons and Rationale

Time Horizon	GWP			Rationale
	CO_2	CH_4	N_2O	
100-Year	1	28	265	The 100-year time horizon for GWP has been adopted by the United Nations Framework Convention on Climate Change and its Kyoto Protocol and used widely as the default metric (IPCC 2014); consistent with the IPCC Fifth Assessment Report in its science communications (IPCC 2013, 2014).
20-Year	1	84	264	Prioritizes gases with shorter lifetimes, such as CH_4, because it does not consider impacts that happen more than 20 years after the emissions occur. Because all GWPs are calculated relative to CO_2, GWPs based on a shorter time frame will be larger for gases with lifetimes shorter than that of CO_2 and will be smaller for gases with lifetimes longer than CO_2.

Source: IPCC 2014

The CH_4 and N_2O GWP values shown in **Table 3-2** do not include climate-carbon feedbacks and the effect of CO_2 from methane oxidation. When considering climate-carbon feedbacks and methane oxidation, the 100-year GWPs for CH_4 and N_2O are 36 and 298, respectively, and the 20-year GWPs are 87 and 268, respectively; however, as mentioned above, there is large uncertainty in the GWP estimates: ±30 percent and ±39 percent for the 20-year and 100-year CH_4 GWPs, respectively, and ±21 percent and ±29 percent for the 20-year and 100-year N_2O GWPs, respectively (IPCC 2013).

In particular, uncertainties related to the climate-carbon feedbacks are large (IPCC 2013). The higher GWP values accounting for both climate-carbon feedbacks and methane oxidation would fall within the uncertainty bounds mentioned above.

In addition, IPCC uses the 100-year GWPs in **Table 3-1** in the calculation of the worldwide GHG inventory total of 52 gigatonnes CO_2-e per year in the Fifth Assessment (IPCC 2014). For the aforementioned reasons, the SEIS analysis used the GWP values listed in **Table 3-2**.

The state, national, and global emissions totals of GHGs (see **Table 3-3**) are reported for comparison with the potential direct and indirect impacts of coal mining on BFO federal lands. A comparison with other metrics is provided for additional context.

Table 3-3
GHG Emissions at Various Scales

Spatial Scale (Year)	GHG Emissions	Source
Wyoming (2017)	60.4 MMT CO_2e per year	EPA 2018b
National (2017)	6,457 MMT CO_2e per year	EPA 2019a
Global (2010)	52 gigatonne* per year	IPCC 2014

* one gigatonne=a thousand million metric tons

Oil and Gas. GHG emissions are quantified for production and downstream combustion of oil, conventional natural gas, and coal bed natural gas (CBNG). The annual production estimates for 2019–2038 are based on the 2015 RMP and 2012 RFD. Cumulative production for each well type is based on the 2012 RFD for 20195–2038. For CBNG, 2012 RFD production is available up to 2031; 2032–2038 CBNG production is assumed to be equivalent to 2031 production. For conventional natural gas and oil wells, 2012

RFD production is available up to 2028; 2029–2038 conventional natural gas and oil well production is assumed to be equivalent to 2028 production. Federal production in 2024 for each well type is based on the 2015 RMP. Federal production for years 2019–2023 and 2025–2038 was estimated for each well type by multiplying each year's cumulative production by the ratio of 2024 federal production to 2024 cumulative production.

Production (upstream) GHG emissions were estimated for each year from 2019 to 2038. This was based on the production estimates for each well type applied in 2015 RMP (Appendix M) emission inventory spreadsheets for CBNG, conventional natural gas, and oil wells.

Downstream gas combustion GHG emissions were estimated separately for CBNG and conventional natural gas wells for each year from 2019 to 2038. This was based on the production estimates above applied to natural gas combustion emission factors from the March 2018 EPA Center for Corporate Climate Leadership GHG Emission Factors Hub (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub).

Downstream oil combustion GHG emissions were estimated separately for oil wells for each year from 2019 to 2038. This was based on the production estimates above applied to distillate fuel oil no. 2 emission factors from the March 2018 EPA Center for Corporate Climate Leadership GHG Emission Factors Hub (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub).

Additional information on the methods is provided in **Appendix C**.

GWP values that reflect 20- and 100-year time horizons (see **Table 3-2**) are used to obtain CO_2e emissions.

Annual oil and gas production estimates are also used to form the basis of the emissions estimates for downstream combustion of oil and gas. Oil and gas combustion emissions are quantified using the EPA GHG emissions factors for stationary source combustion of No. 2 fuel oil and natural gas. GHG emissions due to transportation of oil and gas from the planning area are qualitatively assessed.

The GHG emissions quantified for production and downstream combustion are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative) because the same RFD is used for both. GHG emissions are reported using both 100-year and 20-year GWPs for reasons noted in the above discussion of coal (claim #5). State, national, and global emissions totals of GHGs from the EPA FLIGHT data (2018b), the EIA 2019 Annual Energy Outlook (2019a), and the IPCC Fifth Assessment Report (2014) are reported for comparison with the potential direct and indirect impacts of oil and gas development and production from federal minerals in the planning area (see Error! Reference source not found.). A c omparison with other metrics is provided for additional context.

Assumptions

- Coal production values for each alternative are based on 2018 coal production and EIA 2019 coal production forecasts for average of high and low economic growth scenarios for Wyoming Powder River Basin low-sulfur sub-bituminous coal production (**Appendix B**).
- Coal will be transported one way by diesel locomotive rail over an average transportation distance of 1,115 miles; the distance was calculated using the EIA 2017 coal distribution from Wyoming.
- Fuel consumption to return empty coal railcars is 21.8 percent of the outbound loaded fuel consumption.
- All future coal produced is combusted in US energy generating units.

- Oil and gas production rates are based on the 2015 Proposed RMP/Final EIS, Alternative D (BLM 2015).

Indicators

- MMT of CO_2, CH_4, and N_2O and the resulting CO_2e from coal production, transportation, and downstream combustion over the life of the RMP
- MMT of CO_2, CH_4, and N_2O and resulting CO_2e from oil and gas production, and downstream combustion over the life of the RMP
- GHG emissions from coal, oil, and gas as a percentage of state, national, and global emissions and other metrics
- GHG emission equivalencies from power plants, cars, home electricity use, and equivalent GHG emissions avoided by wind turbines or sequestered by forests

Impacts Common to all Alternatives

Coal

Table 3-4 Error! Reference source not found. summarizes GHG emissions from federal coal production, transportation, and downstream combustion for each forecast year. The details by pollutant (CO_2, CH_4, and N_2O) are shown in **Appendix C**.

The GHG emissions discussed above would contribute incrementally to global climate change. The lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to quantify accurately the potential future impacts of climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world. Given the global and complex nature of climate change, it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** over the 20-year SEIS/RMPA lifetime, based on 20-year and 100-year GWPs are 7,619 MMT CO_2e and 7,363 MMT CO_2e, respectively. The downstream combustion portion is 7,238 MMT CO_2e and 7,193 MMT CO_2e, respectively.

Average annual GHG emissions from federal coal production in the planning area shown in **Table 3-4** are 15.7 MMT CO_2e and 5.2 MMT CO_2e for 20-year and 100-year GWPs, respectively. These represent 26 and 8.6 percent of the 60.4 MMT CO_2e total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** are 398.9 MMT CO_2e and 368.2 MMT CO_2e for 20-year and 100-year GWPs, respectively. These represent 6.2 and 5.7 percent of the 6,457 MMT CO_2e total 2017 US GHG emissions reported by EPA (2019a). These represent 0.77 and 0.71 percent, of the 52 gigaton total 2010 global GHG emissions in CO_2e, as estimated by the IPCC (2014).

Table 3-4
GHG Emissions as CO2e from Federal Coal Production, Transportation, and Downstream Combustion, Based on 20-Year and 100-Year GWPs

Year	Federal RFD Coal Production Rate (MMst)[1]	CO_2e (MMT[2], 20-Year GWP)				CO_2e (MMT[2], 100-Year GWP)			
		Production	Transportation	Combustion	Total	Production	Transportation	Combustion	Total
2019	258.6	19.11	3.98	439.51	462.60	6.37	3.96	436.76	447.09
2020	225.8	16.68	3.47	383.64	403.80	5.56	3.46	381.24	390.26
2021	217.7	16.09	3.35	369.96	389.40	5.36	3.33	367.64	376.34
2022	204.7	15.13	3.15	347.88	366.16	5.04	3.14	345.71	353.89
2023	201.2	14.87	3.10	341.89	359.85	4.96	3.08	339.75	347.79
2024	204.4	15.10	3.15	347.32	365.57	5.03	3.13	345.16	353.33
2025	204.7	15.13	3.15	347.94	366.22	5.04	3.14	345.76	353.94
2026	208.1	15.38	3.20	353.65	372.23	5.13	3.19	351.45	359.76
2027	204.1	15.08	3.14	346.84	365.06	5.03	3.13	344.67	352.82
2028	203.4	15.03	3.13	345.69	363.85	5.01	3.12	343.53	351.66
2029	213.4	15.77	3.28	362.61	381.66	5.26	3.27	360.34	368.86
2030	221.0	16.33	3.40	375.5	395.23	5.44	3.38	373.15	381.98
2031	218.0	16.11	3.35	370.42	389.88	5.37	3.34	368.11	376.82
2032	214.3	15.84	3.30	364.22	383.36	5.28	3.28	361.95	370.51
2033	211.8	15.65	3.26	359.87	378.78	5.22	3.24	357.62	366.08
2034	211.5	15.63	3.26	359.45	378.34	5.21	3.24	357.20	365.65
2035	209.9	15.52	3.23	356.77	375.52	5.17	3.22	354.54	362.93
2036	210.3	15.54	3.24	357.37	376.15	5.18	3.22	355.14	363.54
2037	208.9	15.44	3.21	354.95	373.60	5.15	3.20	352.73	361.07
2038	207.7	15.35	3.20	352.87	371.41	5.12	3.18	350.67	358.97
Total	**4,259**	**314.8**	**65.6**	**7,238.4**	**7,618.8**	**104.9**	**65.2**	**7,193.1**	**7,363.3**
Average	**213.0**	**15.7**	**3.3**	**361.9**	**398.9**	**5.2**	**3.3**	**359.7**	**368.2**

Source: Ramboll 2019
[1]MMst: million short tons
[2]MMT: million metric tons

The average annual GHG emissions due to production, transportation, and downstream combustion of coal forecast to be produced in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b). These equivalencies are presented to put the GHG emissions from the RMP in context of other sources readily understandable to the public.

- GHG emissions from 95 coal-fired power plants in 1 year
- GHG emissions from 78,174,098 passenger vehicles driven for 1 year
- GHG emissions from 64,209,074 homes' electricity use for 1 year
- GHG emissions that may be avoided by 78,025 wind turbines running for 1 year
- Carbon sequestered by 433,342,670 acres of US forests in 1 year

The corresponding numbers, based on the 20-year GWP, are 102 coal-fired power plants, 84,537 wind turbines, 84,692,144 passenger vehicles, 69,562,737 homes, and 469,474,175 acres of forest.

Oil and Gas

Table 3-5, **Table 3-6**, and **Table 3-7**Error! Reference source not found. summarize GHG emissions from the production and downstream combustion of federal oil, conventional natural gas, and CBNG, respectively. The details by pollutant (CO_2, CH_4, and N_2O) are shown in **Appendix C**. GHG emissions would also result from transportation of oil and gas from the planning area by pipeline, rail, or tanker truck. Estimated emissions of GHGs from the transportation and distribution of these products have not been quantified. This is because the focus of this document is a response to the court order instructing the BLM to analyze the downstream combustion of oil and gas open to development under the RMP.

In addition, at the planning level stage, the BLM does not have readily available data on how and where liquid and gaseous fossil fuels that could be produced from the areas open to development under the RMP would be distributed among the forms of transportation (pipeline, rail, and tanker truck) or the quantity distributed to each type. This information is necessary in order to quantify emissions that would be representative of reasonably foreseeable future operations.

Table 3-5
GHG Emissions as CO2e from Federal Oil Production and Combustion, Based on 20-Year and 100-Year GWPs

Year	Federal RFD Oil Production Rate (MMBO)[1]	CO_2e (Metric Tons, 20-Year GWP)			CO_2e (Metric Tons, 100-Year GWP)		
		Production	Combustion	Total	Production	Combustion	Total
2019	1.2	64,351	538,506	602,857	42,847	537,306	580,153
2020	1.4	68,486	607,823	676,310	44,229	606,468	650,697
2021	1.5	70,865	647,692	718,557	45,024	646,248	691,273
2022	1.7	76,579	743,469	820,048	46,934	741,812	788,746
2023	1.9	80,162	803,519	883,681	48,132	801,728	849,860
2024	2.1	85,238	888,607	973,846	49,829	886,627	936,455
2025	2.1	87,207	921,612	1,008,820	50,487	919,558	970,045
2026	2.3	91,609	995,392	1,087,001	51,958	993,173	1,045,131
2027	2.3	91,994	1,001,842	1,093,836	52,087	999,609	1,051,696
2028	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2029	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2030	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2031	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2032	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2033	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2034	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2035	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2036	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2037	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
2038	2.5	95,338	1,057,902	1,153,240	53,205	1,055,544	1,108,749
Total	**43.6**	**1,765,214**	**18,785,385**	**20,550,599**	**1,016,777**	**18,743,516**	**19,760,293**
Average	**2.2**	**88,261**	**939,269**	**1,027,530**	**50,839**	**937,176**	**988,015**

Source: Ramboll 2019
[1]MMBO=million barrels

Table 3-6
GHG Emissions as CO2e from Federal Conventional Natural Gas Production and Combustion, Based on 20-Year and 100-Year GWPs

Year	Federal RFD Conventional Natural Gas Production (BCF)[1]	CO_2e (Metric Tons, 20-Year GWP)			CO_2e (Metric Tons, 100-Year GWP)		
		Production	Combustion	Total	Production	Combustion	Total
2019	1.8	131,308	96,673	227,981	65,554	96,571	162,126
2020	2.0	147,554	108,999	256,553	73,418	108,884	182,302
2021	2.1	155,622	115,121	270,743	77,323	114,999	192,322
2022	2.5	180,184	133,756	313,940	89,211	133,615	222,826
2023	2.6	193,086	143,544	336,630	95,455	143,393	238,848
2024	2.9	213,967	159,387	373,355	105,562	159,219	264,781
2025	3.0	220,358	164,236	384,594	108,655	164,063	272,718
2026	3.3	238,589	178,068	416,657	117,479	177,880	295,359
2027	3.3	238,194	177,768	415,963	117,288	177,581	294,869
2028	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2029	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2030	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2031	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2032	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2033	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2034	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2035	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2036	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2037	3.5	252,898	188,924	441,823	124,405	188,725	313,130
2038	3.5	252,898	188,924	441,823	124,405	188,725	313,130
Total	61.5	4,500,746	3,355,722	7,856,468	2,218,400	3,352,180	5,570,580
Average	3.1	225,037	167,786	392,823	110,920	167,609	278,529

Source: Ramboll 2019
[1]BCF=billion cubic feet.

Table 3-7
GHG Emissions as CO_2e from Federal Coalbed Natural Gas Production and Combustion, Based on 20-Year And 100-Year GWPs

Year	Federal RFD Coalbed Natural Gas Production (BCF)[1]	CO_2e (Metric Tons, 20-Year GWP)			CO_2e (Metric Tons, 100-Year GWP)		
		Production	Combustion	Total	Production	Combustion	Total
2019	23.4	234,608	1,274,868	1,509,476	82,579	1,273,523	1,356,102
2020	24.1	241,590	1,313,501	1,555,091	84,955	1,312,114	1,397,069
2021	24.8	248,572	1,352,133	1,600,705	87,330	1,350,706	1,438,036
2022	25.5	255,555	1,390,765	1,646,320	89,706	1,389,298	1,479,003
2023	29.7	297,449	1,622,560	1,920,009	103,959	1,620,847	1,724,806
2024	34.7	346,325	1,892,986	2,239,311	120,587	1,890,988	2,011,575
2025	35.4	353,307	1,931,619	2,284,926	122,962	1,929,580	2,052,542
2026	36.8	367,272	2,008,883	2,376,155	127,713	2,006,763	2,134,476
2027	37.5	374,254	2,047,516	2,421,770	130,089	2,045,355	2,175,444
2028	35.4	353,307	1,931,619	2,284,926	122,962	1,929,580	2,052,542
2029	29.7	297,449	1,622,560	1,920,009	103,959	1,620,847	1,724,806
2030	25.5	255,555	1,390,765	1,646,320	89,706	1,389,298	1,479,003
2031	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2032	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2033	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2034	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2035	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2036	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2037	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
2038	22.7	227,626	1,236,236	1,463,862	80,204	1,234,931	1,315,135
Total	543.9	5,446,248	29,669,663	35,115,911	1,908,135	29,638,347	31,546,482
Average	27.2	272,312	1,483,483	1,755,796	95,407	1,481,917	1,577,324

Source: Ramboll 2019
[1]BCF=billion cubic feet.

The GHG emissions attributable to the transport of oil and gas produced from the planning area would occur in the form of CO_2, CH_4, and N_2O. GHG emissions attributable to the end use of the produced liquid and gaseous fossil fuels have been estimated by assuming that 100 percent is combusted for heat or energy production. Although the actual end use of these products may also include transportation fuels, stock for plastics, chemical, and synthetic materials production, or other manufacturing, it is reasonably foreseeable to estimate emissions from combustion.

As in the case of coal production, the GHG emissions discussed above due to oil and gas production and downstream combustion would contribute incrementally to global climate change, although at a much lower level, relative to the coal production, transportation, and downstream combustion. As noted previously, the lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to accurately quantify the future impacts on climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world, and it is not possible to accurately distinguish the impacts on global climate change

from GHG emissions originating just from the planning area; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal oil production and downstream combustion shown in **Table 3-5** over the 20-year RMP lifetime, based on 20-year and 100-year GWPs, are 20.6 MMT CO_2e and 19.8 MMT CO_2e, respectively. Downstream combustion contributes 18.8 MMT CO_2e and 18.7 MMT CO_2e.

Average annual GHG emissions from the production and downstream combustion of federal oil produced in the BFO (shown in **Table 3-5**) are 1.0 MMT CO_2e and 1.0 MMT CO_2e using 20-year and 100-year GWPs, respectively. These represent 1.7 and 1.6 percent of the 60.4 MMT CO_2e total 2017 Wyoming GHG emissions for major facilities as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from the production and downstream combustion of federal oil in the BFO represent 0.016 and 0.015 percent, respectively, of the 6,457 MMT CO_2e total 2017 US GHG emissions reported by EPA (EPA 2019a) and 0.0020 and 0.0019 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in CO_2e estimated by IPCC (IPCC 2014).

The average annual GHG emissions reported above using the 100-year GWP are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b). As mentioned above, these equivalencies are presented to put the GHG emissions from the RMP in context of other sources readily understandable to the public.

- GHG emissions from 0.254 coal-fired power plants in 1 year (or emissions from one power plant for 93 days)
- GHG emissions from 209,789 passenger vehicles driven for 1 year
- GHG emissions from 172,312 homes' electricity use for 1 year
- GHG emissions that may be avoided by 209 wind turbines running for 1 year
- Carbon sequestered by 1,162,922 acres of US forests in 1 year

The corresponding numbers based on the 20-year GWP are 0.264 coal-fired power plant GHG emissions, 218,159 vehicles, 179,187 homes, 218 wind turbines, and 1,209,323 acres of forest.

Total GHG emissions from federal conventional natural gas production and downstream combustion shown in **Table 3-6** over the 20-year RMP lifetime, based on 20-year and 100-year GWPs, are 7.9 MMT CO_2e and 5.6 MMT CO_2e, respectively. Downstream combustion contributes 3.4 MMT CO_2e and 3.4 MMT CO_2e.

Average annual GHG emissions from the production and downstream combustion of federal conventional natural gas produced in the BFO (shown in **Table 3-6**) are 0.4 MMT CO_2e and 0.3 MMT CO_2e using 20-year and 100-year GWPs, respectively. These represent 0.7 and 0.5 percent of the 60.4 MMT CO_2e total 2017 Wyoming GHG emissions for major facilities as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from the production and downstream combustion of federal conventional natural gas in the BFO represent 0.002 and 0.003 percent, respectively, of the 6,457 MMT CO_2e total 2017 US GHG emissions reported by EPA (2019a) and 0.0002 and 0.0003 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in CO_2e estimated by IPCC (2014).

The average annual GHG emissions reported above using the 100-year GWP are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- GHG emissions from 0.072 coal-fired power plants in 1 year (or emissions from 1 power plant for 27 days)
- GHG emissions from 59,136 passenger vehicles driven for 1 year
- GHG emissions from 48,572 homes' electricity use for 1 year
- GHG emissions that may be avoided by 59 wind turbines running for 1 year
- Carbon sequestered by 327,807 acres of US forests in 1 year

The corresponding numbers based on the 20-year GWP are 0.101 coal-fired power plant GHG emissions, 83,402 vehicles, 68,503 homes, 83 wind turbines, and 462,322 acres of forest.

Total GHG emissions from federal coalbed natural gas production and downstream combustion shown in **Table 3-7** over the 20-year RMP lifetime, based on 20-year and 100-year GWPs, are 35 MMT CO_2e and 32 MMT CO_2e, respectively. Downstream combustion contributes 30 MMT CO_2e and 30 MMT CO_2e.

Average annual GHG emissions from the production and downstream combustion of federal coalbed natural gas produced in the BFO (shown in **Table 3-7**) are 1.8 MMT CO_2e and 1.6 MMT CO_2e using 20-year and 100-year GWPs, respectively. These represent 2.9 and 2.6 percent of the 60.4 MMT CO_2e total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b).

Average annual GHG emissions from the production and downstream combustion of federal coalbed natural gas in the BFO represent 0.001 and 0.023 percent, respectively, of the 6,457 MMT CO_2e total 2017 US GHG emissions reported by EPA (2019a) and 0.0002 and 0.0028 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in CO_2e estimated by IPCC (2014).

The average annual GHG emissions reported above using the 100-year GWP are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- GHG emissions from 0.405 coal-fired power plants in 1 year (or emissions from 1 power plant for 148 days),
- GHG emissions from 334,888 passenger vehicles driven for 1 year
- GHG emissions from 275,064 homes' electricity use for 1 year
- GHG emissions that may be avoided by 334 wind turbines running for 1 year
- Carbon sequestered by 1,856,387 acres of US forests in 1 year

The corresponding numbers based on the 20-year GWP are 0.451 coal-fired power plant GHG emissions, 372,780 vehicles, 306,187 homes, 372 wind turbines, and 2,066,435 acres of forest.

When GHG emissions from federal oil and gas developed in the BFO are combined (totals from **Table 3-5**, **Table 3-6**, and **Table 3-7**Error! Reference source not found.), the average annual GHG e missions are 3.2 MMT CO_2e and 2.9 MMT CO_2e using 20-year and 100-year GWPs, respectively. These represent 5.3 and 4.7 percent of the 60.4 MMT CO_2e total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b). When compared with US GHG emissions, these values represent 0.049 and 0.044 percent, respectively, of the 6,457 MMT CO_2e total 2017 US GHG emissions reported by EPA (2019a). When compared with global GHG emissions, these values represent 0.0006 and 0.0005 percent, respectively, of the 52 gigaton total 2010 global GHG emissions in CO_2e estimated by the IPCC (2014).

The average annual GHG emissions estimated above for federal oil and gas developed in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- GHG emissions from 0.7 coal-fired power plants in 1 year (or emissions from 1 power plant for 255 days)
- GHG emissions from 616,000 passenger vehicles driven for 1 year
- GHG emissions from 506,000 homes' electricity use for 1 year
- GHG emissions that may be avoided by 604 wind turbines running for 1 year
- Carbon sequestered by 3.4 million acres of US forests in 1 year

The corresponding numbers based on the 20-year GWP are 0.8 coal-fired power plants, 679,000 vehicles, 558,000 homes, 675 wind turbines, and 3.8 million acres of forest.

The Buffalo Field Office Proposed RMP/Final EIS discussed climate change in relation to potential threats to factors contributing to human health. In addition, the US Global Change Research Program (USGCRP) conducted an extensive Climate and Health Assessment to increase the understanding of the various ways climate change may pose a threat to human health (USGCRP 2016). This assessment builds on the Third National Climate Assessment, and some of its findings include the following:

- Average temperatures have been rising and extreme temperatures (hot and cold) have intensified in many parts of the country. Days that are hotter than the average seasonal temperature in the summer or colder than the average seasonal temperature in the winter can cause increased levels of illness and death by compromising the body's ability to regulate its temperature or by inducing direct or indirect health complications.
- Climate change has the potential to harm human health through exposure to degraded air quality.
- Some American populations could be disproportionately vulnerable to climate change, including those with low income, some communities of color and immigrant groups, children and pregnant women, older adults, vulnerable occupational groups, persons with disabilities, and persons with preexisting or chronic medical conditions.
- Some regions of the United States have already observed changes in the frequency, intensity, or duration of certain extreme events, and projections from climate models show that the occurrence and severity of these events could continue to increase with climate change. Extreme weather events are known to have health impacts such as death or injury during an event (for example, drowning during floods). In addition, before or after an extreme event individuals may be involved in activities that put their health at risk (e.g., disaster preparation and post-event cleanup) or may be unable to get sufficient water, food, or medical care following an extreme event. Health risks may also arise long after the event, or in places outside the area where the event took place, as a result of damage to property, destruction of assets, loss of infrastructure and public services, social and economic impacts, environmental degradation, and other factors.

Cumulative Impacts

Cumulative impacts are evaluated from the total production of federal and nonfederal coal, oil, and gas in the planning area, as well as other past, present, and reasonably foreseeable sources of reportable GHG emissions. GHG emissions from the production, transportation, and downstream combustion of coal forecast to be produced on nonfederal lands in the planning area are evaluated following methods similar to those described above using EIA 2019 nonfederal coal production forecasts for the plan period. GHG

emissions from the production and downstream combustion of oil and gas forecast to be developed from non-federal minerals in the planning area (see the 2015 Proposed RMP/Final EIS; BLM 2015) are assessed using methods similar to those described for federal oil and gas above. GWP values for both 20- and 100-year time horizons are used (see **Table 3-2**).

Direct and indirect emissions from nonfederal coal, oil, and gas are combined with direct and indirect emissions from federal coal, oil, and gas, as described above. These emissions totals are also combined with emissions from large sources other than coal mining and oil and gas development and production in the planning area for the most recent (2017) EPA FLIGHT data. The emissions totals also include GHG emissions from the production and downstream combustion of coal, oil and gas from the 2019 Miles City Field Office Coal Leasing Final SEIS and Proposed RMP Amendment (BLM 2019b).

Table 3-8 reports the cumulative effects in terms of GHG emissions from the sources listed above. These include GHG emissions in the planning area, including federal and non-federal coal and oil and gas and other major sources. The cumulative emission totals also include downstream combustion emissions outside the area, resulting from coal and oil and gas developed in the area as well as emissions from the 2019 Miles City Field Office Coal Leasing Final SEIS and Proposed RMP Amendment (BLM 2019b).

Table 3-8
Production and GHG emissions as CO_2e (Average Over Planning Period) from Cumulative Sources, Based on 20-Year and 100-Year GWPs

Production	GHG Emissions	GHG Emissions in CO_2e (MMT/Year)	
		20-year GWP	100-year GWP
Federal coal production 213.0 MMst/yr	GHG emissions from federal coal production	15.7	5.2
	GHG emissions from federal coal transportation	3.3	3.3
	GHG emissions from federal coal combustion	361.9	359.7
Non-federal coal production 31.0 MMst/yr	GHG emissions from non-federal coal production	2.3	0.7
	GHG emissions from non-federal coal transportation	0.5	0.5
	GHG emissions from non-federal coal combustion	52.6	52.3
Federal oil production 2.2 MMBO/yr	GHG emissions from federal oil production	0.1	0.1
	GHG emissions from federal oil combustion	0.9	0.9
Federal conventional natural gas production 3.1 BCF/yr	GHG emissions from federal conventional natural gas production	0.2	0.1
	GHG emissions from federal conventional natural gas combustion	0.2	0.2
Federal coalbed natural gas production 27.2 BCF/yr	GHG emissions from federal coalbed natural gas production	0.3	0.1
	GHG emissions from federal coalbed natural gas combustion	1.5	1.5
Non-federal oil production 10.8 MMBO/yr	GHG emissions from non-federal oil production	0.6	0.4
	GHG emissions from non-federal oil combustion	5.6	5.6
Non-federal conventional natural gas production 26.4 BCF/yr	GHG emissions from non-federal conventional natural gas production	2.1	1.0
	GHG emissions from non-federal conventional natural gas combustion	1.6	1.6

Production	GHG Emissions	GHG Emissions in CO_2e (MMT/Year)	
		20-year GWP	100-year GWP
Non-federal coalbed natural gas production	GHG emissions from non-federal coalbed natural gas production	1.9	0.7
164.8 BCF/yr	GHG emissions from non-federal coalbed natural gas combustion	10.5	10.5
Other cumulative GHG emission sources	GHG emissions from other major sources in 2017 in planning area from FLIGHT (EPA 2018b)*	10.2	10.1
Other cumulative GHG emission sources	BLM Miles City Field Office production and downstream combustion GHG emissions for coal, oil and gas**	83.8	81.2
Cumulative GHG emissions in CO_2e (annual average over plan period)	**-**	**555.8**	**535.6**

Source: Ramboll 2019
All numbers shown are annual average over planning period except for FLIGHT data.
MMst=million short tons; MMT=million metric tons; MMBO-million barrels of oil; BCF=billion cubic feet
Cumulative totals may not add up due to rounding.
*FLIGHT facility emissions include emissions from power plants in the planning area, which are included in the downstream combustion of coal category; therefore, the cumulative GHG emissions shown in the next row are an over-estimate
**Data source: BLM Miles City Field Office 2019 Resource Management Plan Amendment

Summary

GHG emissions from the production and downstream combustion of coal, oil, and conventional and coal bed natural gas open to development under the SEIS/RMPA were calculated using 100-year and 20-year GWPs. This was done to represent GHG impacts over the longer-term 100-year timespan used in the EPA's national GHG inventory and the shorter 20-year life of the RMP for comparison. GHG emissions from coal transportation were also quantified. GWP values selected for this analysis represent the most current widely recognized and widely used estimates in the climate science community. Differences in CO_2e emissions between the two time horizons mostly reflect the short atmospheric lifetime of methane, relative to carbon dioxide and nitrous oxide. As a result, the differences are largest for such sources as coal production with relatively large ratios of methane-to-carbon dioxide emissions.

Coal, oil, and gas production and therefore GHG emissions are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative). Average annual GHG emissions over the RMP plan period for coal, oil, and gas are compared for federal and nonfederal resources and with other cumulative sources in **Table 3-9**. Cumulative annual average emissions (total CO_2e) are 555.8 MMT/year and 535.6 MMT/year, using the 20-year and 100-year time horizon GWPs, respectively. These values represent 8.3 percent and 1.0 percent of the total 2017 national and 2010 global annual CO_2e emissions,[4] respectively. These were based on the 100-year time horizon values and will contribute to the climate change impacts described under *Affected Environment*, above.

[4] 2010 is the year of the most recent global GHG emissions inventory shown in the IPCC Fifth Assessment (IPCC 2014).

Table 3-9
Summary of Annual Average GHG Emissions from Coal, Oil, and Gas Production, Transport, and Downstream Combustion Over the 20-Year Life of the SEIS/RMPA RFD

Annual Average GHG Emissions	CO_2e MMT/Year (20-Year GWPs)	CO_2e MMT/Year (100-Year GWPs)
Federal action total	384.1	371.1
Nonfederal total	77.7	73.2
Other cumulative sources within the planning area	10.2	10.1
Other cumulative GHG emissions due to BLM Miles City Field Office production and downstream combustion of coal, oil and gas	83.8	81.2
Total (annual average over life of the SEIS/RMPA)*	**555.8**	**535.6**

Source: Ramboll 2019
* Numbers may not add exactly to the total due to rounding

Over the 20-year life of the plan, SEIS/RMPA sources will release 11,116 and 10,712 MMT CO_2e for 20-year and 100-year time horizon GWPs, respectively. Approximately 14 percent of emissions from the RFD are associated with nonfederal resources. Other cumulative sources in the BFO planning area contribute just over 15 percent of total emissions.

Downstream combustion is the dominant source of GHGs for coal, oil, and gas: overall, combustion CO_2e emissions account for 80 percent and 83 percent of the RFD (action) emissions shown in **Table 3-9** for 20-year and 100-year GWPs, respectively. By 2038, global GHG emissions are estimated to be between approximately 30 and 80 gigatonnes CO_2e annually under the IPCC lower bound and higher bound representative concentration pathways (RCP 2.6 and RCP 8.5), respectively (IPCC 2014). Cumulative annual average emissions over the plan period, when considering emissions in the BFO planning area and the MCFO production and combustion emissions, will then represent between 1.8 percent and 0.7 percent of the global emissions. This would be the case under different future global representative concentration scenarios and would contribute, in part, to the climate change impacts described under *Affected Environment*, above.

3.5.2 Social and Economic Considerations

This section incorporates by reference the affected environment described in the 2015 Proposed RMP/Final EIS (Section 3.8, Socioeconomic Resources, p. 607). A summary as it pertains to the decisions for this SEIS/RMPA is included below.

Affected Environment

Although the BFO administers public lands and resources in Campbell, Johnson, and Sheridan Counties, there are strong social and economic ties between the BFO and communities in Converse, Crook, Natrona, and Weston Counties. While the 12 mines producing federal coal in Wyoming's Powder River Basin are in Campbell County, many of the miners and mine operations personnel live in surrounding counties. Because so many of the mines' employees have long commutes from residences in other counties, several of the mine operators run commuter buses to and from surrounding counties to minimize traffic and safety risks associated with drowsy driving after long shifts. General demographic and economic information for these counties can be found in their respective RMPs: Campbell County, Johnson County, and Sheridan counties in the Buffalo RMP (BLM 2015); Converse and Natrona counties in the Casper RMP (BLM 2007) and Crook and Weston Counties in the Newcastle RMP (BLM 2000).

While Wyoming's Powder River Basin does not share the same multi-generational legacy as Appalachia, coal employment has become deeply rooted in the personal and cultural identity of northeastern Wyoming over

the last 30-plus years. Individuals that work for coal mines in Campbell County enjoy good pay and benefits, but they also take great pride in being part of America's coal heritage and in helping to power homes and businesses across the country. The broader communities in which these miners and mine operations personnel live also collectively take pride in the fact that their residents are hardworking individuals whose labor is helping to power the country. Homage for these qualities often serve as a foundation for strong bonds within communities, and logos, mascots, and themed community events often serve as reminders of the ties that bind residents to each other and to the Powder River Basin.

Attitudes, Values, and Beliefs

People have strong attitudes, values, and beliefs (AVBs) associated with natural resources, and these AVBs shape the way they view natural resource issues and public land management. AVBs associated with coal and the BFO's management of federal coal resources are diverse and held by those who live in the region and across the country. AVBs associated with the BFO's management of federal coal resources expressed during scoping related to three categories: local economic opportunities and employment, mineral revenues and funding for public services, and other resources.

Local Economic Opportunities and Employment

Public officials and residents are often concerned about how changes in public land management may affect their livelihoods or those of their constituents. While larger cities generally have more diversified economies and a greater number of employment opportunities, rural communities are often more specialized with respect to natural resource-dependent industries (e.g., mineral development, agriculture, and outdoor recreation); thus, management of natural resources can have a disproportionately large effect on economic opportunities and employment in rural communities.

Relative to other natural resource dependent industries in the US, jobs in the coal industry are highly concentrated geographically within a few producing regions and cumulatively account for a very small proportion of total employment opportunities across the country. In 2017, the coal industry employed an average of 53,051 miners and mine operations personnel, most of which were employed in Wyoming, West Virginia, Kentucky, and Illinois. Wyoming mines supported 5,637 of these coal jobs in 2017, and 1 out of every 11 coal jobs in the US that year were supported by the 12 mines operating in the Wyoming portion of the PRB (MSHA 2019; EIA 2018). Relative to total county employment, jobs supported by these 12 mines accounted for 13.5 percent of all employment opportunities in Campbell County and 2 percent in Converse County in 2017 (MSHA 2019; BEA 2019).

Employment in the coal industry fluctuates annually with production levels. In 2018 production across the 12 mines declined by approximately 11.9 MMst from the previous year. This translated to a loss of 75 coal jobs, with a total of 4,702 miners and mine operations personnel employed across the 12 mines (MSHA 2019). These jobs in the coal industry were estimated to have supported $539.1 million in direct labor income that year.

Coal production can also stimulate economic opportunities and employment in other industries. In 2018, coal production and employment in Wyoming's Powder River Basin was estimated to support an additional 7,302 jobs and $437.3 million in labor income regionally in industries that supply goods and services to the coal industry (indirect employment and labor income), as well as in industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income (induced employment and labor income). Since federal coal estate accounts for approximately 90 percent of all coal in Wyoming's

Powder River Basin, the majority of these economic opportunities were attributable to the development of federal coal administered by the BLM.

Mineral Revenues and Funding for Public Services

Since mineral revenues serve as an important funding mechanism for schools, roads, infrastructure, and public services, public officials are often concerned about how management and development of minerals in their jurisdiction may affect government coffers. Production of federal coal in the BFO generates federal, state, and local revenues through royalties, rents, state severance taxes, and local ad valorem taxes. Revenues generated through these mechanisms, and disbursed according to legal statutes, are substantial and account for a large share of total state and local total revenues each year. Since mineral revenues are a function of production levels and market prices, even relatively small changes in these factors can mean big gains or losses in revenues.

Federal Revenues

Annual mineral revenues generated from leased federal coal are derived from rents and royalties. In 2018, the 12 mines operating in the BFO held leases on 131,837 acres of federal coal estate that were subject to annual rents of $3 per acre. Collectively, these leases generated more than $395,511 in rental revenue. These mines are also required to pay royalties on the value of minerals extracted from their federal mineral leases. Coal mined from the surface of federal tracts is subject to royalties assessed at 12.5 percent of the minerals' gross market value. All federal mineral revenues are collected by the US Office of Natural Resource Revenue (ONRR), and 49 percent of these receipts are disbursed back to the state in which they were generated (ONRR 2019).

State Revenues

In additional to the 49 percent of federal mineral receipts returned to the state, coal mine operators in Wyoming's Powder River Basin are required to pay severance taxes to the state. These taxes are assessed on the taxable value of production at 7 percent. In 2018, the extraction of federal coal in the BFO generated more than $200 million in state severance taxes. The distribution of severance tax revenues is set by the Wyoming legislature, with concurrence by the governor. The basic formula includes a constitutionally mandated 2.5 percent diversion of proceeds to the Permanent Wyoming Mineral Trust Fund (PWMTF), while the remaining revenues are distributed based on a legislatively established, two-tier formula to fund environmental remediation of leaking underground storage tanks, water development, local governments, highway and state aid to county road funds, capital construction, education, the State's general fund, and its budget reserve account (WY Stat § 39-14-801).

Local Revenues

In addition to federal royalties and state severance taxes, coal extracted from federally leased tracts is also subject to local ad valorem taxes, which is a property tax assessed at 100 percent of the market value of gross production and retained by the county where production occurs. While all 12 mines are considered to be in Campbell County, the southernmost mine straddles the Campbell and Converse County line. Approximately one-third of their production comes from minerals in Converse County; thus, both counties collect ad valorem taxes from the production of federal coal. Mines operating in the BFO owed $146 million in ad valorem taxes to Campbell County from their production of federal coal, while another $3.9 million in ad valorem taxes on federal coal was assessed by Converse County.

While a portion of federal and state mineral revenues generated from federal coal production are distributed back to Campbell and Converse Counties, these counties and the municipalities and special districts in them

largely rely on ad valorem taxes to fund schools, roads, hospitals and to provide public services for residents. As discussed above, changes in production levels or market prices can mean big gains or losses in revenues.

Other Resources

During public scoping, people also expressed AVBs associated with other resources, specifically concerns about adverse impacts on wildlife and aquatic species and water resources.

Many individuals, both those living in and outside the BFO's social and economic environment, also expressed AVBs associated with climate change and the potential risk it poses to the health and well-being of people. While there is still uncertainty in the degree to which climate will change and in how people may be affected, depending on which climate models are used, many Americans believe that climate change is the greatest challenge that humanity currently faces.

Direct and Indirect Impacts

Although considerations by the BLM to alter the Alternative A CDPA could affect the acreage and volume of coal reserves brought forward for further leasing consideration, proposed changes to the CDPA are unlikely to affect production over the next 20 years.

The 12 mines operating in the BFO have federal coal leases that grant their operations valid and existing rights to the recoverable reserves remaining on their leases. While the initial terms of federal coal leases are for 20 years, leases that demonstrate diligent development within the first 10 years of issuance can be extended for as long as commercial quantities of coal are produced each year. Annual commercial quantity requirements can also be met by paying an advance royalty in lieu of coal production or a combination of both.

Since mines already have recoverable reserves on hand, annual production decisions are driven by market demand and mine mouth prices[5] for low-sulfur sub-bituminous coal from Wyoming's Powder River Basin. Coal production is driven by the market demand in the US electric fuel energy mix. The combination of a large supply and lower prices is expected to increase the propensity of natural gas in the US electric generation fuel mix, leading to the decreased competitiveness of coal-fired electricity generation and eventual retirement of less efficient coal plants (AEO 2019). Forecast market demand for coal is described in further detail in **Appendix B**.

Longer-term production decisions are still heavily influenced by market conditions and forecasts but also by whether a mine operator can incur additional debt to obtain leases on new coal tracts and still operate with a sufficient profit margin. As reasonably foreseeable coal development is a function of both short-term and long-term production decisions, the RFD for coal in the BFO is governed by short-term and long-term forecasts of market demand and prices. For a detailed discussion of the RFD, its underlying assumptions, and market trends forecast by the Energy Information Administration, see **Appendix B**.

Analysis Methods

Assumptions

- All future production of federal coal in the BFO will occur at mines currently operating in the CDPA.
- There will be no disruptive changes to technology currently used for coal extraction or transportation.

[5] Mine mouth electric plants are coal-burning electricity-generating power plants that purchase directly from coal mines. They report prices to the US Energy Information Administration (EIA) within the US Department of Energy.

- Federal coal production will be for low sulfur sub-bituminous coal.
- The RFD (Appendix B) is representative of future federal coal production in the CDPA.
- Forecast mine mouth prices for low-sulfur sub-bituminous coal from Wyoming's Powder River Basin produced by EIA for its 2019 Annual Energy Outlook are representative of the future market value of coal extracted from the CDPA.
- Federal, state, and local taxes will continue to be levied on coal extracted from the CDPA at current royalty and tax rates.
- The pace and timing of coal development will continue to depend on many factors outside of the BLM's control, most notably the price of coal products on regional, national, and international markets and on national and world market conditions.

- Indicators Employment supported by coal production
- Labor income supported by coal production
- Value added supported by coal production
- Tax revenue collected by federal government, state, and counties supported by coal production

Direct, Indirect, and Induced Effects

Local Economic Opportunities and Employment

Forecasts for the domestic energy market show that coal will account for a declining share of the US electric generation mix over the next 20 years, causing the demand for and production of Wyoming Powder River Basin coal to decline. The 2019 annual energy outlook (AEO) projections for Wyoming's Powder River Basin show that production is anticipated to fall by approximately 1 percent annually between 2019 and 2038 (EIA 2019b). The RFD developed based on AEO 2019 forecasts for the region projects that 236.6 MMst of coal will be mined from the BFO on annual average over the planning period, 213 MMst of which will be produced from federally leased coal tracts (**Appendix B**).

Based on recent production volumes per worker at the 12 coal mines, federal coal production is forecast to support 3,413 coal jobs and $391.3 million in direct labor income on annual average over the next 20 years. The indirect and induced employment stimulated by production in the coal industry is further projected to support another 5,300 jobs and $343.5 million in labor income across the seven counties. For more information on annual average economic contributions of federal coal production under the RFD, see **Appendix D**.

Declining coal production and employment in the coal industry, whether projected or realized, can be concerning to rural communities, not only because local employment opportunities can be more limited, but because non-management wages in the coal industry are often higher than those in other local industries. According to national wage estimates published by the Bureau of Labor Statistics, production and nonsupervisory coal miners earned a median wage of around $33 per hour. First-line supervisors of mechanics, installers, and repairers at coal mines earned around $42 per hour, while mining machine operators earned about $27 per hour. Support services staff also tend to be well compensated, with human resource specialists making $30 per hour, financial clerks earning $21 per hour, and administrative assistants earning $18 per hour (BLS 2018).

The loss of coal jobs can also have a ripple effect within the regional economy, resulting in additional job losses in industries that supply goods and services to the coal industry, as well as in industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their wages.

Increases in unemployment often give rise to economic instability in local communities, and the stress of financial uncertainty and instability can negatively affect the well-being of residents. Because this region is so dependent on mineral extraction, it has survived several boom and bust cycles. During these periods of bust, affected residents can feel increasing despair as they struggle to find work or take jobs that pay much lower wages. Demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, have also been observed to increase during economic downturns that result from slowed activity and lower employment in the region's mineral extraction industries. Collectively, these factors can adversely affect community cohesion and quality of life in affected communities.

Mineral Revenues and Funding for Public Services

Federal Revenues

Forecast production of federal coal under the RFD will continue to generate these annual rents and royalties. On annual average, leasing and production of federal coal in the BFO is projected to generate $346.3 million between 2019 and 2038. Forty-nine percent of which is disbursed back to the State of Wyoming.

State Revenues

Forecast annual average production under the RFD is estimated to continue to generate nearly $156.8 million in state mineral tax revenue between 2019 and 2038. State mineral taxes and federal minerals disbursements are combined and primarily allocated to State funds, based on a legislatively established two-tier funding system. Only a portion of these revenues are disbursed to the counties in which they were generated.

Local Revenues

Forecast production of federal coal under the RFD will continue to generate ad valorem taxes in these counties; however, production in Converse County is anticipated to taper off over the next 10 years. On annual average, leasing and production of federal coal in the BFO is projected to generate $119.6 million in ad valorem tax revenue for Campbell County between 2019 and 2038 and nearly $3.2 million in tax revenues for Converse County over the next 10 years. Future declines in coal production based on forecast market conditions are likely to cause local governments and special districts to face budget deficits. The timing of these budget shortfalls will further strain local governments and special districts, as funding shortages overlap with increasing demand for public services as a result of rising unemployment.

Other Resources

As forecast federal coal production with the proposed CDP under the Alternative B would be the same as under the Alternative A CDP, impacts on the AVBs discussed above would be the same as those forecast and discussed above under *Direct and Indirect Impacts*. Impacts associated with other resources serve as a proxy for impacts associated with their AVBs for those resources. These impacts are discussed in **3.5.3**, Biological Resources. While potential impacts of climate change on people have not been monetized using social cost metrics (see **Appendix D** for further discussion on why these metrics were not used), impacts of climate change on human health and safety are discussed in **Section 3.5.1**, Air Resources, including greenhouse gases and climate change.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in and near the planning area have the potential to affect coal production outside of BLM management decisions.

