U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

May 2024

Buffalo Field Office

Final Supplemental Environmental Impact Statement and Proposed Resource Management Plan Amendment

Total Cost: $600,000

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Wyoming High Plains District
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834-2436
www.blm.gov/wy

Dear Reader:

Enclosed is the Final Supplemental Environmental Impact Statement (SEIS)/Proposed Resource Management Plan Amendment (RMPA). The Final SEIS/Proposed RMPA 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 this Final SEIS/Proposed RMPA is to provide an additional analysis for land use planning that:

- Completes a new coal screening and analysis that considers a no-leasing and a limited coal leasing alternative.
- Discloses the public health impacts, both climate and non-climate impacts, of burning fossil fuels (coal, oil, and gas) from the decision area.

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* [4:20-cv-00076-GF-BMM]*)*. The Proposed RMPA would replace the decisions for coal leasing availability in the 2015 Buffalo Field Office Resource Management Plan (RMP)/Record of Decision (ROD).

Pursuant to BLM's planning regulations at 43 Code of Federal Regulations (CFR) 1610.5-2, any person who participated in the planning process for this Proposed RMPA and has an interest that is or may be adversely affected by the planning decisions may protest approval of the planning decisions contained therein. The Final SEIS/Proposed RMPA is open for a 30-day protest period, initiated by tye publication of the Notice of Availability in the *Federal Register*.

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 (for example, meeting minutes or summaries or correspondence).

Instructions for filing a protest with the Director of the BLM regarding the Proposed RMPA 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 a hard copy.

All protests must be in writing and submitted through ePlanning or mailed.

ePlanning website:
https://eplanning.blm.gov/eplanning-ui/project/2021239/510

Regular Mail and Overnight Delivery:

BLM Director
Attn.: Protest Coordinator (HQ210)
Denver Federal Center, Building 40 (Door W-4)
Lakewood, CO 80215

All protests must be received on or before June 17, 2024.

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 the BLM in your protest to withhold your personal, identifying information from public review, 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 BLM Director's decision 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 ROD. The ROD will be available to all parties at https://eplanning.blm.gov/eplanning-ui/project/2021239/510.

Sincerely,

Todd D. Yeager
Buffalo Field Manager
Bureau of Land Management

Final Supplemental Environmental Impact Statement and Proposed 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 (EIS) and Proposed Resource Management Plan Amendment (RMPA) augments the analysis for the 2015 Buffalo Field Office Approved Resource Management Plan and the 2019 Supplemental EIS (SEIS). In this Final SEIS, the Bureau of Land Management (BLM) Buffalo Field Office analyzed no-leasing, limited coal leasing, and continued leasing alternatives in accordance with the 2019 Approved RMPA; and supplemented the analysis of coal, oil, and gas downstream emissions.

The BLM is the lead agency for this Final SEIS/Proposed RMPA, with the following 13 cooperating agencies participating in developing the plan: the Campbell County Commission, Johnson County Commission, Campbell County Conservation District, Wyoming Office of the Governor, Office of Wyoming Senator John Barrasso, Office of Wyoming Senator Cynthia Lummis, Office of Wyoming Representative Harriet Hageman, Wyoming Department of Agriculture, Wyoming Department of Environmental Quality, Wyoming Game and Fish Department, United States (US) Environmental Protection Agency Region 8, the US Department of the Interior National Park Service, and the US Department of the Interior Office of Surface Mining Reclamation and Enforcement.

In the 2019 Supplemental FEIS, the BLM considered two alternatives based on the reasonably foreseeable development (RFD) scenario. Based on the court order, this Final SEIS analyzes three alternatives. The alternatives focus on the volume of BLM-administered coal being made available for the future consideration of leasing; this coal volume varies among alternatives.

Under Alternative A, the no-leasing alternative, the BLM would not accept new coal lease applications. Existing leases within the coal development potential area (CDPA) would continue to produce coal until 2041. Under Alternative B, the No Action Alternative, the full amount of BLM-administered recoverable coal in the CDPA (48.01 billion short tons) would be available for the future consideration of leasing. Under this alternative, coal production could last through 2338. Under Alternative C, the Limited Leasing Alternative, a limited amount of BLM-administered recoverable coal (1.24 billion short tons) would be available for leasing. This alternative would provide coal to last until approximately 2048. Planning issues addressed in detail include air quality, greenhouse gases, climate change, public health, socioeconomics, and environmental justice.