Non-federal coal accounts for approximately 10 percent of total coal production in Campbell County. Direct spending and employment from non-federal coal producers has additional direct, indirect, and induced

economic effects that ripple throughout the state and local economies. Coal companies must pay corporate income taxes to the IRS and a coal excise tax on mining. Current coal excise rates are $0.25 per ton of coal for surface mines, but coal excise taxes are limited to 2 percent of the market value (ONRR 2019c). The IRS transfers collected funds to the Black Lung Disability Trust Fund (ONRR 2019c). Reductions in coal production are also expected for non-federal coal, and economic losses associated with reduced non-federal coal productions would have additional effects not described under *Environmental Consequences*.

Coal market demand has the potential to vary from EIA estimates, based on market factors driving changes in demand for the domestic fuel generation energy mix. The abundance and low prices of natural gas are expected to reduce the demand for coal production for energy generation and lead to the retirements of less efficient coal plants through 2050. While global market demand is expected to increase, driven by coal-powered generation in China, India, and Southeast Area, US coal exports may not increase due to competitiveness of suppliers closer to major global markets. More information on domestic and international coal markets, coupled with how PRB coal compares in quality to open market sales, is described in **Appendix B**.

3.5.3 Biological Resources (Unsuitability Criteria #9,11,12, 14, and 15)

Affected Environment

Detailed descriptions of BLM special status wildlife can be found in Section 3.4.9, Special Status Species—Wildlife (including Greater Sage-Grouse) of the 2015 Proposed RMP/Final EIS and in Section 3.10.8 Threatened, Endangered, Proposed, and Candidate Species, BLM Sensitive Species, and USFS Sensitive Species and Management Indicator Species of the Wright Area Final EIS (BLM 2015, 2010).

Table 3-10 summarizes BLM special status species with potential to occur in the CDPAs for both alternatives. Detailed descriptions of general fish and wildlife resources can be found in Section 3.4.6, Fish and Wildlife Resources—Wildlife of the 2015 Proposed RMP/Final EIS and Section 3.10 Wildlife of the Wright Area Final EIS (BLM 2015, 2010). Due to the relationship between wildlife habitats managed by the BLM and wildlife species managed by the WGFD, the two agencies established a statewide agreement to facilitate cooperation for wildlife.

Federal Threatened and Endangered Species

There is no federal designated critical habitat in the CDPAs but there are two listed species with potential to occur. The northern long-eared bat is the only federally listed wildlife species with potential to occur in Campbell County; however, its preferred summer roosting habitat is conifer forest, which is less than 1 percent of the CDPAs (960 acres in Sheridan County and 3,690 acres in Campbell County under Alternative A and 1,400 acres in Campbell County under Alternative B, making the potential for disturbing this species unlikely.

Bats can use a wide variety of habitats, although caves and abandoned mines are critical habitat components that they depend on for nurseries and hibernacula.[6] The closest known maternity roost and hibernacula are in the Black Hills in South Dakota outside of the CDPA. One northern long-eared bat observation has been documented in northeast Campbell County, north of the Alternative A CDPA.

[6] A shelter occupied during the winter by a dormant animal.

Table 3-10
Special Status Species with Potential for Occurrence in the CDPAs

Common Name	Applicable Unsuitability Criterion Number	Potential to Occur in the CDPAs
Bald-golden eagle nests Bald-golden eagle roosts	11 12	Present; nests and roosts documented in the Alternative A CDPA
Ferruginous hawk	14	Present; nests documented in the Alternative A CDPA
Greater Sage-Grouse	15	Present; leks and priority habitat in the Alternative A CDPA
Swainson's hawk	14	Present; common summer breeder in Wyoming
Western burrowing owl	15	Present (breeding); confirmed breeder throughout much of Wyoming
Baird's sparrow	14	Low; uncommon summer resident that uses short-grass prairie habitats
Brewer's sparrow	14	Present; common summer resident occupying sagebrush shrubland and other shrubland habitats throughout the state
Loggerhead shrike	14	Present; common summer resident, using pine-juniper, woodlands, short and mixed-grass prairies, and shrublands
Long-billed curlew	14	Low (breeding); common summer breeding resident throughout much of central and western Wyoming; rare in eastern Wyoming
Mountain plover	14	Present; observations in the Wyoming Natural Diversity Database include sightings near Gillette and in the Thunder Basin National Grassland.
Sage sparrow	14	Low; no observations in the Alternative A CDPA
Sage thrasher	14	Present; resident throughout Wyoming
Trumpeter swan	14	Present, observations in the Wyoming Natural Diversity Database
White-face ibis	14	Low; no observations in the Alternative A CDPA
Black-tailed prairie dog	15	Present; occur in the eastern third of Wyoming
Northern long-eared bat	9	Low; northeastern Campbell County is the extreme western edge of its known summer range; limited summer roosting and foraging habitat in the Alternative A CDPA. No maternity or hibernacula known in Wyoming.
Swift fox	15	Present; considered common in Wyoming.
Northern leopard frog	15	Present; inhabits permanent water bodies of the prairie, foothill, and montane zones below 9,000 feet; found throughout Wyoming
Ute ladies-tresses orchid	9	Low; occurrences in Converse, Goshen, Laramie, and Niobrara Counties of eastern Wyoming; identified in the Antelope Creek watershed. Not documented despite several years of surveys associated with the Campbell County mines.

One threatened plant species, Ute ladies'-tresses orchid, could be present in the CDPAs and is known to occur in Converse, Goshen, Laramie, and Niobrara Counties of eastern Wyoming; it has been identified in the Antelope Creek watershed, upstream of the southern coal mines. A description of Ute ladies'-tresses orchid is in Section 3.9.3 Threatened, Endangered, Proposed, and Candidate Plant Species in the Wright Area EIS (BLM 2010). Habitat for this perennial orchid includes riparian and wet meadow habitats, along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features in historical floodplains of major rivers. Threats to this species include water developments, competition from invasive species, habitat fragmentation, urbanization, and collection by humans (USFWS 1992).

Bald and Golden Eagle Nest and Roosts

Eagle nests and roosts have been documented in both CDPAs. Bald eagles are closely associated with water bodies to provide for their mainly fish diets. Golden eagles are wide ranging and can use a variety of habitats for foraging including prairie, agricultural, and sagebrush communities (see **Table 3-1** for vegetation acres in the CDPAs). They require suitable cliffs or large trees for nesting. Presently there are no identified eagle winter roosts sites in the RFD area.

Migratory Bird Species of High Federal Interest

Presently there are no migratory birds of high federal interest, but BLM special status species could become of high interest in the future, and therefore they are discussed. There are five BLM special status migratory birds—Brewer's sparrow, loggerhead shrike, mountain plover, sage thrasher, and trumpeter swan—that are known to be present or have high potential to occur in the CDPAs (**Table 3-10**). Mountain plover and loggerhead shrike use prairie and, occasionally, agricultural vegetation communities; Brewer's sparrow and sage thrasher are dependent on sagebrush habitats (see **Table 3-1** for vegetation acres in the CDPAs). Threats to migratory birds are habitat fragmentation and degradation, land conversion, incompatible land uses, water quantity and quality, collision with and power lines, and interspecific competition for nest sites.

There are five BLM special status raptor species—Swainson's hawk, ferruginous hawk, western burrowing owl, golden eagle, and bald eagle—that are known to occur in the CDPAs (**Table 3-10**). (Bald and golden eagle nests and roost are covered above.) All raptor nests would be considered during coal lease applications and coal development.

Table 3-11 shows documented raptor nests current when this document was written. Threats to raptors are habitat degradation, fragmentation, and loss, collision and electrocution from power lines, and incompatible land use practices, such as land conversion, clear cutting, industrial activities, and burrowing mammal removal. Other challenges are impacts from contaminants and human disturbance during sensitive periods (BLM 2015). The number of raptor nests in the Alternative A coal development potential area are 524 in Campbell County and 50 in Sheridan County; in the Alternative B CDPA, there are 389 known raptor nests. In the RFD area, 106 raptor nests were identified.

Riparian and wetland habitats provide important habitat for migratory birds. Detailed descriptions of riparian and wetland communities can be found in Section 3.4.3, Vegetation, Riparian/Wetland Resources, in the 2015 Proposed RMP/Final EIS, and Section 3.7, Wetlands, pages 3-165 through 3-175 in the Wright Area Final EIS (BLM 2015; 2010). Wetlands would be inventoried as part of the leasing application process, where a determination of unsuitability would be made in coordination with the US Army Corp of Engineers and Wyoming DEQ. There are 590 acres of riparian habitat (210 acres in Sheridan County and 380 acres in Campbell County) and 4,660 acres of wet meadows (2,290 acres in Sheridan County and 2,370 acres in Campbell County) under Alternative A and 340 acres riparian and 2,200 acres wet meadows in Campbell County under Alternative B acceptable for further consideration for leasing (see **Table 3-1** for vegetation acres in the CDPAs); nevertheless, coal development and surface disturbance are expected to occur only in the RFD area, not the full CDPAs. Presently, 210 acres riparian habitat and 320 acres of wet meadow are mapped in the RFD area. Wet meadows and riparian areas are diverse and valuable habitats. Wetlands are regionally sparse, and few are in Wyoming (BLM 2015).

Energy development, roads, dispersed recreation, urbanization, grazing, and climate change can degrade riparian and wetland habitats. The cumulative impacts of multiple uses complicate the effectiveness of land management to achieve riparian objectives.

Table 3-11
Identified Raptor Nests in the CDP Areas and RFD Area

Raptor Nests	Nests CDP Area Alternative A (Sheridan County)	Nests CDP Area Alternative A (Campbell County)	Nests CDP Area Alternative A (Total)	Nests CDP Area Alternative B	Nests Coal RFD Area
Bald eagle	14	2	16	2	0
Burrowing owl	1	9	10	9	10
Ferruginous hawk	0	347	347	259	44
Golden eagle	11	73	84	45	16
Great-horned owl	5	13	18	11	0
Merlin	1	0	1	0	0
Osprey	1	0	1	0	0
Northern harrier	0	6	6	5	4
Prairie falcon	3	0	3	0	0
Red-tailed hawk	26	61	87	45	10
Short-eared owl	0	3	3	3	4
Swainson's hawk	0	50	50	46	10
Unknown buteo	0	11	11	8	0
Unknown raptor	37	63	100	37	8

Sources: BLM GIS Data 2019; WGFD GIS Data 2018

Species of High State Interest

Detailed descriptions of BLM special status wildlife can be found in Section 3.4.9, Special Status Species—Wildlife (including Greater Sage-Grouse) and descriptions of general fish and wildlife resources can be found in Section 3.4.6, Fish and Wildlife Resources—Wildlife of the 2015 Proposed RMP/Final EIS and Section 3.10.8 Threatened, Endangered, Proposed, and Candidate Species; BLM Sensitive Species; and USFS Sensitive Species and Management Indicator Species of the Wright Area Final EIS (BLM 2015; 2010).

The Powder River Basin Greater Sage-Grouse population is known to occur in the CDPAs. The State of Wyoming created a Greater Sage-Grouse conservation strategy (Executive Order 2015-4) to ensure the conservation of the species in Wyoming.

BLM special status mammals known to occur are the black-tailed prairie dog and swift fox. Black-tailed prairie dogs are found throughout the Great Plains in short-grass and mixed-grass prairie area. Its population and range have declined due to habitat degradation and pest control. Many other wildlife species, such as the swift fox, mountain plover, ferruginous hawk, and burrowing owl, depend on the black-tailed prairie dog for some portion of their life cycle. Prairie habitats comprise 398,360 acres under Alternative A (51,230 acres in Sheridan County and 347,130 acres in Campbell County) and 267,880 acres under Alternative B CDPA. In the RFD area, there are 57,760 acres of prairie habitat.

In Wyoming, the swift fox is considered a common resident and uses prairies in the eastern plains, agricultural areas, irrigated native meadows, and the banks of roads and railroads.

Aquatic species that warrant coal development consideration are the northern leopard frog and Yellowstone cutthroat trout. The northern leopard frog is widespread and can inhabit a variety of aquatic habitats, but specific location data are limited. Degradation of water quality and aquatic habitats are the greatest conservation concerns. There are 6,410 acres (2,600 acres in Sheridan County and 3,810 acres in Campbell

County) under Alternative A and 3,530 acres (in Campbell County) under Alternative B of combined riparian, wet meadow, and water habitats in the CDPAs. Only 210 riparian acres and 320 wet meadow acres are in the RFD area. Yellowstone cutthroat trout has the potential to occur in Sheridan County, upstream of the Alternative A CDPA, in Big Horn Mountain streams in the Tongue River drainage.

Big game species expected to occur in suitable habitats throughout the CDPAs are pronghorn, white-tailed deer, and mule deer. Pronghorns are unique to the western plains of North America and inhabit grasslands and semidesert shrublands. In Wyoming, mule deer occur in mountains and associated foothills, broken hill country, and prairie grasslands and shrublands; white-tailed deer are present, concentrated on major river corridors, shrubby riparian, and associated irrigated agricultural lands. Elk formerly ranged over much of central and western North America. Suitable elk habitat occurs throughout the state, but occupancy is limited primarily to the Rochelle Hills herd in the southeast corner of Campbell County and the Big Horn mountain herd in western portion of Sheridan County during hard winters.

Direct and Indirect Impacts

Analysis Methods

Assumptions

- The area evaluated for indirect effects (mining) on most wildlife species is the RFD area and the area for indirect leasing effects is the CDPAs.
- Short- and long-term surface disturbance are assumed to occur in vegetation types, in proportion to the availability of these vegetation types, in the RFD area. Affected acreages for vegetation types are not absolute.
- Because of the migratory nature and relative mobility of some wildlife species, they are affected by actions on non-BLM-administered land more than other species. In the case of migratory species, effects on winter and migration habitats could adversely affect the viability of some species. Winter and migration habitats are assumed to be at least as important to long-term viability of these species as breeding and nesting habitats.
- The USFWS or State could designate additional wildlife to be of high interest, as additional data are collected and evaluated. These species would be managed as discussed under the alternatives.
- The Ute ladies'-tresses orchid is not known in the CDPAs but typically occurs in riparian and wetland habitat. Plant species of high federal or State interest that are present or with the potential to be present in riparian and wetland habitats could be affected by water quality or water use in the RFD area.
- Actions that reduce the threat of establishment or spread of invasive species directly benefit plant species of high federal or state interest. IM 2006-073 (BLM 2006) establishes policy and guidance for the use of certified weed seed-free products and mulch in restoration projects on public lands.
- As more monitoring and survey data become available, it is possible that populations of plant species of high federal or state interest could be found.
- All known raptor nests from the BLM's GIS database were used in the analysis. Raptor nests were analyzed in accordance with USFWS recommendations to protect nesting raptors. Nests of unknown raptor species were analyzed as golden eagle nests, when in trees, and as ferruginous hawk nests, when on the ground.
- Unsuitability screening will be applied at the time of lease application, using current scientific data, such as those for nest locations and wildlife habitat.

- There are no direct impacts on state or federal species, based on planning level decisions, to determine areas as acceptable or unacceptable for consideration for coal leasing; however, the impact analysis below identifies indirect effects, based on foreseeable leasing and mining.
- The BLM, in cooperation with State and other federal wildlife agencies, is responsible for managing habitat quality, suitability, and usability, whereas the WGFD and the USFWS have primary authority for managing wildlife populations; therefore, this analysis relies primarily on vegetation changes and loss of habitat use due to disruptive activities to estimate effects on wildlife habitats.
- High-quality habitats foster healthy and abundant biological communities appropriate to those habitats.
- The quality and quantity of crucial winter range and parturition range and migration corridors are generally considered to be the limiting factors on big game populations in the CDPAs. The ability of these areas to support wildlife populations is a factor in determining population levels.
- Natural variability in wildlife health, population levels, and habitat conditions will continue. Periods of mild or severe weather and outbreaks of wildlife disease or insects and plant diseases that affect habitat can also affect wildlife population levels.
- The BLM uses best available information, peer-reviewed science, management and conservation plans, research, and BLM directives to guide fish, aquatic species, and wildlife habitat management.
- Delineations of important wildlife habitats, such as occupied grouse leks, big game crucial winter ranges, and raptor nests, will be modified, based on habitat monitoring, wildlife population surveys, and other information provided by industry, the BLM, and the WGFD.
- The factors with the greatest impact on vegetation and soil health are the introduction and expansion of invasive plants species, and surface-disturbing activities,.
- Precipitation levels and soil characteristics, namely high saline soils with minimal soil structure, are the dominant limiting factors affecting reclamation potential.
- Short-term effects on vegetation will be the most prevalent at any given time, depending on reclamation timing and effectiveness. Longer term effects on vegetation will occur less often but will affect plant communities longer.
- The effects of surface disturbance will affect a fraction of the total acres projected under management decisions, depending on the type (short- versus long-term) and timing of disturbance.
- Riparian and wetland systems comprise only a small portion of lands but offer more species and diversity than any other land type.

Indicators

- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in wetland and riparian communities.
- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in listed species habitat.
- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in potential migratory bird nesting habitat.
- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in potential habitat for species of state interest.

Impacts Common to All Alternatives

New leases would most likely be near existing leases, and development and coal mining would proceed west from existing mine disturbance in the coal development potential areas. Riparian and wet meadow vegetation

communities comprise less than 1 percent of the RFD area and so would have minor impacts associated with potential coal development. Wetlands and riparian communities would continue to be evaluated under the multiple use screen.

Formal wetland inventories would be conducted as part of the process of obtaining a surface mining permit. In Wyoming, once a wetland delineation has been verified, it is made a part of the mine permit document. A reclamation plan is created to incorporate the replacement of at least equal types and number of jurisdictional wetland acreages. Disturbed non-jurisdictional wetlands would be restored as required by the authorized federal or State agency and would have to be approved before mining operations could be conducted on the areas that are leased.

The alternatives do not differ in their protection approach for biological resources. Site-specific surveys for each lease area and appropriate perimeters would be part of the mine permitting process if the tracts are leased. This would include appropriate surveys for BLM special status species, coordination with state and federal wildlife agencies, creation of a mining plan that could include site-specific mitigation, and habitat restoration.

Mining impacts are both short term (until successful habitat restoration is achieved) and long term (persisting beyond successful restoration). Short-term impacts include road kills by mine-related traffic, injury or mortality of individual species, restrictions on wildlife movement created by fences, spoil piles, and pits, displacement of wildlife from mining areas (including abandonment of nests or nesting and breeding habitat for birds), increased competition between animals in areas next to mining operations, and increased noise, dust, and human presence.

Displaced animals may find equally suitable habitat that is not occupied by other animals or may occupy poorer quality habitat than that from which they were displaced. Longer term impacts include alterations in topography and vegetation, particularly the reduction in shrub density and introduction of invasive plant species, and could cause a decrease in vegetation diversity and changes to wildfire characteristics. Impacts on each species would be addressed and mitigated at the project level.

Although the amount of area acceptable or unacceptable for further consideration for leasing differs between the two alternatives, the coal RFD area is the same; therefore, the extent of potential mining impacts on special status wildlife is anticipated to be the same during the life of the SEIS/RMPA. **Table 3-12** provides areas that would be determined unsuitable in the CDPA and RFD area, with exceptions for BLM special status species. Final unsuitability would be determined as part of the screening process, when coal leases are requested and use best available science.

Federal Threatened and Endangered Species (Criterion 9)

Presently there is no critical habitat or habitat of essential value (as determined by the USFWS) where the presence of threatened or endangered species has been scientifically documented in the Alternative A CDPA. The threatened Ute ladies'-tresses orchid has potential to occur in the CDPAs in riparian or wetland habitats. Northern long-eared bats are unlikely to be affected by potential coal leasing or coal development due to lack of preferred habitat and no known roost or hibernacula sites. If there is potential for federally listed species presence in a coal project site, appropriate surveys for species and their suitable habitat would occur. If identified, ESA Section 7 consultation would be initiated. This would ensure that coal mining would not jeopardize threatened and endangered species at the project level.

Table 3-12
Acres Identified in the CDP Areas and RFD Area Under Special Status Species Criteria

Unsuitability Criterion Number and Wildlife Resource	Acres CDPA Alternative A (Sheridan County)	Acres CDPA Alternative A (Campbell County)	Acres CDPA Alternative A (Total)	Acres CDPA Alternative B	Acres in the Coal RFD Area
11. Bald eagle[1] nests	5,010	1,670	6,680	1,670	0
11. Golden eagle[1] nests	2,710	20,023	22,733	12,066	3,060
12. Eagle winter[1] roosts	4,331	0	4,331	0	0
15. Burrowing owl habitat[2]	5,372	9,082	14,454	6,753	350
15. Greater Sage-Grouse priority habitat management area (PHMA) [2]	0	2,964	2,964	0	0
15. Greater Sage-Grouse general habitat management area (GHMA) [2]	446	2,349	2,795	1,401	374
15. Swift fox habitat[2]	5,372	9,082	14,454	6,753	350
15. Fish population streams (quarter-mile buffer) [2]	19,133	85,673	104,806	65,513	13,897
15. Elk crucial winter range[2]	0	2,331	2,331	1,954	160
15. Elk calving areas[2]	0	2,346	2,346	25	0
15. Sharp-tailed grouse lek habitat (quarter-mile buffer) [2]	1,490	986	2,476	735	100

[1] Source: BLM GIS Data 2019
[2] Source: WGFD GIS Data 2018
Unsuitability criteria would be applied at the time of lease application and would use current best available science. Acreages above are examples of acres determined unsuitable. Exceptions to unsuitability may occur; see **Appendix A**, Coal Screening Report.

Bald and Golden Eagle Nests (Criterion 11) and Roosts (Criterion 12)

Indirect impacts on raptors, including bald and golden eagles, would be avoided or minimized through surveys and consultation with appropriate federal and state wildlife agencies. Eagle nest sites and roosts are present in the Alternative A CDPA; the Alternative B CDPA contains fewer nest sites and no winter roosts. Alternative B reduces potential effects from potential coal leasing, compared with Alternative A. Presently there are a few golden eagle nests and no identified eagle winter roosts sites in the RFD area. Protection for eagles would be adjusted for potential mining activities, based on site-specific information through

coordination with, and written approval from, the USFWS. One potential mitigation option is that active golden eagle nests may be relocated prior to coal mining.

Migratory Bird Species of High Federal Interest (Criterion 14)

Presently the USFWS does not identify any migratory birds of high federal interest in the BFO; however, BLM special status species could become of high interest and, therefore, are considered for land management decisions, including coal development. Indirect impacts from potential coal leasing and development are habitat loss, reduced reproductive success through nest disturbance or loss, and injury or mortality from collision with vehicles or coal infrastructure. Most special status migratory birds would be able to avoid direct impacts due to their mobile nature.

Surveys for raptor nests would be made prior to coal leasing. If nests are identified, then coordination with State and federal wildlife agencies to establish mitigation would result. For example, in accordance with USFWS recommendations, ferruginous hawk nests could be moved or artificial nests would be installed away from the mine.

Management actions focus on maintaining or increasing the viability and biological integrity of migratory bird foraging and nesting habitats in the CDPAs. Prairie obligate species, such as loggerhead shrike and mountain plover, could be affected through coal development in prairie habitats. Prairie habitats comprise 398,360 acres under Alternative A (51,230 acres in Sheridan County and 347,130 acres in Campbell County), and 267,880 acres under Alternative B CDPA. In the RFD area, 57,760 acres of prairie habitats occur. Similarly, sagebrush obligate species, such as sage thrasher, Brewer's sparrow, and sage sparrow, could be affected by mining in 50,890 sagebrush acres in the RFD; they could be affected by leasing in the 295,200 sagebrush acres (15,120 in Sheridan County and 280,080 acres in Campbell County) acceptable for further consideration for leasing under Alternative A and 199,000 sagebrush acres acceptable for further consideration for leasing under Alternative B . Since Alternative A has more prairie and sagebrush acres acceptable for further consideration for leasing, Alternative A could result in more potential impacts on prairie and sagebrush obligate migratory birds beyond the life of the RMP, compared with Alternative B ; however, over the next 20 years the reasonably foreseeable coal development is not anticipated to differ under either alternative.

Species of High State Interest (Criterion 15)

Indirect impacts on burrowing owls from coal mining could include collapsing burrows, habitat loss, displacement from habitat, and disturbance during sensitive breeding or wintering seasons. Under criterion 15, burrowing owl habitat, including prairie dog colonies, would be screened as unsuitable with exceptions. The black-tailed prairie dog is important to support burrowing owls for burrow creation. As described under effects common to all alternatives, further site-specific environmental analysis would occur prior to coal leasing and would address impacts and protection measures for burrowing owls. Alternative A could result in more potential impacts on burrowing owls beyond the life of the RMP; however reasonably foreseeable coal development is not anticipated to differ under either alternative (see **Table 3-12**).

Should areas be leased, mined, and reclaimed, alterations in the topography and vegetative communities would likely result in such changes in species composition from pre-mine conditions. Until sagebrush returns to its pre-mining density levels, there would be a reduction in potential habitat for wildlife species associated with sagebrush habitat in the RFD area. When an application for a new coal lease or lease modification is submitted, the BLM will determine whether the lease application area is unsuitable for all or certain coal mining methods, pursuant to 43 CFR 3461.5 and the screening criteria.

Approximately 50,890 acres of sagebrush habitat are in the RFD area under both alternatives. Coal development could degrade Greater Sage-Grouse habitat and indirectly affect habitat quality for this species. Intact sagebrush shrublands in northeast Wyoming are increasingly limited, and any amount of additional fragmentation has the potential to adversely affect associated wildlife and contribute to an overall shift in vegetation communities toward a grassland-dominated system; therefore, potential disturbance to sagebrush communities from mining could have greater impacts than in other parts of the state.

No new coal lease applications in PHMA (core population areas and core population connectivity corridors) are reasonably foreseeable. Mining would expand from the west of existing leases; PHMA is in the eastern portion of the Campbell County CDPAs, and there are no PHMA in the RFD area.

The BLM will review individual lease applications, in consultation with the WGFD, and will identify specific mitigation regarding Greater Sage-Grouse. The adverse impacts would be minor for Greater Sage-Grouse, as development would be unlikely to occur within PHMA (core population areas and core population connectivity corridors). Also, coordination with WGFD for site-specific mitigation would minimize adverse impacts in the remainder of Greater Sage-Grouse habitat.

Alternative A has more sagebrush habitat and 2,964 acres of PHMA in Campbell County acceptable for further consideration for leasing than Alternative B (no acres of PHMA). Similar to the situation for sagebrush-obligate migratory birds, Alternative A could result in more potential impacts on sagebrush-dependent Greater Sage-Grouse from leasing and mining beyond the life of the RMP, compared with Alternative B.

Swift foxes are considered common throughout Wyoming but are of special State interest. Under criterion 15, swift fox habitat would be considered for unsuitability screening and require coordination with WGFD for any coal mining in identified swift fox habitat. Indirect effects from coal development are habitat loss, fragmentation, and degradation until site reclamation restores habitats to pre-mining conditions. Increased human presence and traffic associated with mining operations could displace swift fox, result in injury or mortality from vehicle collisions, or disrupt natural behaviors. Acres of potential swift fox habitat, based on prairie dog colony habitat, occur in the RFD area; this could change over time as more accurate habitat mapping and site-specific surveys are conducted.

Alternative A would make more swift fox habitat acceptable for further consideration for leasing than Alternative B, which could result in more potential impacts on swift fox beyond the life of the SEIS/RMPA; however, reasonably foreseeable coal development is not anticipated to differ under the two alternatives, as development would be contained within the RFD area.

In the screening process for unsuitability of coal development, the BLM would take into consideration elk crucial winter range, parturition areas,[7] and migration corridors, pronghorn antelope crucial winter range, and mule deer crucial winter range. There are no acres of pronghorn antelope or mule deer crucial winter range or elk migration corridors in the CDPAs; there are no elk calving areas in the RFD area. Eastern Wyoming winters typically are not severe enough for snow depths to limit big game movements. Impacts on big game populations are expected to be minor; this is due to the small RFD area, future coal development occurring in or near existing areas of coal development disturbance, and the application of criterion 15 to protect species of high State interest. Alternative A has higher potential for impacts on elk, with more habitat

[7] Birthing areas

acceptable for further consideration for leasing, although it is not reasonably foreseeable during the life of the SEIS/RMPA.

Indirect effects on sharp-tailed grouse are similar to those on Greater Sage-Grouse. Due to unsuitability criterion 15, coordination with WGFD and requiring a mitigation plan would reduce adverse impacts from coal leasing and mining on sharp-tailed grouse at the project-level.

Fish streams could be deemed unsuitable, with exceptions, under criterion 15. Exceptions could occur in coordination with WGFD and with stipulations to protect, restore, or mitigate water resources at the individual lease application level. This would ensure the conservation of aquatic species.

Alternative A has higher potential for impacts on aquatic species than Alternative B, as it has more acres of aquatic habitat acceptable for further consideration for leasing. The Yellowstone cutthroat trout could be present in Sheridan County, for Alternative A CDPA only. No impacts on cutthroat trout are anticipated, as neither coal leasing nor development are likely in Sheridan County.

Other special status species of high interest to the State, including amphibians (northern leopard frog), reptiles, and plants, would be considered during site-specific analysis for lease applications and prior to coal mining development. As sites are surveyed and species of high interest are identified, the BLM would require adequate protection, mitigation, and reclamation planning prior to authorization.

Cumulative Impacts

Cumulative impacts would be the same as those described in Sections 4.4.3, 4.4.5, 4.4.6, 4.4.7, 4.4.8, and 4.4.9 of the 2015 Proposed RMP/Final EIS and Section 4.1.1, Coal Development, Section 4.2.8, Vegetation, Wetlands, and Riparian Areas, and 4.2.9, Wildlife and Fisheries, of the Wright Area Final EIS (BLM 2015, 2010).

The 2015 Proposed RMP/Final EIS identified up to 195,700 acres of maximum disturbance, while the revised RFD identified up to 36,620 acres of surface disturbance. This is 22 percent of the surface disturbance analyzed for cumulative impacts in the 2015 Proposed RMP/Final EIS, so the extent of impacts would decrease.

The 2015 Proposed RMP/Final EIS provides an in-depth cumulative effects analysis for Greater Sage-Grouse (see Section 4.4.9.9, Greater Sage-Grouse Cumulative Effects Analysis for the Buffalo Planning Area [BLM 2015]). Coal development is likely to affect nesting, brood rearing, and winter habitat. Sagebrush shrublands are the predominant vegetation type in the RFD area and are increasingly limited in northeastern Wyoming. The loss or degradation of 50,890 acres of sagebrush habitat could be significant to the already at-risk Powder River basin population; however, through the State's Greater Sage-Grouse conservation strategy, local extirpation is unlikely.

Mining in the RFD area would not affect the overall regional raptor and migratory bird populations, due to their mobile nature and the availability of habitat at the landscape scale; however, potential habitat loss in the RFD area of 57,760 prairie and 50,890 sagebrush acres could contribute to loss or degradation of foraging habitat, when combined with other actions, such as urbanization and oil and gas development.

In general, adverse impacts on riparian-wetland systems are a product of surface-disturbing activities associated with mineral resource development, motorized vehicle use, road construction, and agricultural land uses. Surface-disturbing activities, water depletions, changes in stream hydrology, increased sedimentation, changes in water quality (including clarity), and introduction of invasive species can adversely

affect fish, amphibians, and aquatic species. The primary means by which aquatic-dependent species could be affected are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian/wetland vegetation that increases sedimentation, barriers to fish passage, discharged water, and stormwater runoff.

Cumulative impacts result from actions on adjoining lands that affect habitat availability and levels of disturbance to special status wildlife. The greatest factor influencing biological resources in the CDPAs are scattered landownership. Because most of the species of concern are wide ranging, activities on adjoining landownerships could diminish or could benefit management on public lands, depending on the activities.

The BLM anticipates coal development only in the RFD area, and future coal leasing would be most likely next to the western boundaries of existing leases. The intermingling of private, state, and US Forest Service (USFS) lands on BLM-administered lands throughout the CDPAs ensures that activities outside of the BLM's control would continue.

Surface-disturbing activities in vegetation communities would continue on adjacent private, state, BLM, and USFS lands. Alternative A has more wildlife habitats (such as sagebrush, riparian, wetlands, and prairie) acceptable for further consideration for leasing, which, in the long term, may result in larger potential disturbances to these habitats, compared with Alternative B; therefore, Alternative A may contribute to more cumulative effects over the long term; however, based on foreseeable coal development, the alternatives would not significantly differ during the life of the SEIS/RMPA.

3.6 UNAVOIDABLE ADVERSE IMPACTS

Section 102(C) of NEPA mandates disclosure of "any adverse environmental effects which cannot be avoided should the proposal be implemented." These are impacts for which there are no mitigation measures or impacts that would remain, even after mitigation measures are implemented. Implementing this SEIS/RMPA and subsequent activity- or project-specific coal mining would result in unavoidable adverse impacts on some resources. These impacts are described in detail above and are summarized herein.

As discussed under irreversible and irretrievable impacts, below, the specific nature and extent of the implementation-level impacts cannot be clearly defined, due to unknowns about site-specific implementation and associated mitigation measures.

In general, development and surface-disturbing activities associated with coal extraction would result in unavoidable adverse impacts, including soil compaction and erosion, soil homogenization, loss of vegetation cover, spread of noxious weeds, disturbance to and displacement of wildlife, visual intrusions on the landscape, and potential loss of cultural or paleontological resources.

3.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Section 102(2)(C) of NEPA and Section 1502.16 of the CEQ regulations for implementing NEPA require that the discussion of environmental consequences include a description of ". . . any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented."

Coal extraction from lands acceptable for further consideration for leasing would result in the irreversible and irretrievable loss of those coal reserves. In addition, coal mining development and surface disturbance would have potentially irretrievable and potentially irreversible effects on vegetation, wildlife habitat, and livestock grazing if reclamation proves unsuccessful. Irreversible effects on soils and water quality could occur, depending on the implementation of mitigation measures and their efficacy.

3.8 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Section 102(C) of NEPA requires a discussion of the relationship between local, short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources. Short-term is defined as anticipated to occur within 1 to 5 years of implementation of the activity. Long-term is defined as following the first 5 years of implementation but within the life of this SEIS/RMPA (projected to be 20 years).

Coal extraction and the resulting surface disturbance would result in various short-term adverse impacts, such as increased localized soil erosion or damage to wildlife habitat. Management actions and BMPs would minimize the effect of short-term uses and would reverse the change in the long term; however, coal extraction and the associated infrastructure could result in some long-term productivity impacts, regardless of reclamation.

This page intentionally left blank.

Appendix A
Coal Screening Process

This page intentionally left blank.

TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES

Page

ATTACHMENT

ADDITIONAL INFORMATION

Responses to Landowner Letters Documented in the Decision File

Appendix A. Coal Screening Process

A.1 Introduction

As part of the land use planning process (regulated under 43 CFR 1600), surface management agencies are charged with screening public land resources through a series of criteria. This separates lands suitable for development of coal resources from those unsuitable, because of potential resource conflicts with coal development (43 CFR 3420.1-4(d)).

This appendix describes the screening process for coal resources undertaken by the BFO, complying with 43 CFR 3420.1-4(e)(1–4). The screening process informs potential land use decisions regarding acceptability for coal leasing under the alternatives analyzed in the BFO SEIS/RMPA.

The BLM used a coal screen developed for the 2001 RMP revision for the 2015 Proposed RMP/Final EIS, which authorizes federal coal resources in the planning area. To date, the BLM has issued 131,837 acres of BLM-administered federal coal for coal leases in the BFO planning area.

The coal screen described in this appendix provides updated information on coal potential and criteria resources in the BFO decision area since it was last screened in 2001.

A.2 Regulatory Overview

Federal coal resources are governed by Section 522(b) of the Surface Mining Control and Reclamation Act and the regulations at 43 CFR 3400 and 1600. One aspect of coal leasing governed under these regulations is land use planning (43 CFR 3420.1-4(d) and 1610.7-1) and the review of federal lands for suitability for coal leasing (43 CFR 3461). These regulations identify certain lands as categorically unacceptable for leasing because they contain significant values that conflict with coal development. These include components of the National Wildlife Refuge System, the National System of Trails, and incorporated cities, towns, and villages, among other entities. Other areas disqualified for leasing are critical habitat for threatened and endangered species and cultural resources listed on the National Register of Historic Places.

The regulations at 43 CFR 3420 govern the land use planning process as it pertains to coal, including the four-step screening process for identifying areas acceptable for further consideration for leasing (43 CFR 3420.1-4). Under this process, the BLM must complete the following:

- Identify coal with development potential—Lands determined to have development potential are considered acceptable for further consideration for leasing and are applied to the remaining coal screens. Lands determined to not have development potential are eliminated from further consideration for leasing.
- Apply unsuitability criteria—Lands with coal potential are assessed with procedures outlined in 43 CFR 3461. Lands with coal potential may be eliminated from further consideration from leasing if determined to be unsuitable without stipulation or exception.
- Analyze multiple use conflict—43 CFR 3420.1-4e (3) states that "multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing, to protect resource values of a locally important or unique nature not included in the unsuitability criteria." Multiple use values may include possible oil and gas development, soil, forest, wildlife, recreation, agriculture, and watershed resources. Lands with coal potential may be eliminated from further consideration for leasing where multiple uses conflict.

- Consult surface owners—This screen requires the BLM to consult with qualified surface owners whose land overlies federal coal with development potential. The BLM asks the qualified surface owners for their preference for or against offering the coal deposits under their land for lease. Lands with coal potential may be eliminated from further consideration for leasing, based on qualified surface owner preference.

The BLM will undertake additional analysis and consultation, as necessary, before it issues new leases.

A.3 SCREENING PROCESS OVERVIEW

A.3.1 Screen 1—Coal Development Potential

The BLM determined the coal development potential area (CDPA) for the BFO using stripping ratios, where appropriate and available. The BLM used drill data from the Wyoming Oil and Gas Conservation Commission, where the BLM's own data were not available.

The adjustment of the CDPA is based on coal quality and stripping ratio; that is, the cost to produce. Coal quality is measured partly by the British thermal unit (BTU) range at which it burns, with higher quality coal burning hotter; that is, at a higher BTU. Mines in the northern part of the decision area produce coal that burns in the 8,200 to 8,400 BTU range, the mines in the central part of the decision area produce in the 8,400 to 8,600 BTU range, and the mines in the southern part of the decision area produce in the 8,600 to over 8,800 BTU range.

To balance the cost of production and quality, and in keeping with the current pricing in the coal market, the BLM used stripping ratios of 4:1, 5:1, and 6:1 for mines in the northern, central, and southern parts of the decision area, respectively.

The BLM applied a stripping ratio of 4:1 to the area around the mines in the northern part of the decision area: the Rawhide, Eagle Butte, Wyodak, and Dry Fork mines. The BLM applied a stripping ratio of 5:1 to the area around mines in the middle part of the decision area: the Caballo, Belle Ayr, Cordero Rojo, and Coal Creek mines. Finally, The BLM applied a stripping ratio of 6:1 to the area around mines in the southern part of the decision area: the Black Thunder, School Creek, North Antelope/Rochelle and Antelope mines.

The stripping ratio is most accurate and most predictive near the western end of active mines. This is because this is where most drill data are collected, in anticipation of westward progression of mining activity. Where BLM data were sparse—notably, the east side of the Southern Mine Group—the BLM used Wyoming Oil and Gas Conservation Commission drill data to determine the availability of coal; the BLM modified the CDPA to reflect these findings. Although there is coal on the eastern boundary of the Southern Mine Group, available data suggest what is available is not economic to develop.

A.3.2 Screen 2—Unsuitability Assessment

The BLM BFO interdisciplinary team of resource specialists reviewed available data and solicited expertise from state and federal agencies to assess the applicability of each of the 20 unsuitability criteria to the decision area. **Table A-2** provides a detailed breakdown of each criterion, lands found unsuitable under each criterion, and total acreages identified and designated as unsuitable for coal development under each criterion.

For BLM-administered federal coal resources beneath state lands, the BLM will consult with the Wyoming governor's office during the governor's consistency review for the EIS, in accordance with 43 CFR 3420.1-7.

The United States Forest Service screens and makes the allocation decision for federal coal beneath the Thunder Basin National Grassland surface; the BLM consults with that agency during lease actions.

A.3.3 Screen 3—Evaluation of Multiple Land Use Decisions to Protect Other Resource Values and Land Uses

Within the range of alternatives analyzed in the BFO Final SEIS/RMPA, the BLM could eliminate additional coal deposits from further consideration for leasing. The BLM would do this to protect other resource values and land uses, where they are not protected under the 20 unsuitability criteria through coordination with other government agencies and organizations. Additional coal deposits can be eliminated from further consideration for leasing through site-specific analyses completed before lease sales. Because almost all BLM-administered federal coal deposits lie beneath lands owned or administered by other entities, the BLM will consult with those entities before eliminating the federal coal deposits beneath them from further consideration for leasing.

A.3.4 Screen 4—Consultation with Qualified Surface Owners

Because almost all BLM-administered federal coal deposits lie beneath lands owned or administered by other entities, the BLM will consult with those entities before eliminating the federal coal deposits beneath them from further consideration for leasing.

The BLM sent letters to all identifiable private surface owners with parcels overlying BLM-administered federal coal resources in Campbell County only (Sheridan County was removed with the coal development potential Screen 1). The BLM requested that the surface owners confirm that they are qualified to express their preference on mining federal coal resources (see 43 CFR 3400.0-5[gg][1] and [2]). The BLM also asked that the surface owners respond with their preference for or against mining by other than underground methods—that is, surface mining—on the BLM-administered federal coal resources beneath their land. A sample of the letters sent to private surface owners can be found in **Attachment 1**.

In order to be a qualified surface owner in accordance with the regulations at 43 CFR 3400.0-5, the individuals must have the following characteristics:

- Hold legal or equitable title to the surface of split estate lands
- Have their principal place of residence on the land or personally conduct farming, or ranching operations on a farm or ranch unit to be affected by surface mining operations, or receive directly a significant portion of their income, if any, from such farming and ranching operations
- Have met the first two conditions for a period of at least 3 years, except for persons who gave written consent less than 3 years after they met the requirements

In computing the 3-year period, the BLM Authorized Officer should include periods during which the title was owned by a relative of such person by blood or marriage if, during such periods, the relative would have met the requirements of this section.

The BLM will verify qualified surface ownership and surface owner preference for or against mining by other than underground methods (surface mining) before issuing any lease for federal coal resources beneath privately owned parcels. No leases for surface mining will be issued without qualified surface owner consent.

A.4 COAL DEVELOPMENT POTENTIAL RESULTS

Total acres of BLM administered coal with development potential for Alternative B and the Proposed Plan are tabulated under **Table A-1**. Alternative B is mapped in **Figure A-1.**

Table A-1
BLM Administered Coal Resources in the Alternative B and Proposed Plan

Federal Coal Status	Alternative B (acres)	Proposed Plan (acres)
BLM Administered Coal with current federal leases	481,139	521,986
BLM Administered Coal, excluding current federal coal leases	349,302	390,149

Source: BLM GIS 2019

A.5 UNSUITABILITY ASSESSMENT RESULTS

The acres designated unsuitable under each unsuitability criterion are tabulated under **Table A-2**; areas identified as unsuitable under each of the unsuitability criteria are mapped in **Figures A-2** through **A-9**. For each criterion, resources that trigger unsuitability are identified. (Note that the resources identified are not exhaustive of that type of resource in the decision area but are only those resources that overlie areas with coal potential identified under Screen 1 and that result in unsuitable designation.)

Acreages are not additive across the table because of overlapping resources, such as Wilderness Study Areas, which drive unsuitability also designated as Visual Resource Management Area I and therefore subject to both Criteria 5 and 6. The Proposed Plan acreage total includes the acres identified in Alternative B and the additional acres included in the Proposed Plan.

Table A-2
Application of Unsuitability Criteria

Criterion	Criterion Name and Applicable Resources in the Planning Area, Including Data Sources	Acres Unsuitable in the Alternative B	Acres Unsuitable in the Proposed Plan
Criterion 1	Federal lands for preservation, such as for National Parks, National Wildlife Refuges, and Wilderness Areas: Cities (13,290 acres) Source: BLM surface ownership layer	13,290 acres	13,290 acres
Criterion 2	Federal lands within rights-of-way (ROWs) or easements or surface leases for residential, commercial, industrial, or other public purposes: • Nonlinear ROWs—204 acres for the Alternative B and 206 acres for the Proposed Plan • Linear ROWs—117 acres for the Alternative B and 193 acres for the Proposed Plan Source: BLM ROWs and easements layer	321 acres	399 acres
Criterion 3	Buffer zones along road ROWs and next to communities, public schools, occupied dwellings, churches, public parks, and cemeteries: • Buildings—17,244 acres for the Alternative B and 17,411 acres for the Proposed Plan • County roads—2,033 acres for the Alternative B and 2,251 acres for the Proposed Plan • State highways—WY 59, WY 450 (773 acres for the Alternative B and 853 acres for the Proposed Plan) • Interstate highways—I-90 (466 acres for the Alternative B and the Proposed Plan)	21,182 acres	21,647 acres

Criterion	Criterion Name and Applicable Resources in the Planning Area, Including Data Sources	Acres Unsuitable in the Alternative B	Acres Unsuitable in the Proposed Plan
Criterion 3 *(continued)*	• US highway—US 16 (339 acres for the Alternative B and the Proposed Plan) • Cemeteries—315 acres for the Alternative B and the Proposed Plan • Agency roads—12 acres for the Alternative B and the Proposed Plan Sources: Campbell County building and cemetery layers; Sheridan County building layer; BLM transportation layer	*(see above)*	*(see above)*
Criterion 4	Wilderness Study Areas Source: BLM wilderness study area layer	0 acres	0 acres
Criterion 5	Scenic areas Source: BLM Visual Resources Management layer	0 acres	0 acres
Criterion 6	Scientific study[1] Source: 2001 BLM RMP	0 acres	0 acres
Criterion 7	Historic lands and sites Source: BLM cultural layer	0 acres	0 acres
Criterion 8	Natural areas Source: BLM surface ownership	0 acres	0 acres
Criterion 9	Federally designated critical habitat for threatened and endangered species Source: USFWS critical habitat layer	0 acres	0 acres
Criterion 10	State listed threatened and endangered species[2]	0 acres	0 acres
Criterion 11	Bald and golden eagle sites: • Bald eagle nest buffers—1,670 acres for the Alternative B and Proposed Plan • Golden eagle nest buffers— 12,066 acres for the Alternative B and 15,701 acres for the Proposed Plan Source: BLM raptor nest layer	13,736 acres	17,371 acres
Criterion 12	Bald and golden eagle roost and concentration areas Source: BLM eagle roost layer	0 acres	0 acres
Criterion 13	Falcon nesting sites Source: BLM raptor nest layer	0 acres	0 acres
Criterion 14	Migratory birds of high federal interest Source: USFWS	0 acres	0 acres
Criterion 15	Habitat for species of state interest: • Greater Sage-Grouse leks—1,407 acres for the Alternative B and the Proposed Plan • Sharp-tailed grouse leks—735 acres for the Alternative B and the Proposed Plan • Burrowing owl habitat—6,753 acres for the Alternative B and 7,959 acres for the Proposed Plan • Elk crucial winter range—1,954 acres for the Alternative B and the Proposed Plan • Elk calving areas—25 acres for the Alternative B and the Proposed Plan	17,627 acres	20,039 acres

Criterion	Criterion Name and Applicable Resources in the Planning Area, Including Data Sources	Acres Unsuitable in the Alternative B	Acres Unsuitable in the Proposed Plan
Criterion 15 *(continued)*	• Swift fox habitat—6,753 acres for the Alternative B 7,959 acres for the Proposed Plan Sources: WGFD big game seasonal ranges and migration corridor layers; WGFD sage-grouse and sharp-tailed grouse lek layers; WGFD sage-grouse core population and connectivity corridor layers; WGFD prairie dog layer	*(see above)*	*(see above)*
Criterion 16	100-year floodplain Source: Federal Emergency Management Agency national floodplain hazard layer	0 acres	0 acres
Criterion 17	Municipal watersheds Source: Campbell and Sheridan Counties	0 acres	0 acres
Criterion 18	Natural resource waters Source: 2001 BLM RMP	0 acres	0 acres
Criterion 19	Alluvial valley floors Source: US Office of Surface Mining, Reclamation, and Enforcement potential alluvial valley floors layer	12,202 acres	13,265 acres
Criterion 20	State proposed criteria Source: BLM Washington Office	0 acres	0 acres

Source: BLM GIS 2019

[1] No scientific study areas have been determined unsuitable.

[2] No Wyoming Endangered Species Act

A.6 RESULTS OF MULTIPLE LAND-USE DECISIONS

In addition to the areas eliminated from further consideration for coal leasing by the unsuitability criterion under Screen 2, above, land use decisions to protect resources of high value to the public may eliminate additional coal deposits from further consideration (**Figure A-10**). No lands or resource conflicts were identified in the 2015 Proposed RMP/Final EIS that would restrict coal development beyond the areas identified under the unsuitability criteria (Screen 2). **Table A-3** includes multiple use conflicts that the BFO decided not to remove as unacceptable for further consideration for coal leasing; it also shows the rationale behind the decisions.

The BLM considered air quality when completing the multiple-use screen. Existing data and modeling done for the 2015 Proposed RMP/Final EIS showed no air quality standards were exceeded, based on the national ambient air quality standards under the Clean Air Act; therefore, the BLM did not designate the resulting geographic area as not suitable for further leasing of coal.

There is presently insufficient data for an accurate wetland assessment in the Alternative B or Proposed Plan area. Wetlands would be inventoried as part of the leasing application process, where the BLM would make a determination of unsuitability, in coordination with the US Army Corp of Engineers and the Wyoming Department of Environmental Quality.

After close review of resources and in consultation with state and federal agencies, the BLM recommended a number of resources as unsuitable for coal leasing, due to conflicts in use; therefore, the BLM eliminated them from further consideration for coal leasing under Screen 3.

Table A-3
Multiple Use Conflicts Not Recommended as Unacceptable for Coal Leasing

Resource Topic	Resource Potentially in Conflict with Coal	Reason for not Analyzing
Soils	Soils with depths less than 50 centimeters	Scattered distribution, with limited geographic extent
	Sandy and clayey soils	Scattered distribution, with limited geographic extent
	Reclamation resistant soil chemistries	Scattered distribution, with limited geographic extent
Grazing	Livestock allotments	Allotment acreages sufficient to accommodate limited development
Solid minerals	Salable mineral pits	7 contracts in the Alternative B and 1 contract in the additional Proposed Plan; no direct conflict anticipated
	Locatable mineral plans of operations	Two free use permits in the Alternative B ; no direct conflict anticipated
	Uranium	No potential uranium areas in the Alternative B
	Wyoming Department of Environment Quality mining permits	23 permits in the Alternative B; no direct conflict anticipated
	Active mining claims	No active claims in the Alternative B
Fluid minerals	Active wells	663 wells in 27 unitized areas in the Alternative B and an additional 95 wells and 1 unit in the additional Proposed Plan; following resolution of IBLA 2018-203, the BLM determined that coal leases would suspend oil and gas activities where the two conflict.

Source: BLM GIS 2019

In sum, 933 acres were excluded from leasing under this screen for Alternative B and the Proposed Plan. Resources removed from further consideration because of their significance and potential conflict with coal development are a municipal airport (697 acres) and a special recreation management area (236 acres).

A.7 RESULTS OF CONSULTATION WITH QUALIFIED SURFACE OWNERS

The BFO mailed letters to 372 private landowners who own property larger than 40 acres in the decision area. The BLM included an addressed, postage-paid envelope to encourage response. The 40-acre threshold was based on the qualification criterion that a significant portion of income should come from the parcel. Corporate landowners were included in those who were sent letters; this is because the parcels they own may likely provide significant income, even where there may not be principal residences on the property.

Letters were sent on January 30, 2019, requesting response by March 1, 2019, and requested verification of landowner qualifications, opinion on leasing federal coal beneath their surface (favor, against, and undecided), and inquiring if they have previously provided consent for surface mining (see example letter in **Attachment 1**). Results are listed in **Table A-4**; landowner response letters are included in the Decision File.

There is no significant opposition to mining in the areas with the highest likelihood of coal mining. The owners objecting to mining are mostly separated from active mines or are in areas having moderate to low development potential. No areas were made unsuitable, based on landowner response. Before potential leases are delineated, surface owners would again be contacted as to their preference for or against surface coal mining, in accordance with the BLM Coal Leasing Handbook.

Table A-4
Private Surface Owner Response within All Alternatives

Surface Owner Consultation	Status	Letter Number	Percent Response	Acres Represented
Letter Delivery	Sent	372	—	977,000
	Delivered	367	99	975,000
	Returned by US Postal Service	3	1	1,520
Landowner response rate	Responses received	160	43	472,000
	Delivered without response	207	56	504,000
Landowner opinion on leasing	For	66	18	218,000
	Against	45	12	112,000
	Undecided	41	11	87,000
	Received, no response	8	2	53,000

Source: BFO 2019

A.8 CONCLUSION

The information above describes the processes for and outcomes of the BLM's screening process to identify lands acceptable for further consideration for leasing, in accordance with federal regulations governing federal coal management and land use planning. The allocations resulting from this process are included in the alternatives considered in the BFO SEIS/RMPA. These allocations are intended to cover the entire coal potential area for the BLM-administered federal mineral estate in that document. This was done to allow future coal leasing decisions in these areas to proceed without a need to amend the decisions in the SEIS/RMPA. The BLM will undertake additional site-specific analyses and consultation, as necessary, before issuing new leases.

Table A-5
Coal Screening Results

Coal Screen	Results	Acres in Alternative B	Acres in Proposed Plan
Coal screen #1	Coal development potential	481,139	521,986
Coal screen #2	No exception	24,791	25,854
	Exception	34,826	39,927
Coal screen #3	Multiple use	881	881
Coal screen #4	Consultation with landowners	0	0

Source: BLM GIS 2019

A.9 REFERENCE

BLM GIS. 2019. GIS data on file with the BLM's eGIS server, used for calculations or figures related to the coal development strategy. BLM, Buffalo Field Office, Wyoming.

Figure A-1
Unsuitability Screening Results

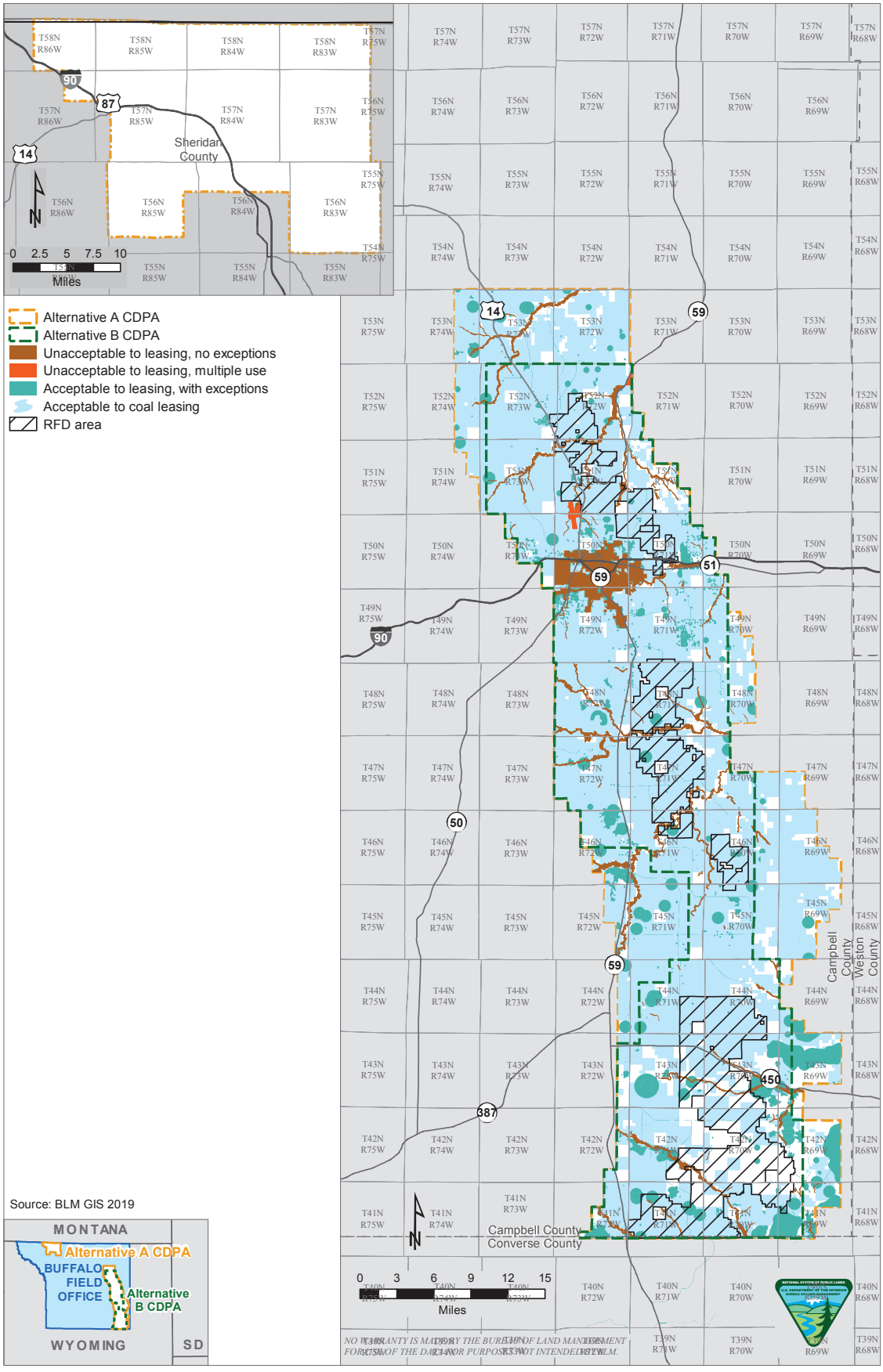
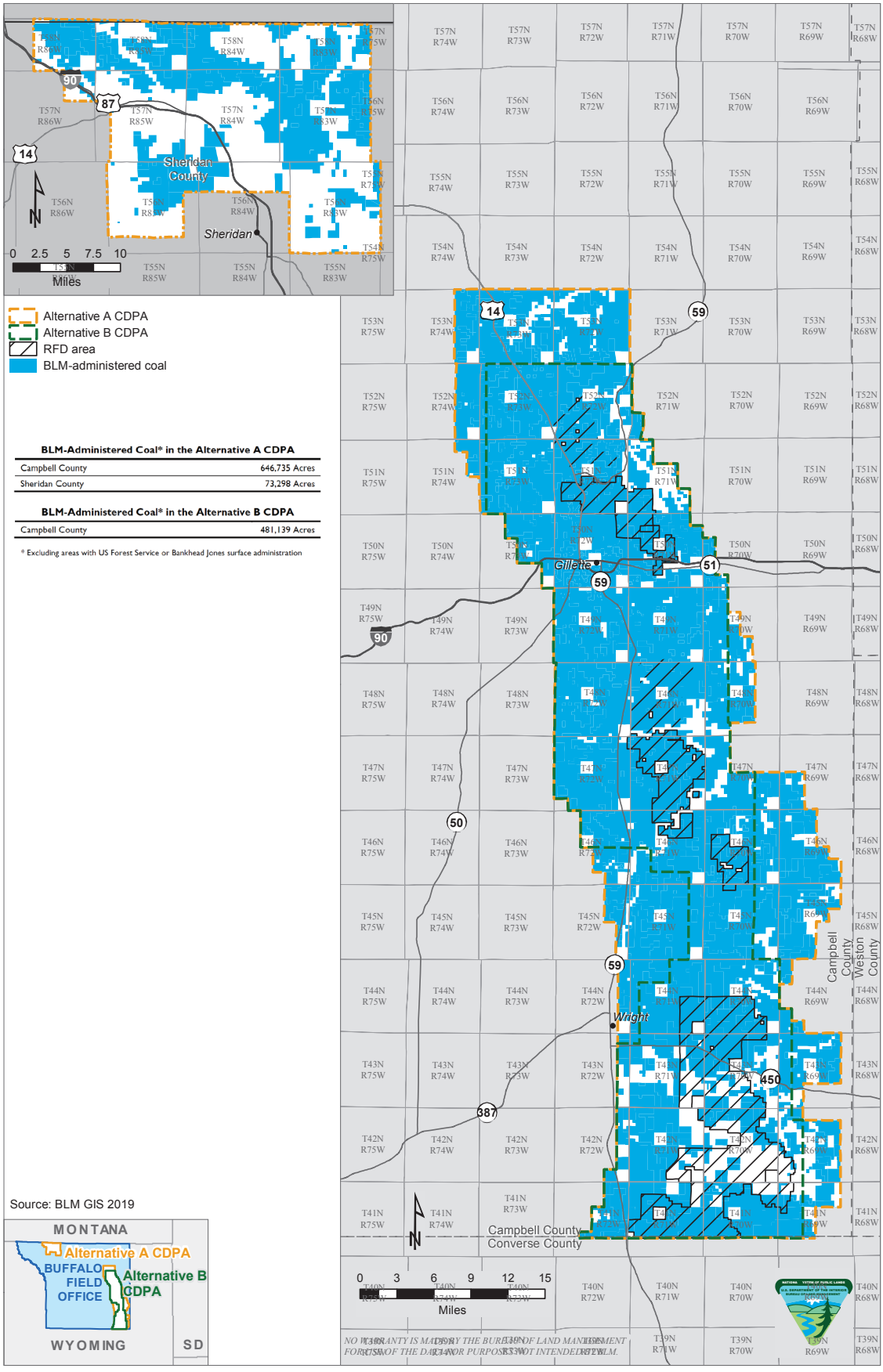


Figure A-2
Screen 1 Coal Development Potential



BLM-Administered Coal* in the Alternative A CDPA

Campbell County	646,735 Acres
Sheridan County	73,298 Acres

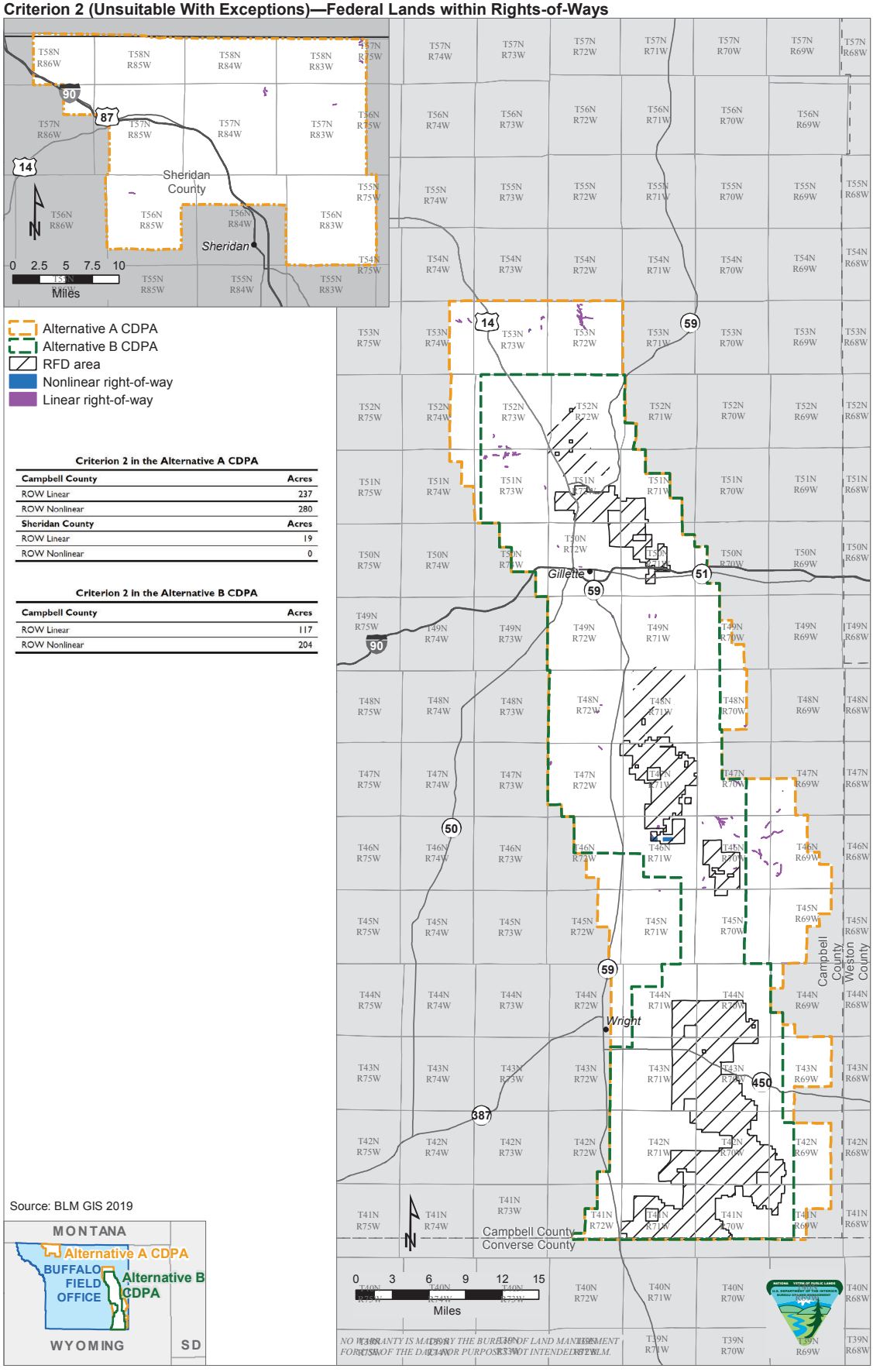
BLM-Administered Coal* in the Alternative B CDPA

Campbell County	481,139 Acres

* Excluding areas with US Forest Service or Bankhead Jones surface administration

Figure A-3

Screen 2 Unsuitability Assessment:
Criterion 2 (Unsuitable With Exceptions)—Federal Lands within Rights-of-Ways



Criterion 2 in the Alternative A CDPA

Campbell County	Acres
ROW Linear	237
ROW Nonlinear	280
Sheridan County	**Acres**
ROW Linear	19
ROW Nonlinear	0

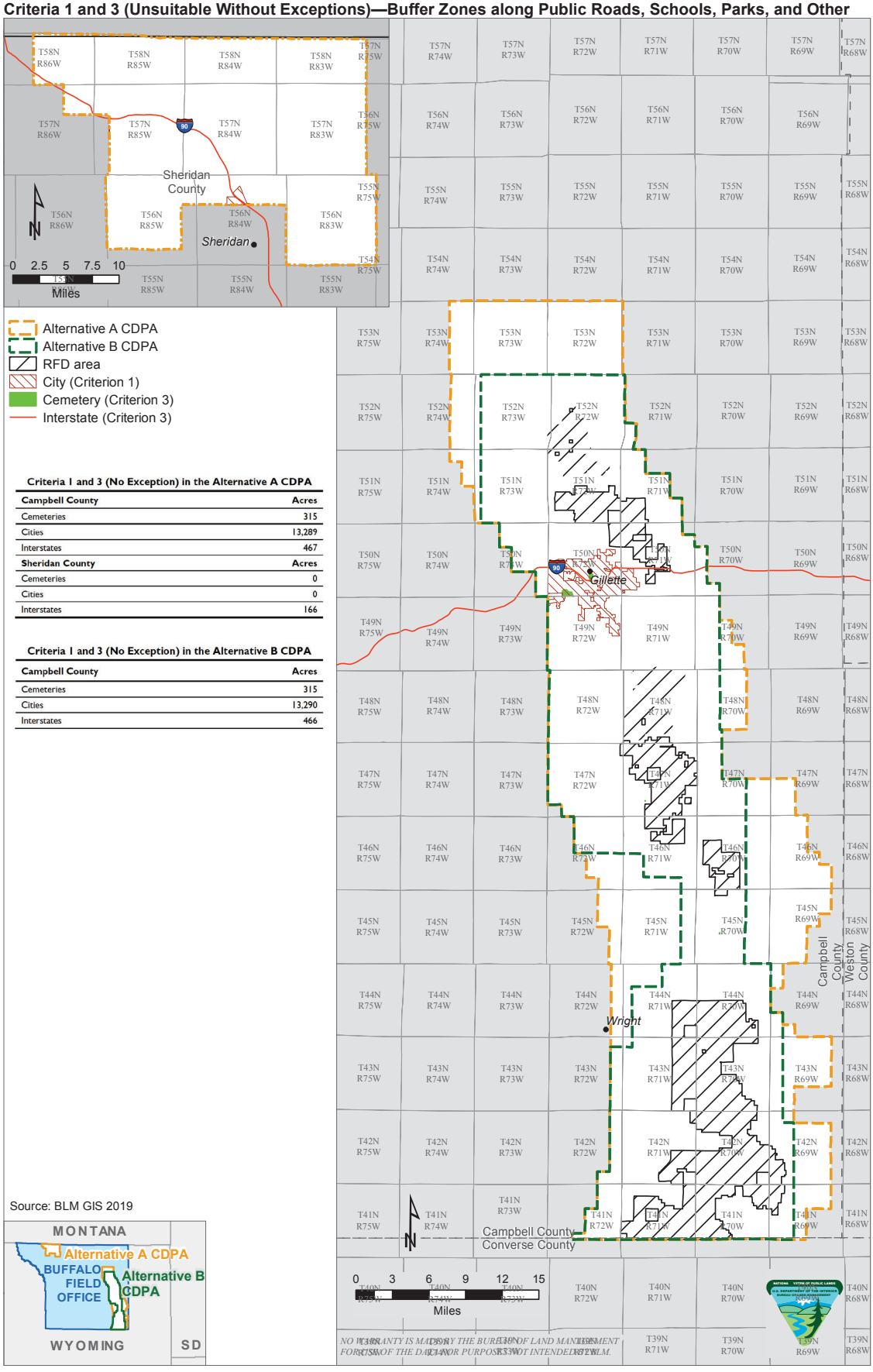
Criterion 2 in the Alternative B CDPA

Campbell County	Acres
ROW Linear	117
ROW Nonlinear	204

Source: BLM GIS 2019

Figure A-4

Screen 2 Unsuitability Assessment:
Criteria 1 and 3 (Unsuitable Without Exceptions)—Buffer Zones along Public Roads, Schools, Parks, and Other



Criteria 1 and 3 (No Exception) in the Alternative A CDPA

Campbell County	Acres
Cemeteries	315
Cities	13,289
Interstates	467
Sheridan County	**Acres**
Cemeteries	0
Cities	0
Interstates	166

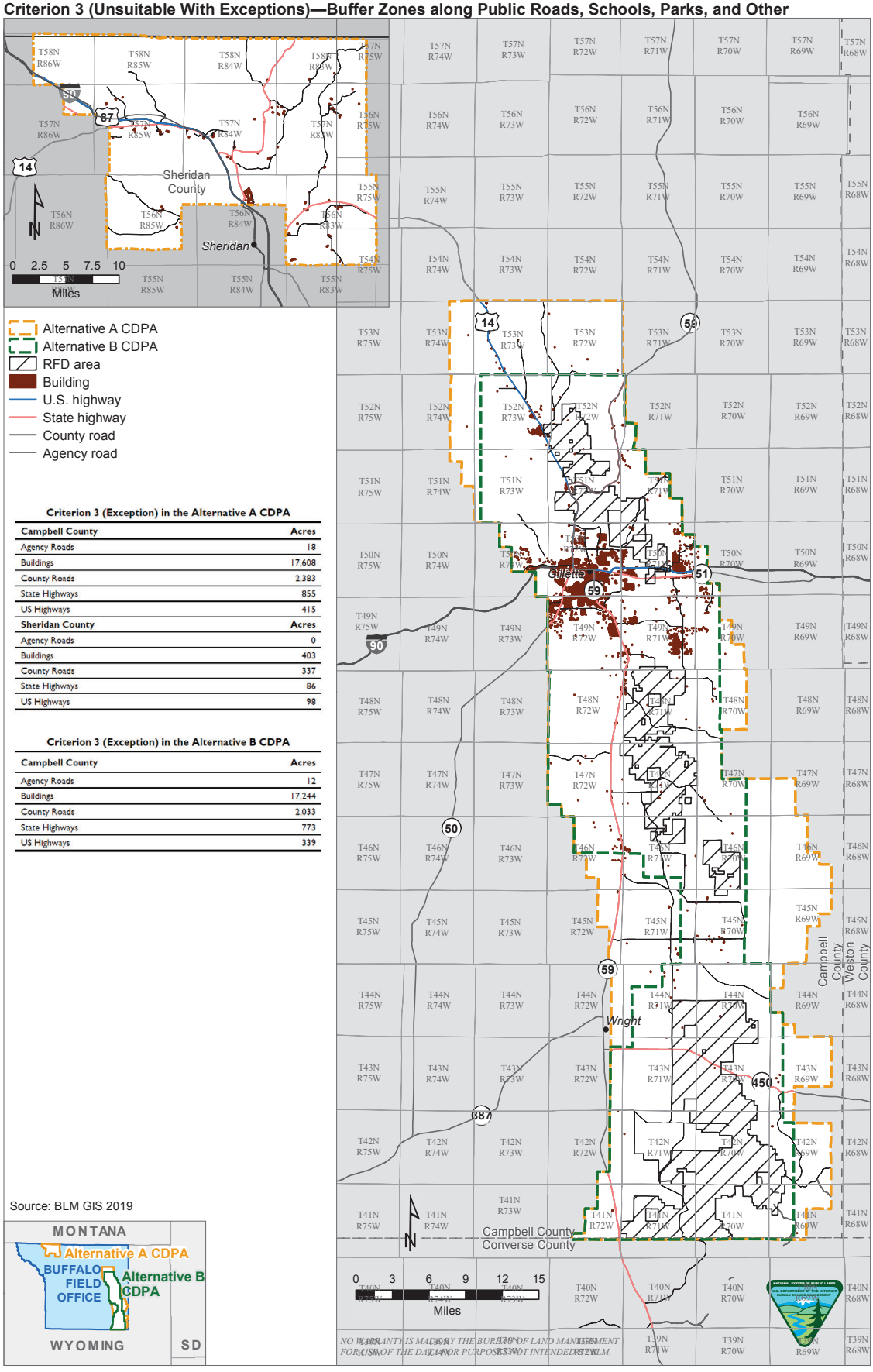
Criteria 1 and 3 (No Exception) in the Alternative B CDPA

Campbell County	Acres
Cemeteries	315
Cities	13,290
Interstates	466

Source: BLM GIS 2019

Figure A-5

Screen 2 Unsuitability Assessment:
Criterion 3 (Unsuitable With Exceptions)—Buffer Zones along Public Roads, Schools, Parks, and Other



Criterion 3 (Exception) in the Alternative A CDPA

Campbell County	Acres
Agency Roads	18
Buildings	17,608
County Roads	2,383
State Highways	855
US Highways	415
Sheridan County	**Acres**
Agency Roads	0
Buildings	403
County Roads	337
State Highways	86
US Highways	98

Criterion 3 (Exception) in the Alternative B CDPA

Campbell County	Acres
Agency Roads	12
Buildings	17,244
County Roads	2,033
State Highways	773
US Highways	339

Source: BLM GIS 2019

Figure A-6

Screen 2 Unsuitability Assessment:
Criterion 7 (Unsuitable With Exceptions)—Historic Lands and Sites

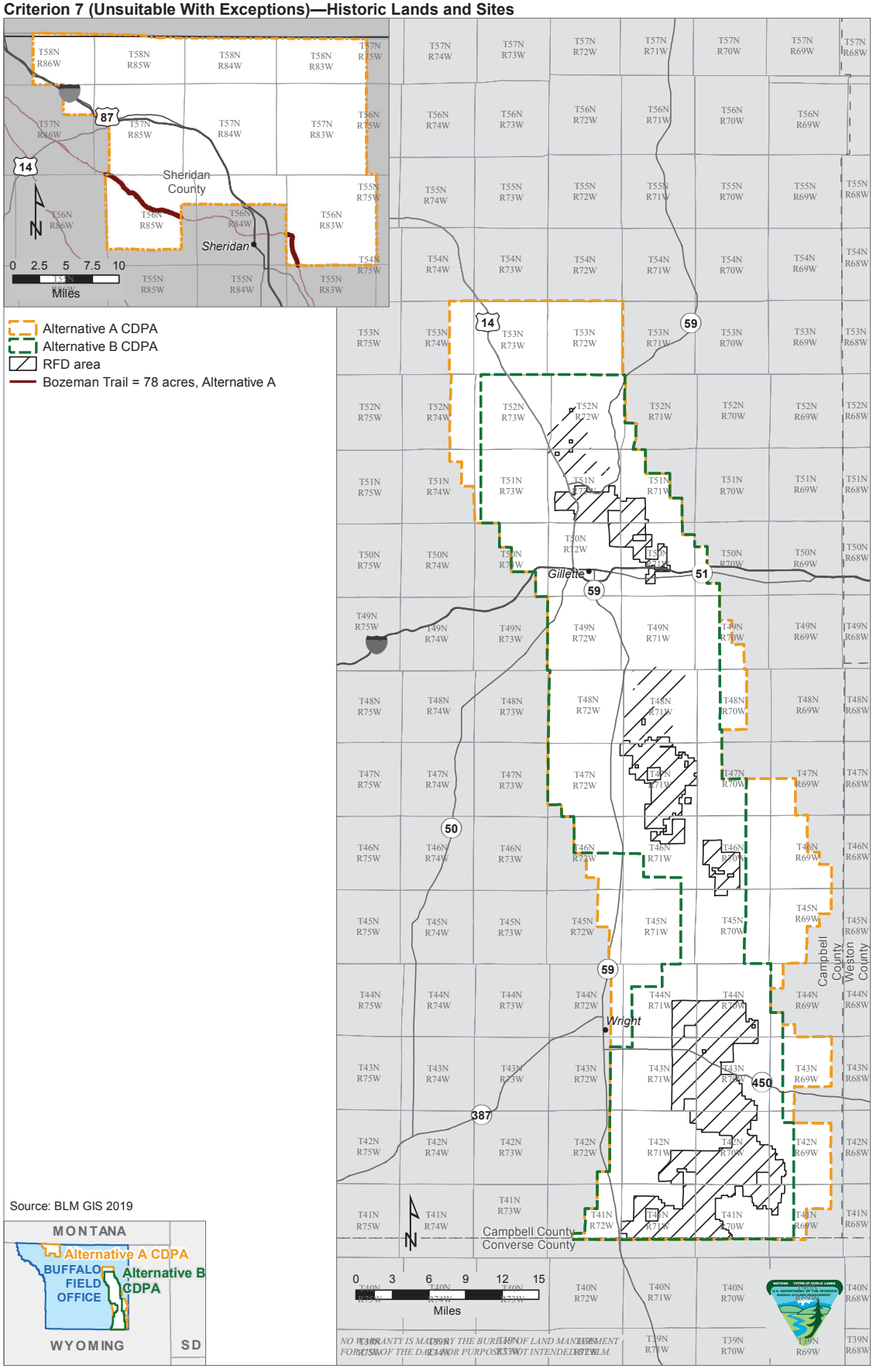
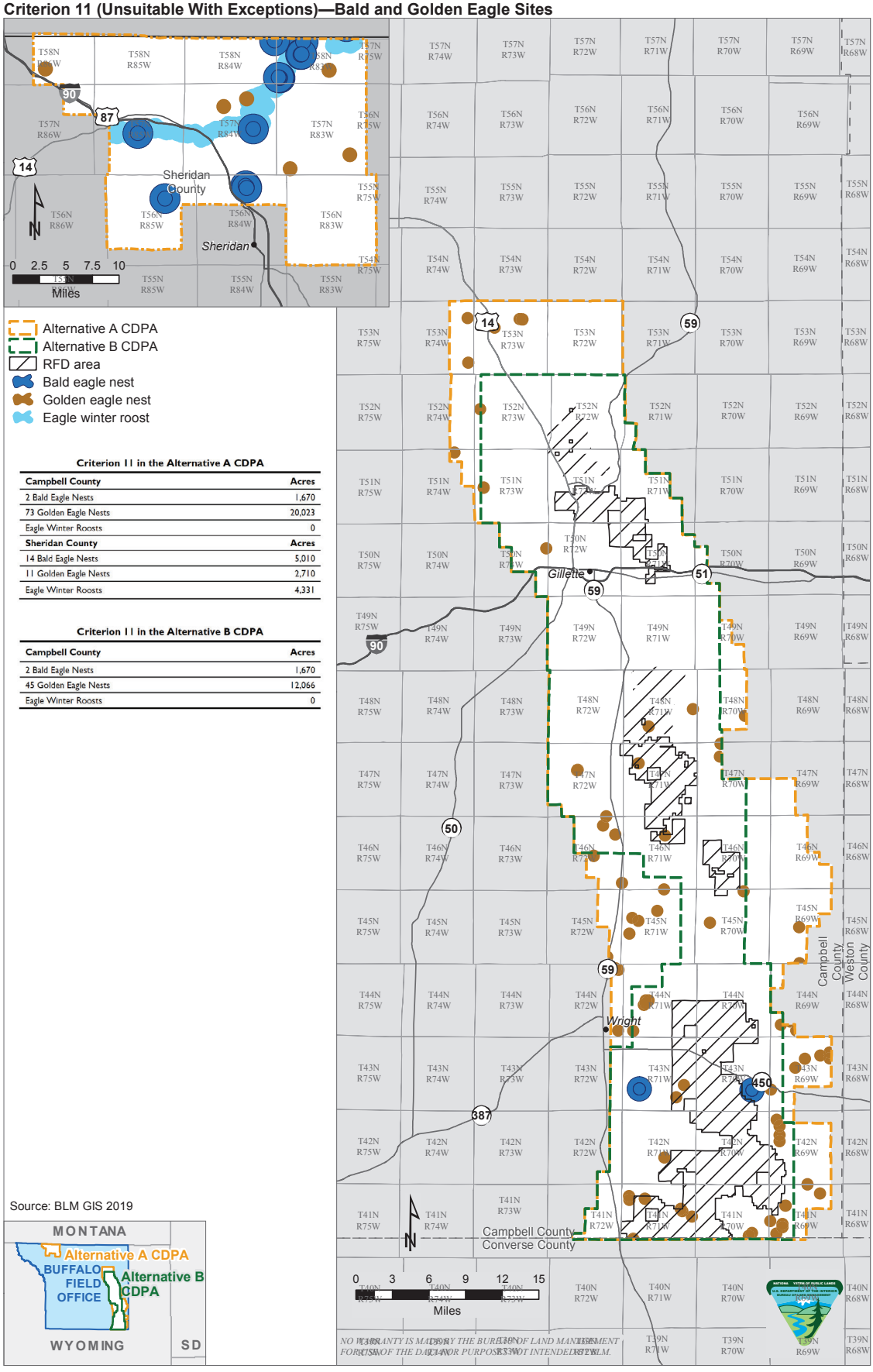


Figure A-7

Screen 2 Unsuitability Assessment:
Criterion 11 (Unsuitable With Exceptions)—Bald and Golden Eagle Sites



Criterion 11 in the Alternative A CDPA

Campbell County	Acres
2 Bald Eagle Nests	1,670
73 Golden Eagle Nests	20,023
Eagle Winter Roosts	0
Sheridan County	**Acres**
14 Bald Eagle Nests	5,010
11 Golden Eagle Nests	2,710
Eagle Winter Roosts	4,331

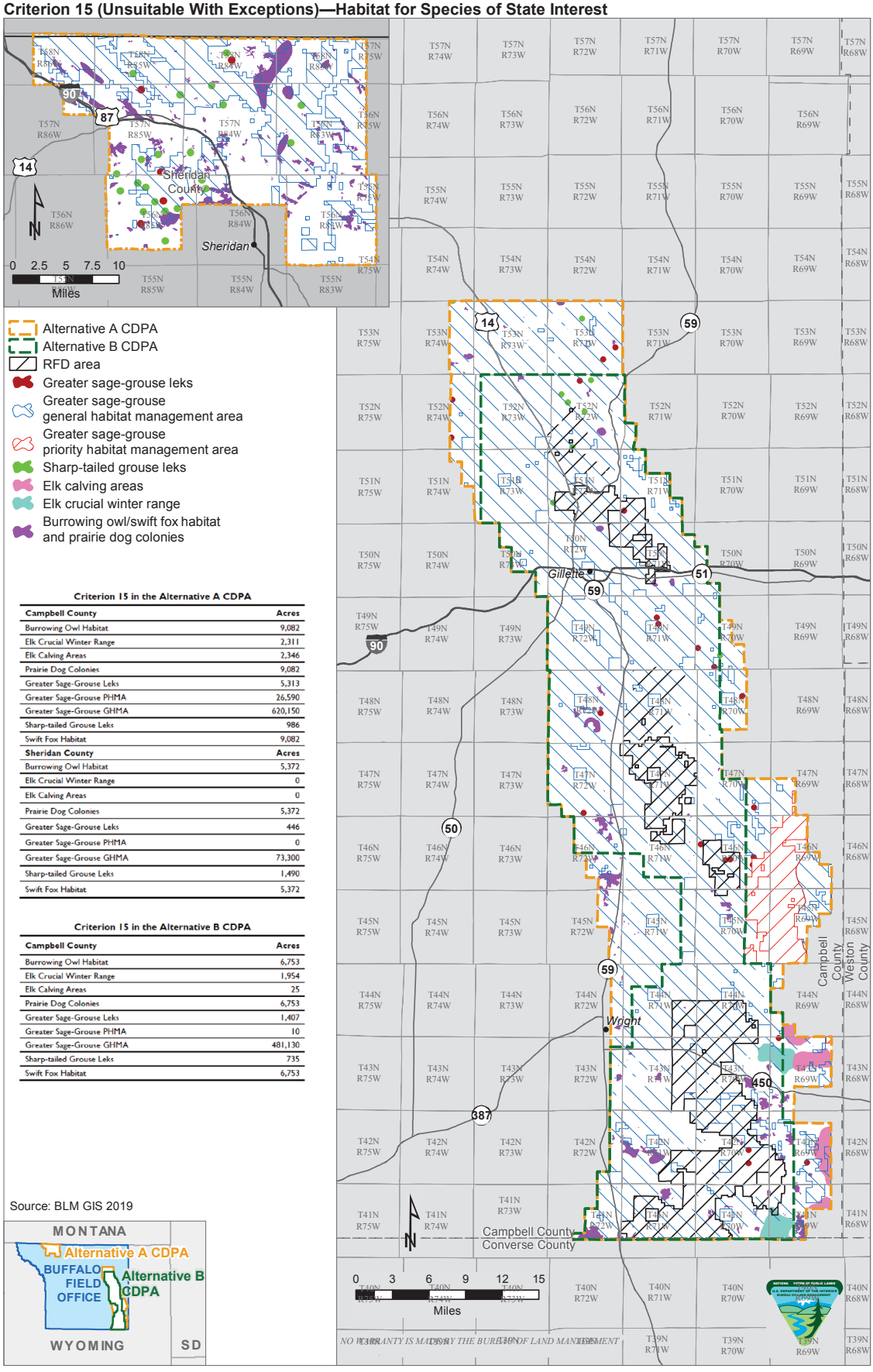
Criterion 11 in the Alternative B CDPA

Campbell County	Acres
2 Bald Eagle Nests	1,670
45 Golden Eagle Nests	12,066
Eagle Winter Roosts	0

Source: BLM GIS 2019

Figure A-8

Screen 2 Unsuitability Assessment:
Criterion 15 (Unsuitable With Exceptions)—Habitat for Species of State Interest



Criterion 15 in the Alternative A CDPA

Campbell County	Acres
Burrowing Owl Habitat	9,082
Elk Crucial Winter Range	2,311
Elk Calving Areas	2,346
Prairie Dog Colonies	9,082
Greater Sage-Grouse Leks	5,313
Greater Sage-Grouse PHMA	26,590
Greater Sage-Grouse GHMA	620,150
Sharp-tailed Grouse Leks	986
Swift Fox Habitat	9,082
Sheridan County	**Acres**
Burrowing Owl Habitat	5,372
Elk Crucial Winter Range	0
Elk Calving Areas	0
Prairie Dog Colonies	5,372
Greater Sage-Grouse Leks	446
Greater Sage-Grouse PHMA	0
Greater Sage-Grouse GHMA	73,300
Sharp-tailed Grouse Leks	1,490
Swift Fox Habitat	5,372

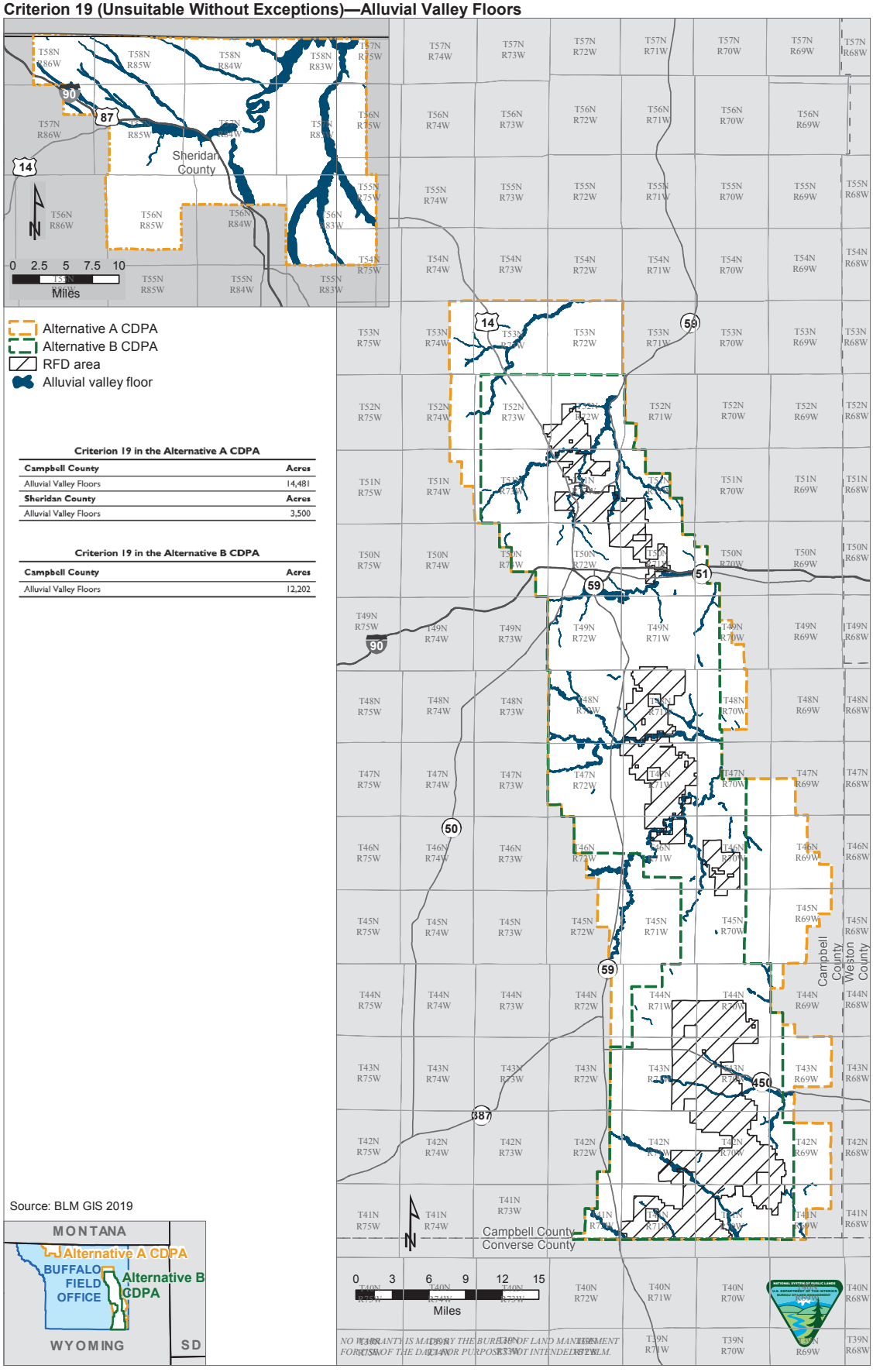
Criterion 15 in the Alternative B CDPA

Campbell County	Acres
Burrowing Owl Habitat	6,753
Elk Crucial Winter Range	1,954
Elk Calving Areas	25
Prairie Dog Colonies	6,753
Greater Sage-Grouse Leks	1,407
Greater Sage-Grouse PHMA	10
Greater Sage-Grouse GHMA	481,130
Sharp-tailed Grouse Leks	735
Swift Fox Habitat	6,753

Source: BLM GIS 2019

Figure A-9

Screen 2 Unsuitability Assessment:
Criterion 19 (Unsuitable Without Exceptions)—Alluvial Valley Floors



Criterion 19 in the Alternative A CDPA

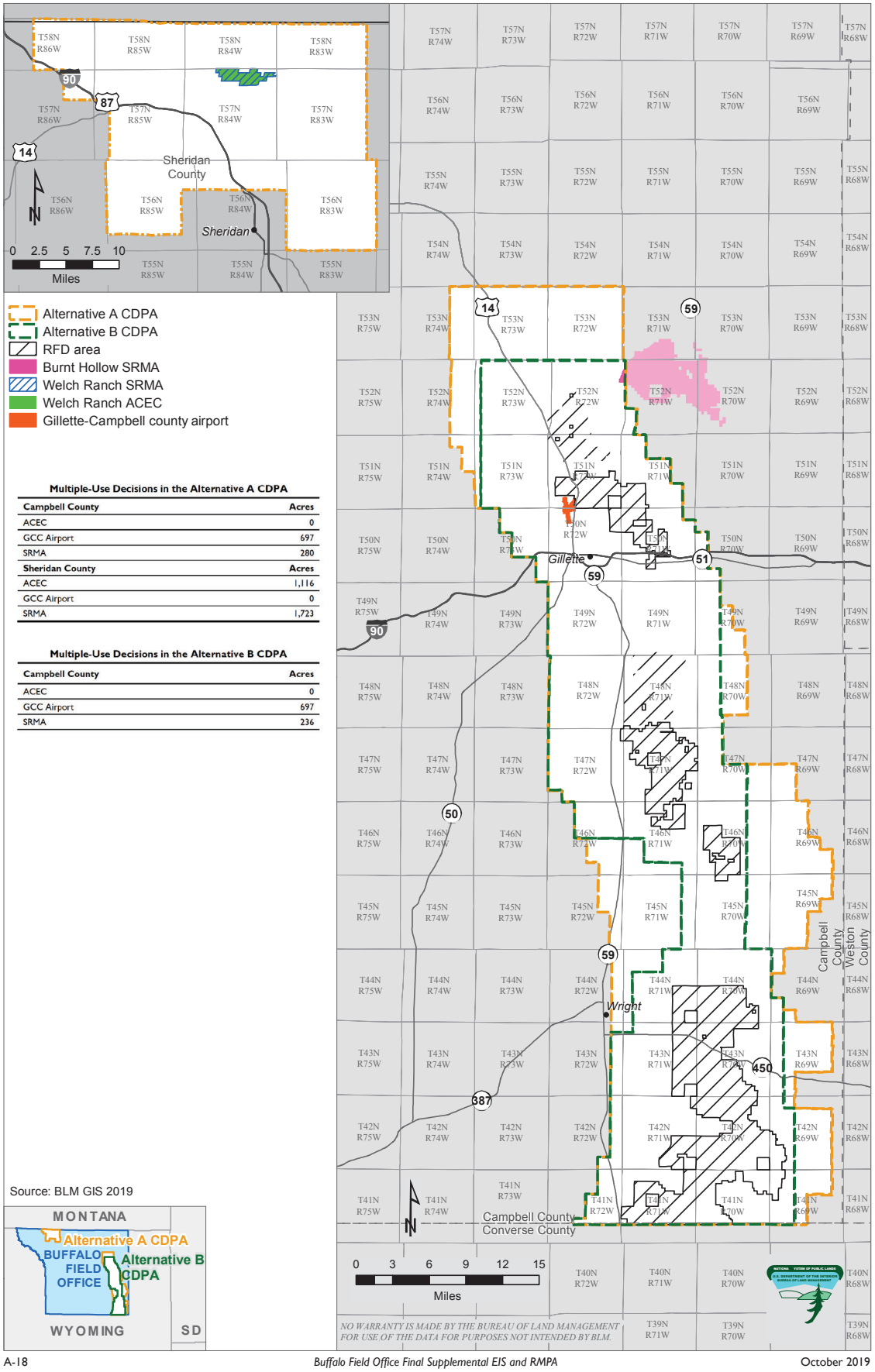
Campbell County	Acres
Alluvial Valley Floors	14,481
Sheridan County	**Acres**
Alluvial Valley Floors	3,500

Criterion 19 in the Alternative B CDPA

Campbell County	Acres
Alluvial Valley Floors	12,202

Source: BLM GIS 2019

Figure A-10
Screen 3 Multiple-Use Decisions (Unacceptable for Leasing)



Multiple-Use Decisions in the Alternative A CDPA

Campbell County	Acres
ACEC	0
GCC Airport	697
SRMA	280
Sheridan County	**Acres**
ACEC	1,116
GCC Airport	0
SRMA	1,723

Multiple-Use Decisions in the Alternative B CDPA

Campbell County	Acres
ACEC	0
GCC Airport	697
SRMA	236

Source: BLM GIS 2019

Attachment 1
Sample Private Landowner Letter

This page intentionally left blank.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

In Reply Refer To:
1610

January 30, 2019

RE: Surface Owner Consultation Coal Screen – Supplemental Environmental Impact Statement to the Approved Resource Management Plan for the Buffalo Field Office.