The BLM selected Alternative A, No Leasing, as the Proposed RMP Amendment making no BLM-administered coal available for leasing within the planning area. The Proposed Amendment does not affect the area with coal development potential (screen 1) or the area determined to be suitable for surface coal mining (screen 2). Collectively, the mines have sufficient federal coal leased to meet forecasted production levels into 2041.

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ACRONYMS AND ABBREVIATIONS

	Full Phrase
AEO	Annual Energy Outlook
AQRV	air quality related value
AQS	United States Environmental Protection Agency's Air Quality System
AR6	Sixth Assessment Report (of the Intergovernmental Panel on Climate Change)
ARTSD	Air Resources Technical Support Document
BCF	billion cubic feet
BFO	United States Department of the Interior, Bureau of Land Management, Buffalo Field Office
BLM	United States Department of the Interior, Bureau of Land Management
°C	degrees Celsius
CAA	Clean Air Act
CAMx	Comprehensive Air Quality Model with Extensions
CAP	criteria air pollutant
CDPA	coal development potential area
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COVID-19	coronavirus
CR	chromium
DNA	deoxyribonucleic acid
DOI	United States Department of the Interior
DPM	diesel particulate matter
EDA	United States Economic Development Administration
EGU	electricity-generating unit
EIA	United States Energy Information Administration
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
ES	executive summary
°F	degrees Fahrenheit
FEIS	final environmental impact statement
FLPMA	Federal Land Policy and Management Act of 1976
FMR	federal mineral royalties
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GIS	geographic information system
GWP	global warming potential
HAP	hazardous air pollutant
IMPROVE	Interagency Monitoring of Protected Visual Environments
IPCC	Intergovernmental Panel on Climate Change
IRIS	Integrative Risk Information System

kg/ha	kilogram/hectare
MACT	maximum achievable control technology
MMT	million metric tons
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NCA	Fourth National Climate Assessment
ND	not disclosable
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	ammonia
NO	nitric oxide
NO_2	nitrogen dioxide
NOI	notice of intent
NOx	nitrogen oxide
NRMP	natural resource management plan
NTEC	Navajo Transitional Energy Company, LLC
NTN	National Trends Network
O_3	ground-level ozone
PFYC	potential fossil yield classification
PM	particulate matter
$PM_{2.5}$	particulate matter equal to or lesser than 2.5 microns
PM_{10}	particulate matter equal to or lesser than 10 microns
PSD	prevention of significant deterioration
RFD	reasonably foreseeable development
RFFA	reasonably foreseeable future actions
RMP	resource management plan
RMPA	resource management plan amendment
ROD	record of decision
SC-GHG	social cost of greenhouse gases
SEIS	supplemental environmental impact statement
SO_2	sulfur dioxide
SO_4	sulfate
US	United States
USFS	United States Department of Agriculture, Forest Service
USFWS	United States Department of Interior, Fish and Wildlife Service
VOC	volatile organic compound
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WY	Wyoming

Executive Summary

Introduction

The United States (US) Department of the Interior, Bureau of Land Management (BLM) has prepared this final supplemental environmental impact statement (SEIS) and proposed 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 of 1976 (FLPMA; 43 US Code 1701 et seq.); requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008); and the BLM's Land Use Planning Handbook, H-1601-1 (BLM 2005).

The BLM prepared this Final SEIS/Proposed RMPA to respond to the US District Court for the District of Montana court order (*Western Organization of Resource Councils, et al. v. Bureau of Land Management* [4:20-cv-00076-GF-BMM]). The district court found the BLM violated NEPA and ordered the BLM to complete a new coal screen and remedial NEPA analysis for the 2019 SEIS/RMPA (BLM 2019). Specifically, the order requires: (1) The BLM must complete new coal screening and NEPA analysis that considers a no-leasing and limited coal leasing alternatives, (2) The BLM must disclose the public health impacts, both climate and non-climate, of burning fossil fuels (coal, oil, and gas) from the planning areas.

The approved RMPA could amend the 2015 Approved RMP/Record of Decision (ROD) concerning the coal allocation decision. Information about this Final SEIS/Proposed RMPA can be obtained on the project website: https://eplanning.blm.gov/eplanning-ui/project/2021239/510. The BFO completed the 2015 Approved RMP/ROD in September 2015; the BLM amended it in 2019, based on the 2019 WORC SEIS/RMPA. The 2015 Approved RMP/ROD 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 2019 Approved RMPA Coal Development Potential Area (CDPA); see **Figure ES-1**.

Purpose of and Need for the Resource Management Plan Amendment

The purpose of this Final SEIS/Proposed RMPA is to provide an additional analysis for land use planning that:

(1) Completes a new coal screening and analysis that considers no-leasing and limited coal leasing alternatives; and
(2) Discloses the public health impacts, both climate and non-climate impacts, of burning fossil fuels (coal, oil, and gas) from the decision area.

Scoping

The formal public scoping process for the Draft SEIS/Potential RMPA began with the publication of the notice of intent in the *Federal Register* on October 3, 2022 (87 *Federal Register* 59818); the BLM also posted the notice of intent on the project website (https://eplanning.blm.gov/eplanning-ui/project/2021239/510). The period during which the public could submit scoping comments ended November 2, 2022.

The BFO received 18 unique written submissions that included 172 substantive comments in 27 issue categories. Most comments regarded the alternatives, FLPMA, best available science, and the following resource-specific issues: air quality, climate change, public health, and environmental justice. Detailed information can be found in the scoping report on the ePlanning website.

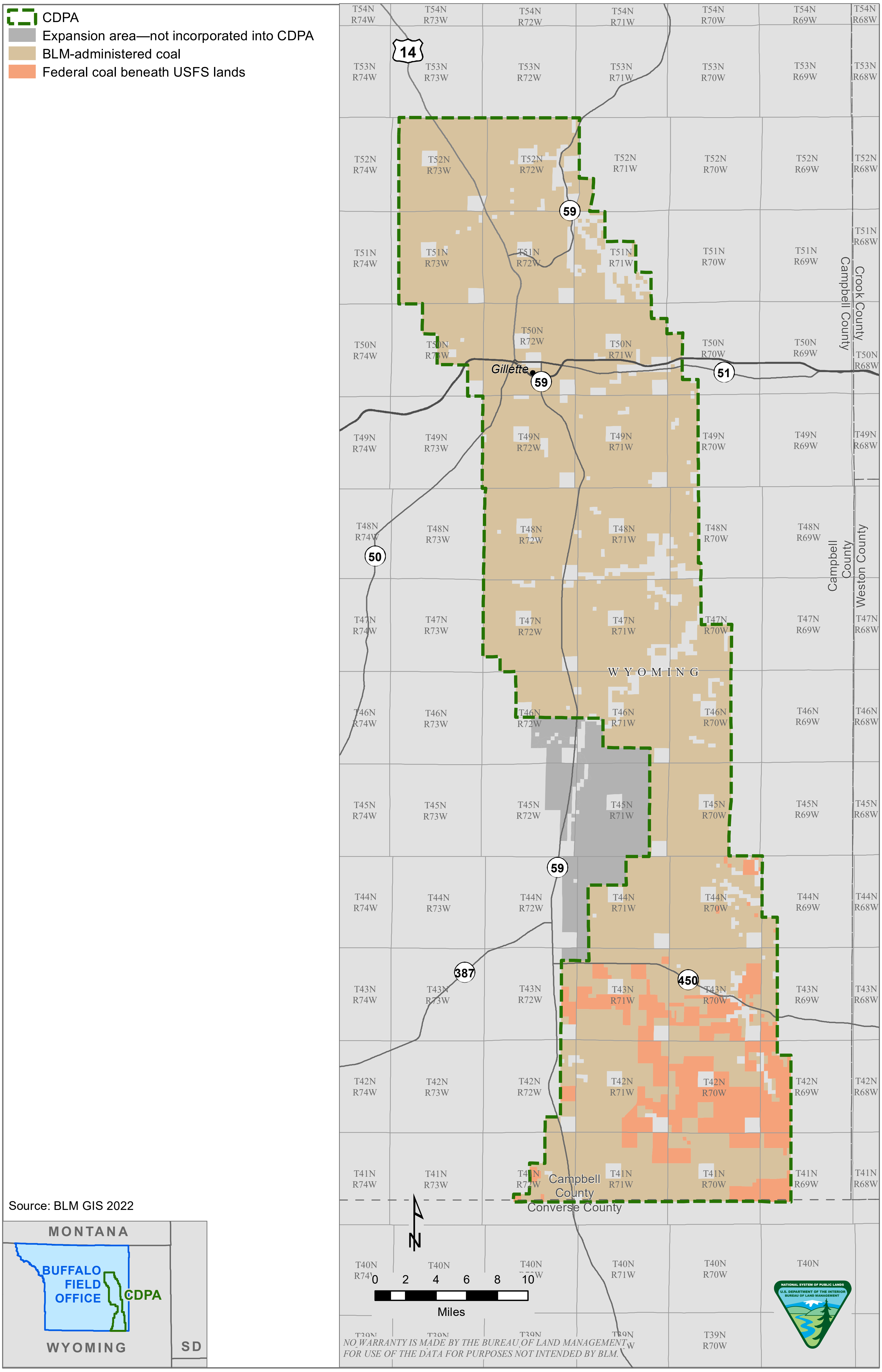
The BLM engaged with Sovereign Tribal Nations, federal, state, and local governments as part of this SEIS/RMPA. The BLM sent letters to eligible agencies inviting them to be cooperating agencies and to assist with the document. The BLM also invited interested Sovereign Tribal Nations to assist with the document and asked through letters, emails, and personal conversation if the Sovereign Tribal Nation wanted to initiate formal government-to-government consultation. The BLM held a meeting for cooperating agencies and Sovereign Tribal Nations before the public scoping meeting, which took place on October 17, 2022.