Dear Surface Owner:

On November 28, 2018, the Bureau of Land Management (BLM) published a Notice of Intent (NOI) for a potential amendment to the Approved Resource Management Plan (RMP) for the Buffalo Field Office and to prepare an associated Supplemental Environmental Impact Statement (SEIS). This potential amendment and associated SEIS is in response to a United States Montana District Court opinion and order (Western Organization of Resource Councils, et al vs BLM; CV 16-21-GF-BMM; 3/23/2018 and 7/31/2018).

In response to the order, the BLM is re-evaluating the four coal screens in accordance with 43 CFR 3420.1-4(e). The coal screens include: identification of coal development potential, 20 unsuitability criteria, multiple use conflicts, and surface owner consultation. The BLM has identified your private lands, which overlie federal coal deposits, as lands determined to have potential for coal development.

In accordance with 43 CFR 3420.1-4(e)(4)(i), BLM requests you notify the Buffalo Field Office in writing by **March 1, 2019** on the following information:

1. If you are a surface owner for lands within the coal development potential area identified on the attached map.
2. Your preference for or against mining by other than underground mining techniques on Enclosure 1.
3. Any additional information on your lands that would be beneficial in determining the suitability or unsuitability for coal leasing.

To facilitate this request, the BLM has enclosed a document, Enclosure 1, with the appropriate information being requested. Please use Enclosure 1 to notify the Buffalo Field Office on the points listed above, and return it by using the enclosed envelope by **March 1, 2019**.

Any views provided through this request may be used in the completion of the SEIS and may be available for public review. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold, from public view, your personal identifying information, we

cannot guarantee that we will be able to do so. All submissions from organizations, from businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be available for public review.

Because this is a planning document, lands considered under this SEIS would be analyzed to determine if they are acceptable for further considerations for coal leasing or unacceptable for further considerations for coal leasing. Leasing decisions would be considered under separate NEPA reviews when an application for leasing is submitted to the BLM. Therefore, the BLM would not be making leasing decisions at this time.

After review of the surface owner consultation responses, the SEIS will be prepared. BLM plans to have the SEIS available for public comment in spring 2019. The SEIS will be posted on the BLM e-Planning website, https://go.usa.gov/xP6S3 or https:eplanning.blm.gov; where the project webpage can be found by conducting a land use plan text search for Wyoming, Buffalo Field Office. Updated information, and associated documents, are also posted on the e-Planning project website.

We look forward to hearing from you on this project. If you have any questions, please contact Tom Bills, Planning and Environmental Coordinator, at (307) 684-1133.

Sincerely,

Todd D. Yeager
Field Manager

Enclosure 1 – Documentation of Surface Owner Consultation
Map – BLM Coal Development Potential Area, Campbell County

Enclosure 1.

Please returned to the Buffalo Field Office by March 1, 2019.

Please Check One:

___ I am authorized to express my views as a qualified surface owner in accordance with 43 CFR 3400.0-5(gg), having met the following requirements; I hold legal or equitable title of this land surface. I have my principal residence on this land, or I personally farm or ranch on this land, or I receive a significant portion of my income from farm or ranch operations on this land. I have met the requirements since _____.

___ I do not meet the requirements for a qualified surface owner in accordance with 43 CFR 3400.0-5(gg). Please explain below.

_____

_____

_____

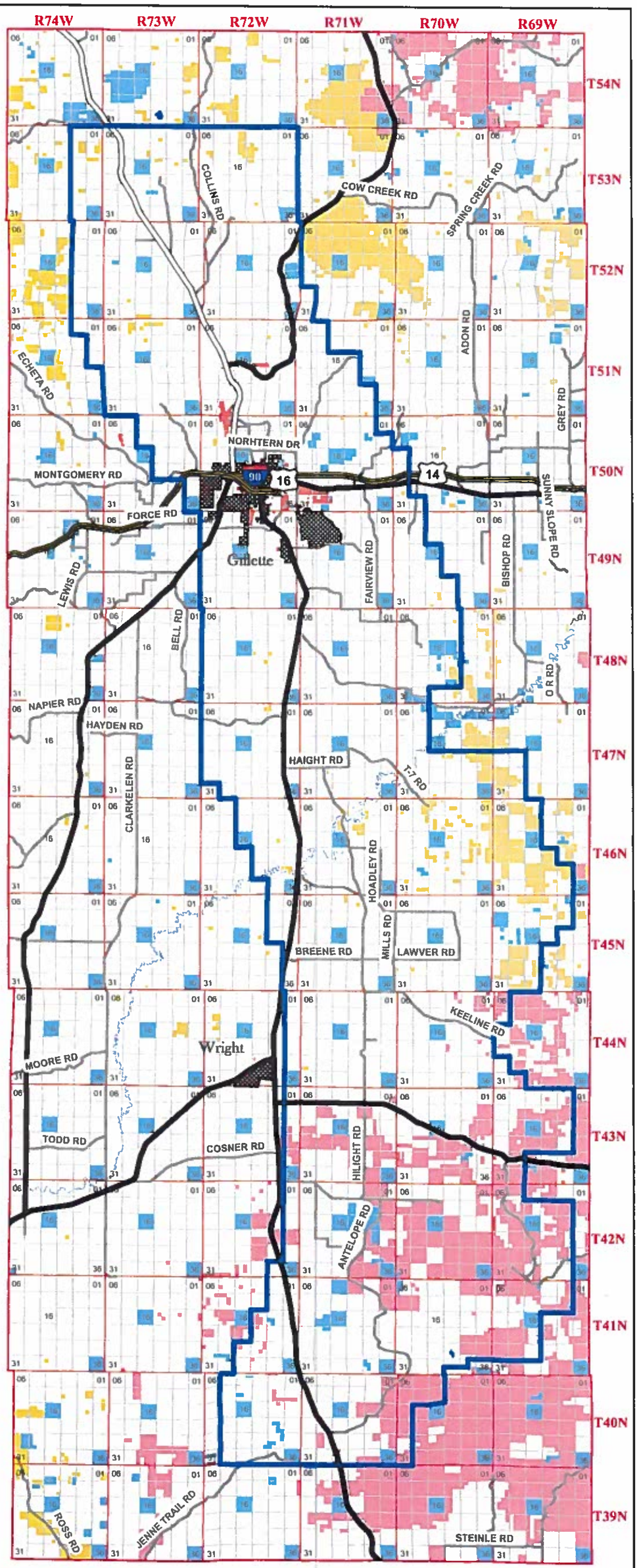
_____

Please identify your view(s) on leasing as listed below by aliquot or group of land description also listed below. Multiple views can be identified by aliquot or group land description(s). Provide additional information on the reserve side.

1. I am in favor of leasing of federal coal on these lands. ____
2. I am against leasing of federal coal on these lands. _____
3. I am undecided in favor or opposed to federal coal leasing on these lands. _____
4. I have already given written consent for surface mining of federal coal on these lands. _____

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold, from public view, your personal identifying information, we cannot guarantee that we will be able to do so. All submissions from organizations, from businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be available for public review.

This page intentionally left blank.


R74W
R73W
R72W
R71W
R70W
R69W
T54N
T53N
T52N
T51N
T50N
T49N
T48N
T47N
T46N
T45N
T44N
T43N
T42N
T41N
T40N
T39N
COLLINS RD
COW CREEK RD
SPRING CREEK RD
ADON RD
ECHETA RD
GREY RD
NORHTERN DR
MONTGOMERY RD
16
90
14
SUNNY SLOPE RD
FORCE RD
Gillette
LEWIS RD
BELL RD
FAIRVIEW RD
BISHOP RD
O R RD
NAPIER RD
HAYDEN RD
HAIGHT RD
T-7 RD
CLARKELEN RD
HOADLEY RD
MILLS RD
BREENE RD
LAWVER RD
KEELINE RD
Wright
MOORE RD
TODD RD
COSNER RD
HILIGHT RD
ANTELOPE RD
ROSS RD
JENNE TRAIL RD
STEINLE RD
BLM
Coal Development Potential
Boundary
CDP Boundary
Thunder Basin
National Grasslands
Bureau of Land
Management
Local Government
State
Water
N
Miles
0
10

This page intentionally left blank.

Appendix B

Reasonably Foreseeable Development

This page intentionally left blank.

TABLE OF CONTENTS

Chapter Page

TABLES

Page

FIGURES

Page

This page intentionally left blank.

Appendix B. Reasonably Foreseeable Development

B.1 Introduction

The US Geological Survey estimated in 2013 that the entire Powder River Basin (PRB) had approximately 162 billion tons of technically recoverable coal and approximately 25 billion tons of economically recoverable coal, depending on price (Scott and Luppens 2013). Most of the easily accessible reserves are federally administered coal resources in the southern PRB, administered by the BFO in Wyoming. Since 1985, approximately 10.8 billion tons of coal in the planning area were under consideration for leasing on both federal and non-federal coal estates; however, only a portion of all coal estates in the planning area have actually been leased. The CDPA in the 2015 Proposed RMP/Final EIS identified coal resources with economic potential for development. This area with development potential included 686,896 acres, or 15 percent of the 4.7-million acres of federal coal estate that the BFO administers, and 73.8 billion short tons of coal.

The BFO conducted a coal screening in 2001 and the identified CDPA was carried forward in the 2015 RMP. As part of this SEIS, the BFO reapplied coal screens and conducted a new unsuitability assessment to identify lands in Campbell and Sheridan Counties that are acceptable for further consideration for leasing (**Appendix A**). The new coal screening brought forward 455,467 acres and 52.2 million short tons (MMSt) of coal for further leasing consideration. While this coal screen identified areas with potential to develop, not all coal resources will be leased or developed over the next 20 years; thus, a reasonably foreseeable development (RFD) scenario was developed to project coal development in the CDPA between 2019 and 2038.

In the RFD developed for this SEIS, the BLM analyzed energy market projections developed by the US Energy Information Administration (EIA and publicly released as part the Annual Energy Outlook 2019 (EIA 2019a). Modelers at EIA produced these forecasts using the National Energy Modeling System (NEMS) model. It is an integrated model of the US energy system linked to a macroeconomic model developed and maintained by the Office of Energy Analysis within the EIA; however, modelers at EIA did not modify the underlying assumptions used in the NEMS run for the Annual Energy Outlook 2019 or support a separate NEMS run for this analysis.

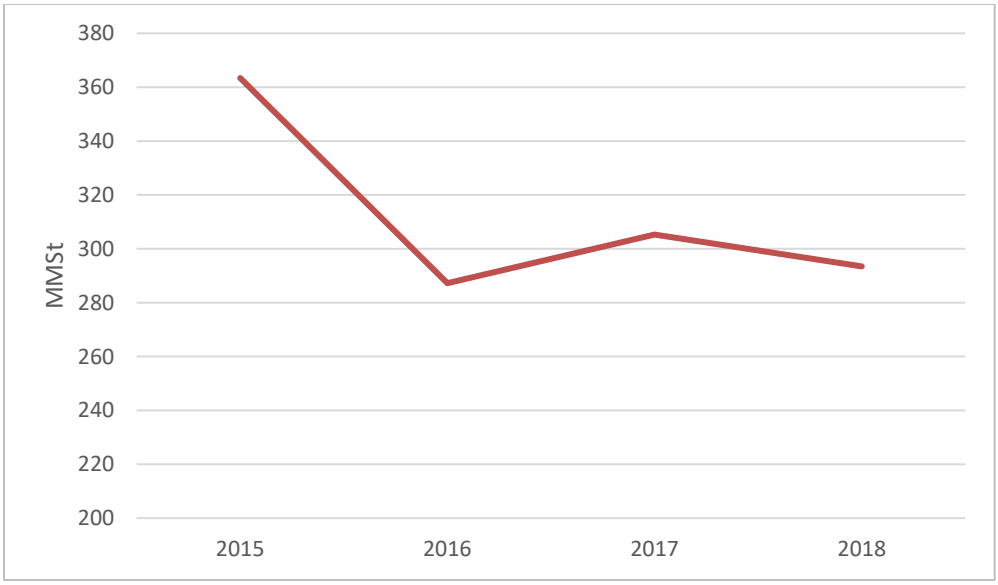
All forecasts developed for the Annual Energy Outlook are modeled projections of what *may* happen, given certain assumptions and methods, and not predictions of what *will* happen (EIA 2019a). Detailed information on the underlying assumptions used in the modeling for AEO 2019 are available online at https://www.eia.gov/outlooks/aeo/assumptions/.

B.2 Production Trends Since 2015

The PRB continues to be the largest coal-producing region in the United States. Coal from the southern PRB in Wyoming is used almost exclusively for domestic electric power generation, and its overall share of the domestic market has been growing. This is largely attributable to its low sulfur content, which enables power plants and other emitters to reduce costs associated with pollution controls, and because its thick coal seams and low stripping ratios allow producers to keep costs low. In 2018, coal accounted for approximately 28 percent of US electric generation, and Wyoming PRB coal accounted for nearly 40 percent of total US coal (EIA 2019a).

Since the Record of Decision (ROD) for the BFO RMP was signed in 2015, production by the 12 coal mines operating in the BFO has been declining. In 2015, these mines collectively produced 363.4 MMSt from recoverable reserves of federal and non-federal coal; however, their production dropped by nearly 76.2 MMSt to 287.2 MMSt in total in 2016. While production slightly recovered in 2017, rising to 305.3 MMSt, production fell another 11.8 MMSt to 293.4 MMSt in 2018 (**Figure B-1**).

Figure B-1: Annual Production in the Southern Powder River Basin (2015–2018)



Source: MSHA 2019

Although the BLM accounts for only 1 percent of surface ownership in the Wyoming's PRB, federal coal resources are estimated to account for approximately 90 percent of all coal estate in the BFO. Based on coal estate ownership, 264.1 MMSt of federal coal was estimated to have been produced across the 12 mines in 2018. As of February 2019, these mines held 131,837 acres of coal estate and 15.1 billion short tons of federal coal under lease. Most of this was under lease by the three most southern mines, where coal is of higher quality and better able to command a price premium. Although production by these mines accounted for 66 percent of total production in the southern PRB in 2018, these mines operated well below the full capacity determined by their Wyoming DEQ permits (**Table B-1**).

Table B-1
Remaining Mining Life Based on 2018 Production

Location	Number of Mines	Average Remaining Mine Life	Share of Total Production	Average Capacity Utilization
Northern Mines	5	22.1	13.1%	37%
Central Mines	4	18.0	20.3%	34%
Southern Mines	3	17.6	66.6%	51%

Source: BLM 2019, MSHA 2019

Based on capacity utilization (i.e., annual production as a percent of maximum permitted production under Wyoming DEQ permits) and recoverable reserves held under existing federal leases in 2018, the 12 operating mines are projected to have sufficient reserves, on average, to continue producing for another 20 years (BLM 2019). Mines collectively in these regions have sufficient reserves to support long-term

operations; however, some of the central and southern mines are beginning to run low on remaining recoverable reserves, and the mine operators could submit applications to lease additional tracts within the next 20 years.

B.3 FORECAST PRODUCTION TRENDS

Energy market projections are subject to a high level of uncertainty because of the many factors that can influence them over time, including changes in demographics, economic growth, technological advances, and environmental regulations (EIA 2019a). Since coal plays a vital role in worldwide energy markets, forecasts for coal demand and production are also subject to a high level of uncertainty. This is because of the many factors that influence consumption rates, including coal's share of the domestic electricity generation fuel mix and delivered coal prices relative to alternative fuel sources.

As discussed in the Wright Area Remand Final EA (BLM 2019), supply and demand in the context of the electric power system does not easily conform to the norms of the general supply and demand model of other commodities. This is due to 1) limited storage capacity, which requires production and supply on demand, 2) utilities in the traditional vertically integrated system operating as monopolies in a geographic region, and 3) other nonmarket mechanisms, such as spot market price caps, operating reserve requirements, non-price rationing protocols, and administrative protocols for managing system emergencies (BLM 2019).

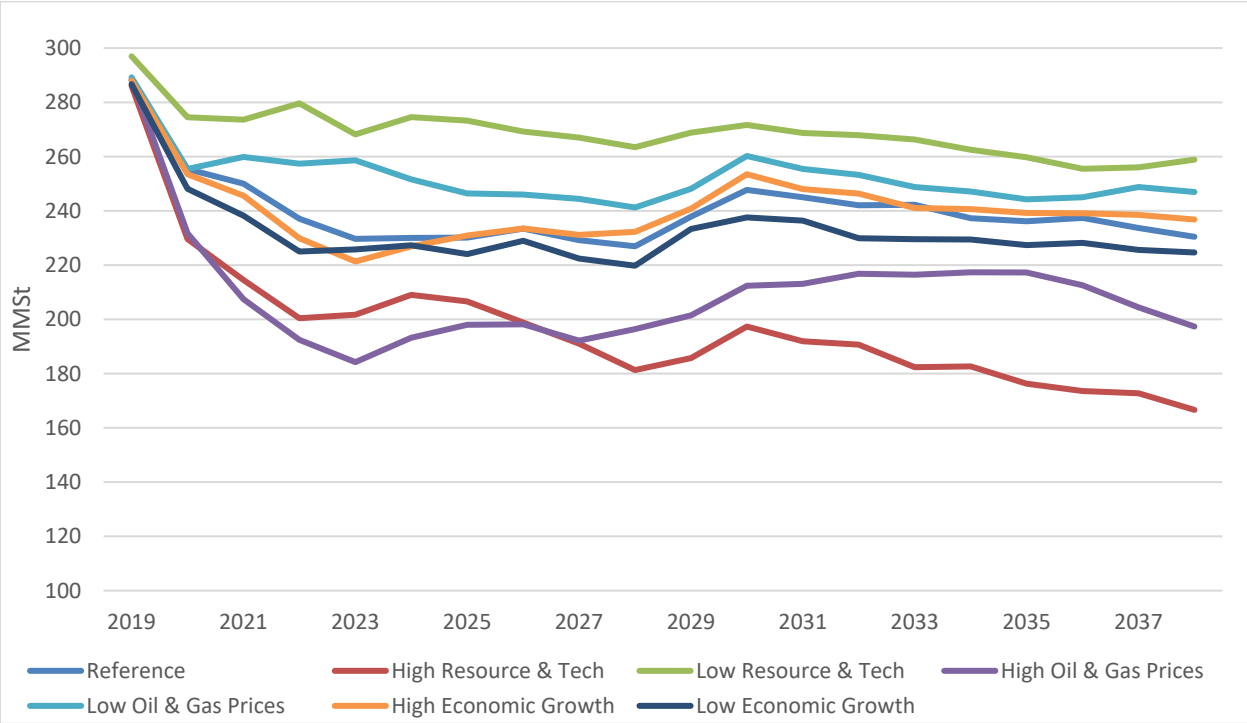
Forecast fluctuations in annual production over the next 20 years will largely be attributable to trends in the domestic coal market, changes in the domestic electricity generation fuel mix, and demand in export markets. Between 2019 and 2038, production in the Wyoming Powder River Basin is anticipated to fall by approximately 1 percent on annual average. As shown in **Figure B-2**, AEO 2019 projections show that coal production is likely to decline through 2023, followed by a short period of growth between 2028 and 2030, and then declining again through 2038. Forecasts influencing trends in the coal market are further discussed below.

B.3.1 Domestic Market

Coal produced in the US is generally used in coal-fired power plants to generate electricity; however, low natural gas prices have decreased the competitiveness of coal as a fuel source for electricity generation and caused coal's share of the domestic electricity generation fuel mix to decline. Between 2019 and 2038 coal's share of the electricity generation fuel mix is expected to decline, from about 28 to 17 percent, while renewables grow from 18 percent to about 26 percent, and natural gas grows from 34 percent to about 38 percent, under the reference case (EIA 2019a). And under all AEO 2019 cases, coal's projected share of the electricity generation fuel mix is expected to decline between 2019 and 2038. This would be the case as falling prices for natural gas and renewable energy continue to increase making them competitive fuel source substitutes. The reduced competitiveness of coal-fired energy generation is projected to lead to the retirements of inefficient coal-fired power plants and increasing investment and development of combined-cycle natural gas power generators through 2025 (EIA 2019a).

The projected lower energy demand of coal, coupled with the retirement of inefficient coal-fired power plants, is expected to reduce US coal production. AEO 2019 projects domestic coal production to decrease through 2035, from 762 million short tons in 2018 to 608 million short tons in 2035, before stabilizing around 600 million short tons through the remainder of the analysis period (EIA 2019a). The western coal region, which includes the PRB, is projected to decline by 85 million short tons from 2018 through 2035 (EIA 2019a).

Figure B-2: Annual Coal Production in Wyoming Powder River Basin (2019–2038)



Source: EIA 2019a

B.3.2 Export Market and Global Demand

Global markets are difficult to predict, as the factors that affect domestic market demand also occur in the global market and are coupled with trade barriers, transportation costs, and relative intensity of exchange rates.

The Asia Pacific region drives both supply and demand in the global coal market. This region has the most proven coal reserves, primarily in Australia, China, and India, and these reserves account for approximately 41 percent of the global total (Spencer 2018). In addition to being some of the world's largest coal producers, China and India are also the two largest consumers. In 2017, China consumed 1,892 million metric tons,[1] while India consumed another 424 million metric tons. This accounted for 50.7 percent and 11.4 percent of global consumption (IEA 2019; BP 2018). As such, the Asia Pacific region also dominates the global import/export market. In 2016, China (256 Million tons [Mt]), India (191 Mt), and Japan (190 Mt) ranked as the top coal importers, while Australia (392 Mt), Indonesia (370 Mt), and Russia (166 Mt) ranked as the top coal exporters (BGR 2017).

Given the type and quality of US coal, US exports are primarily used to support the global power sector. While there has been growth in global power generation, this growth has been driven primarily by efforts in Europe for renewable energy (Spencer 2018). The global market for coal has remained relatively stable, accounting for 89.1 percent of world energy resources (BGR 2017). Although global market demand for coal is expected to grow between 2019 and 2038 as coal-fired generation in China and India increases, US exports are expected to remain stable over the same period (IEA 2019; EIA 2018).

[1] While the US measures coal volumes in short tons, countries that use the metric system measure coal in metric tons. One metric ton is equivalent to 1.1 short tons, so 1 million metric tons would be equal to 1.1 MMst.

B.4 REASONABLY FORESEEABLE DEVELOPMENT

The reasonably foreseeable development of federal coal in the BFO was projected from publicly available data produced by the EIA as part of the Annual Energy Outlook 2019 report (EIA 2019a). Modelers at the EIA produced the AEO 2019 forecasts using the NEMS model. This is an integrated model of the US energy system linked to a macroeconomic model developed and maintained by the Office of Energy Analysis within the EIA.

To account for the uncertainty inherent to energy markets, modelers at the EIA have developed a reference case and six side cases (high or low oil price, high or low oil and gas resource and technology, and high or low economic growth) that are modeled in NEMS. Forecasts under the high oil and gas resource and technology scenarios do consider how new technologies, such as carbon fiber and coal to liquid or gas, may affect resource consumption over time, even though these technologies are highly speculative. As national aggregation is not sufficient to account for the physical and economic characteristics unique to geographical producing regions (Stevens et al 1979), the NEMS takes a regional approach to account for these differences (EIA 2019a).

As part of EIA's analysis, projections for low sulfur and medium sulfur sub-bituminous coal in the Wyoming Powder River Basin under the seven scenarios have been developed and made publicly available online at eia.gov. The BLM analyzed coal production forecasts across the seven AEO 2019 scenarios. It developed reasonably foreseeable development scenarios for resources in Campbell and Sheridan Counties by averaging annual production forecasts under the high and low economic growth scenarios. This was done because averaging results from these scenarios yielded estimates closest to 2018 production, as reported by the Mine Safety Health Administration. Under this RFD, 243.9 MMSt of coal was projected to be produced on annual average between 2019 and 2038 in Wyoming's PRB.

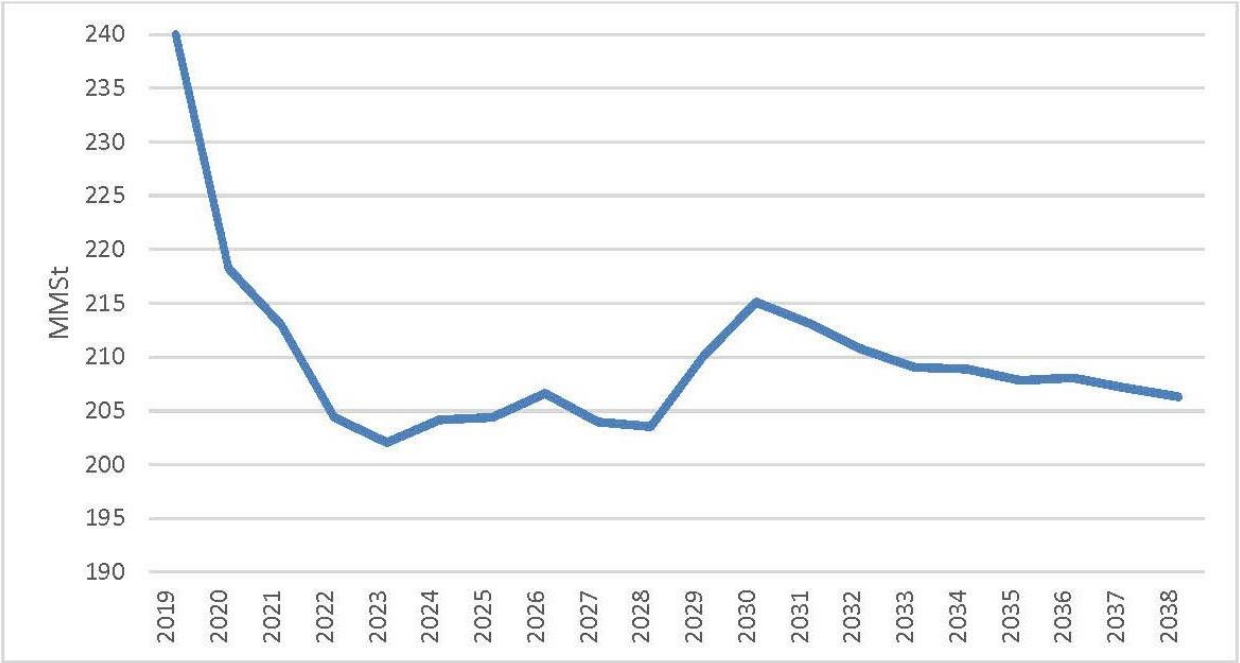
An RFD for federal coal resources administered by the BFO was further developed, based on projections for low-sulfur sub-bituminous coal and the proportion of total coal resources under federal ownership. Since 90 percent of the region's coal resources are administered by the BLM, this RFD assumed that 90 percent of all low-sulfur sub-bituminous coal production in the Wyoming PRB would be produced from federal coal in the CDPA.

On annual average, 213 MMSt of federal coal is projected to be produced between 2019 and 2038. As shown below in **Figure B-3**, federal coal production is forecast to steeply decline over the next 4 years. Production will stabilize until 2028 and will pick up until it peaks in 2030. Between 2030 and 2038, production is forecast to steadily decline. In total, 4.2 billion short tons of federal coal are projected to be produced and 36,620 acres will be disturbed in the CDPA over the next 20 years under the RFD developed from the EIA AEO 2019 coal production projections for the region.

Although two new mines in Sheridan County have been proposed, their proposed locations would make it highly unlikely for either one to lease or produce federal minerals within the next 20 years. The Brooks Mine has been proposed but not permitted by the State of Wyoming for the development of carbon fiber. Information submitted to the State of Wyoming in support of a permit indicates that there would be no federal minerals within the proposed mine boundary.

Youngs Creek Mine does have a State of Wyoming permit issued in 1977; however, there has been no commercial development of the coal resources. The BLM has not received any formal or informal leasing requests for federal coal related to this mine.

Figure B-3: RFD for Federal Coal in the Southern Powder River Basin (2019–2038)



Until commercial development plans are conceptualized and a leasing request is submitted, the BLM is unable to consider either mine in the RFD for federal coal. This is due to the unknown estimated production potential and resource constraints that could limit production; thus, the RFD assumes all federal production between 2019 and 2038 will occur at the 12 mines currently operating in Campbell County.

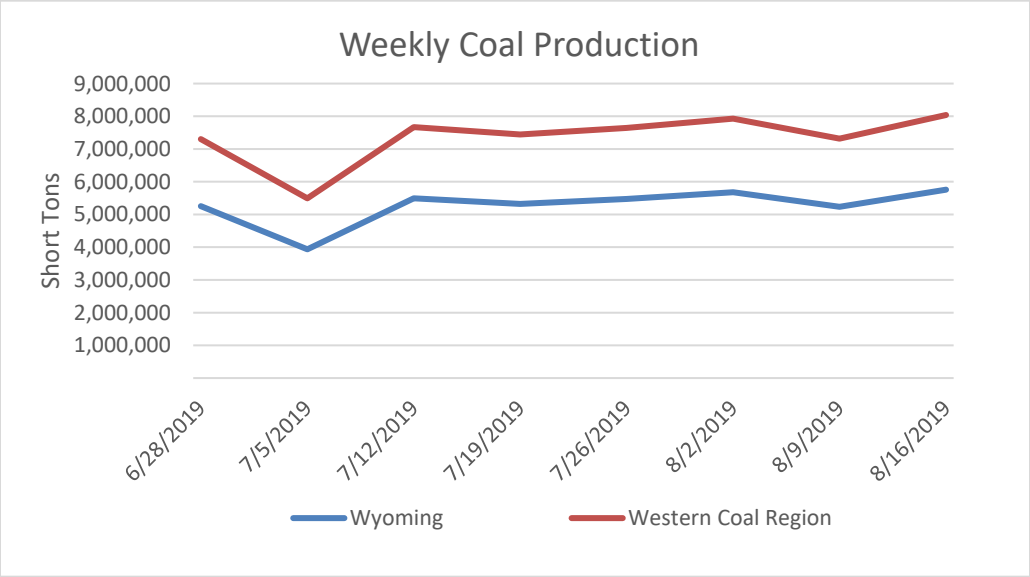
As discussed in Appendix A, updated coal screening identified a greater number of acres as being unsuitable for future consideration for coal leasing than the coal screen developed for the 2001 RMP revision; however, these proposed changes to the CDPA boundary are unlikely to affect reasonably foreseeable development within the CDPA over the next 20 years. This is because the additional tracts excluded through the updated coal screen were not leased by a mine operating in the CDPA or next to any recoverable reserves mines currently held under an existing lease. For these reasons, reasonably foreseeable development in the CDPA is anticipated to be the same under both alternatives.

Increases or decreases in production levels over the next 20 years could extend or shorten the remaining life of operating mines as reserves are recovered at faster or slower rates. As the rate at which reserves are recovered changes, mine operators will reassess their operation plans and will determine whether more reserves will need to be leased. As lease by applications are received, the BLM will continue to consider future tracts in the CDPA for leasing.

Although highly speculative at this time, some mine operators could decide to halt operations if demand and pricing remain weak and the recoverable reserves held through their existing leases begin to run low. If mines in the northern or central part of the southern PRB were to close, unused capacity across the three southern mines would be sufficient to absorb the closing mines' market shares by increasing production. In this manner, overall production of low-sulfur sub-bituminous coal from the PRB would be unlikely to be affected by future mine closures, although the distribution of production across operating mines could change. Recent closures of 2 mines operating in the BFO have supported this assumption. Production

(**Figure B-4**) and prices (**Figure B-5**) for PRB coal has remained stable since the mines were shuttered on July 1, 2019. These data bolster the RFD's assumption that underused capacity across mines producing higher quality coal is sufficient to offset production declines at other PRB mines, without disrupting the overall supply of PRB coal.

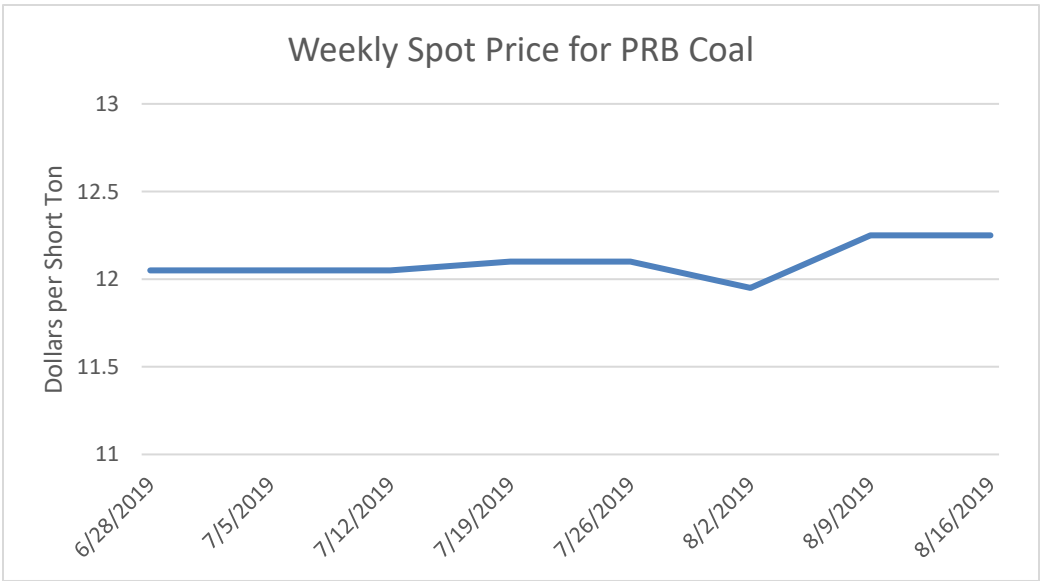
Figure B-4: Weekly Coal Production[1]



Source: EIA 2019b

[1] Weekly coal production for the PRB is not reported separately from statewide or coal producing region totals.

Figure B-5: Weekly Spot Prices for Powder River Basin Coal



Source: EIA 2019c

B.5 REFERENCES

BLM, High Plains District Office. 2019. Coal leasing and mining data, Casper Wyoming.

BGR (Bundesanstalt fur Geowissenschaften und Rohstoffe). 2017. BGR Energy Study 2017: Data Developments Concerning German and Global Energy Supplies.

BP (British Petroleum). 2018. British Petroleum Statistical Review of World Energy. Vol. 67.

EIA (Energy Information Agency). 2018. Annual Coal Report. Internet website: https://www.eia.gov/coal/annual/

_____. 2019. Annual Energy Outlook 2019 with projections to 2050. Internet website: https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf.

_____. 2019b. Archive weekly and monthly coal production. Internet website: https://www.eia.gov/coal/production/weekly/.

_____. 2019c. Coal Markets: Average weekly coal commodity spot prices: Powder River Basin. Internet website: https://www.quandl.com/data/EIA/COAL-US-Coal-Prices-by-Region

MSHA (Mine Safety and Health Administration). 2019. Yearly Production Information. Mine Data Retrieval System. Internet website: https://arlweb.msha.gov/drs/ASP/MineAction70002.asp.

Scott, D. C., and J. A. Luppens. 2013. "Assessment of coal geology, resources, and reserve base in the Powder River Basin, Wyoming and Montana." US Geological Survey Fact Sheet 2012–3143.

Spencer, D. 2018. Market Analysis: BP Chief Economist. Internet website: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/chief-economist-analysis.html#analysis-coal.

Appendix C

Air Resources Technical Support Report

This page intentionally left blank.

Appendix C. Air Resources Technical Support Report

This appendix provides additional details on the greenhouse gas (GHG) emission estimates completed for the air resources analysis (see Chapter 3 of the SEIS/RMPA for the Buffalo Field Office. **Tables 3-4** through **3-7** in **Section 3.5.1** of the SEIS/RMPA summarize total GHG emissions in units of carbon dioxide equivalents (CO_2e) from federal coal, oil, natural gas, and coal bed natural gas. This appendix details GHG emissions by pollutant.

Tables C-1 through **C-4** show the GHG emissions for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), the primary compounds that contribute to GHG emissions in the Buffalo Field Office. **Table C-1** presents the CO_2, CH_4, and N_2O emissions from federal coal production, transportation, downstream combustion and compound totals, while **Table C-2**, **Table C-3**, and **Table C-4** present the CO_2, CH_4, and N_2O emissions from oil and gas production and downstream combustion processes. Oil and gas transportation emissions are discussed qualitatively in **Section 3.5.1** of the SEIS/RMPA.

Emission factors and methods used in the calculations are discussed in **Section 3.5.1**. More information on the calculation method and emission factors used is provided in this appendix. The Excel spreadsheets mentioned below are available in the administrative record for the SEIS/RMPA.

C.1 COAL

The annual coal production rates and GHG emissions from federal and non-federal coal production, transportation, and downstream combustion were derived as described below.

C.1.1 Coal Production Rate

The annual coal production rates were forecast by the BFO for a reasonably foreseeable development (RFD) scenario for anticipated federal and non-federal coal resource development in the BFO from 2019 to 2038. It was based on development trends and expected changes to those development trends. The development of the RFD coal production rates is described in Appendix B.

C.1.2 Coal Production Emissions

GHG emissions for coal production are calculated from the default coal methane emissions factor for surface mines in the EPA's State Inventory and Projection Tool, at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. It is applied to Wyoming and the annual RFD coal production rates for 2019–2038. The EPA tool is provided in "Coal Module.EPA State Inventory Projection Tool.xlsm" and the calculation of production emissions is shown in the Excel file BFO_Coal_O&G.xlsx in the "Coal_production" tab. The EPA's tool does not provide information on CO_2, and N_2O emissions from coal production.

C.1.3 Coal Transportation Emissions

Estimated emissions of CO_2, CH_4, and N_2O from transportation of federal and non-federal coal by rail using diesel locomotives were based on annual tons of coal produced and average train haul distance, EPA emission factors for diesel locomotives and Burlington Northern Santa Fe Railway fuel efficiency factors and typical ratio of weight of unloaded train car to loaded car (see SEIS Section 3.5.1 and references

therein for details on the data used), The method for calculating the emissions is discussed in detail in Section 3.5.1 and the calculations are shown in the file "BFO_transportation.xlsx."

C.1.4 Coal Downstream Combustion Emissions

Downstream emissions from federal and non-federal coal combustion were estimated using emissions factors for CO_2, CH_4, and N_2O for stationary combustion of sub-bituminous coal from the EPA Emission Factors for Greenhouse Gas Inventories, March 2018 (2018b). All of the coal produced was assumed to be combusted. The emissions factors used for CO_2, CH_4, and N_2O are 1,676 kilograms per short ton, 190 kilograms per short ton, and 28 kilograms per short ton, respectively. The emissions factor for sub-bituminous coal was used because the coal produced in the planning area is primarily sub-bituminous. Non-sub-bituminous coal outside the planning area was not considered because the US District Court order of March 2018 stated downstream combustion must be considered for the resource open to development under the RMP. The calculation of downstream combustion emissions is shown in the Excel file BFO_Coal_O&G.xlsx in the "Coal_downstream" tab.

C.2 Oil

Table C-2 shows annual federal oil production and CO_2, CH_4, and N_2O emissions from production and combustion. The annual federal oil production and CO_2e emissions are shown in Table 3-5 in Chapter 3 of the SEIS. The sources of information and calculation methods are described below.

C.2.1 Oil Production Rate

Annual cumulative oil production (barrels) for 2015 to 2028 is taken from Table 7 in the 2012 RFD (FinalBFORFD_2012.pdf; FinalBFORFD_T_7.xlsx). Cumulative oil production is 3,713,155 barrels for 2015, 12,241,511 barrels for 2024, and 14,573,724 for 2028. Annual cumulative oil production from 2029 to 2038 is held static and is set equal to that for 2028.

From Table M.2, in 2015 RMP, the federal oil well count in 2024 is 2,723; the cumulative oil well count in 2024 is 5,451.

From grid cell D58 in tab "Computations" in Oil-BFO RMP_Cumulative.12-17-2012 (003)jg.xlsx: Cumulative oil production in 2024 (per 2015 RMP) is 4,126,848 barrels (4.1268 MMBbl); thus federal oil production in 2024 = (2,723/5,451) x 4.1268 = 2.0615 MMBbl.[1]

The ratio of federal to cumulative oil production in 2024 = 2.0615/12.241511 = 16.840%. This percentage and the annual cumulative oil production from Table 7 in the 2012 RFD is used to obtain the estimated federal production from 2019 to 2028. This percentage is then applied to the cumulative production rate of 14.57 MMBbl for 2028, which is held static from 2029 to 2038 to obtain the federal oil production for those years.

C.2.2 Oil Production Emissions

From the 2015 RMP (see Oil-BFO RMP_Federal Only.12-17-2012.xlsx, tab "Input-Output," grid cells BM, BN and BO):

[1] The BLM used 2024 cumulative oil production from 2015 RMP only to estimate the federal production.

Alternative D production emissions in 2024 are as follows: CO_2 = 35,131.7, CH_4 = 697.08, N_2O = 1.06 short tons/year = > CO_2 = 31,871, CH_4 = 632, N_2O = 0.95 metric tons/year.

Per the 2015 RMP, 2015 cumulative oil production = 6,377,975 bbl, 2015 cumulative oil well count = 4.606; therefore, the rate of 2015 cumulative oil production = 1,385 bbl/well.

With 2015 cumulative oil production as 3.71 MMBbl, per the 2012 RFD, the well count = 3,713,155/1,385 = 2679; therefore, in Oil-BFO RMP_Cumulative.12-17-2012 (003)jg.xlsx, tab "Input-Output," grid cell G10 is updated to 2,679, and grid cell G9 is updated to 730.

This rate is used to calculate federal well numbers for 2019–2038. By changing well count in Oil-BFO RMP_Federal Only.12-17-2012.xlsx, tab "Input-Output," grid cell G11, GHG emissions are calculated for each year. Cumulative oil production in 2024, per the 2015 RMP, = 4.1268 MMBbl and the cumulative oil well count in 2024 = 5,451; therefore, cumulative oil production rate in 2024 = 757.1 bbl/well.

The rate of cumulative oil production is used to calculate cumulative oil well counts for 2019–2038. By changing well count in Oil-BFO RMP_Cumulative.12-17-2012 (003)jg.xlsx, tab "Input-Output," grid cell G11, GHG emissions are calculated for each year.

The annual emission rates in short tons per year calculated as described above are converted to metric tons per year.

C.2.3 Oil Combustion Emissions

Combustion emission calculations for federal and cumulative are shown in the tab "combustion" in BFO_Oil.xlsx. Emissions factors for distillate fuel oil no. 2 were used: 10.21 kg CO_2/gallon, 0.41 g CH4/gallon, 0.08 g N2O/gallon. This is because this represents a typical use in the US for residential heating.

These emissions factors were obtained from the EPA emission factors table in emission-factors_mar_2018_0.pdf, at https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

C.3 Natural Gas

Tables C-3 and C-4 shows annual federal conventional and coalbed natural gas production rates and CO_2, CH_4, and N_2O emissions from production and combustion. The annual federal production and CO_2e emissions are shown in Tables 3-6 and 3-7. The sources of information and calculation methods are described below.

C.3.1 Conventional Natural Gas Production Rate

The 2015 and 2024 federal conventional natural gas wells and production rate from the 2015 RMP spreadsheet (NaturalGas-BFO RMP Federal Only.12-17-2012.xlsx, grid cells B13 and B15) are as follows:

2015: Federal NG production = 3.49 billion cubic feet (BCF), federal wells = 233, (based on 14,960 msf/well)

2024: Federal NG production = 2.92 BCF, federal wells = 269, (based on 10,850 msf/well)

So, the 2024 production rate = 0.01086 BCF/well.

The 2015 and 2024 cumulative conventional NG wells and production rate from the 2015 RMP spreadsheet (NaturalGas-BFO RMP Cumulative.12-17-2012 (002)jg.xlsx, grid cells B13 and B15) are as follows:

2015: NG production = 8.45 BCF, wells = 565 (based on 14,960 msf/well)

2024: NG production = 28.09 BCF, wells = 2589 (based on 10,850 msf/well)

So, 2024 production rate = 0.01085 BCF/well

The federal-to-cumulative ratio for conventional NG in 2024 = 2.92/28.09 = 10.401%.

This ratio for 2024 was used for all years from 2019 to 2038 to estimate the federal NG production rate, based on cumulative NG production rates, which in turn were taken from Table 7 in the 2012 RFD.

C.3.2 Coalbed Natural Gas Production Rate

The 2015 and 2024 CBNG federal wells and production rate from the 2015 RMP spreadsheet (CBNG-BFO RMP Federal Only.12-17-2012.xlsx, grid cells B16 and B18) are as follows:

2015: Federal CBNG production = 70.9 BCF, federal wells = 5493 (based on 0.013 bcf/well)

2024: Federal CBNG production = 34.7 BCF, federal wells = 1775 (based on 0.020 bcf/well)

The 2015 and 2024 cumulative CBNG wells and production rate from the 2015 RMP spreadsheet (CBNG-BFO RMP Cumulative.12-17-2012.xlsx, grid cells B13 and B15) are as follows:

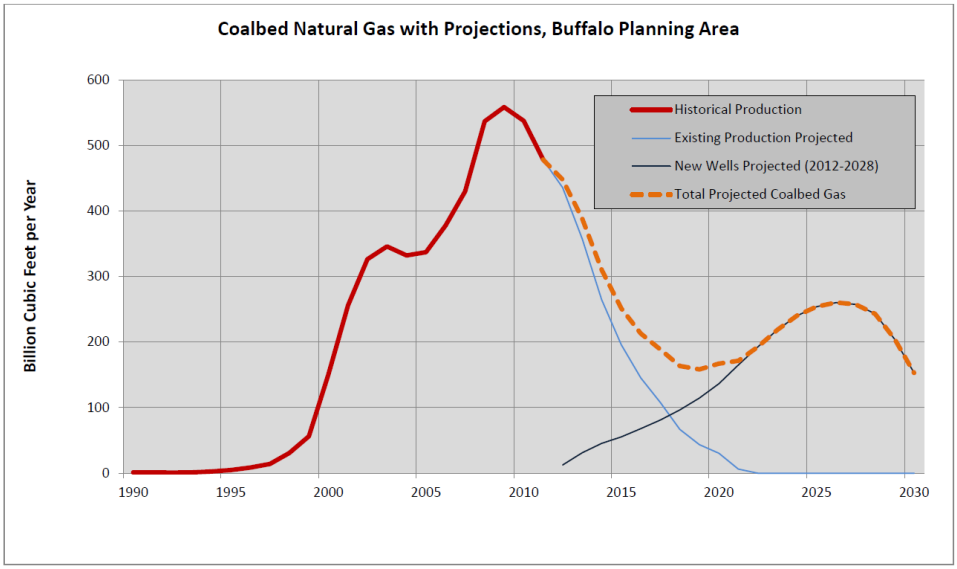
2015: Cumulative CBNG production = 280.0 BCF, wells = 21,702 (based on 0.013 bcf/well)

2024: Cumulative CBNG production = 245.0 BCF, wells = 12,535 (based on 0.020 bcf/well)

The federal-to-cumulative ratio for CBNG in 2024 = 34.7/245.0 = 14.163%.

This ratio was used for all years from 2019 to 2038 to estimate federal CBNG production rate, based on cumulative CBNG production rates, which in turn were taken from Figure 45 in the 2012 RFD (reproduced below).

Figure 45. Historical coalbed natural gas production and base line projection of production through 2028 for the Buffalo Planning Area. Cumulative production through 2011 is 4,789 billion cubic feet of gas. Estimated cumulative production through 2028 is 8,906 billion cubic feet of gas. Data are from Wyoming Oil and Gas Conservation Commission and IHS Energy Group (2012).



C.3.3 Natural Gas Production Emissions

The 2024 federal production emissions from the 2015 RMP (see NaturalGas-BFO RMP Federal Only.12-17-2012.xlsx, grid cells BM, BN and BO in tab "Input-Output") are as follows:

Alternative D production emissions in 2024: CO_2 = 56,479, CH_4 = 2,134, N_2O = 0.15 short tons/year; therefore, CO_2 = 51,237, CH_4 = 1,936, N_2O = 0.46 metric tons/year.

The rate of 2024 federal conventional natural gas production (0.01086 bcf/well) is used to calculate federal well counts from 2019 to 2038. By changing well numbers in NaturalGas-BFO RMP Federal Only.12-17-2012.xlsx, tab "Input-Output," grid cell G14, GHG emissions are calculated for each year.

Similarly, in NaturalGas-BFO RMP cumulative.12-17-2012.xlsx, tab "Input-Output," grid cells G12 and G13 are changed to 565 and 8.45 BCF, based on the calculation in B.1. The rate of 2024 cumulative conventional natural gas production (0.01085 BCF/well) is used to calculate federal well counts from 2019 to 2038. By changing the well count in grid cell G14, GHG emissions are calculated for each year.

The annual emissions rates in short tons per year calculated as described above are converted to metric tons per year.

C.3.4 Coalbed Natural Gas Production Emissions

The 2024 federal production emissions from the 2015 RMP (see "CBNG-BFO RMP Federal Only.12-17-2012.xlsx", grid cells BN and BO, BP in tab "Input-Output") are as follows:

Alternative D production emissions in 2024: CO_2 = 8,492, CH_4 = 4,443, N_2O = 0.06 short tons/year = > CO_2 = 7,704, CH_4 = 4,031, N_2O = 0.05 metric tons/year

The rate of CBNG production (0.02 BCF/well) is used to calculate federal well counts from 2019 to 2038. By changing the well count in CBNG-BFO RMP Federal Only.12-17-2012.xlsx, tab "Input-Output," grid cell G17, GHG emissions are calculated for each year.

Similarly, with the same production rate, cumulative CBNG production emissions are calculated by changing well count in CBNG-BFO RMP Cumulative.12-17-2012.xlsx, tab "Input-Output," grid cell G17.

The annual emissions rates in short tons per year calculated as described above are converted to metric tons per year.

C.3.5 Conventional and Coalbed Natural Gas Downstream Combustion Emissions

Combustion emission calculations for federal and cumulative are shown in the "combustion" tab in BFO_NG.xlsx and BFO_CBNG.xlsx. The emissions were calculated from the annual gas production rate and the emission factors for natural gas provided below. All natural gas produced was assumed to be combusted.

The following emissions factors were used for natural gas (both conventional and coalbed natural gas): 0.05444 kilograms CO_2 per scf, 0.00103 grams CH_4 per scf, and 0.0001 grams N_2O per scf. These emission factors were obtained from the EPA natural gas combustion emission factors (emission-factors_mar_2018_0.pdf) at https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

Table C-1
CO_2, CH_4, and N_2O emissions from Federal Coal Production, Transportation, and Combustion

Year	Federal RFD Coal Production Rate (MMst)[1]	CO_2 (MMT)[2]				CH_4 (MMT)[2]				N_2O (MMT)[2]			
		Prod	Trans	Comb	Total	Prod	Trans	Comb	Total	Prod	Trans	Comb	Total
2019	258.6	NE	3.9	433.5	437.4	0.23	0.000	0.05	0.28	NE	0.00011	0.007	0.01
2020	225.8	NE	3.4	378.4	381.8	0.20	0.000	0.04	0.24	NE	0.00010	0.006	0.01
2021	217.7	NE	3.3	364.9	368.2	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2022	204.7	NE	3.1	343.1	346.2	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2023	201.2	NE	3.1	337.2	340.2	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2024	204.4	NE	3.1	342.6	345.7	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2025	204.7	NE	3.1	343.2	346.3	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2026	208.1	NE	3.2	348.8	352.0	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2027	204.1	NE	3.1	342.1	345.2	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2028	203.4	NE	3.1	340.9	344.0	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2029	213.4	NE	3.2	357.6	360.9	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2030	221	NE	3.4	370.3	373.7	0.19	0.000	0.04	0.24	NE	0.00010	0.006	0.01
2031	218	NE	3.3	365.3	368.6	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2032	214.3	NE	3.3	359.2	362.5	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2033	211.8	NE	3.2	354.9	358.1	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2034	211.5	NE	3.2	354.5	357.7	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2035	209.9	NE	3.2	351.9	355.1	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2036	210.3	NE	3.2	352.5	355.6	0.19	0.000	0.04	0.23	NE	0.00009	0.006	0.01
2037	208.9	NE	3.2	350.1	353.2	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01
2038	207.7	NE	3.1	348.0	351.2	0.18	0.000	0.04	0.22	NE	0.00009	0.006	0.01

[1]MMst: million short tons

[2]Prod=production, Trans=transportation, Comb=combustion. Note coal production emissions for CO_2 and N_2O were not included in the 2015 Proposed RMP/Final EIS.
NE = Not estimated. This is because these values were not calculated in the 2015 Proposed RMP/Final EIS. They will be small, compared with the combustion values.

Table C-2
CO_2, CH_4, and N_2O Emissions from Federal Oil Production and Combustion

Year	Federal RFD Oil Production Rate (MMBO)[1]	CO_2 (Metric Tons)[2]			CH_4 (Metric Tons)[2]			N_2O (Metric Tons)[2]		
		Prod	Comb	Total	Prod	Comb	Total	Prod	Comb	Total
2019	1.2	31,845	535,592	567,436	384	22	406	1	4	5
2020	1.4	31,850	604,533	636,383	433	24	457	1	5	6
2021	1.5	31,853	644,187	676,039	461	26	487	1	5	6
2022	1.7	31,860	739,445	771,305	529	30	559	1	6	7
2023	1.9	31,865	799,170	831,035	572	32	604	1	6	7
2024	2.1	31,871	883,798	915,669	632	35	668	1	7	8
2025	2.1	31,873	916,624	948,498	656	37	693	1	7	8
2026	2.3	31,879	990,005	1,021,884	708	40	748	1	8	9
2027	2.3	31,880	996,420	1,028,299	713	40	753	1	8	9
2028	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2029	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2030	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2031	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2032	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2033	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2034	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2035	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2036	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2037	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9
2038	2.5	31,884	1,052,176	1,084,060	752	42	795	1	8	9

[1]MMBO=million barrels of oil
[2]Prod=production; Comb=combustion

Table C-3
CO_2, CH_4, and N_2O Emissions from Federal Natural Gas Production and Combustion

Year	Federal RFD NG Production Rate (BCF)[1]	CO_2 (Metric Tons)[2]			CH_4 (Metric Tons)[2]			N_2O (Metric Tons)[2]		
		Prod	Comb	Total	Prod	Comb	Total	Prod	Comb	Total
2019	1.8	32,599	96,473	129,072	1,174	2	1,176	0.3	0.2	0.5
2020	2.0	36,262	108,774	145,036	1,324	2	1,326	0.3	0.2	0.5
2021	2.1	38,082	114,882	152,964	1,398	2	1,400	0.3	0.2	0.6
2022	2.5	43,620	133,479	177,099	1,625	3	1,627	0.4	0.2	0.6
2023	2.6	46,528	143,247	189,776	1,743	3	1,746	0.4	0.3	0.7
2024	2.9	51,237	159,057	210,294	1,936	3	1,939	0.5	0.3	0.8
2025	3.0	52,678	163,896	216,574	1,995	3	1,998	0.5	0.3	0.8
2026	3.3	56,788	177,699	234,488	2,163	3	2,166	0.5	0.3	0.8
2027	3.3	56,699	177,400	234,099	2,159	3	2,162	0.5	0.3	0.8
2028	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2029	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2030	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2031	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2032	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2033	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2034	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2035	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2036	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2037	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9
2038	3.5	60,014	188,533	248,548	2,295	4	2,298	0.5	0.3	0.9

[1]BCF = billion cubic feet
[2]Prod = production; Comb = combustion

Table C-4
CO2, CH4, and N2O Emissions from Federal Coalbed Natural Gas Production and Combustion

Year	Federal RFD CBNG Production Rate (BCF)[1]	CO_2 (Metric Tons)[2]			CH_4 (Metric Tons)[2]			N_2O (Metric Tons)[2]		
		Prod	Comb	Total	Prod	Comb	Total	Prod	Comb	Total
2019	23.4	6,554	1,272,229	1,278,783	2715	24	2739	0.04	2.3	2.4
2020	24.1	6,626	1,310,782	1,317,408	2797	25	2822	0.04	2.4	2.4
2021	24.8	6,697	1,349,334	1,356,032	2879	26	2905	0.04	2.5	2.5
2022	25.5	6,770	1,387,887	1,394,656	2962	26	2988	0.04	2.5	2.6
2023	29.7	7,201	1,619,201	1,626,402	3455	31	3486	0.05	3.0	3.0
2024	34.7	7,704	1,889,068	1,896,772	4031	36	4067	0.05	3.5	3.5
2025	35.4	7,776	1,927,620	1,935,396	4113	36	4150	0.05	3.5	3.6
2026	36.8	7,920	2,004,725	2,012,645	4278	38	4316	0.05	3.7	3.7
2027	37.5	7,992	2,043,278	2,051,270	4360	39	4399	0.05	3.8	3.8
2028	35.4	7,776	1,927,620	1,935,396	4113	36	4150	0.05	3.5	3.6
2029	29.7	7,201	1,619,201	1,626,402	3455	31	3486	0.05	3.0	3.0
2030	25.5	6,770	1,387,887	1,394,656	2962	26	2988	0.04	2.5	2.6
2031	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2032	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2033	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2034	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2035	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2036	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2037	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3
2038	22.7	6,482	1,233,677	1,240,159	2633	23	2656	0.04	2.3	2.3

[1]BCF = Billion Cubic Feet
[2]Prod = production; Comb = combustion

Appendix D

Economic Technical Appendix

This page intentionally left blank.

Appendix D. Economic Technical Appendix

This appendix is intended to provide additional information on the assumptions and methods used to assess impacts to the attitudes, values, and beliefs (AVBs) discussed in **Section 3.5.2** of this SEIS.

D.1 Local Economic Opportunities and Employment

While there is no fixed definition for economic opportunity, most agree that it corresponds to the realization of personal potential and the ability to profit from one's work. This can be achieved through self-employment, or by working for an employer. In relation to the purpose and need outlined in **Section 1.1**, this analysis limited its focus to local economic opportunities and employment supported by economic activity in the coal sector. Qualitative and quantitative data were collected to determine the significance of this industry to the regional social and economic environment. An economic contribution analysis was further conducted to measure how employment and labor income generated in the coal sector further generates additional economic opportunities and employment in other sectors of the regional economy. AVBs associated with local economic opportunities and employment would be supported by economic activity in the coal sector, and declines in local economic opportunities and employment would be considered not to support these AVBs.

The first step in conducting the contribution analysis was to obtain from the Mine Safety and Health Administration the 2018 production and employment data for the 12 mines operating in the BFO. These data were then used to estimate an average production volume per job that could be applied to annual federal production levels forecasted under the RFD (**Appendix B**). Next, a regional input-output model for the seven counties was generated using IMPLAN software and databases,[1] and response coefficients for a job change in employment in the coal sector were obtained. These response coefficients were then applied to direct employment supported by federal coal production under the RFD to estimate its annual direct, indirect, and induced economic contributions. Economic contributions were measures in terms of jobs, income, and economic output (i.e., value of production). As described in **Section 3.5.2,** direct contributions are those in the coal industry, indirect contributions are those in the coal industry's supply chain, and induced contributions are those in industries where direct and indirect labor wages are spent.

Projected annual average contributions over the next 20 years are reported in **Section 3.5.2**. The RFD forecasts periods of both rising and declining production (**Appendix B**). Economic activity (i.e., jobs, income and the value of output in industries) will fluctuate with production levels. Annual average contributions during these periods of expansion and contraction are reported below.

[1] IMPLAN is a platform that combines a set of extensive databases, economic factors, multipliers, and demographic statistics with a highly refined modeling system that is fully customizable. It is one of the most widely used input-output models for conducting regional economic analyses. More information on IMPLAN software and databases is available at: https://www.implan.com/

Table D-1
Average Annual Economic Contributions
(2019–2023) in Millions of 2018 Dollars

Type of Effect	Employment	Labor Income	Output
Direct	3,551	$ 407.2	$ 3,582.0
Indirect	3,085	$ 258.5	$ 760.8
Induced	2,430	$ 99.0	$ 332.4
Total	**9,066**	**$ 764.7**	**$ 4,675.2**

Table D-2
Average Annual Economic Contributions
(2024–2027) in Millions of 2018 Dollars

Type of Effect	Employment	Labor Income	Output
Direct	3,291	$ 377.3	$ 3,319.1
Indirect	2,859	$ 239.5	$ 704.9
Induced	2,252	$ 91.8	$ 308.0
Total	**8,402**	**$ 708.6**	**$ 4,332.0**

Table D-3
Average Annual Economic Contributions
(2028–2030) in Millions of 2018 Dollars

Type of Effect	Employment	Labor Income	Output
Direct	3,407	$ 390.6	$ 3,436.4
Indirect	2,960	$ 247.9	$ 729.8
Induced	2,331	$ 95.0	$ 318.9
Total	**8,698**	**$ 733.5**	**$ 4,485.1**

Table D-4
Average Annual Economic Contributions
(2031–2038) in Millions of 2018 Dollars

Type of Effect	Employment	Labor Income	Output
Direct	3,390	$ 388.7	$ 3,419.5
Indirect	2,945	$ 246.7	$ 726.3
Induced	2,320	$ 94.5	$ 317.3
Total	**8,655**	**$ 729.9**	**$ 4,463.1**

D.2 MINERAL REVENUES AND FUNDING FOR PUBLIC SERVICES

As discussed in **Section 3.5.2**, Wyoming and local governments, municipalities, and special districts rely heavily on revenues generated from mineral leasing and production. Forty-nine percent of federal mineral receipts are disbursed to Wyoming and distributed according to its statutes. Wyoming also assesses a severance tax on all minerals extracted in the state. These revenues are distributed to statewide funds and local governments according to a legislatively established two-tier formula.

In addition to federal and state revenues, federal production and the facilities and equipment at mines are also subject to county property taxes, known as ad valorem taxes. While local governments may receive a small disbursement of mineral revenues from the State, ad valorem mineral revenues account for a much larger share of total revenues at the county level each year. This is vital funding for school districts, libraries, workforce centers, public safety services, and public works projects. AVBs associated with the provision of these public services are supported by mineral revenues generated from the production of coal; declines in the funding for and provision of these services would be considered not to support these AVBs.

Since federal, State, and local mineral revenues are based on the value of production, with the exception of federal rents, they are highly responsive to changes in market conditions. As production changes in response to changes in price and demand, so does the assessed value of production subject to set royalties and tax rates. Projected mineral revenues under the RFD were estimated, based on a number of assumptions, including annual production levels, projected coal prices over the next 20 years, royalty and tax rates, and the number of federal coal acres under lease. Assumptions for the various calculations are reported below in **Table D-5**. Average annual mineral revenue estimates for the four time periods reported above are included in **Tables D-6** through **D-9**.

Table D-5
Assumptions for Estimating Mineral Revenues Between 2019 and 2038

Type	Assumptions
Production	Annual production was provided by the RFD (**Appendix B**). The southernmost mine straddles the Campbell and Converse county line and currently produces one-third of its annual production from minerals in Converse County. Coal tracts in Converse County are anticipated to be mined out within the next 10 years.
Price	A weighted average price was estimated by averaging EIA price forecasts for Wyoming Powder River Basin coal under the high and low economic growth scenarios and weighting average prices by annual production under the RFD.
Federal royalties	Federal royalties were estimated at 12.5% of the market value of federal mineral production.
Federal rents	Rents on federal leases were estimated at $3 per acre. Since it is highly uncertain how many acres will be held under lease over the next 20 years, acreage subject to annual rents was held constant even though acreages may change as areas are mined out or additional tracts are leased
Severance taxes	State severance taxes were estimated at 7% of market value of federal mineral production.
Ad valorem	Ad valorem taxes were estimated based on a 59.88 mill levy on the market value of federal production in Campbell County and 65.75 mill levy on the market value of federal mineral production in Converse County.

Table D-6
Average Annual Mineral Revenues
(2019–2023) in Millions of 2018 Dollars

Type of Effect	Mineral Revenues
Federal[1]	$ 360.3
State	$ 201.4
Local	$ 171.9

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

Table D-7
Average Annual Mineral Revenues
(2024–2027) in Millions of 2018 Dollars

Type of Effect	Mineral Revenues
Federal[1]	$ 333.9
State	$ 186.6
Local	$ 159.3

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

Table D-8
Average Annual Mineral Revenues
(2028–2030) in Millions of 2018 Dollars

Type of Effect	Mineral Revenues
Federal[1]	$ 345.7
State	$ 193.2
Local	$164.8

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

Table D-9
Average Annual Mineral Revenues
(2031–2038) in Millions of 2018 Dollars

Type of Effect	Mineral Revenues
Federal[1]	$ 344.0
State	$ 192.2
Local	$ 163.7

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

D.3 OTHER RESOURCES

Many values associated with other affected resources have nothing to do with how these resources stimulate economic activity, generate revenues, or contribute to gross domestic product. While people often do not have to pay to gain access to these natural resources, they still derive satisfaction and well-being from their interactions with the environment. These interactions can include both direct on-site interactions and those independent of their direct use. Commonly referred to as passive use values, these non-use values can include those derived from knowing the resource exists, knowing there is the option to use the resource in the future, off-site interactions, and knowing that future generations will also have the ability to derive value from the resource. Collectively, these use and passive use values influence the AVBs by which individuals view resources and impacts on these resources. AVBs associated with biological and physical resources will be supported when actions do not adversely affect them, and adverse impacts on these resources would be considered not to support these AVBs.

D.3.1 Biological and Physical Resources

AVBs associated with air, water, and wildlife generally relate to their overall quality. People often acknowledge that they care about and derive value from clean air and water and healthy wildlife. AVBs associated with these resources generally support conservation and coincide with negative AVBs toward environmental degradation, as degradation can adversely affect the health of these resources.

Impacts on air resources were analyzed in terms of emissions generated from oil and gas development forecast in the RFD for the 2015 BFO RMP and the RFD for coal development outlined in **Appendix B**. These impacts are discussed in Section 4.1.1 of the 2015 Proposed RMP/Final EIS and **Section 3.5.1** of this SEIS/RMPA.

Impacts on wildlife were determined based on possible surface disturbances in areas with development potential carried forward through the suitability screen. Impacts on wildlife are discussed in **Section 3.5.3**, Biological Resources, of this SEIS/RMPA. Potential adverse impacts on these resources would be considered not to support these AVBs.

Social Cost Metrics

A subset of AVBs associated with air resources directly pertain to GHGs and climate change. During public scoping, the BLM received several comments advocating for the supplement environmental review in response to the opinion and order of the United States District Court, District of Montana (*Western Organization of Resource Councils, et al. vs. BLM*) to include monetary estimates of damages associated with GHGs and climate change. Other commenters argued that environmental reviews under NEPA are required to monetize the social costs of GHGs and climate change when the economic benefits of fossil fuel extraction have been monetized, and that the social cost of carbon (SCC) and social cost of methane (SCM) must be used to analyze and disclose the significance of emissions resulting from management of oil gas and coal under the SEIS/RMPA.

While the BLM did consider using SCC/SCM protocols, they were ultimately not carried forward for analysis for several reasons. First, monetary estimates of damages associated with GHGs are not useful for informing decisions when they cannot be considered alongside other monetized costs and benefits or used in the calculation of net benefits or cost-benefit ratios. Without monetized estimates of other impacts, including those on other resources, and of social benefits realized through industrial efficiencies, technological advances, and time savings, there is no context in which social costs of GHGs can be interpreted.

While **Section 3.5.2** provides estimates of economic activity and mineral revenues in relation to expressed attitudes, values, and beliefs associated with local economic opportunities and employment and mineral revenues and funding for public services. Estimates of employment, income, and revenues were not expressed as benefits or costs, thus they are not directly comparable to monetary estimates of the social cost of GHGs.

While employment, income, and revenues may be perceived as benefits by employees, local governments, and residents, they may also be perceived as costs to the employer; therefore, it is critical to distinguish that how people may perceive an economic impact is not the same as, nor should be interpreted as, a cost or a benefit. This is a key distinction discussed in economic literature (Boardman et al. 2011; Watson et al. 2007; Kotchen 2011).

A report by Power et al. (2016) illustrates the distinction between economic impacts and economic costs and benefits. Specifically, the report states, "Economic Impacts and Economic Benefits and Costs are conceptually different types of economic consequences associated with a local economic change such as changes in coal mining." They should not be confused or added together. Power et al. (2016) uses the phrase "local economic vitality" when discussing the impacts of a coal mine on local employment, payroll, and payments to governments. These are the economic metrics in which those concerned about expanding the volume of economic activity taking place in a community are most interested. When discussing actual benefits and costs, the phrase "local economic well-being" is used. Some benefits and costs are associated with commercial exchange, but other economic benefits and costs are not evaluated by commercial markets. They are non-market in character and have to be accounted for in other ways. Most environmental benefits and costs are non-market in character but must nonetheless be analyzed in an EIS. The report further states, "Local economic impacts must be distinguished from local economic benefits and costs when considering the economic consequences of a coal mine or coal lease". Also stated is, "In our discussions thus far, we have phrased the potential economic consequences of coal mining in two different ways: Impacts on local economic vitality and impacts on local economic well-being. These are not offered as two different ways of labeling the same thing. These labels refer to the two quite different types of economic consequences we have been discussing". Finally, the report describes how the U.S. Forest Service distinguishes between economic impacts and economic costs and benefits:

- Economic impacts are not measures of economic benefits and costs.
- Economic impacts are typically measured at the local level while economic benefits and costs typically are measured on the basis wherever and to whomever they may accrue.

While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in the SEIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects."

This evaluation of climate impacts fully responds to the specific requirements of the District Court of Montana's ruling. Specifically, the BFO SEIS/RMPA quantifies the GHG emissions based on global warming potential (GWP) values for both 20- and 100-year time horizons. This is done to calculate carbon dioxide equivalents (CO_2e) (see **Tables 3-4** through **3-7** in the BFO SEIS/RMPA for a description of the GWPs and scientific relevance of these two time horizons). Additionally, GHG emissions from coal, oil, and gas from the BFO are reported as a percentage of state, national, and global emissions.

In addition to quantifying GHG emissions, the BLM further considered potential impacts of climate change on people and qualitatively discussed that shifts in precipitation and temperatures may adversely affect human health and safety in a number of ways. The BLM took this approach because climate change and potential climate impacts, in and of themselves, are often not well understood by the general public (Etkin and Ho 2007; National Research Council 2009). This is in part due to the challenges associated with communicating about climate change and climate impacts, stemming in part from the fact that most causes are invisible, such as greenhouse gases, and there is a long lag time and geographic scale between causes and effects (National Research Council 2010).

Research indicates that for difficult environmental issues, such as climate change, most people more readily understand the issue under the following scenarios:

- If it is brought to a scale that is relatable to their everyday lives (Dietz 2013)
- When the science and technical aspects are presented in an engaging way, such as via narratives about the potential implications of the climate impacts (Corner, Lewandowsky, Phillips, and Roberts 2015)
- If examples are used and information is made relevant to the audience and the local and global scales are linked (National Research Council 2010)

The BLM's approach recognizes that there are environmental impacts associated with the development and use of fossil fuels. It quantifies potential GHG emission estimates and discusses potential climate change impacts qualitatively; this effectively informs the decision-maker and the public of the potential for GHG emissions and the potential implications of climate change. This approach presents the data and information in a manner that follows many of the guidelines for effective climate change communication developed by the National Academy of Sciences (National Research Council 2010). It makes the information more readily understood and relatable to the decision-maker and the general public.

Finally, the SCC/SCM protocols do not measure the actual incremental impacts of a project on the biophysical environment in a specific geographic location and does not include all damages or benefits from greenhouse gas emissions. The SCC/SCM protocols estimate economic damages associated with an increase in CO_2 emissions, typically expressed as a 1 metric ton increase in a single year, and includes potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years.

The estimate is developed by aggregating results "across models, over time, across regions and impact categories, and across 150,000 scenarios" (Rose et al. 2014, p. 8-1). The dollar cost figure arrived at is based on the SCC/SCM calculation and represents the value of damages avoided if, ultimately, there is no increase in carbon or methane emissions. But the dollar cost figure is generated in a range and provides little benefit in assisting the BLM Authorized Officer's decision for this RMPA.

D.4 REFERENCES

Boardman, A. E., D. H. Greenberg, A. R. Vining, and D. L. Weimer. 2011. *Cost-Benefit Analysis: Concepts and Practice*, fourth edition. Publisher: Pearson Education Inc., London, England.

Corner, A., Lewandowsky, S., Phillips, M. and Roberts, O. 2015. The uncertainty handbook-A practical guide for climate change communicators. Bristol: University of Bristol.

Dietz, T. 2013. Bringing values and deliberation to science communication. Proceedings of the National Academy of Sciences (PNAS) 110(3): 14081-14087.

Etkin, D., and E. Ho. 2007. "Climate change: Perceptions and discourses of risk." *Journal of Risk Research* 10(5): 623–641, DOI: 10.1080/13669870701281462

Haveman, R. H. and S. Farrow. 2011. "Labor expenditure and benefit-cost accounting in times of unemployment." *J. Benefit-Cost Analysis* 2(2): Article 7.

Kotchen, M. J. 2011. Cost-benefit analysis. Chapter in: Encyclopedia of climate and weather, Second edition. Schneider, S.H., editor-in-chief. New York, Oxford University Press: pp 312-315.

National Research Council. 2010. Informing an effective response to climate change: Washington D.C.., The National Academies Press.

Power, T. M., D. S. Power, and J. M. Brown. 2016. The Economic Consequences of the Federal Coal Leasing Program: Improving the Quality of the Economic Analysis. July 27, 2016. Missoula, Montana.

Rose, S. K., D. Turner, G. Blanford, J. Bistline, F. de la Chesnaye, and T. Wilson. 2014. Understanding the Social Cost of Carbon: A Technical Assessment. EPRI, Palo Alto, California. Report #3002004657

Watson P., Wilson, J, Thilmany, D., and Winter, S. 2007. Determining economic contributions and impacts: What is the difference and why do we care? JRAP 37(2):1-15.

Appendix E

Coordination and Consultation

This page intentionally left blank.

TABLE OF CONTENTS

Chapter Page

TABLES

Page

This page intentionally left blank.

Appendix E. Coordination and Consultation

E.1 Introduction

This appendix describes the public outreach and participation opportunities associated with developing this SEIS/RMPA. As part of the process, the BLM consulted and coordinated with tribes, government agencies, and other stakeholders.

The BLM conducts land use planning in accordance with NEPA requirements, CEQ regulations, and DOI and BLM policies and procedures for implementing NEPA. NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early in and throughout the planning process. This is to develop a reasonable range of alternatives to proposed actions and to prepare environmental documents that disclose the potential impacts of proposed actions and alternatives.

The BLM involved the public and other agencies by way of *Federal Register* notices, public and informal meetings, individual contacts, media releases, and the SEIS/RMPA website. This involvement was at the heart of the planning process leading to this document.

E.2 Public Collaboration and Outreach

Public involvement is a vital and legal component of the SEIS/RMPA process. Public involvement vests the public in the decision-making process and allows for full environmental disclosure. Guidance for implementing public involvement under NEPA is codified in 40 CFR 1506.6, thereby ensuring that federal agencies make a diligent effort to involve the public in the NEPA process.

The BLM involved the public in the SEIS/RMPA during the following phases:

- Scoping before NEPA analysis to determine the scope of issues and alternatives to be addressed in the RMP/EIS
- During development of alternatives to be considered in the SEIS/RMPA
- Collaboration with federal, state, local, and tribal governments, and cooperating agencies
- DSEIS public comment period
- Governor's consistency review
- Protest period

The public scoping phase has been completed and is described below; the public outreach and collaboration phases are ongoing throughout the SEIS/RMPA process. The public can obtain information from the project's ePlanning website, https://go.usa.gov/xP6S3.

E.3 Public Scoping

The purpose of the public scoping process is to identify issues and planning criteria that should be considered in the SEIS/RMPA and to initiate public participation in the planning process. Detailed information about public scoping can be found in the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website, https://go.usa.gov/xP6S3.

E.3.1 Public Notification

Notice of Intent

The formal public scoping process for the SEIS/RMPA began with the publication of the NOI in the *Federal Register* on November 28, 2018 (FR Doc. 2018–25845); the BLM also posted the NOI on the project website (https://go.usa.gov/xP6S3). The BLM notified the public of its intent to prepare the SEIS/RMPA for the 2015 Buffalo Field Office Approved Resource Management Plan. It is in response to a United States District Court, District of Montana, opinion and order. The NOI included a call for coal and other resource information and identified SEIS topics. The scoping period lasted 30 days, ending on December 28, 2018.

Project Website

The BLM maintains a project website with information related to the development of the SEIS: https://go.usa.gov/xP6S3. The website includes background documents, maps, public meeting information, and contact information.

News Releases

During the public scoping period, the BLM sent press releases to 30 newspapers and websites, 8 television stations, and 13 radio stations in the region, announcing public involvement opportunities, scoping meetings, and educational forums. The complete list of media outlets is included as Appendix B of the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website, https://go.usa.gov/xP6S3.

Other Notifications

In addition to issuing press releases, the BLM notified the public about the scoping process via a variety of sources. Local and regional articles and news bulletins regarding some aspect of the SEIS/RMPA process were published in newspapers, both in and outside of the planning area.

Scoping Meetings

Following publication of the NOI for the SEIS/RMPA, the BLM conducted one scoping meeting in Gillette, Wyoming, on December 19, 2018. The meeting began with a PowerPoint presentation describing the purpose of the SEIS/RMPA, project approach, and opportunities for public involvement. Materials presented and additional information can be found in the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website: https://go.usa.gov/xP6S3.

Scoping Comments Received

The BLM received 37 unique written comment letters during the public scoping period, November 29 to December 28, 2018. These submissions contained 278 unique comments. Detailed information about the comments and the public outreach process can be found in the Buffalo Supplemental EIS and RMP Amendment Scoping Report, available on the project's ePlanning website: https://go.usa.gov/xP6S3. The issues identified during public scoping and outreach helped us refine the list of planning issues, which guided the development of alternatives management strategies for the SEIS/RMPA.

E.4 Public Comments on the Draft SEIS/RMPA

The BLM published a notice of availability for the Draft SEIS/RMPA in the *Federal Register* on May 17, 2019, which initiated the 90-day comment period. On June 27, the BLM hosted a public meeting at the Campbell County Public Library to present the Draft SEIS/RMPA to the public and solicit comments. Two members of the public attended the meeting.

All public comments are posted on the project's ePlanning website, at https://go.usa.gov/xP6S3. **Appendix I** is a record of BLM responses to substantive comments.

E.5 PROTEST PROCESS

The notice of availability for the Proposed RMPA/Final SEIS published by the US Environmental Protection Agency in the *Federal Register* starts the 30-day protest period. Detailed information on submitting protests can be found on the BLM protest website, https://www.blm.gov/programs/planning-and-nepa/public-participation/filing-a-plan-protest. All protests must be received by the close of the protest period.

A signed ROD/Approved RMPA will be issued after the Governor's consistency review and after protests have been resolved, at which point the decision is final and the RMPA becomes official.

E.6 MAILING LIST

The BLM initially compiled a mailing list of over 63 individuals, agencies, and organizations who had participated in past BLM projects. Attendees at all public meetings were added to the mailing list if they wanted to receive or continue to receive project information. In addition, all individuals or organizations who submitted scoping comments were added to the mailing list.

Through this process, the BLM was able to revise the mailing list to remove undeliverable addresses and to add new interested parties. The mailing list currently includes approximately 84 entries. Throughout the planning process, the BLM will continue to accept requests to be added to or to remain on the official SEIS/RMPA distribution list. The complete mailing list is included as part of the administrative record.

E.7 LIST OF PREPARERS

Table E-1
List of Preparers

Affiliation/Preparer	Name	Role/Responsibility
BLM Interdisciplinary Team	Todd Yeager	Buffalo Field Manager
	Thomas Bills	Planning and Environmental Specialist (SEIS/RMPA Team Lead)
	Casey Freise	Assistant Field Manager—Lands and Minerals
	Chris Durham	Assistant Field Manager—Resources
	Walter Loewen	Wyoming State Office Planner
	Melissa Hovey	Air Quality Specialist
	Jennifer Dobb	Economist
	Arnie Irwin	Soil Scientist
	Brent Sobotka	Hydrologist
	Amber Haverlock	Realty Specialist
	Georges L. "Buck" Damone III	Archaeologist
	Dusty Hill	Geologist
	Shari Ketcham	Biologist
	Dusty Kavitz	GIS Specialist
	Will Robbie	Petroleum Engineer
	Steve Wright	Coal Program Manager
Environmental Management and Planning Solutions, Inc. (EMPSi)	David Batts	Program Manager
	Holly Prohaska	Project Manager
	Katie Patterson	Leasable Minerals (Oil, Gas, Coal)
	Francis Craig	Minerals; Public Heath
	Zoe Ghali	Social and Economic
	Angelo Sisante	Social and Economic
	Meredith Zaccherio	Vegetation and Special Status Plants

Affiliation/Preparer	Name	Role/Responsibility
Environmental Management and Planning Solutions, Inc. (EMPSi) *(continued)*	Matthew Smith	Soil and Water Resources
	Julie Remp	Wildlife and Special Status Wildlife
	Amy Cordle	Air Quality and Climate Change
	Derek Holmgren	Water Resources
	Peter Gower, AICP, CEP	Lands and Realty/Rights-of-Way/Renewable Energy
	Kevin Doyle	Paleontological Resources
	Derek Holmgren	Visual Resources
Ramboll	Krish Vijayaraghavan	Air Quality and Climate Change
	Ralph Morris	Air Quality and Climate Change
	Courtney Taylor	Air Quality and Climate Change
	Susan Kemball-Cook, PhD	Air Quality and Climate Change
	Tom Whitehead, PG	Soils and Geography

E.8 TRIBAL CONSULTATION

Consultation with Native American tribes is part of the NEPA scoping process and a requirement of FLPMA. On November 9, 2018, the BFO sent letters to the following tribes, inviting them to be cooperating agencies and to assist with the SEIS/RMPA. In the letters, the BLM also asked if the tribes wanted to initiate formal government-to-government consultation. No tribes responded to the request; however, the BLM will continue to inquire throughout development and implementation of the SEIS/RMPA. During the public comment period on the Draft SEIS/RMPA, the Yankton Sioux Tribe provided feedback related to consultation and noted that they were opposed to any coal extraction.

Table E-2
Tribes Contacted for Government-to-Government Consultation

Tribal Government
Cheyenne River Sioux
Crow
Crow Creek Sioux
Eastern Shoshone
Ft. Peck/Assiniboine/Sioux
Lower Brule Sioux
Northern Arapahoe
Northern Cheyenne
Oglala Sioux
Rosebud Sioux
Santee Sioux
Sisseton-Wahpeton Oyate
Spirit Lake Tribe
Standing Rock Sioux
Yankton Sioux

E.9 AGENCY CONSULTATION

The SEIS/RMPA is within the scope of both the Endangered Species Act (2015 Biological Opinion) and National Historic Preservation Act consultations. There are no effects on a listed or proposed species or designated or proposed critical habitat or National Register eligible sites that were not considered in the 2015 RMP.

E.10 COOPERATING AGENCIES

The BLM is the lead agency for the SEIS/RMPA. The BLM wrote to 12 local, state, and federal agencies, inviting them to participate as cooperating agencies for the SEIS/RMPA. Ten representatives agreed to participate as designated cooperating agencies (**Table E-3**).

Table E-3
Cooperating Agency Participation

Campbell County Commission
Johnson County Commission
Sheridan County Commission
Campbell County Conservation District
Office of the Governor, Wyoming
Wyoming Department of Environmental Quality
Wyoming Department of Game and Fish
United States Environmental Protection Agency, Region 8
United States Department of the Interior, Office of Surface Mining and Reclamation
United States Department of the Interior, Fish and Wildlife Service

This page intentionally left blank.

Appendix F
Glossary

This page intentionally left blank.

Appendix F. Glossary

1976 Federal Leasing Law. The 1976 Federal Leasing Law mandates that 49 percent of collected federal royalties are returned to the state where natural resource extraction occurred. The remainder of the collected federal royalty rates are distributed to federal funds and administration fees.

Ad valorem tax. Ad Valorem Taxes are imposed by counties within Wyoming and vary from county to county. Ad Valorem percentages are based on mill levies, where a one percent Ad Valorem tax is assessed on the taxable value of production per 10 mill levies in a county.

Alluvial valley floor. The unconsolidated stream laid deposits holding streams where water availability is sufficient for sub-irrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits.

Area of critical environmental concern. Area where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources, or other natural systems or processes; or to protect human life and safety from natural hazards.

Best management practices (BMPs). A suite of techniques that guide or may be applied to management actions to aide in achieving desired outcomes. BMPs are often developed in conjunction with land use plans, but they are not considered a planning decision unless the plans specify that they are mandatory.

Big game crucial winter range. Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

Carbon dioxide equivalent. The amount of a greenhouse gas that would have the same global warming impact as carbon dioxide when measured over a specific timescale. Since different gases contribute to different levels of atmospheric warming, the total carbon dioxide equivalent is calculated by multiplying the emissions of each greenhouse gas by its global warming potential and then summing across all gases.

Coal development potential area. The area determined to have potential for coal development, using coal stripping ratios in accordance with the first required coal screen under 43 CFR 3420.1-4.

Coal excise tax. A production tax levied on domestic coal production within the United States. Revenue is collected by the IRS and funds the Black Lung Disability Trust Fund (BLDTF). Coal Excise Taxes were restructured at the beginning of CY 2019 to $0.25 per short ton of produced coal but may not exceed 2 percent of the market value of production.

Connectivity habitat. Connectivity habitats (as defined in Wyoming EO 2015-4) are state-designated areas identified as important for to maintain transmission of genetic material between core area populations. It may not include breeding, late brood-rearing, or winter habitats. Along with core habitat, connectivity habitat is one of two components of PHMA.

Core population area. Core habitats (as defined in Wyoming EO 2015-4) are state-designated areas identified as the most important for Greater Sage-Grouse and include breeding, late brood-rearing, and

winter habitats. It does not include known migration or connectivity corridors or winter concentration areas. Along with connectivity habitat, core habitat is one of two components of PHMA.

Critical habitat. An area occupied by a threatened or endangered species "on which are found those physical and biological features: (1) essential to the conservation of the species, and (2) which may require special management considerations or protection" (as defined under the ESA of 1973).

Crucial habitat. Parts of the habitat necessary to sustain a wildlife population at critical periods of its life cycle. This is often a limiting factor on the population, such as breeding or winter habitat.

Cultural resource. The present expressions of human culture and the physical remains of past activities, such as historic buildings, structures, objects, districts, landscapes, and archaeological sites. These resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They also may include sacred sites and natural features of landscapes that are significant to living communities.

Decision area. This area is where the BLM administers federal land that contains coal in the BFO.

Downstream combustion: Combustion of coal, oil or gas at a location different from the place of production or development.

Endangered species. Any species that is in danger of extinction throughout all or a significant portion of its range, as determined by the US Fish and Wildlife Service.

General habitat management area (GHMA). An area of seasonal or year-round Greater Sage Grouse habitat outside of priority habitat.

Greenhouse gas equivalency. A measure to understand in everyday terms what reducing or increasing greenhouse gas emissions by a specific amount means, such as the number of power plants or cars that would produce the same emissions, the number of wind turbines running that would avoid these emissions, and the number of homes whose electricity use would generate the same amount of emissions.

Habitat. In wildlife management, the major elements of habitat are considered to be food, water, cover, and living space. The definition includes the following two usages: a species-specific environment or environmental conditions suitable for occupancy by that species, or; a particular land cover type that provides an environment or environmental conditions suitable for occupancy by many species.

Historic property. Cultural resources—such as historic buildings, structures, objects, districts, or archaeological sites—that are listed on, or eligible for inclusion on, the National Register of Historic Places.

IMPLAN. IMPLAN (Impact Analysis for Planning) is an Input-Output model designed to identify regional economic impacts in response to a change in the economy.

Invasive species. A nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Lek. A traditional breeding area for Greater Sage-Grouse and sharp-tailed grouse in which males assemble to establish dominance, display, and breed. These areas are usually open areas with short vegetation within sagebrush habitats, usually on broad ridges, benches, or valley floors where visibility and hearing acuity are excellent. Also called dancing grounds or strutting grounds.

Metric ton. A unit of weight equal to 1,000 kilograms (2,205 pounds).

Mine Mouth. Mine Mouth Electric Plants are coal-burning electricity generating power plans that purchase directly from coal mines. They report prices to the Energy Information Administration Agency (EIA) within the US Department of Energy.

National Register of Historic Places (NRHP). A listing of resources that are considered significant at the national, state, or local level and that have been found to meet specific criteria of historic significance, integrity, and age.

Occupied lek. A lek that has been active during at least one strutting season within the last 10 years.

Office of Natural Resource Revenue. The Office of Natural Resource Revenue is an office with the US Department of Interior responsible for collecting, accounting, and verifying natural resource and energy revenues due to States, American Indians, and the US Treasury.

Priority habitat management area (PHMA). Areas that have been identified as having the highest conservation value to maintaining sustainable Greater Sage-Grouse populations; they include breeding, late brood-rearing, and winter habitats. Core population areas and connectivity habitat, as described in Wyoming EO 2015-4, are PHMA.

Raptor. Bird of prey with sharp talons and strongly curved beaks (hawks, falcons, owls, and eagles).

Recoverable reserves. Recoverable reserves represent the tonnage of coal that can be recovered from existing coal reserves at producing coal mines.

Reasonably Foreseeable Development (RFD) area. This is the area of current leases and leases by application for the BFO. It includes 141,762 acres in Campbell County.

Riparian habitat. An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores and streambanks are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Section 106 process. Refers to a section of the National Historic Preservation Act of 1966 (NHPA) that requires Federal agencies to take into account the effects of their actions on historic properties. The NHPA created the Advisory Council on Historic Preservation (ACHP) and authorized the ACHP to issue regulations governing the implementation of Section 106. These regulations are set forth in 36 C.F.R. Part 800.

Section 7 consultation. The requirement of Section 7 of the ESA that all federal agencies consult with the USFWS or the National Marine Fisheries Service if a proposed action might affect a federally listed species or its critical habitat.

Sensitive species. Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. Primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

Severance tax. Severance Taxes are statewide taxes imposed on the extraction of natural resources intended for consumption. The Severance Tax rate for Wyoming is 7 percent.

Short ton. A unit of mass equal to 2,000 pounds.

Special status species. Special status species are species proposed for listing, officially listed as Threatened, Endangered, proposed, or are candidates for listing as Threatened or Endangered under the provisions of the Endangered Species Act; those listed by a state in a category implying potential endangerment or extinction; and those designated by the State Director as sensitive.

Stripping ratio. The amount of overburden that must be removed to gain access to a similar amount of coal.

Threatened species. Any species that is likely to become Endangered within the foreseeable future throughout all or a significant portion of its range, as determined by the US Fish and Wildlife Service.

Tons. The equivalent of 2,000 pounds. All tons in this EIS are short tons.

Vegetation community. An assemblage of plant populations in a common spatial arrangement.

Vegetation type. A plant community with distinguishable characteristics described by the dominant vegetation present.

Waterway. Any body of water including lakes, rivers, streams, and ponds whether or not they contain aquatic life.

Wetlands. Areas that are inundated or saturated by surface or groundwater often and long enough to support and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

Appendix G
References

This page intentionally left blank.

Appendix G. References

AAR (Association of American Railroads), 2018. Railroads and Coal. Internet website: https://www.aar.org/wp-content/uploads/2018/05/AAR-Railroads-Coal.pdf.

BEA (Bureau of Economic Analysis). 2019. CAEMP25N: Total Full-Time and Part-Time Employment by NAICS Sector. Internet website: https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1.

BLM (Bureau of Land Management). 2000. Record of Decision and Approved Resource Management Plan for Public Lands Administered by the Newcastle Field Office. BLM/WY/PL-00/027+1610. Newcastle, Wyoming. September 2000.

_____. 2001. Approved Resource Management Plan for the Public Lands Administered by the Bureau of Land Management Buffalo Field Office. US Department of the Interior, Bureau of Land Management, Buffalo Field Office. Buffalo, Wyoming. April 2001.

_____. 2006. Instruction Memorandum No. 2006-073, Weed-Free Seed Use on Lands. Administered by the Bureau of Land Management. U.S. Department of the Interior, Bureau of Land Management.