Issues

The BLM read and reviewed all 172 scoping comments received and categorized them into the following issue categories:

- NEPA
  - Public outreach
  - Cooperation, collaboration, and partners
  - Cooperating agency relationships
  - Alternatives
  - Best available science
- FLPMA
- Other laws
- Relationship with other state or local plans
- Purpose and need
- Coal development potential
- Direct and indirect impacts
- Cumulative impacts
- Monitoring and mitigation
- Specific issues
  - Air quality
  - Climate change
  - Wildlife and special status species
  - Public health
  - Economics
  - Social cost of greenhouse gases
  - Environmental justice
  - Livestock grazing
  - Vegetation

Figure ES-1
Coal Development Potential Area (CDPA)



Source: BLM GIS 2022

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- Water (general)
- Surface water
- Groundwater
- Riparian areas
- Other

The BLM further characterized the 172 comments that pertained to resources and resource uses, based on the specific resource or resource use. Table 2-1 in the BFO Draft SEIS/Potential RMPA Scoping Report (BLM 2022a) shows the number of comments by specific resource or resource use. Approximately 9 percent of the resources and resource use comments related to air quality, 4 percent related to climate change, 14 percent related to public health, and 5 percent related to the social cost of carbon.

Planning Criteria

Planning criteria guide development of the SEIS/RMPA by defining the decision space. According to 43 CFR 1610.4–2(b), 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 following are the planning criteria considered in the development of this document:

- The SEIS/RMPA complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy.
- Lands covered in the SEIS/RMPA are those federal lands and federal mineral estate, including split-estate, managed by the BLM. No decisions will be made relative to non-BLM-administered lands; this includes federal minerals beneath surface lands managed by another federal agency (that is, the US Forest Service [USFS]).
- The RMPA will propose land use planning decisions to determine lands acceptable for further consideration for coal leasing.
- In the SEIS/RMPA, the BLM uses a collaborative and multijurisdictional 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 Sovereign Tribal Nations, as long as the plans and policies 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.

Management Alternatives

The SEIS/RMPA alternatives focus solely on availability for future coal leasing in response to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, 4:20-cv-00076-GF-BMM (D. Mont. 2022). The range of alternatives meets the purpose of and need for the SEIS/RMPA and responds to issues raised during scoping (see **Chapter 1**, **Section 1.3**, and the BFO scoping report [BLM 2022a]).