_____. 2007. Proposed Resource Management Plan and Final Environmental Impact Statement for the Casper Field Office Planning Area. BLM/WY/PL-07/017+1610. Casper, Wyoming. June 2007.

_____. 2008. Handbook H-1790-1. BLM NEPA Handbook. Washington, DC. January 2008.

_____. 2009. Final Environmental Impact Statement for the South Gillette Area Coal Lease Applications: WYW172585, WYW173360, WYW172657, WYW161248. BLM/WY/PL-09/029+1320. Gillette, Wyoming. August 2009.

_____. 2010. Final Environmental Impact Statement for the Wright Area Coal Lease Applications. BLM/WY/PL-10/022+1320. Gillette, Wyoming. July 2010.

_____. 2015. Buffalo Field Office Proposed Resource Management Plan and Final EIS. BLM/WY/PL-15/022+1610. Buffalo, Wyoming. September 2015.

_____. 2019a. Buffalo Field Office RMP Supplemental EIS and RMPA Scoping Report. Buffalo, Wyoming. March 2019.

_____. 2019b. Miles City Field Office Supplemental Environmental Impact Statement and Resource Management Plan Amendment. Miles City, Montana. September 2019.

BLM GIS Data. 2019. GIS data from the BLM's eGIS server. Buffalo Field Office, Wyoming.

BLS (Bureau of Labor Statistics). 2018. May 2018 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 212100—Coal Mining. Internet website: https://www.bls.gov/oes/current/naics4_212100.htm#51-0000.

BNSF (Burlington Northern Santa Fe). 2017. BNSF Corporate Responsibility and Sustainability Report, 2017. Internet website: http://www.bnsf.com/in-the-community/environment/pdf/sustainability-report-2017.pdf.

_____. 2019. Coal Cars; Thermal Coal. March. Internet website: https://www.bnsf.com/ship-with-bnsf/ways-of-shipping/equipment/coal-cars.html.

CEQ (Council on Environmental Quality) 1997. Environmental Justice Guidance Under the National Environmental Policy Act. Washington DC, December 10, 1997. Internet website: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf.

Conant, R. T., D. Kluck, M. Anderson, A. Badger, B. M. Boustead, J. Derner, L. Farris, et al. 2018. "Northern Great Plains." In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, Volume II (D. R. Reidmiller, C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, and B. C. Stewart, editors). US Global Change Research Program, Washington, DC, USA. Pp. 941–986. doi: 10.7930/NCA4.2018.CH22.

EIA (US Energy Information Administration). 2018. Annual Coal Report 2017. Released November 2018. Internet website: https://www.eia.gov/coal/annual/pdf/acr.pdf.

_____. 2019a. US Energy Information Administration Coal Data Browser, Coal Shipments to Electric Power Sector, Heat Content by Plant, Wyoming 2017. Internet website: https://www.eia.gov/coal/data/browser/#/topic/49?agg=0,2,1&rank=g&geo=vvvvvvvvvvvo&freq=A&start=2001&end=2017&ctype=map&ltype=pin&rtype=s&maptype=0&rse=0&pin=.

_____. 2019b. Annual Energy Outlook 2019 with Projections to 2050. Office of Energy Analysis. Released April 2019. Internet website: https://www.eia.gov/outlooks/aeo/.

EPA (Environmental Protection Agency). 2016. Greenhouse Gas Inventory Guidance, Direct Emissions from Mobile Combustion Sources. Internet website: https://www.epa.gov/sites/production/files/2016-03/documents/mobileemissions_3_2016.pdf.

_____. 2018a. Climate Change Indicators: Greenhouse Gases, Major Long-Lived Greenhouse Gases and Their Characteristics. Internet website: https://www.epa.gov/climate-indicators/greenhouse-gases.

_____. 2018b. Facility Level Information on Greenhouse Gases Tool (FLIGHT). Internet website: https://ghgdata.epa.gov/ghgp/main.do#.

_____. 2018c. EPA Center for Corporate Climate Leadership, GHG Emissions Factors Hub, Emission Factors for Greenhouse Gas Inventories. Internet website: https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.

_____. 2019a. Draft Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2017, EPA 430-P-19-001, February 2019. Internet website: https://www.epa.gov/ghgemissions/draft-inventory-us-greenhouse-gas-emissions-and-sinks-1990-2017.

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

_____. 2014. "Climate Change 2014: Synthesis Report." Contribution of Working Groups I, II, and III to the *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (R. K. Pachauri and L. A. Meyer, Core Writing Team editors). IPCC, Geneva, Switzerland.

MSHA (Mine Safety and Health Administration). 2019. Mine Data Retrieval System. Internet website: https://www.msha.gov/microstrategy.

NOAA (National Oceanic and Atmospheric Administration). 2018. New federal climate assessment for US released. Internet website: https://www.noaa.gov/news/new-federal-climate-assessment-for-us-released.

ONRR (Office of Natural Resource Revenue). 2019. Natural Resource Revenue Data: Wyoming. Internet website: https://revenuedata.doi.gov/explore/WY.

Ramboll. 2019. Ramboll staff calculations.

State of Wyoming. 2015. State of Wyoming Executive Department Executive Order 2015-4 (replaces 2011-5 and 2013-3); Greater Sage-Grouse Core Area Protection. Cheyenne, Wyoming. July 2015.

Union Pacific. 2019. Large Open-Top Hopper: Commodities: Coal, Petroleum Coke, Sand, Rock. Internet website: https://www.up.com/customers/all/equipment/descriptions/open-top_hoppers/index.htm.

USFWS (United States Fish and Wildlife Service). 1992. Endangered and Threatened Wildlife and Plants; Final Rule to List the Plant *Spiranthes diluvialis* (Ute Ladies'-Tresses) as a Threatened Species. *Federal Register*. 57(12): 2048–2054.

USGS (US Geological Survey). 2018. Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14. November 23, 2018. Internet website: https://pubs.er.usgs.gov/publication/sir20185131.

USGCRP (US Global Change Research Program). 2016. "The impacts of climate change on human health in the United States: A scientific assessment." (A. Crimmins, J. Balbus, J. L. Gamble, C. B. Beard, J. E. Bell, D. Dodgen, R. J. Eisen, et al., editors.) US Global Change Research Program, Washington, DC. Internet website: http://dx.doi.org/10.7930/J0R49NQX.

WGFD GIS Data. 2018. Geographic Information System Data. Wyoming Game and Fish Department GIS Datasets. Gillette, Wyoming.

This page intentionally left blank.

Appendix H
Index

This page intentionally left blank.

Appendix H. Index

Appendix I

Public Comments and BLM Response

This page intentionally left blank.

TABLE OF CONTENTS

Chapter Page

TABLE

Page

This page intentionally left blank.

Appendix I. Public Comments and BLM Response

This volume presents comments the BLM received on the Buffalo Field Office SEIS/RMPARMPA. It also includes a description of the public comment process, how all comments were considered, and responses to all substantive comments.

I.1 DRAFT SEIS/RMPA COMMENT PROCESS

The National Environmental Policy Act (NEPA) requires that all substantive comments received before a decision is reached must be considered to the extent feasible and that agencies must respond to all substantive written comments submitted during the public comment period for an EIS (40 CFR 1503.4). Comments must be in writing (including paper or electronic format or a court reporter's transcript taken at a formal public meeting or hearing), substantive, and timely, in order to merit a written response.

Although the BLM diligently considered each comment letter, the comment analysis process involved determining if a comment was substantive or non-substantive. In performing this analysis, the BLM relied on Section 6.9.2, Comments, in the BLM NEPA Handbook H-1790-1 to determine what constituted a substantive comment.

A substantive comment does one or more of the following

- Questions, with a reasonable basis, the accuracy of the information or analysis in the EIS
- Questions, with a reasonable basis, the adequacy of the information or analysis in the EIS
- Presents reasonable alternatives other than those in the Draft EIS that meet the purpose and need of the proposed action and address significant issues
- Questions, with a reasonable basis, the merits of an alternative or alternatives
- Causes changes in or revisions to the proposed action
- Questions, with a reasonable basis, the adequacy of the planning process itself

Additionally, the BLM's NEPA handbook identifies the following types of substantive comments:

- Comments on the Adequacy of the Analysis—Comments that express a professional disagreement with the conclusions of the analysis or assert that the analysis is inadequate are considered substantive; they may or may not lead to changes in the Final EIS. Interpretations of analyses should be based on professional expertise. Where there is disagreement within a professional discipline, a careful review of the various interpretations is warranted. In some cases, public comments may necessitate a reevaluation of analytical conclusions. If, after reevaluation, the BLM Authorized Officer responsible for preparing the EIS does not think that a change is warranted, the response should provide the rationale for that conclusion.
- Comments That Identify New Impacts, Alternatives, or Mitigation Measures—Public comments on a Draft EIS that identify impacts, alternatives, or mitigation measures that were not addressed in the draft are considered substantive. This type of comment requires the BLM

Authorized Officer to determine if it warrants further consideration; if so, he or she must determine if the new impacts, new alternatives, or new mitigation measures should be analyzed in the Final EIS, in a supplement to the Draft EIS, or in a completely revised and recirculated Draft EIS.

- Disagreements with Significance Determinations—Comments that directly or indirectly question, with a reasonable basis, determinations on the significance or severity of impacts are considered substantive. A reevaluation of these determinations may be warranted and may lead to changes in the Final EIS. If, after reevaluation, the BLM Authorized Officer does not think that a change is warranted, the BLM's response should provide the rationale for that conclusion.

Comments that failed to meet the above description were considered non-substantive.

The Draft RMPA/SEIS was published on May 17, 2019, and the 90-day comment period officially ended on August 15, 2019. The BLM received written comments by mail, fax, email, online comment form via the project website in ePlanning (https://go.usa.gov/xP6S3), and handwritten submissions at public meetings.

The BLM held one public meeting during the comment period on June 27, 2019 in Gillette, Wyoming.

Comments received covered a wide spectrum of thoughts, opinions, ideas, and concerns. The BLM recognizes that commenters invested considerable time and effort to submit comments on the Draft RMPA/SEIS. The agency developed a comment analysis method to ensure that all comments were considered, as directed by NEPA regulations. This systematic process ensured that all substantive comments were tracked and considered.

On receipt, each comment letter was assigned an identification number and logged into a database that allowed the BLM to organize, categorize, and respond. Substantive comments from each letter were coded to appropriate categories, based on content, and the link to the commenter was retained. The categories generally follow the sections presented in the Draft RMPA/SEIS, though some related to the planning process or editorial concerns.

The BLM received a total of 23 comment letter submissions. Some commenters expressed personal opinions or preferences, their comments had little relevance to the adequacy or accuracy of the Draft RMPA/SEIS, or their comments represented commentary on management actions that are outside the scope of this NEPA analysis. These commenters did not provide specific information to assist the BLM in making a change to the existing action alternatives, did not suggest new alternatives, and did not take issue with methods used in the Draft RMPA/SEIS; these comments were not addressed further in this document.

The BLM read, analyzed, and considered all comments of a personal or philosophical nature and all opinions, feelings, and preferences for one element or one alternative over another. Because such comments were not substantive, the BLM did not respond to them. It is also important to note that, while the BLM reviewed and considered all comments, none were counted as votes. The NEPA public comment period is neither an election nor does it result in a representative sampling of the population; therefore, public comments are not appropriate to be used as a democratic decision-making tool or as a scientific sampling mechanism.

Commenters who recommended additional studies, data, or scientific literature to be incorporated into the analysis were reviewed by subject matter experts; new information and citations were incorporated into the Proposed RMP/Final EIS, as appropriate. Comments citing editorial changes to the document were reviewed and incorporated. The Final SEIS/RMPA has been technically edited and revised to fix typos, missing references, definitions, and acronyms and provides other clarifications as needed.

I.2 HOW TO READ THIS VOLUME

The BLM assigned a letter number to every unique communication received during the Draft RMPA/SEIS public comment period. **Table I-1** contains all substantive comments with the BLM's responses and is organized by the comment category. Commenter names and applicable organizations or agencies are provided for those submitting letters who did not request their information be withheld.

Table I-1
Substantive Public Comments and BLM Responses

Row #	Organization Name	Comment Text	Response Text
1.	**Best Available Information**		
2.	Institute for Policy Integrity	We also attach as supporting documents: (1) a report on modeling choices, (2) a report on the upstream externalities of PRB coal, (3) our amicus brief from a 10th Circuit case about energy substitution, (4) BOEM's 2015 description of MarketSim, (5) EIA's 2018 updated Coal Market Module, and (6) comments prepared on BLM's 2018 draft EA on the Wright Area Remand. Please note that due to copyright concerns, we are not able to attach every important source. We presume that BLM will have access to the various academic literature we cite, and have included full citations and URLs when available. We also presume that BLM has full access to other government documents that, due to the attachment file size limits, we have not included, such as BLM's own energy substitution analysis in the Greater Mooses Tooth 2 EIS, and the Surface Transportation Board's and FERC's energy substitution analyses in EISs.	The BLM, in developing the RFD, used publicly available data, which are summarized in the EIA's annual energy outlook. Results from the NEMS run are summarized in the Annual Energy Outlook 2019 (AEO 2019). The government considers this the best available information, and it has been used in multiple, accepted federal RFDs. The references show that the BLM analyzed a sufficient range of background information to analyze impacts and to make an informed decision.
3.	Institute for Policy Integrity	Of the considerable literature on energy substitution analysis that BLM ignores, the most notable omission is the work on energy substitution that the Department of the Interior has relied on elsewhere. Specifically, the Bureau of Ocean Energy Management has developed a model, MarketSim, to study consumer surplus and energy substitutes for its oil and gas leases, by modeling not just oil and gas, but coal, nuclear, renewables, electricity imports, and electricity demand.39 For its assumptions of "long-run elasticities,"40 BOEM selected estimates from the literature based on methodological quality, data richness, and statistical significance.41 For its estimates of elasticity of coal, MarketSim uses Jones (2014), which studied long-run inter-fuel substitution among coal, oil, gas, electricity, and biomass using EIA data from 1960-2011.42 In the DSEISs, BLM never explains why it did not consult MarketSim or Jones (2014) for evidence of demand elasticities. Jones (2014) estimates	The reasonably foreseeable development scenario (RFD) for federal coal in the BFO projects federal coal development in Wyoming's Powder River Basin over the next 20 years. It was developed from coal forecasts publicly available online from the EIA through the Annual Energy Outlook 2019 (EIA 2019). All forecasts developed for the Annual Energy Outlook are modeled projections of what may happen given certain assumptions and methods and not predictions of what will happen. Detailed information on the underlying assumptions of EIA 2019 are available at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed in Alternative B. The RFD for federal coal production in the CDPA is the same under both alternatives; management decisions analyzed in the SEIS

Row #	Organization Name	Comment Text	Response Text
3. *(cont.)*	*(see above)*	both short-run and long-run elasticities, and finds that about 17% of the eventual substitution effect occurs in the first year, with 50% of the total substitution occurring by about the third year, and 90% of the total substitution occurring by the eleventh year;43 "long run elasticities are almost six times larger than their short run counterparts."44 In other words, the time horizon matters, and the total substitution effect increases with time. The long-run own-price elasticity for coal "is well above unity," meaning that consumers "can significantly reduce their coal usage and switch to one of the other three fuels when coal prices rise."45 Jones also finds that, even in the short run, coal can be substituted by both natural gas and electricity, as well as by oil, and in fact "the strongest channels of substitution are from coal to electricity, oil or natural gas."46. 39 Bureau of Ocean Energy Mgmt., BOEM 2015-054, Consumer Surplus and Energy Substitutes for OCS Oil and Gas Production: The 2015 Revised Market Simulation Model (MarketSim): Model Description (2015). 40 Id. at 2. 41 Id. at 16.42 Id. at 16-17. Note that while Jones (2014) studied the industrial sector, these estimates are the only demand elasticity figures for coal given by MarketSim (except for the assumption that, for exports, coal has an own-price demand elasticity of -1.00), indicating that BOEM applied the elasticities to other coal uses, including electricity. See Id. at 17 note 7, applying the industrial sector value from Jones (2014) to the category "Coal—Other." 43 Clifton Jones, The Role of Biomass in US Industrial Interfuel Substitution, 69 Energy Pol'y 122, 124 (2014). 44 Id. at 125. 45 Id. at 125. 46 Id. at 125.	would not cause market conditions (i.e., supply, demand, and prices) for coal to deviate from those forecast in EIA 2019; therefore, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
4.	Institute for Policy Integrity	Other useful literature on energy substitution that BLM's draft EA does not mention includes: * Gerking and Hamilton (2008) finds that when rail transportation costs for Powder River Basin coal dropped, "Given the estimated price elasticity of demand for PRB coal of -3.79, this change in relative prices suggests that power plant operators substituted heavily in the favor of PRB coal and away from the use of other alternative fuels for the generation of electric power throughout the market area. This substitution could have occurred, for example, through utilization of coal mixtures tilted toward heavier use of PRB coal and using PRB coal-fired generating units more intensively. . . . [T]he decline in both the mine-mouth price of PRB coal together with the decline in railroad freight rates induced power plant operators to substitute PRB coal for high-sulfur coal as well as for other fuels because demand for PRB coal is price elastic."49 Conversely, therefore, if the marginal costs of PRB coal were to increase-for example, under an alternative action that involved less or no leasing-electricity suppliers might substitute "heavily" away from regional coal, either by using their coal-fired generators less intensively or by switching to coal substitutes with lower transportation costs and therefore lower upstream emissions. * Nate Blair et al. (2006) concludes that "higher coal prices would dramatically increase" use of renewable wind energy.50 * Lu et al. (2012) uses a regional econometric model and find that over half of the decrease in emissions from the power sector from 2008 to 2009 are attributed to reduction in relative gas price and the resulting switch away from coal-fired generation (with the rest of emissions reductions mostly due to the economic downturn).51 * Knittel et al. (2015) focuses on duel-fuel plants that burned both coal and gas at some point between 2003 and 2012, and finds that, due to "highly significant" fuel price coefficients, the drop in price of natural gas that occurred between June 2008 and the end of 2012 led to a 19% decrease in carbon dioxide emissions in investor-owned utilities in restructured markets, and a 33% reduction at investor-owned utilities in traditional electricity markets.52 * Linn et al., (2014) finds that higher coal prices cause a	The RFD for federal coal in Wyoming's Powder River Basin projects future development over the next 20 years based on forecasted market conditions(i.e., supply, demand, and prices). As discussed in Appendix B, the RFD was developed from coal forecasts publicly available online from EIA through the Annual Energy Outlook 2019 (EIA 2019). All forecasts developed for the Annual Energy Outlook are modeled projections of what may happen given certain assumptions and methods; they are not predictions of what will happen. Detailed information on the underlying assumptions used to model forecasts for EIA 2019, including factors that would affect coal's share of the electricity generation fuel mix, are available at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed in Alternative B. The RFD for federal coal production in the CDPA is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not directly affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources. While production volumes and coal's share of the electricity generation fuel mix may change over the next 20 years, these changes would occur across alternatives and would be driven by outside market and societal forces.

Row #	Organization Name	Comment Text	Response Text
4. *(cont.)*	*(see above)*	decrease in heat-rates as well as a significant effect on utilization.53 * Fell and Kaffine (2018) undertakes a "nuanced examination of the intensive margin response of coal-fired plants to changing relative fuel prices and wind generation," and finds that the joint impact of low natural gas prices and high wind generation levels is much larger than the independent impact of each on the reduction in coal-fired generation.54 This underscores the need for elasticity studies and substitution analyses to consider not just fossil fuel substitutes, but all energy substitute options together. *Collier & Venables (2014): "The key point is the existence of demand side substitutes for coal, in the form of oil, gas and renewables; the long run price elasticity of demand for a single fuel source (coal) is therefore likely to be high, even if the elasticity of demand for energy as a whole is low."55 * Works by Ko and Dahl (1998 and 2001), which BLM relied on in the 2018 draft EA for the Wright Area Remand, in fact support significant potential for substitution away from coal. The 2001 paper, for example, predicts "that the shifts from coal to gas will increase if restructuring results in more competition in electricity generation."56 This prediction could be important given the changes in the structure and competition of electricity markets since 1993, which was the year that Ko and Dahl's data came from.57 Ko and Dahl actually find a larger change in gas demand for a given change in coal price than other literature they review had found, and they find a larger elasticity in those utilities that burn only coal and gas versus in those utilities that burn coal, oil, and gas.58 Ultimately, Ko and Dahl find "fuel choice to show a considerable amount of price responsiveness."59 Ko and Dahl's work also has important limitations, including its age (it is based on 1993 data, which is before not just the shale gas boom, but also key changes in the electricity market's structure), its short-run estimates (it is based only on monthly data from 1993),60 and its focus on fossil fuels to the exclusion of renewables or changes in electricity demand. That said, neither Ko and Dahl's work nor its summary of the literature supports BLM's false conclusion that there would be	*(see above)*

Row #	Organization Name	Comment Text	Response Text
4. *(cont.)*	*(see above)*	no meaningful substitution away from coal under the no action alternative. 49 Shelby Gerking & Stephen Hamilton, What Explains the Increased Utilization of Powder River Basin Coal in Electric Power Generation? 90 Am. J. Ag. Econ. 933, 948-49 (2008) (emphasis added). 50 Nate Blair et al., Long-Term National Impacts of State-Level Policies 8 (Nat'l Renewable Energy Lab. Conf. Paper 620-40105, June 2006), https://www.nrel.gov/docs/fy06osti/40105.pdf. 51 X. Lu, J. Salovaara & M.B. McElroy, Implications of the Recent Reductions in Natural Gas Prices for Emissions of CO2 from the US Power Sector, 46 Environmental Science & Technology 3014 (2012). 52 Chris Knittel, K. Metaxoglou, and A. Trindade, Natural Gas Prices and Coal Displacement: Evidence from Electricity Markets, (MIT-CEEPR Working Papers, 2015- 013), http://ceepr.mit.edu/files/papers/2015-013.pdf. 53 J. Linn, E. Mastrangelo, and D. Burtraw, Regulating greenhouse gases from coal power plants under the Clean Air Act, 1 J. Ass'n Envtl. & Res. Econs. 97 (2014). 54 Harrison Fell & Daniel Kaffine, The Fall of Coal: Joint Impacts of Fuel Prices and Renewables on Generation and Emissions, 10 Am. Econ. J.: Econ. Pol'y 90 (2018). The above examples are illustrative of the other literature available on this subject. BLM should more thoroughly review the relevant literature. But the clear upshot from these examples and from the literature that BLM itself cites is that coal's own-price and cross-price elasticities in no way support BLM's conclusion that there will be effectively zero substitution away from coal under the various action alternative. Rather, the proposed actions under the Buffalo and Miles City plans will most likely change market prices in ways that increase total demand and total emissions.	*(see above)*

Row #	Organization Name	Comment Text	Response Text
5.	Institute for Policy Integrity	In 2016, the Institute for Policy Integrity submitted to BLM a detailed report on The Bureau of Land Management's Modeling Choice for the Federal Coal Programmatic Review.72 The report reviewed the suitability of NEMS, MarketSim, and IPM for analyzing, among other things, energy substitution effects. The report highlights the pros and cons of each model, but ultimately concludes that any model is likely a better choice than no model,73 that models like MarketSim can be modified to meet BLM's needs, and that all of the available models can generate at least some highly useful information to analyze BLM coal leases.74 Even if modeling were somehow truly too exorbitant and infeasible (and again, it is not), it still would not follow that BLM's perfect substitution assumption would be the best default position. Instead, a no substitution assumption would at least provide a useful upper-bound estimate of greenhouse gas emissions and would be consistent with how BLM currently calculates economic benefits (see below). The Federal Energy Regulatory Commission, for example, has used both gross downstream emission estimates and "full burn" estimates in its environmental impact statements to supplement its rough attempts to estimate net post-substitution downstream emissions.75 By comparison, perfect substitution provides no useful environmental information under NEPA and, as the Tenth Circuit ruled, contradicts basic principles of supply and demand. Again, BLM's best option is to model the energy substitution effects. Only if modeling is truly too exorbitant and infeasible should BLM then apply a default assumption of no substitution. 72 Peter Howard, The Bureau of Land Management's Modeling Choices for the Federal Coal Programmatic Review (Policy Integrity 2016), https://policyintegrity.org/files/publications/BLM_Model_Choice.pdf 73 Id. at 5 ("If no model meets all criteria, a model should be selected that meets the minimum criteria or that can be modified to meet the minimum criteria."). 74 Id. at 12. 75	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or other substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
5. *(cont.)*	*(see above)*	See FERC, Southeast Market Pipelines Project: Final Supplemental Environmental Impact Statement, FERC EIS 0279F at 5 (2018), https://www.ferc.gov/industries/gas/enviro/eis/2018/02-05-18-FEIS/02-05-18-FEIS.pdf.	*(see above)*
6.	Institute for Policy Integrity at NYU School of Law et al.	BLM Must Assess Actual Incremental Climate Impacts, Not Just the Volume of Emissions The tons of greenhouse gases emitted by a project are not the "actual environmental effects" under NEPA. Rather, the actual effects and relevant factors are the incremental climate impacts caused by those emissions, including: * property lost or damaged by sea-level rise, coastal storms, flooding, and other extreme weather events, as well as the cost of protecting vulnerable property and the cost of resettlement following property losses; * changes in energy demand, from temperature-related changes to the demand for cooling and heating; * lost productivity and other impacts to agriculture, forestry, and fisheries, due to alterations in temperature, precipitation, CO2 fertilization, and other climate effects; * human health impacts, including cardiovascular and respiratory mortality from heat-related illnesses, changing disease vectors like malaria and dengue fever, increased diarrhea, and changes in associated pollution; * changes in fresh water availability; * ecosystem service impacts; * impacts to outdoor recreation and other non-market amenities; and * catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."

Row #	Organization Name	Comment Text	Response Text
7.	Institute for Policy Integrity at NYU School of Law et al.	These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. Compare Interagency Working Group on the Social Cost of Carbon, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis at 6-8, 29-33 (2010), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf [hereinafter 2010 TSD]; with Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, see EPA, Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment (2017); U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment (2017); EPA, Climate Change in the United States: Benefits of Global Action (2015); Union of Concerned Scientists, Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate (2018). 26 2018 Intergovernmental Panel on Climate Change, Summary for Policymakers, in Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of	While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." This evaluation of climate impacts fully responds to the specific requirements of the District of Montana's ruling. Specifically, the BFO SEIS/RMPA quantifies the GHG emissions based on global warming potential (GWP) values for both 20- and 100-year time horizons to calculate carbon dioxide equivalents (CO_2e) (see Tables 3-4 through 3-7 in the BFO SEIS/RMPA for a description of the GWPs and scientific relevance of these two time horizons). Additionally, GHG emissions from coal, oil, and gas from the BFO are reported as a percentage of state, national, and global emissions. In addition to quantifying GHG emissions, the BLM considered potential impacts of climate change on people and qualitatively discussed that shifts in precipitation and temperatures may adversely affect human health and safety in a number of ways. For an explanation of why the BLM took this approach, see revised text in Appendix D.

Row #	Organization Name	Comment Text	Response Text
7. *(cont.)*	*(see above)*	Climate Change, Sustainable Development, and Efforts to Eradicate Poverty 11 (Valérie Masson-Delmotte et al. eds., 2018), available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf [hereinafter, Summary of IPCC 1.5°C Report].	*(see above)*
8.	Institute for Policy Integrity at NYU School of Law et al.	BLM therefore falls short of its legal obligations and statutory objectives by focusing just on volume estimates. Similarly, courts have held that just quantifying the acres of timber to be harvested or the miles of road to be constructed does not constitute a "description of actual environmental effects," even when paired with a qualitative "list of environmental concerns such as air quality, water quality, and endangered species," when the agency fails to assess "the degree that each factor will be impacted."	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
9.	Institute for Policy Integrity at NYU School of Law et al.	BLM Should Use the Interagency Working Group's 2016 Estimates of the Social Cost of Carbon and the Social Cost of Methane In 2016, the IWG published updated central estimates for the social cost of greenhouse gases: $50 per ton of carbon dioxide, $1440 per ton of methane, and $18,000 per ton of nitrous oxide (in 2017 dollars for year 2020 emissions).	The BLM considered and ultimately decided not to use the use of social cost of carbon (SCC) and the social cost of methane (SCM) protocols for this environmental review. These reasons for this are outlined in revised text in Appendix D of the BFO SEIS/RMPA.

Row #	Organization Name	Comment Text	Response Text
10.	Sierra Club	The oil and gas industry is the nation's largest industrial source of methane pollution.18 The U.S. loses at least 1 to 3 percent of its total natural gas production each year when methane, a potent greenhouse gas, is leaked, flared (burned), or vented to the atmosphere during natural gas and oil production and distribution.19 In addition, a series of recent studies found that methane emissions from the oil and gas sectors are 60 percent greater than official U.S. government estimates.20 As BLM acknowledges, methane's lifetime in the atmosphere is much shorter than carbon dioxide (CO2), but methane is more efficient at trapping radiation than CO2.21 Thus, BLM must not understate the climate impact of methane emissions resulting from its approvals by using an outdated or incorrect estimate of methane's global warming potential ("GWP"). A GWP is a measure of the amount of warming caused by the emission of one ton of a particular greenhouse gas relative to one ton of carbon dioxide.22 For each greenhouse gas, a GWP has been calculated to reflect how long each gas remains in the atmosphere, on average, and how strongly it absorbs energy.23 The methane GWP estimates how many tons of carbon dioxide would need to be emitted to produce the same amount of global warming as a single ton of methane. This is important because methane is a much more potent greenhouse gas than carbon dioxide.24 Relative to carbon dioxide, methane has much greater climate impacts in the near term than the long term, and, therefore, also including a short-term measure of climate impacts would be most effective in considering policies to avoid significant global warming in the near-term. 18 Jayni Foley Hein, Federal Lands and Fossil Fuels: Maximizing Social Welfare in Federal Energy Leasing, 42 Harv. Envtl. L. Rev. 1, 19 (2018), (citing U.S. EPA, Overview of Greenhouse Gases, https://perma.cc/53W7-QRVY). Attached as Exhibit 14. 19 Id. (citing U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012 (2014), https://perma.cc/V9Y3-9K8V). Attached as Exhibit 15. 20 Ramón A. Alvarez et al., Assessment of methane emissions from the US oil and gas supply chain, 361 (6398)	GWPs are subject to significant uncertainties (+/- 30% and +/- 39% for the 20-year and 100-year methane GWP, as per IPCC AR5, Table 8.SM.14). The BLM used GWPs for both 20- and 100-year time horizons for methane and N_2O, as listed in the International Panel On Climate Change Fifth Assessment Report (IPCC AR5) and published in Table 1-3 of the EPA's US Greenhouse Gas Emissions and Sinks inventory.

Row #	Organization Name	Comment Text	Response Text
10. *(cont.)*	*(see above)*	Science, (2018), 186-188. Attached as Exhibit 16. 21 U.S. EPA, Overview of Greenhouse Gases - Methane, https://perma.cc/53W7-QRVY. Attached as Exhibit 17. 22 Gunnar Myhre and Drew Shindell et al., Anthropogenic and Natural Radiative Forcing in IPCC, Climate Change 2013: The Physical Science Basis, Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2013), 710-712, available at: http://www.climatechange2013.org/images/report/WG1AR5_Chapter08_FINAL.pdf. Attached as Exhibit 18. 23 Id.	*(see above)*
11.	Sierra Club	While BLM disclosed GWPs for both the 20-year and 100-year time horizons from the IPCC's 2013/2014 Fifth Assessment Report (hereinafter, "AR5"), it failed to use the correct values for methane GWP from that report. Miles City DSEIS at 3-13; Buffalo DSEIS at 3-12. BLM cites a 100-year methane GWP of 28 and a 20-year methane GWP of 84. Miles City DSEIS at 3-13; Buffalo DSEIS at 3-12. AR5 includes a range of estimates for methane GWP.25 Without including climate-carbon feedbacks ("cc fb"), methane has a 100-year GWP ("GWP100") of 28 and a 20-year GWP ("GWP20") of 84. However, the IPCC also notes that, "[t]hese values do not include CO2 from methane oxidation. Values for fossil methane are higher by 1 and 2 for the 20 and 100 year metrics, respectively (Table 8.A.1) (emphasis added)."26 In other words, the most current lower-end scientific estimate of GWP100 for fossil methane, which is what will be produced from these BLM leases, is 30, not 28, and for GWP20 is 85, not 84. The IPCC also provides upper end estimates of fossil methane GWP100 and GWP 20 with cc fb of 36 and 87, respectively. BLM has provided no justification for why it relies on the incorrect, lower-end estimates of GWP100 and GWP20. These failures undermine the accuracy and integrity of the GWP analysis. See 40 C.F.R. §§ 1500.1(b), 1502.24. Thus, BLM failed to provide a "full and fair discussion" of the methane pollution resulting from its actions, as required by NEPA. See id. § 1502.1.	The GWPs used in the Supplemental EIS are not necessarily lower bounds on the true values, since GWP values are subject to significant uncertainties (+/- 30% and +/- 39% for the 20-year and 100-year methane GWP, as per IPCC AR5, Table 8.SM.14); thus, the true values may be lower than the values used. An increase of 1 in the 20-year methane GWP represents a change of 1% in the GWP value; an increase of 2 in the 100-year methane GWP represents a change of 7%. Both values are well within the methane GWP uncertainty bounds cited in AR5. The selection of GWPs in the Supplemental EIS were based on consistency with GWPs used in the EPA's national GHG inventory and the global emission reported in AR5, neither of which included additional CO_2 from methane oxidation or climate-carbon feedbacks.

Row #	Organization Name	Comment Text	Response Text
12.	Sierra Club	BLM does not provide the emissions factors it calculated for conventional natural gas and CBNG, nor does it state whether separate emissions factors were developed for different GHGs. Moreover, BLM's methodology for deriving emissions factors - dividing conventional natural gas and CBNG GHG emissions by the total gas production - will result in underestimates of emissions by overestimating the amount of production responsible for a given amount of leakage. BLM's stated rationale for not using separate conventional natural gas and CBNG production volumes - that such volumes were not included in the 2015 PRMP/FEIS - is completely insufficient and falls far short of its obligations under NEPA. The 2015 PRMP/FEIS contains separate estimates for the number of foreseeable conventional natural gas and CBNG wells.28 BLM could and should have used these estimates of numbers of wells to develop individual production estimates for different well types. BLM entirely omits any discussion of the methodology used to determine emissions associated with oil production. 28 BLM, Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area, (May 2015), 2248, available at: https://eplanning.blm.gov/epl-front-office/projects/lup/36597/63637/68979/BFO_PRMP¬FEIS.pdf. Attached as Exhibit 19.	Additional information relevant to emissions factors is provided in Appendix C of the Supplemental EIS. The BLM has updated its production GHG emissions estimates to include separate production volumes for conventional natural gas and CBNG.
13.	Sierra Club	Read the latest studies coming out from NCAR (and from the EU) which reveal that the temperature rise planet-wide is much more sensitive to the rise in CO2 than was previously thought. We can now expect 5 degrees C of warming for the same amount of CO2 that was previously thought to result in 2 degrees C of warming.	The statement does not include a comment that requires response.

Row #	Organization Name	Comment Text	Response Text
14.	Thunder Basin Coal Company, LLC	The draft coal screen, Figure A-8, identifies a potential area as unsuitable due to a possible alluvial valley floor (AVF). This area is located in T44N-R71W. The Wright Area Final Environmental Impact Statement (FEIS) completed by the Bureau of Land Management (BLM) provides documentation that there should be no AVF in this area. Section 3.6.1.1, North Hilight Field LBA Tract states "Based on previous non-AVF declarations made on Mills Draw and Springen Draw within and adjacent to the existing Jacobs Ranch Mine permit area, which includes a portion of the BLM study area for the North Hilight Field LBA Tract, it is unlikely that WDEQ/LQD would declare that any AVFs exist in the general analysis area for the North Hilight Field tract." A portion of this area has been amended into Black Thunder Mine's SMCRA Permit #233. Prior to amending this land into the permit, an AVF determination was completed for this area. The results of this report show that there are no AVFs in this area. This report can be found in Black Thunder Mine's Permit Appendix D-1 1, Volume 2 of 4, Report D-11 RV.6. With the available documentation, TBCC requests that this AVF be removed from Figure A-8 and these lands be included into the acceptable acreage prior to finalizing this SEIS. Figure 2-2, Alternative B must also be revised to remove the AVF from the figure. The acreage should also be adjusted on this figure and any other associated references and text should also be revised.	BLM removed the Springen Draw alluvial valley floor (AVF) as requested, as the WDEQ made a negative AVF declaration in Black Thunder Mine's permit (#233, Appendix D11, Exhibit D-11.1.1). The alluvial valley floors displayed in the Draft SEIS were from a 1985 U.S. Office of Surface Mining, Reclamation, and Enforcement report titled "Reconnaissance Maps to Assist in Identifying Alluvial Valley Floors, Powder River Basin, Montana and Wyoming." The report identifies "potential" AVFs and acknowledges that further investigation is necessary to verify AVFs. SEIS maps and AVF acreage were updated to reflect the removal of Springen Draw from the "potential" AVFs.

Row #	Organization Name	Comment Text	Response Text
15.	**Air (including greenhouse gas emissions and climate change)**		
16.	Institute for Policy Integrity at NYU School of Law et al.	These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. Compare Interagency Working Group on the Social Cost of Carbon, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis at 6-8, 29-33 (2010), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf [hereinafter 2010 TSD]; with Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, see EPA, Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment (2017); U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment (2017); EPA, Climate Change in the United States: Benefits of Global Action (2015); Union of Concerned Scientists, Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate (2018). 26 2018 Intergovernmental Panel on Climate Change, Summary for Policymakers, in Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context	While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in the SEI in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." This evaluation of climate impacts fully responds to the specific requirements of the District of Montana's ruling. Specifically, the BFO SEIS/RMPA quantifies the GHG emissions based on GW values for both 20- and 100-year time horizons to calculate carbon dioxide equivalents (CO_2e) (see Tables 3-4 through 3-7 in the BFO SEIS/RMPA for a description of the GWPs and scientific relevance of these two time horizons). Additionally, GHG emissions from BFO coal, oil, and gas are reported as a percentage of state, national, and global emissions. In addition to quantifying GHG emissions, the BLM considered potential impacts of climate change on people and qualitatively discussed how shifts in precipitation and temperatures may adversely affect human health and safety in a number of ways. For an explanation of why the BLM took this approach, see revised text in Appendix D.

Row #	Organization Name	Comment Text	Response Text
16. *(cont.)*	*(see above)*	of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty 11 (Valérie Masson-Delmotte et al. eds., 2018), available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf [hereinafter, Summary of IPCC 1.5°C Report].	*(see above)*
17.	Sierra Club	The oil and gas industry is the nation's largest industrial source of methane pollution.18 The U.S. loses at least 1 to 3 percent of its total natural gas production each year when methane, a potent greenhouse gas, is leaked, flared (burned), or vented to the atmosphere during natural gas and oil production and distribution.19 In addition, a series of recent studies found that methane emissions from the oil and gas sectors are 60 percent greater than official U.S. government estimates.20 As BLM acknowledges, methane's lifetime in the atmosphere is much shorter than carbon dioxide (CO2), but methane is more efficient at trapping radiation than CO2.21 Thus, BLM must not understate the climate impact of methane emissions resulting from its approvals by using an outdated or incorrect estimate of methane's global warming potential ("GWP"). A GWP is a measure of the amount of warming caused by the emission of one ton of a particular greenhouse gas relative to one ton of carbon dioxide.22 For each greenhouse gas, a GWP has been calculated to reflect how long each gas remains in the atmosphere, on average, and how strongly it absorbs energy.23 The methane GWP estimates how many tons of carbon dioxide would need to be emitted to produce the same amount of global warming as a single ton of methane. This is important because methane is a much more potent greenhouse gas than carbon dioxide.24 Relative to carbon dioxide, methane has much greater climate impacts in the near term than the long term, and, therefore, also including a short-term measure of climate impacts would be most effective in considering policies to avoid significant global warming in the near-term. 18 Jayni Foley Hein, Federal Lands and Fossil Fuels: Maximizing Social Welfare in Federal Energy Leasing, 42	GWPs are subject to significant uncertainties (+/- 30% and +/- 39% for the 20-year and 100-year methane GWP, as per IPCC AR5, Table 8.SM.14). The BLM used GWPs for both 20- and 100-year time horizons for methane and N_2O, as listed in the International Panel On Climate Change Fifth Assessment Report (IPCC AR5) and published in Table 1-3 of the EPA's US Greenhouse Gas Emissions and Sinks inventory.

Row #	Organization Name	Comment Text	Response Text
17. *(cont.)*	*(see above)*	Harv. Envtl. L. Rev. 1, 19 (2018), (citing U.S. EPA, Overview of Greenhouse Gases, https://perma.cc/53W7-QRVY). Attached as Exhibit 14. 19 Id. (citing U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012 (2014), https://perma.cc/V9Y3-9K8V). Attached as Exhibit 15. 20 Ramón A. Alvarez et al., Assessment of methane emissions from the US oil and gas supply chain, 361 (6398) Science, (2018), 186-188. Attached as Exhibit 16. 21 U.S. EPA, Overview of Greenhouse Gases - Methane, https://perma.cc/53W7-QRVY. Attached as Exhibit 17. 22 Gunnar Myhre and Drew Shindell et al., Anthropogenic and Natural Radiative Forcing in IPCC, Climate Change 2013: The Physical Science Basis, Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2013), 710-712, available at: http://www.climatechange2013.org/images/report/WG1AR5_Chapter08_FINAL.pdf. Attached as Exhibit 18. 23 Id.	*(see above)*

Row #	Organization Name	Comment Text	Response Text
18.	Sierra Club	While BLM disclosed GWPs for both the 20-year and 100-year time horizons from the IPCC's 2013/2014 Fifth Assessment Report (hereinafter, "AR5"), it failed to use the correct values for methane GWP from that report. Miles City DSEIS at 3-13; Buffalo DSEIS at 3-12. BLM cites a 100-year methane GWP of 28 and a 20-year methane GWP of 84. Miles City DSEIS at 3-13; Buffalo DSEIS at 3-12. AR5 includes a range of estimates for methane GWP.25 Without including climate-carbon feedbacks ("cc fb"), methane has a 100-year GWP ("GWP100") of 28 and a 20-year GWP ("GWP20") of 84. However, the IPCC also notes that, "[t]hese values do not include CO2 from methane oxidation. Values for fossil methane are higher by 1 and 2 for the 20 and 100 year metrics, respectively (Table 8.A.1) (emphasis added)."26 In other words, the most current lower-end scientific estimate of GWP100 for fossil methane, which is what will be produced from these BLM leases, is 30, not 28, and for GWP20 is 85, not 84. The IPCC also provides upper end estimates of fossil methane GWP100 and GWP 20 with cc fb of 36 and 87, respectively. BLM has provided no justification for why it relies on the incorrect, lower-end estimates of GWP100 and GWP20. These failures undermine the accuracy and integrity of the GWP analysis. See 40 C.F.R. §§ 1500.1(b), 1502.24. Thus, BLM failed to provide a "full and fair discussion" of the methane pollution resulting from its actions, as required by NEPA. See id. § 1502.1. 25 - *id. 26 - Id.*	The GWPs used in the Supplemental EIS are not necessarily lower bounds on the true values, since GWP values are subject to significant uncertainties (+/- 30% and +/- 39% for the 20-year and 100-year methane GWP, as per IPCC AR5, Table 8.SM.14); thus, the true values may be lower than the values used. An increase of 1 in the 20-year methane GWP represents a change of 1% in the GWP value; an increase of 2 in the 100-year methane GWP represents a change of 7%. Both values are well within the methane GWP uncertainty bounds cited in AR5. The selection of GWPs in the Supplemental EIS were based on consistency with GWPs used in the EPA's national GHG inventory and the global emission reported in AR5, neither of which included additional CO_2 from methane oxidation or climate-carbon feedbacks.

Row #	Organization Name	Comment Text	Response Text
19.	Sierra Club	BLM does not provide the emissions factors it calculated for conventional natural gas and CBNG, nor does it state whether separate emissions factors were developed for different GHGs. Moreover, BLM's methodology for deriving emissions factors - dividing conventional natural gas and CBNG GHG emissions by the total gas production - will result in underestimates of emissions by overestimating the amount of production responsible for a given amount of leakage. BLM's stated rationale for not using separate conventional natural gas and CBNG production volumes - that such volumes were not included in the 2015 PRMP/FEIS - is completely insufficient and falls far short of its obligations under NEPA. The 2015 PRMP/FEIS contains separate estimates for the number of foreseeable conventional natural gas and CBNG wells.28 BLM could and should have used these estimates of numbers of wells to develop individual production estimates for different well types. BLM entirely omits any discussion of the methodology used to determine emissions associated with oil production. 28 BLM, Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area, (May 2015), 2248, available at: https://eplanning.blm.gov/epl-front-office/projects/lup/36597/63637/68979/BFO_PRMP¬FEIS.pdf. Attached as Exhibit 19.	Additional information relevant to emission factors is provided in Appendix C of the Supplemental EIS. The BLM has updated its production GHG emission estimates to include separate production volumes for conventional natural gas and CBNG.

Row #	Organization Name	Comment Text	Response Text
20.	Campbell County University of Wyoming, Department of Energy Resources	Federal and state CCS/CCUS-related regulations are in place in anticipation of more projects being developed in the United States in the years ahead. Federally, for example, the U.S. Environmental Protection Agency ("EPA") has issued regulations governing: (1) the injection of C02 in a variety of geologic formations5; and (2) the management of C02 emissions under a variety of Clean Air Act ("CAA") regulatory programs that apply to major stationary sources, including coal-fired power plants. Under the CAA' s Prevention of Significant Deterioration program, technologies such as CCS/CCUS may be deemed a "Best Available Control Technology" ("BACT") based upon consideration of a variety of technical, economic and related factors. Specifically with respect to BACT, EPA has stated the following: For the purposes of a BACT analysis for GHGs, EPA classifies CCS as an add-on pollution control technology that is "available" for facilities emitting C02 in large amounts, including fossil fuel-fired power plants, and for industrial facilities with high-purity C02 streams (e.g., hydrogen production, ammonia production, natural gas processing, ethanol production, ethylene oxide production, cement production, and iron and steel manufacturing). For these types of facilities, CCS should be listed in Step 1 of a top-down BACT analysis for GHGs. This does not necessarily mean CCS should be selected as BACT for such sources. Many other case specific factors, such as the technical feasibility and cost of CCS technology for the specific application, size of the facility, proposed location of the source, and availability and access to transportation and storage opportunities, should be assessed at later steps of a top-down BACT analysis. However, for these types of facilities and particularly for new facilities, CCS is an option that merits initial consideration and, if the permitting authority eliminates this option at some later point in the top-down BACT process, the grounds for doing so should be reflected in the record with an appropriate level of detail. 6 And although the recently finalized Affordable Clean Energy rule under section 111 (d) of the CAA did not include CCS as a Best Source of Emission Reduction ("BSER"), EPA stated that	Thank you for this information. The BLM does not complete BACT analyses on coal mining actions. A BACT analysis would be completed by the delegated authority, such as the Wyoming DEQ, at the time an air permit is issued for a coal-fired power plant by that agency. The BLM looks forward to incorporating the results of University of Wyoming research into its future analyses.