The BLM updated the 2019 Supplemental EIS coal screening (**Appendix A**) to determine a baseline for coal acceptability for further consideration for leasing. Screen 1, identification of coal with development potential, did not change. This is because the coal quality and stripping ratios used to evaluate the cost to production have not changed since 2019. Errors in data reporting (such as reporting hectares instead of acres) were corrected, and resource information was updated for Screen 2, application of unsuitability criteria. Surface owner consultation (Screen 4) was not substantially different than it was in 2019; therefore, it did not change the acceptability for coal leasing. The BLM varied the alternatives by refining the multiple-use coal screen (Screen 3) to consider greenhouse gas emissions as a nexus for climate change.

The alternatives focus on the volume of BLM-administered coal being made available for the future consideration of leasing; this coal volume varies among alternatives. The multiple-use coal screen contains the specific restraints per alternative that were applied during the coal screen process (**Appendix A**).

Alternative A: No Leasing Alternative

Under Alternative A, the No Leasing Alternative, the application of the multiple-use screen resulted in the coal development potential area (CDPA) being unacceptable for future consideration of federal coal leasing throughout the duration of the planning period (through 2038). At the end of the planning period an RMP revision would reevaluate land use allocations. The CDPA is the decision area which includes approximately 481,000 acres of subsurface federal mineral coal estate. Under Screen 3, 48.12 billion short tons of coal were removed from consideration from leasing in order to reduce greenhouse gas (GHG) emissions as a proxy for climate change. The BLM would not accept new coal lease applications, only existing coal leases could be developed, which would continue through their associated lease terms. **Table ES-1** depicts the coal screening results for Alternative A.

Table ES-1
Coal Screening Results for Alternative A, No Leasing

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-48.12
Acceptable for coal leasing	**0**

Source: BLM Geographic Information System (GIS) 2022
[1] See **Appendix A** for the full coal screening process.
[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface.
Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

Alternative B: No Action

Under Alternative B, the No Action Alternative, 48 billion short tons of BLM-administered recoverable coal would be available for the future consideration of leasing in the CDPA. **Table ES-2** depicts the coal screening results for Alternative B, No Action.

Table ES-2
Coal Screening Results for Alternative B, No Action

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-0.11
Acceptable for coal leasing	**48.01**

Source: BLM GIS 2022
[1] See **Appendix A** for the full coal screening results.
[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface. It also includes existing federal coal leases.
Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

Alternative C: Limited Leasing

Under Alternative C, the Limited Leasing Alternative, 1.24 billion short tons of BLM-administered recoverable coal within the CDPA would be available for the future consideration of leasing. Under Screen 3, 46.88 billion short tons of coal were removed from consideration for leasing in order to reduce GHG emissions as a proxy for climate change in response to the court order. **Table ES-3** depicts the coal screening results for Alternative C, Limited Leasing.

Table ES-3
Coal Screening Results for Alternative C, Limited Leasing

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-46.88
Acceptable for coal leasing	**1.24**

Source: BLM GIS 2022
[1] See **Appendix A** for the full coal screening results.
[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface. It also includes existing federal coal leases.
Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

Approximately 1.24 billion short tons would be necessary for the BLM to lease and for the US Office of Surface Mining Reclamation and Enforcement and Wyoming Department of Environmental Quality to permit during the planning period (2038) and prior to 2041, which is when the Energy Information Administration's forecast predicts the currently leased reserves would be exhausted. This is the estimated minimum amount of coal that would allow the mines to be able to continue without interruption. Economics would be the driving factor determining whether and when lease actions would be pursued, allowing the existing mines to continue production. The BLM would evaluate Lease by Applications as they are received, which would determine where the available coal would be leased. The alternative does not identify a specific area; this is because it is not possible to define a geographic area for leasing without interfering with the competitive free-market environment of the 12 independent coal mines.

Preferred Alternative/Proposed Plan

BLM regulations, at 43 CFR, Subpart 1610, requires the BLM to identify its Proposed RMP Amendment in the Final Supplemental EIS. The BLM selected Alternative A, No Leasing, as the Proposed RMP Amendment making no BLM-administered coal available for leasing within the planning area. The Proposed Amendment does not affect the area with coal development potential (screen 1) or the area determined to be suitable for surface coal mining (screen 2). Collectively, the mines have sufficient federal coal leased to meet forecasted production levels into 2041.

The Proposed RMP Amendment 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 Proposed RMP Amendment become final decisions.

Environmental Consequences

The purpose of the environmental consequences analysis in this SEIS/RMPA is to determine the potential for significant impacts from combusting federal coal, oil, and gas originating on BLM-administered lands made available for leasing. The Council on Environmental Quality regulations for implementing NEPA state that the human environment is "comprehensively the natural and physical environment and the relationship of present and future generations of Americans with that environment" (40 CFR 1508.14(m)). The federal action is the BLM's selection of an alternative that the BLM BFO will use to 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 the impacts analysis are included in **Table 1-3** of **Chapter 1**; resources carried forward for analysis are included in **Chapter 3**. **Chapter 3** 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. **Table ES-4** provides a summary of impacts for each resource.

Table ES-4
Impacts Summary for Resources Carried Forward

Resources Brought Forward for Analysis	Impacts		
	Alternative A – No Leasing	**Alternative B – No Action**	**Alternative C – Limited Leasing**
Air resources, including greenhouse gas and climate change	<u>Air quality</u> During 2023–2040, all three alternatives (A, B, and C) would have the same federal production from valid existing rights from approved federal leases, and therefore would have comparable downstream air quality and public health impacts due to these existing leases. Under Alternative A (No Leasing), coal production in the CDPA would end mid-2041 since new coal lease applications would not be accepted. For this reason, there would be no mining, transportation, or downstream combustion emissions under this alternative due to potential new federal leases. <u>GHGs and climate</u> Coal production from existing leases in the CDPA is anticipated to end during 2041 under this alternative when existing federal leases are exhausted. Since no new coal lease applications would be accepted, there would be no coal production resulting from this SEIS; thus, no coal-related GHG emissions would occur under this alternative. The GHG emissions from BLM-administered federal coal would be the lowest of all the alternatives.	<u>Air quality</u> Alternative B (No Action) would allow leasing to continue with a reserve of approximately 48.01 billion short tons. The production and emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed in the Affected Environment would occur. Then, potential future leases would allow for production and emissions to continue. Emissions of criteria and hazardous air pollutants from the mining, transportation, and downstream combustion of coal from potential new federal leases under Alternative B (No Action) would be higher than Alternative A (No Leasing) and C (Limited Leasing). The total recoverable coal reserves are projected to be exhausted in 2338. <u>GHGs and climate</u> Compared with Alternative A (No Leasing), future leasing allowed under Alternative B (No Action) would result in approximately an additional 2,260 MMT of CO_2 equivalents (CO_2e) from mining, transportation, and downstream combustion of federal coal from 2041 to 2048.	<u>Air quality</u> During 2023–2040, all three alternatives would have the same federal production from valid existing rights from approved federal leases, and therefore would have comparable downstream air quality and public health impacts due to these existing leases. Emissions and impacts of all pollutants from potentially new leases would occur from 2041 to 2048. Impacts of all pollutants would be lower in 2048 than the 2041–2047 period reflecting the drop in production in that year as the coal is exhausted before the end of the year. <u>GHGs and climate</u> Compared with Alternative A (No Leasing), future leasing under Alternative C (Limited Leasing) would result in approximately an additional 2,042 million metric tons (MMT) of CO_2e emissions from mining, transportation, and downstream combustion of federal coal from 2041 to 2048. The total federal coal-related CO_2e emissions from future leases during that period are approximately 9.6 percent lower than Alternative B (No Action) due to federal coal being exhausted during 2048 and