Row #	Organization Name	Comment Text	Response Text
20. *(cont.)*	*(see above)*	CCS could nonetheless be used a compliance option by the states: Nevertheless, while many commenters argued that CCS should not be considered part of the BSER, they supported its use as a potential compliance option for meeting an individual unit's standard of performance. The EPA agrees with this assessment. Evaluation of the technical feasibility (e.g., space considerations, integration issues, etc.) and the economic viability (e.g., the prospects and availability of long-term contractual arrangements for sale of captured C02, the cost of constructing a C02 pipeline, the availability of tax credits, etc.) of a CCS project is heavily dependent on source-specific characteristics. Accordingly, state plans may authorize such projects for compliance with this rule.7 5 https://www.epa.gov/uic/class-vi-wells-used-geologic-seguestration-co2. 6 "PSD and Title V Permitting Guidance for Greenhouse Gases," pp. 32-33 (EPA, March 2011) (available at https://www.epa. gov/sites/production/files/2015-07/documents/gh szguid. pdf). 7 84 Fed. Reg. 32520, 32549 (July 8, 2019) (available at https:llwww.govinfo.gov/contentlpkg/FR-2019- 07 - 08/pdf/2019-13507 .pdf. Congress has adopted CCS/CCUS-related incentives, too. For example, in the coming months, the Internal Revenue Service is expected to release implementation guidance for the recently amended section 45Q federal tax credit. 8 Many observers believe that the section 45Q tax credit has the potential to stimulate innovation and the use of carbon capture, utilization, transmission, and storage technologies. The University of Wyoming Carbon SAFE research team's economic model for the Gillette-based project considers the section 45Q credit. CCS/CCUS is expected to grow in importance in the years ahead for a variety of reasons, including implementation of the Paris Agreement next year and state adoption of mid-century net-zero GHG emission standards. In January 2019, the California Air Resources Board recognized utilization of CCS/CCUS technologies as a compliance pathway under that State's Low Carbon Fuel Standard.9	*(see above)*

Row #	Organization Name	Comment Text	Response Text
21.	Campbell County University of Wyoming, Department of Energy Resources	Not all future coal to be produced will necessarily be combusted with unabated C02 emissions. With respect to downstream GHG emissions for coal, the SEIS assumes that "[a]ll future coal produced is combusted in US energy generating units" ("EGUs") (SEIS, p. 3-14). It is reasonably foreseeable that in the future at least some amount of PRB coal may be combusted in EGUs utilizing carbon capture & storage ("CCS") and/or carbon capture utilization & storage ("CCUS") technologies. Congress has provided funding for research and projects related to CCS/CCUS technologies for decades.2 The U. S. Department of Energy (DOE) is currently funding research with the goal of siting one or more large-scale CCS/CCUS projects at coal-fired power plants and other large emitters of C02 by 2026. Known as the Carbon Storage Assurance Facility Enterprise ("CarbonSAFE") initiative, this effort focuses on the development of geologic storage sites for the storage of 50+ million metric tons of C02 from industrial sources, including coal-fired power plants.3 Researchers at the University of Wyoming are leading a CarbonSAFE project in Gillette, Wyoming. Other CCS/CCUS projects are in operation and development worldwide.4 2 See Folger, P. "Recovery Act Funding for DOE Carbon Capture and Sequestration (CCS) Projects," R44387 (Congressional Research Service, Feb. 18,2016) (available at https:llfas.org/sgp/crs/misc/R44387.pdt). 3 https:llwww.netl.doe.gov/coallcarbon-storage/storage-infrastructure/carbonsafe. 4 https:llco2re.col.	The BLM appreciates the information on future uses of coal without combustion, such as a source of rare earth minerals. The BLM looks forward to incorporating results from University of Wyoming research in its future analyses. The BLM, in its analysis for this SEIS, made reasonably conservative assumptions, based on reasonably foreseeable future actions and readily available data, and scientifically defensible emissions data when calculating potential future GHG emissions from the end use of produced coal. The BLM obtained information on emission factors from the EPA and information on the distribution and consumption of coal produced in the region from the EIA. The BLM is confident it represents a reasonable estimate of potential GHG emissions, based on current technology and end uses.

Row #	Organization Name	Comment Text	Response Text
22.	Campbell County University of Wyoming, Department of Energy Resources	Not all future coal to be produced will necessarily be combusted with unabated emissions; some may be utilized/or products. As noted above, with respect to downstream GHG emissions for coal, the SEIS assumes that "[a]ll future coal produced is combusted in US energy generating units" (SEIS, p.3-14). It is reasonably foreseeable that at least some amount of PRB coal may be utilized for non-combustion purposes, such as in the production of high-value products. With funding from the State of Wyoming, for example, researchers at the University of Wyoming are in the midst of a multi-year carbon engineering research program that is investigating non-combustion coal products. Subject to potential resolution of technical and economic considerations, one day PRB coals may also serve as source of Rare Earth Elements and Critical Minerals that are needed in a variety of strategic and renewable energy systems.	The BLM appreciates the information on future uses of coal without combustion, such as a source of rare earth minerals. The BLM looks forward to incorporating results from University of Wyoming research in its future analyses. The BLM, in its analysis for this SEIS, made reasonably conservative assumptions, based on reasonably foreseeable future actions and readily available data, and scientifically defensible emissions data when calculating potential future GHG emissions from the end use of produced coal. The BLM obtained information on emission factors from the EPA and information on the distribution and consumption of coal produced in the region from the EIA. The BLM is confident it represents a reasonable estimate of potential GHG emissions, based on current technology and end uses.
23.	Campbell County University of Wyoming, Department of Energy Resources	Disruptive changes to current technology used/or coal development are possible. The SEIS notes that "[t]here will be no disruptive changes to current technology uses for coal development." As noted above in Comments ##2 & 3, the University of Wyoming, supported by DOE and the State of Wyoming, is advancing various technologies that we believe hold promise for the future use of coal when combusted and new markets for coal. While disruptive changes cannot be predicted, they also cannot be eliminated.	The BLM looks forward to incorporating the results of University of Wyoming research on emerging coal development technologies into its future analyses.

Row #	Organization Name	Comment Text	Response Text
24.	EPA Region 8	The Draft SEIS and Appendix C includes greenhouse gas (GHG) emission estimates but did not estimate carbon dioxide (CO2) and nitrous oxide (N2O) from coal production. We recommend adding this information to the Final SEIS. One possible method for estimation could be to use the Miles City Draft SEIS which did include estimates for CO2 and N2O from coal production and scale the estimates for Miles City by the ratio of coal estimated by the Reasonably Foreseeable Development (RFD) for the Buffalo field office.	Emissions of two GHGs, CO_2 and N_2O, attributable to coal production (direct emissions) were not quantified. This is because the goal of this limited analysis was to respond to the judge's order to analyze the environmental consequences of downstream combustion of coal, oil, and gas open to development under each RMP. In addition, direct emissions of CO_2 and N_2O, were not quantified for the following reasons: • Direct emissions of CH_4 from mining and processing were estimated in the Buffalo RMP (2015) for each mine using the EPA's State Inventory Tool Module (see Appendix M, p. 2,397) • Although CO_2 and N_2O could be directly emitted from fossil fuel combustion in mining equipment, the proportion of direct emissions from mining equipment compared to the downstream combustion emissions and methane off-gassing is typically very small for individual mines. The summation of direct emissions for the total coal production considered under this SEIS is likely to be negligible, compared with the downstream emissions from coal combustion. • An estimation of GHGs from mining can be very speculative and even more so if extrapolating from other mines. The emissions are based to varying degrees, on life of mine, type of and depth to coal, production rates, mining methods, equipment types and fuels, and distribution of produced coal (i.e. mine mouth vs. transport to terminal). The BLM has disclosed that GHGs could be emitted directly from the production and processing phase of operations at each potential mining location. For the reasons mentioned above, the estimation of direct emissions of CO_2 and N_2O from fossil fuel combustion in mining equipment would not provide additional to inform the public or decision-maker for this SEIS.

Row #	Organization Name	Comment Text	Response Text
25.	Institute for Policy Integrity	In both the Buffalo and Miles City Draft Supplemental Environmental Impact Statements (DSEISs) on remand from Western Organization of Resource Councils v. BLM, the agency concludes that there will be no difference in actual greenhouse gas emissions under either plan, no matter which alternative action is selected.2 Even though the various alternatives do contemplate leasing different amounts of acreage, with different tons of recoverable coal and other resources,3 BLM applies the same Reasonably Foreseeable Development (RFD) scenario to all alternatives, rather than conducting an appropriate analysis of market demand based on prices and fuel substitution. BLM is wrong. Leasing these large tracts of low-cost coal reduces the marginal cost of coal production, which increases the quantity supplied and the quantity demanded for a given price, which increases the combustion and emissions from coal. The same market dynamics exist for oil and gas produced under these plans as well. BLM's assumption of perfect substitution relies on incomplete readings of the literature, on out-of-date data cherry-picked out of context, and on conclusions contradicted by its own analysis. It wrongly dismisses the potential for generation shifting, overlooks possible substitutions to renewable energy and demand reductions, and ignores effects on coal exports. BLM fails to actually model the energy substitution effects, relying instead on guesses, and the agency fails to analyze the full upstream and downstream consequences for emissions of the actual market outcomes. BLM also fails to recalculate the supposed economic benefits of leasing that the agency continues to touts-benefits that are overestimated for the same reason that the climate consequences are severely underestimated in the DSEISs: because of overly simplistic and ultimately incorrect assumptions about substitution. BLM must fix all of these mistakes and omissions in its final SEISs on remand. A corrected final analysis will show that alternatives that lease more acreage for fossil fuel development will carry significant environmental consequences compared to alternative with less leasing, and	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision, because emissions across the alternatives would be the same.

Row #	Organization Name	Comment Text	Response Text
25. *(cont.)*	*(see above)*	that the alleged economic benefits of the leases are significantly diminished from its original analysis. Consequently, corrected final SEISs will show decisionmakers that the extent of resource development contemplated by these plans is a bad deal for the environment, for the U.S. government, and for the American people. 2 - Buffalo Field Office, Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment at 3-12, 3-13, 3-21 (2019) [hereinafter Buffalo DSEIS] ("The GHG emissions . . . are the same under [both alternatives]. This is because the same RFD is used in both alternatives."); accord. Miles City Field Office, BLM, Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment 3-12 to 3-14 (2019) [hereinafter Miles City DSEIS]. 3Miles City DSEIS at ES-5, table ES-1; Buffalo DSEIS, 2-1 to 2-2, tables 2-1 to 2-3.	*(see above)*

Row #	Organization Name	Comment Text	Response Text
26.	Institute for Policy Integrity	Overall, BLM relies too heavily on simplifying assumptions about exports that do not reflect reality. Greenhouse gases are, of course, global pollutants that cause the same climate damages with the same impacts to U.S. interests regardless of where in the world they are emitted. BLM therefore needs to model the potential effects of leasing in this area based on global consumption of the fossil fuels produced under these plans.	The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream combustion of coal, oil, and gas open to development under each RMP." Although the exact location and end use of each ton of produced coal is not known, the BLM has made a reasonable assumption that the produced coal evaluated in this EIS will be combusted for electricity generation. This is because consumption data from EIA show that between 80 and 90% of all coal produced in the US is used for this purpose and that greater than 90% of coal produced in Wyoming is used for electricity generation. Similarly, the BLM has used reasonably conservative GHG emissions factors from the EPA for natural gas combustion and oil combustion for residential heating in the US. Also, as the reviewer has noted, greenhouse gases are global pollutants; therefore, the BLM accounted for all GHG emissions from combustion of the coal, gas, and oil open to development under the RMP by assuming that they are 100% combusted and that all of this combustion occurs in the US. The BLM developed the RFD for federal coal in the CDPA, based on Annual Energy Outlook 2019 projections produced by EIA. EIA modelers produced these estimates using an integrated energy market model that includes an international energy module. Information on the assumptions used to model the Annual Energy Outlook 2019 can be found at https://www.eia.gov/outlooks/aeo/assumptions/.

Row #	Organization Name	Comment Text	Response Text
27.	Institute for Policy Integrity	Even to the extent one source of coal can substitute for another source of coal, the greenhouse gas consequences are not necessarily identical. BLM fails to assess the upstream or downstream consequences of coal-coal substitutions, and instead assumes with no explanation that the relative greenhouse gas emissions would be identical across alternatives. In terms of downstream emissions, over 99% of the coal in the area is sub-bituminous, and BLM uses the emissions factors for sub-bituminous coal to calculate downstream emissions.76 But according to EPA's greenhouse gas emission factors for various types of coal, sub-bituminous coal generally emits slightly more carbon dioxide per Btu than the average mixture of coal combusted in the U.S. electric power sector (97.17 kg CO2 per mmBtu for sub-bituminous, versus 95.52 kg CO2 per mmBtu for mixed electric power sector coal).77 Therefore, if sources of coal outside the planning areas substituted for these tracts, total downstream greenhouse gas emissions per mmBtu could decrease. BLM has failed to analyze whether this difference is significant.	The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream combustion of coal, oil, and gas *open to development under each RMP*" (emphasis added). Thus, coal-to-coal substitution need not be considered. The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision, because emissions across the alternatives would be the same.

Row #	Organization Name	Comment Text	Response Text
28.	Institute for Policy Integrity	Similarly, upstream emissions and other upstream externalities can differ depending on the source of coal. Besides methane emitted from the coal extraction process, a major source of upstream emissions from coal mining is the transportation of coal from the mine to the consumer. Travel distances for coal from the Powder River Basin, for example, are longer than the average travel distance for coal in the United States, and travel costs increase with distance travel.78 For example, per metric ton of Wyoming coal mined, the externality costs of greenhouse gas emissions from train transport are nearly twice as high as the externality costs from mine methane-and that does not even count all the other externalities from coal transport, including fatalities from train accidents, health and environmental effects from other air pollution, and congestion and noise from trains.79 Under various alternatives to leasing in these areas, substitute sources of coal will have different-and could have significantly fewer-climate consequences and other externalities. BLM has failed to analyze whether these upstream differences are significant.78 - Jayni Foley Hein & Peter Howard, Illuminating the Hidden Costs of Coal at A13 (Policy Integrity 2015), https://policyintegrity.org/files/publications/Hidden_Costs_of_Coal.pdf. 79 - Id. at Table B.5.	The BLM analyzed emissions from transporting coal by train using data from the Energy Information Agency and average transport distances. It evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." The court order did not require the BLM to analyze other coal sources.
29.	Institute for Policy Integrity at NYU School of Law et al.	In the draft supplemental EISs (DSEISs) on remand, BLM now continues to decline to use the social cost of greenhouse gases. The Miles City DSEIS does not mention the social cost of greenhouse gases at all.6 The Buffalo DSEIS presents spurious arguments in Appendix D on why it need not use the metrics.7. 6 Miles City Field Office, BLM, Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment (2019) [hereinafter Miles City DSEIS]. 7 Buffalo Field Office, Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment at D-5 to D-7 (2019) [hereinafter Buffalo DSEIS].	The BLM considered and ultimately decided not to use the SCC and the SCM protocols for this environmental review for several reasons. These reasons are outlined in revised text in Appendix D of the BFO SEIS/RMPA.

Row #	Organization Name	Comment Text	Response Text
30.	Institute for Policy Integrity at NYU School of Law et al.	In both DSEISs, BLM has failed to adequately analyze and disclose information about the plans' actual environmental consequences, including the significance of the plans' resulting greenhouse gas emissions and contributions to climate change. The social cost of greenhouse gases is a tool that could be used to remedy these failures.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order. As stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
31.	Institute for Policy Integrity at NYU School of Law et al.	in these DSEISs, BLM continues to fail to disclose the significance of the plans' climate effects, and inconsistently selects which effects it wants to contextualize in terms of money (economic effects) and which it does not (climate effects). Despite the District of Montana's ruling, the DSEISs' analyses of the plans' impacts on climate change remain inadequate.	While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in the SEIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." This evaluation of climate impacts fully responds to the specific requirements of the District of Montana's ruling. Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis.
32.	Institute for Policy Integrity at NYU School of Law et al.	A proper quantification of emissions would reveal significant differences in net emissions between the alternatives under consideration, and monetization of those different emissions would reveal the significance of the climate impacts resulting from BLM's choices made in these plans.	The RFD for federal coal production in BFO is the same under both alternatives; thus, emissions resulting from the extraction, transportation, and combustion would be the same under both alternatives. Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis.

Row #	Organization Name	Comment Text	Response Text
33.	Institute for Policy Integrity at NYU School of Law et al.	by only quantifying the volume of greenhouse gas emissions, agencies fail to assess and disclose the actual climate consequences of an action and misleadingly present information in ways that will cause decisionmakers and the public to overlook important climate consequences.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
34.	Institute for Policy Integrity at NYU School of Law et al.	BLM Must Assess Actual Incremental Climate Impacts, Not Just the Volume of Emissions The tons of greenhouse gases emitted by a project are not the "actual environmental effects" under NEPA. Rather, the actual effects and relevant factors are the incremental climate impacts caused by those emissions, including:25 * property lost or damaged by sea-level rise, coastal storms, flooding, and other extreme weather events, as well as the cost of protecting vulnerable property and the cost of resettlement following property losses; * changes in energy demand, from temperature-related changes to the demand for cooling and heating; * lost productivity and other impacts to agriculture, forestry, and fisheries, due to alterations in temperature, precipitation, CO2 fertilization, and other climate effects; * human health impacts, including cardiovascular and respiratory mortality from heat-related illnesses, changing disease vectors like malaria and dengue fever, increased diarrhea, and changes in associated pollution; * changes in fresh water availability; * ecosystem service impacts; * impacts to outdoor recreation and other non-market amenities; and * catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.26. 25 These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."

Row #	Organization Name	Comment Text	Response Text
34. *(cont.)*	*(see above)*	categories are currently omitted from these IAMs. Compare Interagency Working Group on the Social Cost of Carbon, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis at 6-8, 29-33 (2010), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf. [hereinafter 2010 TSD]; with Peter Howard, Omitted Damages: What's Missing from the Social Cost of Carbon (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, see EPA, Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment (2017); U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment (2017); EPA, Climate Change in the United States: Benefits of Global Action (2015); Union of Concerned Scientists, Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate (2018). 26 2018 Intergovernmental Panel on Climate Change, Summary for Policymakers, in Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty 11 (Valérie Masson-Delmotte et al. eds.,	*(see above)*

Row #	Organization Name	Comment Text	Response Text
34. *(cont.)*	*(see above)*	2018), available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf [hereinafter, Summary of IPCC 1.5°C Report].	*(see above)*
35.	Institute for Policy Integrity at NYU School of Law et al.	The Miles City DSEIS briefly mentions changes in temperature, sea level, and precipitation and alludes to effects on "natural and human systems," and refers back to its original description of climate change from 2015,27 but nowhere refers even qualitatively, let alone quantitatively, to the plan's actual contributions to concrete climate effects like property loss, agricultural productivity, or human health. The Buffalo DSEIS does ever so slightly better by mentioning a few possible health effects of climate change in general,28 but still does not characterize the significance of the plan's contributions to actual, individual climate effects, like agricultural productivity or changes in energy demand.27 Miles City DSEIS at 3-8. 28 Buffalo DSEIS at 3-20.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
36.	Institute for Policy Integrity at NYU School of Law et al.	As a result, focusing just on the volume or rate of emissions, as BLM does here, is insufficient to reveal the incremental effect on the climate.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."

Row #	Organization Name	Comment Text	Response Text
37.	Institute for Policy Integrity at NYU School of Law et al.	BLM's comparison here of the plans' annual emissions to either national or global emissions (e.g., annual emissions from Buffalo coal development and combustion are 0.77% of global emissions; annual emissions from Miles City coal are 0.62% of national emissions misleadingly suggests that the project's contribution to climate change is static and small, while in fact a continuing stream of about 400 million metric tons per year in emissions will inflict marginally increasing damage each year as background concentrations rise. Comparing the plans' emissions to a state, national, or global inventory reveals nothing about the significance of the project's contributions to actual environmental impacts.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
38.	Institute for Policy Integrity at NYU School of Law et al.	Characterizing an annual contribution of nearly 400 million metric tons of carbon dioxide equivalent on average per year from coal production and combustion as just 0.77% of global emissions misleadingly makes the climate impacts appear vanishingly small. By comparison, by applying the social cost of carbon dioxide (about $51 per ton for year 2020 emissions in 2017$46), decisionmakers and the public can readily comprehend that 403 million tons of carbon dioxide emitted just in the year 202047 will generate over $20 billion in climate damages in that year alone.48. 2016 TSD, supra note 36. 47 Buffalo DSEIS at 3-14. 48 This calculation in no way accepts BLM's quantification of emissions as accurate or complete. In a proper cost-benefit analysis, future costs and benefits would be discounted to present value.	While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis.
39.	Petroleum Association of Wyoming	We request that BLM explain the methods and assumptions used in its assessment of climate change and greenhouse gas emissions, and include source data like the Wyoming Leasing EA. Though not required by NEPA, the Trades would find an explanation of BLM's methods, assumptions, and source data used in its climate change and greenhouse gas emissions analyses to be helpful.	Additional information on methods and assumptions is provided in Appendix C of the Supplemental EIS.

Row #	Organization Name	Comment Text	Response Text
40.	Sierra Club	BLM does not need exact data on the distribution among forms of transportation or quantity distributed to each type in order to quantitatively estimate emissions. BLM could have provided end-member emissions estimates for each transportation method by assuming all liquid and gaseous fuels would be transported by one method. While actual emissions will differ, this would at least provide the public with some sense of the potential scale of emissions.	The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream *combustion* [emphasis added] of coal, oil, and gas open to development under each RMP." The BLM went beyond the court order in analyzing the environmental consequences of transporting coal, as 95.4% of Wyoming coal is transported by rail (EIA 2018). Oil and gas transportation is more variable; transport methods, volumes, and destinations fluctuate. With this level of variability and unpredictability in oil and gas transport, quantification of estimated emissions would have a high degree of uncertainty and would not inform the decision maker.

Row #	Organization Name	Comment Text	Response Text
41.	Sierra Club	For the Buffalo Field Office, when GHG emissions from federal oil and gas developments are combined, the average annual GHG emissions are 5.1 MMT CO2e and 4.6 MMT CO2e using 20-year and 100-year GWPs, respectively. Buffalo DSEIS at 3-19. But these emissions estimates fail to include transportation emissions and emissions from end uses other than combustion.	The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream *combustion* [emphasis added] of coal, oil, and gas open to development under each RMP." Although the exact location and end use of each ton of produced coal is not known, the BLM has assumed that the produced coal evaluated in this EIS will be combusted for electricity generation. This is a reasonable assumption based on consumption data from the EIA that shows that between 80 and 90% of all coal produced in the US is used for this purpose. In addition, Wyoming coal is considered an excellent "steam coal," which is highly desirable for electricity generation across the United States. More than 90 percent of the coal produced in the US is for electricity generation (WY Geological Survey, https://www.wsgs.wyo.gov/energy/coal). Similarly, the BLM has assumed that all produced oil and gas will be combusted. The BLM has then used emissions factors from the EPA for coal and oil and gas combustion to derive GHG emissions for the downstream combustion of the reasonably foreseeable development of these materials produced in the planning area. The BLM has accounted for the GHG emissions from transportation of coal by rail. Oil and gas transportation is more variable; transport methods, volumes, and destinations fluctuate. With this level of variability and unpredictability in oil and gas transport, quantification of estimated emissions would have a high degree of uncertainty and would not inform the decision-maker. In addition, when considering transport of oil and gas by tanker truck, those emissions to a certain extent have been accounted for by assuming that all product is combusted. When considering transport of oil and gas by pipeline, the GHG emissions due to pipeline leaks and maintenance are typically orders of magnitude less than emissions due to combustion, which are essentially negligible.

Row #	Organization Name	Comment Text	Response Text
42.	Sierra Club	Other indirect emissions sources downstream of the well pad and upstream of end use that BLM should have disclosed and analyzed include, but are not limited to, CH4, CO2, and N2O emissions from: * Gathering and boosting stations; * Compressor stations; * Pig launchers/receivers; * Pipeline blowdowns; * Pipeline leaks; * Pneumatic devices; * Malfunctions and upsets; * Processing plants; and * Distribution pipeline and M&R station leaks	In the 2015 RMP/FEIS, the BLM examined field emissions from many of these types of sources. The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of *downstream combustion* [emphasis added] of coal, oil, and gas open to development under each RMP." In addition, the court did not order a midstream emissions analysis; midstream emissions are speculative and are highly dependent on field conditions and equipment and proximity to compressor stations and other processing facilities, and they are typically negligible in comparison with downstream combustion. Due to the uncertainty in quantifying these emissions, estimated midstream GHG emissions would not provide useful information for the decision-maker.
43.	Sierra Club	BLM acknowledges that combustion is not the only end use but fails to calculate potential emissions from those other end uses, stating, "[a]lthough the actual end use of these products also may include transportation fuels; feedstocks for plastics, chemical, and synthetic materials production; or other manufacturing, it is reasonably foreseeable to estimate emissions from combustion." Miles City DSEIS at Errata 3-12 - 3-13; Buffalo DSEIS at Errata 3-18. BLM failed to provide supporting justification for its omission of an analysis of these other end uses. BLM has not demonstrated that the other potential end-uses it recognizes result in lower GHG emissions than combustion. BLM should estimate GHG emissions based on anticipated end-use or at the very least provide a range of emissions estimates for various reasonable end-use scenarios.	The U.S. District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream *combustion* of coal, oil, and gas open to development under each RMP" (emphasis added). Reliable data on other end uses of the coal and oil and gas forecast to be produced from the planning area are not readily available and are highly speculative. Combustion of coal for electricity generation is an accurate assumption for this planning area. Wyoming coal is an excellent steam coal, which is highly desirable for electricity generation across the United States. More than 90 percent of the coal produced in the US is consumed for electricity generation (WY Geological Survey, internet website: https://www.wsgs.wyo.gov/energy/coal). Combustion is a reasonable surrogate for oil and gas end uses, and emissions are likely greater than other end uses.

Row #	Organization Name	Comment Text	Response Text
44.	Sierra Club	BLM also states that, "[m]ost recently (2012), EPA finalized regulations to reduce pollution from the oil and natural gas industry which is expected to result in substantial reductions in VOC emissions, air toxics, and CH4, an important GHG." Buffalo PRMP/FEIS at 324. However, EPA is currently in the process of weakening and rescinding its methane rules. In 2016, BLM also promulgated its own rules to limit methane emissions from oil and gas operations on federal and tribal lands - rules that have since been mostly repealed. As such, neither BLM's nor EPA's existing regulations are sufficient to prevent methane emissions from oil and gas development on federal and tribal lands. Therefore, BLM must analyze these emissions and include mandatory mitigation measures to address them.	Many states, including Wyoming, still have stringent emissions control requirements; emissions estimates in the EIS are based on reasonably foreseeable development practices. Specific emission control requirements (including controls on methane emissions) would be taken into consideration in environmental impact analyses prepared for specific projects; this detailed information is not available at the RMP stage analyzed in the EIS. In addition, the court determined that the BLM considered methane mitigation measures within its authority under Claim 2 on page 47 "BLM has not violated NEPA by failing to consider an alternative at the RMP level that would mandate the type of methane mitigation measures proposed by Plaintiffs."
45.	Sierra Club	29 Interagency Working Group on the Social Cost of Carbon, United States Government, Technical Support Document: Technical Update on the Social Cost of Carbon for Regulatory Impact Analysis-Under Executive Order 12866 (May 2013). Attached as Exhibit 20. 30 Interagency Working Group on the Social Cost of Carbon, United States Government, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis-Under Executive Order 12866 (February 2010). Attached as Exhibit 21.	The BLM considered and ultimately decided not to use SCC and SCM protocols for this environmental review. The reasons are outlined in revised text in Appendix D of the BFO SEIS/RMPA.

Row #	Organization Name	Comment Text	Response Text
46.	Sierra Club	BLM failed to contextualize emissions, such as through the use of the social cost of carbon protocol, a valid, well-accepted, credible, and interagency-endorsed method of calculating the costs of greenhouse gas emissions and understanding the potential significance of such emissions.2930	While the BLM did not monetize damages associated with GHG emissions and climate change, it evaluated climate impacts in the SEIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." This evaluation of climate impacts fully responds to the specific requirements of the District of Montana's ruling. Specifically, the BFO SEIS/RMPA quantifies the GHG emissions based on GWP values for both 20- and 100-year time horizons to calculate carbon dioxide equivalents (CO_2e) (see **Tables 3-4** through **3-7** in the BFO SEIS/RMPA for a description of the GWPs and scientific relevance of these two time horizons). Additionally, GHG emissions from coal, oil, and gas from the BFO are reported as a percentage of state, national, and global emissions. The BLM's rationale for taking this approach is discussed in Appendix D.

Row #	Organization Name	Comment Text	Response Text
47.	Sierra Club	31 Numerous other analyses identify other actual environmental effects of climate change, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires. See EPA, Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment (May 2017). Attached as Exhibit 22. 32 U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, (2018). Attached as Exhibit 23. 33 U.S. EPA, Climate Change in the United States: Benefits of Global Action, (2015). Attached as Exhibit 24. 34 Union of Concerned Scientists, Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate, (2018). Attached at Exhibit 25.	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference."
48.	Sierra Club	The tons of greenhouse gases emitted by the proposed actions are not the "actual environmental effects" under NEPA. Rather, the actual environmental effects are the climate impacts caused by those emissions, such as property loss, changes in energy demand, impacts to agriculture, forestry, and fisheries, human health impacts, changes in freshwater availability, ecosystem service impacts, impacts to outdoor recreation, and catastrophic impacts. These kinds of impacts are included in the social cost of carbon calculations developed by the Interagency Working Group.31323334	The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097); it states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4, page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference." Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis.

Row #	Organization Name	Comment Text	Response Text
49.	Sierra Club	The U.S. committed to the climate change target of holding the long-term global average temperature "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels"35 under the Paris Agreement.36 The Agreement recognized the 1.5°C climate target because 2°C of warming is no longer considered a safe guardrail for avoiding catastrophic climate impacts and runaway climate change.37 Research that models emissions pathways for meeting 1.5° or 2°C targets shows that a rapid reduction in fossil fuel use in the United States is necessary. Specifically, research indicates that global fossil fuel CO2 emissions must reach net zero by mid-century and likely as early as 2045 for a reasonable likelihood of limiting warming to 1.5° or 2°C.38 The United States must achieve net zero fossil fuel CO2 emissions even earlier: between 2025 and 2030 on average for a reasonable chance of staying below 1.5°C, and between 2040 and 2045 on average for a reasonable chance of staying below 2°C.39 Halting new production and closing most existing oil and gas fields and coal mines before their reserves are fully extracted is one pathway to ending U.S. fossil fuel CO2 emissions between 2025 and 2030, consistent with the Paris climate targets. In light of rapidly shrinking global carbon budgets, BLM should consider a "no leasing" alternative. BLM has broad discretion not to lease public lands for minerals development, and has the responsibility to use this discretion to safeguard environmental and human health resources and values in light of climate change. See, e.g., Udall v. Tallman, 380 U.S. 1 (1965); Rocky Mountain Oil & Gas Ass'n v. U.S. Forest Serv. 157 F.Supp.2d 1142 (D. Mont. 2000). BLM should also use carbon budgeting to contextualize emissions, quantifying how much of the remaining global carbon budget the Buffalo and Miles City RMPs will consume, utilizing the plans' direct and indirect emissions. BLM recently took precisely this approach in a draft environmental assessment ("draft EA") for the New Elk coal lease in Colorado. This is a relatively simple exercise, as BLM's New Elk draft EA demonstrates:	The BLM has included an analysis of cumulative GHG emissions from the production and combustion of coal open to development under the RMP. A carbon budget is based on the premise that there is a strong relationship between GHG emissions and future global temperature increases. Carbon budgeting is an approach for identifying how much additional CO_2 emissions the atmosphere can accept in order to limit global warming to a temperature increase above pre-industrial levels, such as 2.0 degrees Celsius, as defined in the Paris Agreement, or 1.5 degrees Celsius, as used in many integrated climate assessment models. The carbon budget was developed as a tool to assist policymakers in reducing GHG emissions on national and global scales. The budget has evolved over time as scientists refine data and estimates of cumulative carbon emissions that have already occurred. For example, scientists recently revised the budget described in the IPCC Special Report to account for problems associated with the Earth System Models used in the IPCC Fifth Assessment Report budget estimates. These models underestimated historical cumulative CO_2 emissions and projected temperatures warmer than have been observed. According to the IPCC Special Report, "uncertainties in the size of these estimated remaining carbon budgets are substantial." The IPCC SR estimates the budget for a 50/50 chance of exceeding 1.5 degrees Celsius at 580 gigatonnes of CO_2 ($GtCO_2$), with an uncertainty of $\pm 400 GtCO_2$. This uncertainty is nearly 70% of the budget. The uncertainty results from the precise meaning of the 1.5 degrees Celsius target, the definitions of surface temperature and pre-industrial period, the choice in observational temperature datasets, the uncertainty in non-CO_2 factors that influence warming, and if earth-system feedbacks should be taken into account.

Row #	Organization Name	Comment Text	Response Text
49. *(cont.)*	*(see above)*	The newest budget estimates are expressed as the remaining cumulative CO2 emissions from the start of 2018 until the time of net zero global emissions and suggest a value between approximately 420 gigatons of carbon dioxide (GtCO2) and 580 GtCO2. For the purposes of this analysis, an average of 500 GtCO2 is used (BLM 2019). Over the life of the project, the Mine is anticipated to generate 300.3 million tons of CO2e (direct and indirect) if all of the recoverable coal is mined under the Proposed Action. The federal scope or portion of that estimate would be 14.3 percent or 42.9 million tons of CO2e (Proposed Action minus the No Action Alternative). Although not strictly a one-to-one comparison, on a CO2e basis, the No Action Alternative would consume approximately 0.06 percent of the remaining carbon budget, while the federal scope of the Proposed Action Alternative would consume 0.01 percent.40 The fact that BLM has recently used this tool to analyze the climate impact of a single federal coal lease demonstrates the availability of the tool and BLM's ability to apply the tool in the NEPA decision making context. 35 United Nations Framework Convention on Climate Change, Conference of the Parties, Nov. 30-Dec. 11, 2015, Adoption of the Paris Agreement Art. 2, U.N. Doc. FCCC/CP/2015/L.9 (December 12, 2015), http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf ("Paris Agreement"). Attached as Exhibit 26. 36 On December 12, 2015, 197 nation-state and supra-national organization parties meeting in Paris at the 2015 United Nations Framework Convention on Climate Change Conference of the Parties consented to the Paris Agreement committing its parties to take action so as to avoid dangerous climate change. 37 Although President Trump announced on June 1, 2017 that the U.S. would withdraw from the Paris Agreement, the earliest possible effective withdrawal date is November 4, 2020, in accordance with Article 28 of the Agreement. 38 Joeri Rogelj et al., Energy system transformations for limiting end-of-century warming to below 1.5°C, 5 Nature Climate Change, (2015), 519.	With the large uncertainty in the remaining carbon budgets, it is not a useful tool for assigning a GHG emissions significance level at this time. Furthermore, the IPCC Special Report states that proposed actions across many sectors and spatial scales are needed to reduce emissions and limit warming. There is no requirement or mechanism to apply a worldwide carbon budget to a management plan in this EIS. Evaluations of such Proposed Actions are beyond the scope of this EIS. Based on the disclosed GHG emissions in the EIS and the substantial uncertainties in the size of carbon budgets, including carbon budgets would not provide additional useful information to the decision-maker or public. In Section 2.2.5 of the Draft SEIS, the BLM did consider a no leasing alternative for coal; however, this alternative was dismissed from further consideration because making the entire decision area unacceptable for further consideration for coal leasing would not meet the BLM's multiple use mandate under FLPMA, the leasing requirements under the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2; moreover, it would violate valid existing rights. The 2015 RMP did analyze a no leasing alternative for oil and gas under the alternatives considered but eliminated from further analysis section. See 2015 RMP for further details.

Row #	Organization Name	Comment Text	Response Text
49. *(cont.)*	*(see above)*	Attached as Exhibit 27. 39 See Climate Action Tracker, "USA," (last updated November 6, 2017), http://climateactiontracker.org/countries/usa, at rating figure showing U.S. emissions versus year (last visited November 13, 2017). Attached as Exhibit 28. 40 BLM, New Elk Coal Lease By Application, Federal Coal Lease (COC71978), Draft Environmental Assessment, at 3-17 (April 2019). Attached as Exhibit 29.	*(see above)*
50.	Sierra Club	Read the latest studies coming out from NCAR (and from the EU) which reveal that the temperature rise planet-wide is much more sensitive to the rise in CO2 than was previously thought. We can now expect 5 degrees C of warming for the same amount of CO2 that was previously thought to result in 2 degrees C of warming.	The statement does not include a comment that requires a response.
51.	Western Energy Alliance and Petroleum Association of Wyoming	We request that BLM explain the methods and assumptions used in its assessment of climate change and greenhouse gas emissions, and include source data like the Wyoming Leasing EA. Though not required by NEPA, the Trades would find an explanation of BLM's methods, assumptions, and source data used in its climate change and greenhouse gas emissions analyses to be helpful.	Additional information on methods and assumptions is provided in Appendix C of the Supplemental EIS.

Row #	Organization Name	Comment Text	Response Text
52.	Wyoming Mining Association	In particular, WMA has significant concerns that the methodology for considering "downstream" climate implications remain arbitrary and speculative at best and have the very real potential to limit access to the federal coal resource in a manner inconsistent with BLM's charge under the Mineral Leasing Act and multiple-use philosophy.	The US District Court Order of March 2018 states that "BLM must supplement the Miles City FEIS and Buffalo FEIS with an analysis of the environmental consequences of downstream combustion of coal, oil, and gas open to development under each RMP." Although the exact location and end use of each ton of produced coal is not known, the BLM has assumed that the produced coal evaluated in this EIS will be combusted for electricity generation. This is a reasonable assumption, based on consumption data from the EIA that shows that between 80 and 90% of all coal produced in the US is used for this purpose. In addition, Wyoming coal is considered an excellent steam coal, which is highly desirable for electricity generation across the United States. More than 90 percent of the coal produced in the United States is consumed for electricity generation (WY Geological Survey, https://www.wsgs.wyo.gov/energy/coal). Similarly, the BLM has assumed that all produced oil and gas will be consumed through combustion. The BLM has then used emissions factors from the EPA for coal and oil and gas combustion to derive GHG emissions for the downstream combustion of the reasonably foreseeable development of these materials produced in the planning area. The BLM evaluated impacts in the Supplemental EIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition, the use of GHG emissions to evaluate climate change impacts was upheld in the court's opinion and order, as stated under Claim 4 page 47, "BLM's selection of GHG emissions as a proxy by which to analyze climate change impacts represents a scientific judgment deserving of deference." Additional information on the method for evaluating GHG emissions is provided in Appendix C of the Supplemental EIS.

Row #	Organization Name	Comment Text	Response Text
53.		**Biological Resources**	
54.	Campbell County University of Wyoming, Department of Energy Resources	Page 3-33, Direct and Indirect Impacts, Analysis Methods, Assumptions - The factors with the greatest impact on vegetation and soil health are the introduction and expansion of invasive plants species, surface-disturbing activities, large grazing ungulates ... " There is a plethora of science that could be provided outlining the benefits of large grazing ungulates and their impact on soil health and vegetation. It is inappropriate to list cattle and sheep in this category as factors having the greatest impacts on vegetation and soil health and should be removed from this assumption.	"Ungulates" was removed from the text.
55.	Wyoming Game and Fish Department	The SEIS does not provide a detailed analysis of indirect impacts to wildlife and habitat resources, as these analyses have occurred under other environmental reviews. It is our understanding the Department will have the opportunity to participate in a more robust and specific evaluation of impacts to wildlife and habitat when the BLM receives a lease application in the CDP A. As acknowledged in the SEIS, implementation of the State of Wyoming Sage Grouse Executive Order (SGEO) would occur at the leasing stage, as well.	Comment noted. The Wyoming Game and Fish Department will be consulted during implementation phases of coal leasing and development under subsequent NEPA.
56.		**Cumulative Impacts**	
57.	Sierra Club	In order to understand the environmental consequences of BLM's plans, the public and the agency must first understand how BLM's decision to allow massive amounts of coal, oil, and gas production in the planning areas impacts overall production and use of coal, oil, and gas. BLM has the tools that would allow it to study the issue and disclose the market and climate impacts to the public and decisionmakers - other federal agencies have used these market models for years - but BLM has failed to either use the tool or explain its refusal to do so in the SDEISs.	The RFD for federal coal and oil and gas production in BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal, oil, gas, or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.
58.	Sierra Club	In particular, BLM must evaluate the potential energy models - and ultimately use one or more of these models - in order to adequately analyze how various alternatives would affect coal supply, coal combustion, and greenhouse gas emissions.	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or other substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
59.	Sierra Club	Here, BLM cannot isolate the climate impacts of the Buffalo Plan from the Miles City Plan, and vice versa. BLM approved both plan amendments in a single Record of Decision. It is now reviewing both plans along identical public comment timelines. Together, the plans cover one geologic region known as the Powder River Basin. BLM cannot ignore the combined climate impact of these two plans, as they are clearly reasonably foreseeable under 40 C.F.R. § 1508.7. As in the Keystone XL case, leaving out the massive climate impacts of the Buffalo plan from the Miles City DSEIS (and the Miles City plan from the Buffalo DSEIS) leaves out significant information from the climate analysis that is in BLM's possession.	In the BFO SEIS, the BLM did consider impacts from the Miles City SEIS. It updated the text in the final SEIS to clarify this.
60.	**Development Potential**		
61.	Sierra Club	BLM overestimates the amount of coal that can be economically developed, using outdated assumptions about strip ratios and Btu content. BLM should update its analysis using current market conditions and profit forecasts for Powder River Basin coal mines, using data from U.S. Energy Information Administration ("EIA"), company filings with U.S. Securities and Exchange Commission, and other data as appropriate. Starting with an accurate coal development potential area ("CDPA") is critical to the screening process. BLM should also consider the total demand for Powder River Basin coal and how that demand will shrink in the future. BLM should limit leasing to areas that truly have development potential, areas that, if leased, will guarantee to return royalties and other revenue to the Department of the Interior.	The BLM used 2018 production values as its baseline and the EIA's annual energy outlook. The government considers this the best available information and has used it in multiple accepted federal RFDs. The data take into account that demand will shrink in the future. Increasing coal depth, split coal seams, and reduced quality were factors used in defining the boundary of Alternative B. The discussion for defining the Alternative B development potential area is discussed in Section A.3.1 under Screen 1.
62.	State of Wyoming	The decision to reduce acreage with the selection of Alternative B also limits the flexibility of a company to mine in the most efficient manner. Reduced acreage may prohibit more environmentally friendly options and unnecessarily cram operations into a footprint that just does not fit the sensible use of the resource.	Based on the special expertise provided by the cooperating agencies, the Proposed Plan adds 39,784 acres to Alternative B to ensure flexibility for mining in the most efficient manner such as providing for the expansion of existing mines and associated mining infrastructure, and provides an opportunity for future new uses of coal, such as carbon fiber development.

Row #	Organization Name	Comment Text	Response Text
63.	**Direct and Indirect Impacts**		
64.	Institute for Policy Integrity at NYU School of Law et al.	Despite BLM's attempts to use terminology to distinguish the impacts it wants to monetize from those impacts it would prefer not to monetize, NEPA regulations group all these impacts under the same category of "effects": economic and social impacts are listed as "effects" alongside ecological and health impacts, and all these effects must be discussed in as much detail as possible in an adequate NEPA review.78 Whether an effect is a cost, benefit, or transfer, if monetization is the best way to assess that effect's significance and contextualize the precise impacts, then monetization is the best way to comply with NEPA's obligations.	NEPA requires agencies to take a hard look at reasonably foreseeable effects, including those that are ecological, aesthetic, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative (40 CFR 1508 (a) and (b)) when undertaking a major governmental action; however, NEPA provides considerable latitude in what issues are considered significant and the degree and type of analysis that must be conducted to provide decision-makers with sufficient information to make an informed decision. Neither NEPA nor the Council on Environmental Quality's supporting regulations mandate the use of specific analytical methods or metrics. While monetization is one of many ways to facilitate the interpretation of effects, this approach is most useful for informing decisions when all impact indicators have been monetized. Without monetized estimates of other impacts, no context in which social costs can be interpreted. This pertains to impacts on biological and ecological resources and on social benefits realized through industrial efficiencies, technological advances, and time savings.

Row #	Organization Name	Comment Text	Response Text
65.	Institute for Policy Integrity at NYU School of Law et al.	Some of the incremental impacts on the environment that the social cost of greenhouse gas protocol captures-and which the DSEISs fails to meaningfully analyze-include property lost or damaged; impacts to agriculture, forestry, and fisheries; impacts to human health; changes in fresh water availability; ecosystem service impacts; impacts to outdoor recreation and other non-market amenities; and some catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.	Foundational economic theory dictates that an economic impact does not equate to an economic benefit. All estimates of economic activity, in terms of revenue, employment, labor income, total value added, and output that is expected to occur with the proposed action is simply an economic impact, rather than an economic benefit (Watson et al. 2007). Based on their views and values, people may perceive increased economic activity as a positive impact that they desire to have occur; however, that is very distinct from being an economic benefit, as defined in economic theory and method (Watson et al. 200; Kotchen 2011). This distinction is anything but semantical and is further discussed in revised text in Appendix D of the BFO SEIS/RMPA. The BLM considered and ultimately decided not to use the use of SCC and SCM protocols for this environmental review. These reasons for this are outlined in revised text in Appendix D of the BFO SEIS/RMPA.
66.	Sierra Club	In considering a No Leasing alternative, BLM must account for the different market impacts of its considered alternatives in order to understand and compare greenhouse gas emissions across alternatives. This information is essential to understand the climate impacts of the plans, which is the entire point of considering different levels of fossil fuel production.	In Section 2.2.5 of the draft SEIS, the BLM did consider a no leasing alternative for coal; however, this alternative was dismissed from further consideration because making the entire decision area unacceptable for further consideration for coal leasing would not meet the BLM's multiple use mandate under FLPMA, the leasing requirements under the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2; moreover, it would violate valid existing rights. In the 2015 RMP, the BLM did analyze a no leasing alternative for oil and gas under the alternatives considered but eliminated it from further analysis. See the 2015 RMP for further details. A detailed emissions analysis was not necessary because this alternative was not brought forward for further analysis.