Resources Brought Forward for Analysis	Impacts		
	Alternative A – No Leasing	**Alternative B – No Action**	**Alternative C – Limited Leasing**
Air resources, including greenhouse gas and climate change *(continued)*	*(See above.)*	Under Alternative B (No Action), coal mining could potentially continue after 2048 until the approximately 48.01 billion short ton reserve is exhausted. Although it is unrealistic that this would occur (due to changing energy policies and a decline in coal usage), if the remaining amount of coal available for future leasing after 2048 (approximately 46.7 billion short tons) under Alternative B (No Action) is all combusted, this would result in an estimated 79.33 billion metric tons of CO_2e of additional GHG emissions. Coal-related GHG emissions from BLM-administered federal coal would be highest under Alternative B (No Action).	the resulting lower coal production and emissions during that year. There would be no coal production from future leases after 2048, and so GHG emissions from mining, transportation, and downstream combustion of federal coal after 2048 would be zero under Alternative C (Limited Leasing).
	Cumulative Impacts <u>Air quality</u> Cumulative emissions are presented for criteria pollutants and hazardous air pollutants (HAPs) in 2023, the peak year of total federal and nonfederal coal production in the CDPA. Cumulative emissions would be lower in all future years. Modeling shows that contributions from federal coal and oil and gas development are unlikely to result in exceedances of the criteria pollutant standards and HAPs; however, elevated concentrations or deposition may be present near sources such as mines, well pads and power plants. <u>GHGs and climate</u> The production, transportation and processing, and downstream combustion of federal oil, gas, and coal produced in the BFO along with other BLM-authorized activities would result in the emission of GHGs that would contribute to global warming and climate change impacts. Using the Model for the Assessment of Greenhouse Gas Induced Climate Change, the national BLM Specialist Report (2022) estimated that nationally "30-plus years of projected cumulative federal emissions would raise average global surface temperatures by approximately 0.0158 degrees Celsius (°C; 0.0284 degrees Fahrenheit [°F])" or 1 percent of the temperature target of limiting global warming to 1.5°C (2.7°F).		

Resources Brought Forward for Analysis	Impacts		
	Alternative A – No Leasing	**Alternative B – No Action**	**Alternative C – Limited Leasing**
Social and Economic considerations	Under Alternative A (No Leasing), coal production in the CDPA would end mid-2041 since new coal lease applications would not be accepted. Jobs and income supported by existing leases would provide economic contributions as discussed in the affected environment section from 2023 to 2040. After this period, no additional contributions would occur related to BFO federal coal development. State and local services dependent on coal revenues would be impacted by the reduction in revenue, unless revenue is obtained from other sources. No opportunity would be available to develop or maintain alternative coal uses or carbon capture technology beyond 2041, unless a RMP amendment or new RMP allocates additional coal for leasing consideration.	Under Alternative B (No Action), coal would be available for leasing until 2338 based on available coal reserves. For 2023–2048 the average annual contributions from development as estimated at 4,123 total (direct, indirect, and induced) jobs, and 413.9 million dollars. Nonquantitative estimate is provided past 2048 due to limitations of the US Energy Information Administration (EIA) forecast model; however, it is anticipated that employment and labor contributions to the local area would continue. In addition, Alternative B (No Action) would support continued federal, state, and local tax revenue until 2338. Coal would remain available to develop or maintain alternative coal uses or carbon capture technology through at least 2338.	Under Alternative C (Limited Leasing), coal development would continue to approximately 2048. Because estimated coal production is decreasing over time for all alternatives, the average annual economic contributions are lower than Alternative B (No Action) (3,377 jobs, and 339 million in labor income) All contributions to jobs, income, and revenue would end around 2048. No opportunity would be available to develop or maintain alternative coal uses or carbon capture technology beyond 2048, unless a RMP amendment or new RMP allocates additional coal for leasing consideration.