Row #	Organization Name	Comment Text	Response Text
67.	Sierra Club	Third, although BLM refuses to study the market effects of any alternative, it "assumes" that its decisions - across the entire Powder River Basin and all federal lands - have no impact on the amount of coal developed. Buffalo DSEIS at 3-25; Miles City DSEIS at 3-48. This final point is plainly inaccurate and has been rejected by several courts.	On page 3-25 of the draft SEIS, the BLM does not state or assume that its decisions have no impact on the amount of coal developed. The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years.
68.	State of Wyoming	Other than to seemingly avert potential negative public perception issues by selecting Alternative A, there is no justifiable rationale for the BLM's decision to select Alternative B and subsequently reduce the coal development zone in the Buffalo RMP planning area . Coal development potential does not equate directly to downstream greenhouse gas emissions; the coal would have to be leased, developed, transported and utilized at a generation facility -- all of which are factors subject to a variety of unknowns, including markets, economics, regulations, and technology.	As part of the coal screening process (see section A.3), the northwestern corner and east side of the Alternative A Coal Development Potential Area were removed under Alternative B based on the increasing overburden depth, splitting of coal seams, and decreasing quality of the coal (<8,200 BTUs). Based on the special expertise provided by the cooperating agencies, the Proposed Plan adds 39,784 acres to Alternative B to ensure flexibility for mining in the most efficient manner such as providing for the expansion of existing mines and associated mining infrastructure, and provides an opportunity for future new uses of coal, such as carbon fiber development.
69.	**Economics**		
70.	Sierra Club	BLM ignores that fact that its policies impact energy markets in predictable ways and that BLM has in fact studied these impacts in other NEPA reviews. For example, in its Final EIS for the Greater Mooses Tooth 2 offshore oil project, BLM used the Bureau of Ocean Energy Management's ("BOEM") Market Sim energy model to compare energy market substitution effects and different levels of GHG emissions of the No Action and Action Alternatives. As BLM explains in its methodology appendix to the EIS: To evaluate the difference between new OCS oil and gas leasing during the 2017-2022 Program and a No Action Alternative (i.e., no new leases in the 2017-2022 Program), BOEM uses information from EIA to estimate energy sources that would be used in absence of the 2017-2022 Program to meet energy demand. . . . Coal, biofuels, and nuclear and renewable energy sources are substituted for OCS oil and gas in lesser amounts. In addition, it is assumed that there would be some conservation measures, including reduced	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision. The BLM, in developing the RFD, used publicly available data, which is summarized in the EIA's annual energy outlook. Results from the NEMS run are summarized in the AEO 2019. The government considers this the best available information and has been used in multiple accepted federal RFDs.

Row #	Organization Name	Comment Text	Response Text
70. *(cont.)*	*(see above)*	demand and consumption of all energy sources due to higher oil and gas prices in the absence of new OCS resource availability. … Changes in energy consumption patterns are estimated using BOEM's energy market simulation model, MarketSim (Industrial Economics, Inc. 2015)... This model simulates end-use domestic consumption of oil, natural gas, coal, and electricity in four sectors (residential, commercial, industrial, and transportation); primary energy production; and the transformation of primary energy into electricity. MarketSim mostly represents U.S. energy markets, but also captures interaction with world energy markets as appropriate. The model takes current measures of energy production, consumption, and prices assuming no new OCS leasing as a baseline to which a given scenario of OCS production is added.17 17 BLM, Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth 2 Development Project Final Supplemental Environmental Impact Statement, Vol. 3, App. H (unpaginated) (Aug. 2018), available at https://eplanning.blm.gov/epl-frontoffice/projects/nepa/65817/156375/191446/GMT2_Final_SEIS_Volume_3-_Appendicescompressed.pdf. Appendix H attached as Exhibit 13.	*(see above)*
71.	Campbell County University of Wyoming, Department of Energy Resources	Page 3-27, Local Revenues - " ... On annual average, leasing and production of federal coal in the BFO is projected to generate $16.9 million in ad valorem tax revenue for Campbell County between 2019 and 2038 and nearly $435,000 in tax revenues for Campbell County over the next 10 years ... " BLM should clarify this statement as to what type of "tax revenue" they are referring to or is the $435,000 ad valorem taxes for Converse County over the next ten years.	The text in Appendix D of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
72.	Sierra Club	In a 2018 paper published in Nature Climate Change, Peter Erickson and Michael Lazarus estimated a future reference case for U.S. coal, estimated the quantities of federal production that would be affected by a permanent leasing moratorium, and then modeled the market response to those production cuts through 2030. 14 Their analysis looked at market responses both with and without implementation of the Clean Power Plan. Employing the IPM, which includes all U.S. coal resources and power plants, the authors concluded: For coal, results from IPM indicate that, absent the Clean Power Plan, each EJ [exajoule] of coal no longer supplied (due to lease restrictions) to domestic power markets in 2030 would lead to substitution of 0.31 EJ from other coal supplies, especially from the Illinois Basin and Northern Appalachia. The net drop in national coal consumption would be 0.69 EJ for each EJ of federal coal not produced because of the lease restrictions. Gas consumption would also increase 0.35 EJ, to make up for the lost coal-based electricity. For coal export markets, we find that each EJ of US coal no longer exported to Asian power markets (e.g., South Korea and the Philippines) would yield a drop in net coal consumption of 0.30 EJ, accounting for partial substitution by other, higher cost sources of coal (e.g., from Indonesia and Australia). This ratio is within the range of results of global steam coal market modeling analysis, which found that each unit of coal not supplied to the Pacific coal market would lead to a reduction in coal consumption of between 0.1 and 0.4 units, depending on whether the supply market was less constrained (lower result) or more constrained (higher result) (Haftendorn et al. 2012). The higher price of coal would also lead to some switching to natural gas in Asian power markets (less so than in the U.S., given that gas is more costly and less available in Asia), amounting to an increase in natural gas consumption of 0.07 EJ for every EJ of US coal no longer exported due to the lease restrictions. In total, for coal, we find that leasing restrictions would reduce production by 5.4 EJ in 2030. The drop in CO2 emissions from the consumption of federal coal	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision. The BLM, in developing the RFD, used publicly available data, which is summarized in the EIA's annual energy outlook. Results from the NEMS run are summarized in the AEO 2019. The government considers this to be appropriate information and has been used in multiple accepted federal RFDs.

Row #	Organization Name	Comment Text	Response Text
72. *(cont.)*	*(see above)*	(largely from the Powder River Basin) in that year would be about 490 Mt CO2, as shown in Fig. 1b. Increased coal and gas supplies from other sources would add back 162 Mt CO2and 90 Mt CO2, respectively, resulting in a net overall reduction in emissions of 240 Mt CO2.15 14 Peter Erickson and Michael Lazarus, Would constraining US fossil fuel production affect global CO2 emissions? A case study of US leasing policy, Nature Climate Change (January 28, 2018), https://doi.org/10.1007/s10584-018-2152-z. Attached as Exhibit 11. 15 Id. at 8.	*(see above)*
73.	Institute for Policy Integrity	BLM tries to argue that, among fossil fuels, coal is "the most price inelastic with respect to demand," and that coal-reliant states have limited ability to switch away from coal.6 BLM relies principally on two sources to support these claims: Gao et al. 2013, and Elbakidze & Zaynutidnova 2016. Not only are both those studies limited in important ways, but overall those studies do not support BLM's claims. Indeed, BLM even contradicts itself, citing the same sources for the proposition that "natural gas was easily substituted for coal in all U.S. states from 2009 through 2014."7 BLM also concedes that "recent price trends have led to the decline of coal use and increase of natural gas use," and that there are "increasingly positive elasticity of substitution between natural gas and coal."8 BLM also admits that coal could be easily substituted with renewable energy sources, but claims such dynamics are too "difficult to predict."9 In fact, substitution between coal and renewables like solar, onshore wind, offshore wind, hydropower, and biofuels-as well as substitution to nuclear, substitution to imported electricity, effects on exports, effects on technological improvements like heat rate, and effects on reduced demand for coal and for overall electricity-are hallmarks of a proper energy substitution analysis. BLM well knows this, from having recently used the MarketSim model to conduct an energy substitution analysis for the Greater Mooses Tooth 2 (GMT2) Development Project.10 BLM's statements both within these DSEISs and in other documents like the GMT2 EIS contradict its assumptions that the Buffalo and Miles City plans can have no effect on the overall supply,	The RFD for federal coal production in BFO is the same under both alternatives, and management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
73. *(cont.)*	*(see above)*	price, or demand for fossil fuels. Rather, these dynamics can all be modeled, and should be modeled here. 6 Buffalo DSEIS at B-4; Miles City DSEIS at D-11. 7 Buffalo DSEIS at B-3; Miles City DSIES at D-10. 8 Buffalo DSEIS at B-4; see also Miles City DSEIS at D-11. 9 Miles City DSEIS at D-11. 10 BLM, Final Supplemental Environmental Impact Statement: Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth 2 Development Project at 311, table 113 (2018), https://eplanning.blm.gov/epl-frontoffice/projects/nepa/65817/155289/190057/GMT2_Final_SEIS_Volume_1-_Chapters_1-6.pdf (showing "Energy substitutions for GMT2 Project," including increased fuel imports; substitutions between oil, gas, biofuels, coal, nuclear, hydro, solar, wind, imported electricity, and other options; and reduced demand for fuels or electricity).	*(see above)*
74.	Institute for Policy Integrity	Not only does Gao et al. show cross-elasticities between coal and other fuels, but the results do not even support BLM's claim that coal is always the most own-price inelastic fossil fuel. In Table 4, showing static Marshallian unconditional price elasticities, Gao et al. find that, in the PJM and the Midwest regions, coal is more own-price elasticity than gas; and in Table 6, for dynamic Marshallian fuel price unconditional elasticities, Gao et al. find that coal in the Midwest is also more own-price elastic than gas.	The text in Appendix B of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
75.	Institute for Policy Integrity	Elbakidze and Zaynutdinaova also has important limitations, as well as conclusions that contradict BLM's assumptions. First, the overall quality of this presentation paper-which was selected for the Agricultural & Applied Economics Association meeting but has not undergone full peer review-calls into doubt some of its conclusions. Though writing quality is certainly not determinative of the quality of the underlying economic analysis, some of the typographical errors in this work are so severe-such as spelling Rhode Island as "Road Island"-that the writing quality does raise questions about what else may be wrong and whether there are other mistakes in the analysis that a peer review publication process would uncover. Putting those concerns aside, much of the paper goes against BLM's conclusions. The paper begins with the understanding that the electric power sector has "the ability . . . to respond to changes in . . . relative fuel prices." The paper summarizes the past literature as finding that "natural gas was a substitute input for coal . . . to various degrees across the seven electricity generation regions in the US," and as showing that coal consumption can increase due to "factors like decrease in railroad freight rates and power plants' elastic demand for coal. "The paper notes that the decline in coal consumption since 2008 is "not surprising" given changes in relative costs of coal to gas. As for the paper's own results, except for in three states (Iowa, Nebraska, and New Hampshire), the paper finds that "natural gas and coal appear to be substitutes in all states across all three sample periods. "The paper also has some of the same limitations as Gao et al. For example, it specifically "defer[s] examination of . . . renewable sources."	The text in Appendix B of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
76.	Institute for Policy Integrity	BLM also cites a 2008 study by the U.S. Government Accountability Office (GAO) for the idea that "transitioning power plants to alternative fuel sources are unlikely, due to the economic and infrastructural challenges faced (GAO 2008)."22 BLM seems to have in mind converting individual power plants from coal to instead burn other types of fuel. Such retrofits are indeed sometimes technologically complicated, but that is precisely why the GAO study identified generation shifting by reprioritizing the dispatching of electricity generators as a much more efficient and preferred option.23 Additionally, the GAO's conclusions from 2008 turned on assumptions about "high natural gas prices,"24 which no longer hold true after the shale gas boom lowered gas's price. Overall, BLM misses the most relevant point from the 2008 GAO report (about dispatch priority), and so the agency is far too quick to dismiss the potential for generation shifting away from coal to other fuels, like gas or renewables. 22 Buffalo DSEIS at B-4. 23 The GAO report's ultimate conclusion is that "[w]ith respect to the conversion of existing coal-burning plants, stakeholders said that it would be more feasible and cost-effective to construct new natural gas units or dispatch excess capacity at existing natural gas units than to convert a coal plant because of technical and economic factors." Gov't Accountability Office, GAO-08-601R, Implications of Switching from Coal to Natural Gas at 5 (2008), https://www.gao.gov/new.items/d08601r.pdf. Additionally, "EIA data describing the average capacity factors of different generation options demonstrate that significant excess capacity exists at natural-gas-fired plants." Id. at 16. 24 Id. at 5.	The text in Appendix B of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
77.	Institute for Policy Integrity	BLM also cites to several U.S. Energy Information Administration documents, but continues to cherry pick the points that suit it. The executive summary of EIA's 2012 report on Fuel Competition in Power Generation and Elasticities of Substitution paints a much different and much rosier picture of coal-to-gas substitution than the one BLM presents: [A] sudden increase in spot prices for Appalachian coal during 2008 has been followed by a sustained decline in the delivered cost of natural gas, both of which have substantially shifted the dispatch pattern for baseload generation in some parts of the country, favoring natural gas fired united over coal-fired units. . . . The model results indicate that for the United States as a whole, a 10-percent increase in the ratio of the delivered fuel price of coal to the delivered price of natural gas leads to a 1.4-percent increase in the use of natural gas relative to coal.25 In short, the fact that EIA found some degree of inelasticity of demand does not mean that there will be no substitution from coal to other energy sources; perfect elasticity is not required for some significant substitution to occur. Furthermore, contrary to BLM's conclusion that coal is the most own-price inelastic of the fossil fuels, EIA shows that own-price elasticities vary by region of the country, and "in some regions coal is more responsive to price than natural gas."26Even if BLM's gloomier read of the 2012 EIA study were correct (and it is not), there are several important limitations of the 2012 EIA study.27 The report looks only at "competition between coal, natural gas and petroleum,"28 and not other energy substitute options. In fact, while EIA's model assumes that the price of "nuclear, hydropower, and other renewable energy sources" will "have minimal impact on generators' choice of fossil fuel,"29 the report readily acknowledges, for example, that "the availability of hydropower in any given year can have a tremendous impact on the mix of fuels" in the western U.S. region.30 The report draws only on data through the year 2010,31 when relative fuel prices were just beginning to change. The report focuses on a relatively shorter-run period of just six years,	The text in Appendix B of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
77. *(cont.)*	*(see above)*	from 2005 to 2010.32 Because "the capacity mix" in the data "did not vary much during the sample period," the model ran into difficulties with its "attempt[] to account for changes in capacity over the long-run."33 The report explicitly says that it is "present[ing] the short-run estimates of regional cross price elasticities of substitution between coal, natural gas, and oil."34 Over a longer period of time, even greater substitution effects would be likely. If a longer-run study, based on more recent data and accounting for renewable energy, were run today, the results could be very different. Yet to repeat: even with all its limitations, the conclusions of the 2012 EIA report in no way support BLM's assumption that there will be no meaningful substitution away from coal under the no action alternative. 25 EIA, Fuel Competition in Power Generation and Elasticities of Substitution at 1 (2012); see also id. at 4 ("Although various factors contributed to this significant year-over-year shift in the generation fuel mix, the relative change in fuel prices was likely one of the primary drivers."). 26 Id. at 12. 27 The study also identifies as a limitation its reliance on data measured in BTUs, rather than in dollars per MWh, which would "account for relative technological efficiencies and heat rates between generators that use different types of fuel." Id. at 13. 28 Id. at 1. 29 Id. at 7.30 Id. at 11. 31 Id. at 1 ("during the period of 2005-2010"); but see id. at 4 ("This shift from coal to natural gas in the southeast has continued into 2010, 2011, and 2012."). 32 Id. at 1. 33 Id. at 13. 34 Id. at 10.	*(see above)*

Row #	Organization Name	Comment Text	Response Text
78.	Institute for Policy Integrity	BLM's citations to EIA's 2019 Annual Energy Outlook are also misleading, because BLM focuses solely on the single scenario presented in the reference case. But by comparing EIA's different cases, it becomes clear that by changing assumptions or conditions for the supply and price of various fossil fuels, demand changes as well. For example, in the high oil and gas resource and technology case, the relative price of coal increases relative to other fuels as compared to the reference case. With such a change in relative prices, EIA finds that coal-fired retirements accelerate and coal demand drops, by as much as 30% in some regions.35 A change in the supply of coal, by changing the conditions of federal leases, could have a similar kind of effect on relative fuel prices, with a similar kind of effect on demand. BLM ignores such data.35 EIA, AEO2019 at 108, 110 (2019).	As discussed in Appendix B, the BLM examined forecasts under the reference case and six side cases (page B-5) and developed an RFD based on the best fit to 2018 production by the 12 mines operating in the CDPA, as reported by the Mine Safety Health Administration. Detailed information on the underlying assumptions of AEO 2019 are available online at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed in Alternative B. Text in this appendix has been revised to clarify why the RFD for federal coal production in the BFO is the same under both alternatives and how management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 year; therefore, there would be no changes in the price of coal relative to substitute fuel sources or coal's share of the electricity generation fuel mix to change.

Row #	Organization Name	Comment Text	Response Text
79.	Institute for Policy Integrity	Most confusingly, even though the Buffalo DSEIS reports that it uses the EIA's model (NEMS) to forecast production in the reasonably foreseeable development scenario,66 the Buffalo DSEIS also claims that analyzing how net emissions would change in response to competing prices of different fuels is too "complex" with too many "data requirements," and is "beyond the scope" of the DSEIS67-but that is exactly what NEMS is capable of doing. Whether an analysis is "complex" is not the standard under NEPA regulations for when agencies are allowed to forgo production of essential information. 40 C.F.R. § 1502.22(a) provides that "If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement."68 BLM has not explained why the missing information on energy substitution that a model could generate is not "essential to a reasoned choice." Nor has BLM explained why the costs of running the model are "exorbitant." This is especially true since BLM has already used NEMS and so has ready access to it. Furthermore, besides NEMS, other models could be less costly. The costs of licensing and operating various models should be weighed against the long-term benefits of having access to and experience with models to use not just in these proceeding but in all future analyses of leases, regulations, and other policy decisions that BLM will undertake. Compared to all the revenue that BLM expects these kinds of leases will bring to the federal government, the cost of licensing and operating a model that will help the agency ensure its actions are really increasing the net public welfare should seem eminently reasonable. 66 Buffalo DSEIS at B-5, 67 Id. at D-6 to D-7. 68 40 C.F.R. § 1502.22(a) (emphasis added).	The text in Appendix B of the BFO SEIS/RMPA has been revised.

Row #	Organization Name	Comment Text	Response Text
80.	Institute for Policy Integrity	BLM also fails entirely to consider other modeling options besides NEMS. For example, in addition to NEMS, the Surface Transportation Board has also used ICF International's Integrated Planning Model "to assess coal production . . . and distribution patterns."69 Most importantly, the Department of the Interior has already taken some inputs from NEMS, simplified the details, and developed its own model, MarketSim. Though developed by and primarily used by the Bureau of Ocean Energy Management going back decades,70 BLM itself has also now used MarketSim in its Draft Supplemental EIS for the Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth 2 Development Project.71. 69 Surface Transp. Bd., Draft Environmental Impact Statement for the Tongue River Railroad—Appendix C: Coal Production and Markets at C.1-9 (2015), https://www.stb.gov/decisions/readingroom.nsf/UNID/E7DE39D1F6FD4A9A85257E2A0049104D/file/AppC_CoalProduction.pdf. 70 Bureau of Ocean Energy Mgmt., Dep't of Interior, Draft Environmental Impact Statement: Liberty Development Project at 4- 50 (Aug. 2017); see also Bureau of Ocean Energy Mgmt, Proposed Final Outer Continental Shelf Oil & Gas Leasing Program 2012-2017, 110 (2012) (calculating that if the offshore acreage were not leased, 6% of the forgone oil and gas would be replaced by energy conservation). See generally Amicus Brief of the Institute for Policy Integrity, WildEarth Guardians v. BLM, No. 15-8109, at pp.19-24 (10th Cir., submitted Feb. 5, 2016), http://policyintegrity.org/documents/10th_Cir_BLM_Brief.pdf (detailing the history of BOEM's use of MarketSim). 71 BLM, Draft Supplemental EIS: Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth 2 Development Project, Appendix H (2018), https://eplanning.blm.gov/epl-rontoffice/projects/nepa/65817/127980/155727/Appendix_H-_BOEM_Greenhouse_Gas_Lifecycle_Model_Methodology.pdf.	The RFD scenario for federal coal in the BFO projects federal coal development in Wyoming's Powder River Basin over the next 20 years. Although it was developed from coal forecasts publicly available online from the EIA through the Annual Energy Outlook 2019 (AEO 2019). Neither the EIA nor the BLM ran NEMS specifically for the analysis in the BFO SEIS/RMPA. Furthermore, the RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
81.	Institute for Policy Integrity	BLM's estimates of economic effects are also problematic. To begin, in Table D-1 of the Buffalo DSEIS, BLM reports that the units are "Millions of 2018 Dollars" and then lists a total of $536,070,235 for "average annual output." Applying the units to that figure, Table D-1 would imply $536 trillion in output per year. That seems exceedingly unlikely. BLM should correct this error.	The text in Appendix D of the BFO SEIS/RMPA has been revised.
82.	Institute for Policy Integrity	Regardless of the precise numbers, BLM wrongly assumes that the economic effects will not vary across scenarios and will be additional economic gains that will not be offset by changes in economy activity in other regions or sectors.80 BLM supposes that if coal production is halted in these areas, other mines will "absorb the market share."81 Yet if that is true, then production of these mines is coming at the expense of increased production at other mines in the region or elsewhere.80 Buffalo DSEIS at B-6 (assuming that even if operations halted at certain mines, other mines in the regions would "absorb the . . . market shares by increasing production"); id. at B-5 (reporting that 90% of the region's coal is federal coal); id. at 3-26 to 3-27 (assuming that at least over the next 20 years, there will be no difference between the alternatives in coal production or economic effects); see also Miles City DSEIS at 3-48 (assuming no change across alternatives when estimating economic effects). 81 Buffalo DSEIS at B-6; see also Miles City DSEIS at 2-7 (""[T]he resource benefits that could be gained through a total leasing closure could be offset in large part by the resource impacts from the displacement of coal leasing on tribal, state, and private lands.").	As discussed in Appendix B (page B-2), mines operating in the CDPA at the time of this analysis had been producing below their maximum capacities permitted by the State. This is because of unfavorable market conditions. In the event that production at some mines in the BFO were to reduce or halt production, unused capacity at the mines that are better able to command a price premium would enable them to increase production to offset production loses from other mines in the BFO. Some mines have closed shortly after this analysis was conducted, which has supported this assumption. While two mines operating in the BFO halted production as of July 1, 2019, weekly spot prices for low-sulfur Powder River Basin coal have remained relatively constant (average weekly coal commodity spot prices as reported by the EIA from S&P Global; historical spot prices accessed through Quandl database at https://www.quandl .com/data/EIA/COAL). This suggests that these closures did not create a shortage for low-sulfur coal from Wyoming's Powder River Basin, which would have driven up spot prices.

Row #	Organization Name	Comment Text	Response Text
83.	Institute for Policy Integrity	But as BLM is well aware, well over 90% of coal production in the areas and 40% of U.S. coal production already comes from federal leases, and the federal government already collects royalties on those leases. If BLM's perfect substitution assumption were correct, such that other sources of coal can perfectly substitute for this coal, then it must also be true that coal leased under these plans simply substitutes for other sources of coal that would otherwise be mined. At least some of those other sources-perhaps 40 or 90 percent-would surely have been other federal leases. But if coal leasing under these plans perfectly supplant those other leases, those other leases lose the opportunity to generate federal revenue. Yet the DSEISs never subtract from their calculations of supposedly large economic effects (like income and taxes and royalties) the lost benefits from all those would-be sources of coal that will be supplanted by leasing under these plans. Similarly, even substitute private leases produce tax revenue, and yet the DSEISs never subtract from their calculations of incomes or state revenues (like severance taxes, property and production taxes, or sales and use taxes) the lost benefits from all those would-be sources of coal that will be supplanted by leasing under these plans. To whatever extent that other coal could substitute for the extraction that would be forgone under an alternative with less leasing in the planning areas, a significant portion of the economic benefits assigned to the leases-from employment, taxes, royalties, production, and so forth-are coming at the expense of other socioeconomic effects from other mines and so do not represent the net economic benefits that the DSESIs tout as justification for the leases. BLM must recalculate the inaccurate and misleading presentation of economic benefits from the DSEISs.	The BLM conducted an economic impact analysis to assess economic activity and mineral revenues, in relation to expressed attitudes, values, and beliefs (AVBs). These are associated with local economic opportunities and employment and mineral revenues and funding for public services. While indicators for these AVBs included estimates of employment, income, and revenues, these measures were not expressed as benefits or costs which would imply changes in social welfare. Foundational economic theory dictates that an economic impact does not equate to an economic benefit (Watson et al. 200; Kotchen 2011). The distinction between metrics used in economic impact and cost-benefit analyses are further discussed in revised text in Appendix D of the BFO SEIS/RMPA.

Row #	Organization Name	Comment Text	Response Text
84.	Institute for Policy Integrity at NYU School of Law et al.	Therefore, even if the Court defers to BLM's decision to not apply the social cost of greenhouse gases in these DSEISs, doing so is clearly beneficial. Doing so is also straightforward, as all that is required once emissions are quantified is to multiply each year's emissions by the corresponding social cost of greenhouse gas values, discount future climate costs back to present value, and sum across all years. Because the additional information provided by the social cost of greenhouse gas protocol will "benefit" both the public and decisionmakers, BLM should execute the basic math involved (multiplication and addition) and apply the social cost of greenhouse gases.	A discussion of why social cost protocols were not employed in this analysis is included in Appendix D.
85.	Institute for Policy Integrity at NYU School of Law et al.	BLM's barebones and inaccurate explanations for why it did not use the social cost of greenhouse gases here does not excuse the failures to analyze and disclose the significance of emissions resulting from these plans -especially when, as here, BLM makes false representations, such as claiming that "it is not possible to accurately distinguish the impacts on global climate change from GHG emissions originating just from the planning area," 15 when in fact the social cost of greenhouse gas protocol is exactly such a tool.15 Buffalo DSEIS at 3-15; accord. Miles City DSEIS at 3-16.	As discussed in Appendix A, coal screening identifies lands determined to be suitable for future leasing considerations. Since the BLM does not have authority over private or state coal resources, these lands were not included in calculations of recoverable federal coal reserves in the BFO or in the RFD for federal coal development in the BFO's CDPA. The RFD for federal coal development is discussed in revised text in Appendix B. Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis.

Row #	Organization Name	Comment Text	Response Text
86.	Institute for Policy Integrity at NYU School of Law et al.	By failing to use available tools, such as the social cost of greenhouse gases, to analyze the significance of emissions, BLM violates NEPA.	NEPA requires agencies to take a hard look at reasonably foreseeable effects, including those that are ecological, aesthetic, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative (40 CFR 1508 (a) and (b)) when undertaking a major governmental action; however, NEPA provides considerable latitude in what issues are considered significant and the degree and type of analysis that must be conducted to provide decision-makers with sufficient information to make an informed decision. Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis. Neither NEPA nor the CEQ's NEPA supporting regulations mandate the use of specific analytical methods or metrics. The BLM evaluated impacts in the SEIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects." In addition to quantifying GHG emissions, those from coal, oil, and gas from the BFO are reported as a percentage of state, national, and global emissions to provide context to facilitate the interpretation of GHG emissions.

Row #	Organization Name	Comment Text	Response Text
87.	Institute for Policy Integrity at NYU School of Law et al.	Using the social cost of greenhouse gas metrics to monetize climate damages fulfills NEPA's legal obligations in ways that quantification alone cannot.	NEPA requires agencies to take a hard look at reasonably foreseeable effects, including those that are ecological, aesthetic, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative (40 CFR 1508 (a) and (b)) when undertaking a major governmental action; however, NEPA provides considerable latitude in what issues are considered significant and the degree and type of analysis that must be conducted to provide decision-makers with sufficient information to make an informed decision. Revised text in Appendix D further explains why the BLM did not use social cost protocols in this analysis. Neither NEPA nor the CEQ's NEPA supporting regulations mandate the use of specific analytical methods or metrics. The BLM evaluated impacts in the SEIS in accordance with the CEQ's Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84FR30097). It states that "A projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects."
88.	Institute for Policy Integrity at NYU School of Law et al.	If BLM truly believes the plans will result in no economic benefit when viewed from a national perspective, it should say so clearly; instead, the DSEISs touts millions in alleged economic upside, with no mention of any offsetting downside.	The BLM conducted an economic impact analysis to assess economic activity and mineral revenues, in relation to expressed AVBs associated with local economic opportunities and employment and mineral revenues and funding for public services. While indicators for these AVBs included estimates of employment, income, and revenues, these measures were not expressed as benefits or costs that would imply changes in social welfare. Foundational economic theory dictates that an economic impact does not equate to an economic benefit (Watson et al. 2007, Kotchen 2011). The distinction between metrics used in economic impact and cost-benefit analyses are further discussed in revised text in Appendix D of the BFO SEIS/RMPA.

Row #	Organization Name	Comment Text	Response Text
89.	Institute for Policy Integrity at NYU School of Law et al.	in calculating and reporting output and royalties, BLM has presented a monetized estimate of the supposed social benefits of the plans. Consequently, BLM must also use readily available tools to monetize the social costs of the coal, oil and gas development. It is arbitrary to apply inconsistent protocols for analysis of some effects compared to others, and to monetize some effects but not others that are equally monetizable.	The BLM conducted an economic impact analysis to assess economic activity and mineral revenues, in relation to expressed AVBs associated with local economic opportunities and employment and mineral revenues and funding for public services. While indicators for these AVBs included estimates of employment, income, and revenues, these measures were not expressed as benefits or costs that would imply changes in social welfare. Foundational economic theory dictates that an economic impact does not equate to an economic benefit (Watson et al. 2007, Kotchen 2011). The distinction between metrics used in economic impact and cost-benefit analyses are further discussed in revised text in Appendix D of the BFO SEIS/RMPA.
90.	**FLPMA**		
91.	Sierra Club	Development is a possible use, which BLM must weigh against other possible uses-including conservation to protect environmental values, which are best assessed through the NEPA process. Thus, an alternative that closes the [proposed public lands] to development does not necessarily violate the principle of multiple use, and the multiple use provision of FLPMA is not a sufficient reason to exclude more protective alternatives from consideration.	While closing some areas to conserve environmental values does not violate FLPMA, closing all areas would. Alternative B does reduce development area, providing greater conservation of environmental values than Alternative A. In addition, as described in Section 2.2.5, Alternatives Considered but Eliminated from Further Study, coal leasing also complies with the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2. Leases have already been issued for 3 percent of the decision area, or 131,837 acre; therefore, coal development in the decision area will continue, as these leases are subject to valid existing rights.
92.	**Multiple Use**		
93.	Sierra Club	BLM failed to heed the instructions of the court in considering climate change when screening for multiple use considerations in determining how much coal to make available for leasing. BLM must redo its coal screening and especially "screen 3," as ordered by the court.	While climate change does not specifically fall under one of the 20 screening criteria outlined in 43 CFR 3420.1-4(e)(1-4), it could be considered under the multiple use screen. The BLM reviewed reduced emissions as an alternative; however, it was dismissed from further consideration. This is because existing mining infrastructure is already consolidated and highly interconnected, making a new mine start or new infrastructure unlikely in the next 20 years.

Row #	Organization Name	Comment Text	Response Text
94.		**Other Laws**	
95.	Sierra Club	Second, the Mineral Leasing Act ("MLA") similarly does not preclude BLM from considering a No Leasing Alternative, including an alternative where BLM would not issue any future leases for coal, oil, or gas in the Buffalo and Miles City planning areas. The governing statute for oil and gas, the MLA, states: "All lands subject to disposition under this Act which are known or believed to contain oil or gas deposits may be leased by the Secretary." 30 US.C. § 226(a) (emphasis added); see also Udall v. Tallman, 30 U.S. 1, 4 (1965) (MLA "left the Secretary discretion to refuse to issue any lease at all on a given tract"); Burglin v. Morton, 527 F.2d 486, 488 (9th Cir. 1975) ("The permissive word 'may' in Section 226(a) allows the Secretary to lease such lands, but does not require him to do so."); Pease v. Udall, 332 F.2d 62, 63 (9th Cir. 1964) ("[T]he Mineral Leasing Act has consistently been construed as leaving to the Secretary, within his discretion, a determination as to what lands are to be leased thereunder.")	The BLM reviewed the MLA and other applicable legal requirements in determining the lands brought forward in the alternatives as acceptable for further consideration of leasing.
96.		**Public Outreach**	
97.	Yankton Sioux Tribe	We are opposed to any extraction (See attached Resolution) on Treaty lands and do not think proper consultation has been met with the Yankton Sioux Tribe. We are opposed to any projects that continually erode the cultural landscapes of Treaty lands. Through the process outlined in the Ihanktonwan Consultation Wo'ope, we would like to have the area monitored during construction of the project. Please let us know if you will engage in consultation pursuant to the Ihanktonwan Consultation Wo'ope.	This RMP amendment is a planning level document that allocates areas as acceptable for further consideration of leasing. An allocation of "acceptable for further consideration of leasing" does not guarantee an area would be developed. Once lease applications are submitted, there would be an additional opportunity for NEPA analysis and consultation.

Row #	Organization Name	Comment Text	Response Text
98.		**Range of Alternatives**	
99.	Sierra Club	In both the Buffalo and Miles City DSEISs, BLM failed to consider any alternative that reduced the amount of coal available for development. In the Buffalo DSEIS, BLM evaluated only two alternatives: a No Action Alternative, which continued management of coal in the planning area as it existed under the prior plan, and Alternative B, the agency's Preferred Action Alternative, which changed the amount of acres available to leasing (from 686,896 in Alternative A to 455,467 acres under Alternative B), Buffalo DSEIS at ES-5, but did not change the amount of coal likely to be developed.	The SEIS complies with the court order by analyzing a reduced coal volume versus what was analyzed in the 2015 RMP. The BLM used the 2018 production total and the US EIA's coal production forecast to estimate production over the 20-year planning period.
100.	Sierra Club	BLM is incorrect that the presence of coal leases now requires BLM to leave the planning area open to leases in the future. This excuse fails on its face. The alternative proposed by Conservation Groups would not extinguish existing leases, as BLM suggests, but instead preclude issuance of future leases in the planning areas. As explained in detail above, BLM has broad authority to consider such a policy choice for its management of public lands, so it must consider the alternative under NEPA, and it should ultimately select that alternative as it is the only one that adequately protects the public interest	Based on the coal screening analysis and conflicts with other resources, the proposed CDPA is consistent with the FLPMA and MLA.
101.	Sierra Club	BLM must consider No Leasing and Reduced Leasing Alternatives across all fossil fuels - coal, oil, and gas generated under the plans.	The court order required analyzing a reduced coal alternative only, as stated in the Purpose and Need, "Consider an alternative that would reduce the amount of recoverable coal . . . , in order to make a reasoned decision on the amount of recoverable coal made available."
102.	Sierra Club	Please include an alternative in the EWIS that uses alternative energy on BLM lands rather than coal. Please re-write your project purpose and need to allow such an alternative.	The court order required analyzing a reduced coal alternative only, as stated in the Purpose and Need, "Consider an alternative that would reduce the amount of recoverable coal . . . , in order to make a reasoned decision on the amount of recoverable coal made available."

Row #	Organization Name	Comment Text	Response Text
103.	Western Organization of Resource Councils	BLM should analyze and select a No Leasing alternative that precludes issuance of new federal leases of coal, oil, and gas throughout both the Buffalo and Miles City Field Offices. The BLM's analysis shows that new coal leases are not needed to satisfy anticipated demand. Public lands and minerals should be managed for the benefit of all Americans in a way that helps avoid the most harmful effects of climate disruption.	In Section 2.2.5 of the draft SEIS, the BLM did consider a no leasing alternative for coal; however, this alternative was dismissed from further consideration. This is because making the entire decision area unacceptable for further consideration for coal leasing would not meet the BLM's multiple use mandate under FLPMA, the leasing requirements under the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2. Moreover, it would violate valid existing rights. In the 2015 RMP, the BLM did analyze a no leasing alternative for oil and gas under *Alternatives Considered but Eliminated from Further Analysis*. See the 2015 RMP for further details.
104.	Wyoming Mining Association	We strongly recommend the modification of Alternative B such that coal near active mines is not proposed to be removed from future leasing. At a minimum, if these areas are not formally re-designated as available, WMA recommends that BLM acknowledge such areas will remain available for leasing as necessary to maintain ongoing mining operations.	The CDPA boundary does not prohibit proposing a lease outside of it. By regulation, this must follow the same coal screening process. The RMP could be amended to enlarge the CDPA. The BLM would also reevaluate the CDPA with the next RMP revision.

Row #	Organization Name	Comment Text	Response Text
105.	**Reasonably Foreseeable Development**		
106.	EPA Region 8	The assumptions for the environmental analysis on page 3-1 state there would not be any effects from coal mining in Sheridan County because there are not any current coal mines in Sheridan County. The Reasonably Foreseeable Development scenario (Figure 3-1) also does not include development in Sheridan County. Our review identified two issues that appear to conflict with that assumption. The Draft SEIS identifies 68,154 acres of Sheridan County in Alternative A as acceptable for coal leasing, and the State of Wyoming has issued a permit for the Youngs Creek coal mine in Sheridan County. The Brook coal mine is also proposed in Sheridan County. We recommend adding discussions of potential impacts in Sheridan County as applicable for each resource. Environmental impact information could be obtained from several environmental reviews regarding the Spring Creek mine complex such as the Office of Surface Mining Reclamation and Enforcement Environmental Assessment (EA) and Montana Department of Environmental Quality EA as well as the State of Wyoming's coal mining permit information files.	The BLM added clarifying text to the Final SEIS, Appendix B, Section B.4, as follows: "The Brooks Mine has been proposed but not permitted by the State of Wyoming for the development of carbon fiber. Information submitted to the State of Wyoming in support of a permit indicates that the proposed mine boundary would not contain federal minerals. The State of Wyoming issued a permit for the Youngs Creek Mine in 1977; however, there has been no commercial development of its coal resources. The BLM has not received any formal or informal leasing requests for federal coal related to this mine. Until such time as a leasing request is made and commercial development plans are conceptualized, the BLM is unable to consider either mine in the RFDS for federal coal. This is due to the unknown estimated production potential and unknown resource constraints that could limit production."
107.	Sierra Club	Taylor Kuykendall, "Coal's share of US power generation may fall to 11% by 2030: Moody's," S&P Global Market Intelligence, July 10, 2019. Accessible online: https://www.spglobal.com/platts/en/market-insights/latest-news/coal/071019-moodys-expects-coals-share-of-us-power-generation-to-fall-to-11-by-2030. Attached as Exhibit 4.	The RFDS for federal coal in the BFO projects federal coal development in Wyoming's Powder River Basin over the next 20 years. It was developed from coal forecasts publicly available online from the EIA through the AEO 2019. All forecasts developed for the AEO 2019 are modeled projections of what may happen, given certain assumptions and methods and not predictions of what will happen. Detailed information on the underlying assumptions of AEO 2019 are available online at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed under Alternative B.

Row #	Organization Name	Comment Text	Response Text
108.	Sierra Club	Other industry analysts predict even sharper declines: Moody's, the credit ratings agency, recently issued a forecast that coal's contribution to electricity production may drop as low as 11% from its current level of 26%.4 Moody's predicts that this nearly 60% decline will severely impact coal mines in the Powder River Basin, and thus is germane to BLM's market analysis for the planning areas.4 Taylor Kuykendall, "Coal's share of US power generation may fall to 11% by 2030: Moody's," S&P Global Market Intelligence, July 10, 2019. Accessible online: https://www.spglobal.com/platts/en/market-insights/latest-news/coal/071019-moodysexpects- coals-share-of-us-power-generation-to-fall-to-11-by-2030. Attached as Exhibit 4.	The RFDS for federal coal in the BFO projects federal coal development in Wyoming's Powder River Basin over the next 20 years. It was developed from coal forecasts publicly available online from the EIA through the AEO 2019. All forecasts developed for the AEO 2019 are modeled projections of what may happen, given certain assumptions and methods and not predictions of what will happen. Detailed information on the underlying assumptions of AEO 2019 are available online at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed under Alternative B.
109.	Sierra Club	In general, the Buffalo Field Office RFDs anticipate a realistic decline in coal production in the coming years. It also wisely assumes no new mine will access federal coal in Sheridan County within the next 20 years. The only element of some concern is the anticipated increase in coal production from 2028-2030. For the sake of transparency and building public trust in the Buffalo Field Office's RFD, the office should explain in the final SEIS the model's factors that produce the coal production increase in those years.	The BFO's RFD was developed from projections modeled by the EIA for the AEO 2019, using the assumptions outlined in Appendix B. More detailed information on trends forecast by the EIA over the next 20 years can be obtained from the AIO 2019 at https://www.eia.gov/outlooks/aeo/. As discussed in Appendix B, the BLM examined forecasts under the reference case and six side cases (page B-5). It then developed an RFD based on the best fit to 2018 production by the 12 mines operating in the CDPA, as reported by the Mine Safety Health Administration. Detailed information on the underlying assumptions of the AEO 2019 are available online at https://www.eia.gov/outlooks/aeo/assumptions/. The assumptions that the BLM used to create the RFD for federal coal are discussed under Alternative B. Text in Appendix B has been revised to clarify why the RFD for federal coal production in the BFO is the same under both alternatives. Also discussed is how management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years; therefore, there would be no changes in the price of coal relative to substitute fuel sources or coal's share of the electricity generation fuel mix.

Row #	Organization Name	Comment Text	Response Text
110.	Sierra Club	In April 2016, researchers at Harvard University and Vulcan Philanthropies released a paper that utilized ICF's Integrated Planning Model to analyze the market and climate impacts of various federal coal policies, including a scenario where BLM phased out federal coal leasing entirely.6 The analysis found that in a scenario where the Clean Power Plan is not implemented, reducing federal coal leasing, or ending it outright, would result in a slight up-tick in mining non-federal coal reserves, but that the market would also shift to electricity generation by gas and renewables, which would result in a substantial reduction in greenhouse gas emissions from the electricity sector.7 6 Todd Gerarden et al., "Federal Coal Program Reform, the Clean Power Plan, and the Interaction of Upstream and Downstream Climate Policies," (April 2016). Attached as Exhibit 6.7 Id.	Phasing out federal coal leasing at the national level is beyond the scope of the SEIS/RMPA. As discussed in Appendix B, the RFDS for federal coal in the BFO projects federal coal development in Wyoming's Powder River Basin over the next 20 years. The RFDS for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.
111.	Sierra Club	The attached report of economist Dr. Thomas Power11 analyzes available energy economy models and concludes that the two models best suited to this type of analysis, based on the prior use by other agencies and the known characteristics of the models, are EIA's National Energy Modeling System, used to generate its widely cited Annual Energy Outlook reports, and ICF International's Integrated Planning Model ("IPM"), used by EPA to evaluate market responses to various policy proposals since at least 2004.12. 11 Thomas Michael Power and Joel M. Brown, "Assessing the Ability of Contemporary Models to Calculate the GHG Implications of Federal Coal Leasing Decisions and Other Federal Energy Management Decisions," Power Consulting, (May 21, 2015). Attached as Exhibit 8. 12 Id. at v. Accord, Peter H. Howard, "The Bureau of Land Management's Modeling Choice for the Federal Coal Programmatic Review," Institute for Policy Integrity, (2016). Attached as Exhibit 9.	The RFD for federal coal production in BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
112.	Sierra Club	According to ICF, its Integrated Planning Model uses a linear optimization framework and can be used to evaluate changes in wholesale power dispatch taking into account system reliability, environmental constraints, fuel choice, transmission, and capacity expansion.13 ICF's IPM has been used in recent years to evaluate the market and environmental impacts of several high-profile proposals related to the extraction and transportation of fossil fuels, including the U.S. State Department's review of the Keystone XL tar sands pipeline.13 ICF International, "Integrated Planning Model," available at http://www.icfi.com/insights/products-and-tools/ipm (last visited June 7, 2019). Attached as Exhibit 10.	The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.
113.	Sierra Club	BLM relies on Elbakidze and Zaynutdinaova (2016) to support its conclusion that coal "has been found to be the most price inelastic energy source in the energy mix, as consumer demand does not respond drastically to changes in coal prices." Buffalo DSEIS at B-4; Miles City DSEIS at D-11. This conclusion is simply not found in the cited study. Rather, the unpublished paper relied on by BLM concluded that the opposite is generally true. According to Elbakidze and Zaynutdinaova, "Natural gas and coal act as substitutes, with positive cross price elasticities, in most of the states during both periods."16 That means that as the price of coal increases, utilities - the primary consumers of thermal coal produced in the Powder River Basin - respond by switching to a different fuel. The study goes on to note exceptions to that general rule, but it is inappropriate to draw the conclusion, as the EA has done, that the results show that utilities are unable to substitute natural gas for coal. Rather, the study confirms that such substitution is generally found. 16 Levan Elbakidze and Gulnara Zaynutdinaova, Substitution in electricity generation: A state level analysis of structural change from hydraulic fracturing technology, (2016), pg. 14. Attached as Exhibit 12.	The BLM has revised text in Appendix B of the BFO SEIS/RMPA. The RFD for federal coal production in the BFO is the same under both alternatives; management decisions analyzed in the SEIS/RMPA would not affect market conditions (i.e., supply, demand, and prices) for coal or substitute fuel sources projected over the next 20 years. As a result, energy market modeling to assess substitution among fuel sources is not necessary to inform the management decision.

Row #	Organization Name	Comment Text	Response Text
114.	Sierra Club	BLM also states that "[p]ower plants and generation units require significant investment costs and infrastructural requirements specific to the fuel source; transitioning power plants to alternative fuel sources are unlikely, due to the economic and infrastructural challenges faced." Buffalo DSEIS at B-4. Although this is true, it is irrelevant. No one is suggesting that rising coal prices would cause the owners of coal-fired generation units to convert those to natural gas. Rather, utilities simply ramp up or down existing resources in response to changes in the relative price of fuels such as coal, gas, nuclear, wind, and solar.	No change is required; the information provides context.
115.	Wyoming Mining Association	The WMA believes that adjustments to reserves on the eastern boundary are reasonable and are not likely to be mined. However, some of the reserves removed in areas west of active coal mines have potential to be developed. Removal of these reserves would impact long term viability of existing coal mining operations, as significant operator investment has already been made in acquiring reserves and establishing infrastructure required to mine the coal.	As part of the coal screening process (see section A.3), the northwestern corner and east side of the Alternative A Coal Development Potential Area were removed under Alternative B based on the increasing overburden depth, splitting of coal seams, and decreasing quality of the coal (<8,200 BTUs). Based on the special expertise provide by the cooperating agencies, the Proposed Plan adds 39,784 acres to Alternative B to ensure flexibility for mining in the most efficient manner such as providing for the expansion of existing mines and associated mining infrastructure, and provides an opportunity for future new uses of coal, such as carbon fiber development.

Row #	Organization Name	Comment Text	Response Text
116.		**Unsuitability**	
117.	Sierra Club	BLM claims that it is powerless to consider reducing coal leasing on the public lands BLM manages to help prevent climate change because the coal screening process does not include climate change in the list of considerations for whether to list coal resources "unsuitable" for development. In Miles City, BLM stated that its coal screening criteria, set out at 43 C.F.R. § 3420.1-4e "are clear in their direction that coal unsuitability is based on protecting specific, high-value resources and does not balance unspecific resource concerns." Miles City DSEIS at 2-7. In Buffalo, BLM stated that it "is required to go through the coal screening process outlined in 43 CFR 3420 et. seq. versus applying a blanket no leasing alternative. During this coal screening process, BLM analyzed all relevant resources when considering what areas to make acceptable for further consideration for coal leasing." Buffalo DSEIS at 2-7. Although BLM went through the coal screening process, the coal screening criteria do not include climate change.	While climate change does not specifically fall under one of the 20 screening criteria outlined in 43 CFR 3420.1-4(e)(1-4), it could be considered under the multiple use screen. The BLM reviewed reduced emissions as an alternative, as a nexus to multiple use screen for climate change; however, it was dismissed from further consideration. This is because mining infrastructure is already consolidated and highly interconnected, making a new mine start or new infrastructure unlikely in the next 20 years.

This page intentionally left blank.