Resources Brought Forward for Analysis	Impacts		
	Alternative A – No Leasing	Alternative B – No Action	Alternative C – Limited Leasing
Social and Economic considerations *(continued)*	Cumulative Impacts Nonfederal coal accounts for approximately 10 percent of total coal production in Campbell County. Direct spending and employment from nonfederal coal producers have additional direct, indirect, and induced economic effects that ripple throughout the state and local economies. In the absence of federal coal, mines would be unlikely to be economically viable, and would be likely to close. As a result, further reduction in coal production and economic losses associated with reduced nonfederal coal productions would have additional effects not quantified under *Environmental Consequences*. Long-term social-economic effects are discussed qualitatively because the BLM does not currently have a model suitable to perform long-term social-economic impact analyses. Coal market demand has the potential to vary from the 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. While global market demand is expected to increase (driven by coal-powered generation in China, India, and Southeast Asia), US coal exports would likely not increase due to globalized market competition. China and India have their own large coal reserves, with China being the leading global producer of coal. A new coal export terminal on the US West Coast is unlikely, as illustrated by the 2021 denial of the U.S. Supreme Court's acceptance to hear Montana and Wyoming's complaint that Washington State interfered with their lawful interstate commerce by failing to permit a proposed coal export terminal (Gruver 2021).. Wyoming tax incentives, such as a lower severance tax rate for coal exported from Canadian and Mexican terminals, exist partially due to such litigation activities; however, they have yet to yield significantly observable increases in global exportation of Powder River Basin coal. While a small amount of Montana Powder River Basin coal has been exported, between the uncertain international market, lack of US export terminals, and the transportation costs, exportation of Wyoming Powder River Basin coal is not foreseeable.		
Environmental justice	Impacts Common to All Alternatives Under all alternatives, identified environmental justice communities in the socioeconomic analysis area (46 percent of census block groups) and in the downstream combustion area (60 percent of census block groups in the vicinity of combustion points) have the potential for disproportionate adverse impacts from changes in coal resource management and associated coal development. This is because environmental justice communities have been found to have higher rates of exposure to existing air pollution and preexisting health conditions associated with environmental justice socioeconomic indicators, with the additional potential to be impacted by emissions from coal mining, transportation, and combustion. Under all alternatives, it is anticipated that coal production would be reduced over time based on the EIA's forecasted reduction in coal demand. Emission-related impacts on downstream environmental justice communities would decline with the reduced production; however, local adverse economic impacts on environmental justice communities are likely to increase with the loss of coal-related employment opportunities, social programs, and state and county revenues that fund public services such as general government operations, K-12 school operations, and major maintenance.		

<table>
<tr><th rowspan="2">Resources Brought Forward for Analysis</th><th colspan="3">Impacts</th></tr>
<tr><th>Alternative A – No Leasing</th><th>Alternative B – No Action</th><th>Alternative C – Limited Leasing</th></tr>
<tr><td rowspan="2">Environmental justice
(continued)</td><td>Under alternative A, the No Leasing Alternative, no additional coal leasing would be authorized. Following the depletion of coal development under existing leases around 2041, potential for impacts on environmental justice communities from BFO coal devolvement and combustion would be removed.

Wyoming environmental justice populations would be adversely impacted from the loss of coal-related economic revenue and social programs funded from coal production, unless a new RMP allocates additional coal for leasing consideration.</td><td>Under Alternative B, the No Action Alternative, environmental justice communities would experience the potential for disproportionate adverse impacts from coal mining and combustion for the longest period of time; no restrictions would be placed on potential future leases, and based on coal reserves, production may continue until 2338.

Wyoming environmental justice populations would be least impacted from reductions in coal-related economic revenue and social programs funded from coal production.</td><td>Under Alternative C, the Limited Leasing Alternative, impacts on environmental justice communities would be limited to around 2048, when coal development authorized under potential future leases would be diminished.

Wyoming environmental justice populations would be adversely impacted from the loss of coal-related economic revenue and social programs funded from coal production, unless a new RMP allocates additional coal for leasing consideration.</td></tr>
<tr><td colspan="3">Cumulative Impacts
Local and downstream analysis area emissions and pollutants emitted through coal mining and combustion would continue to have potential impacts on identified environmental justice communities. The contribution to cumulative impacts would be greatest under Alternative B, the No Action Alternative, impacts would have the potential to continue until 2338, given the available coal reserves. Under Alternative C, the Limited Leasing Alternative, impacts would occur until 2048. Under Alternative A, the No Leasing Alternative, potential environmental justice impacts would be reduced for the local analysis area following the cessation of federal coal production around 2041.

Mining of BFO coal would continue to contribute to greenhouse gas emissions, which add to ongoing impacts from climate change on human health and disease in numerous ways, as detailed in *Public Health Impacts*. Some existing health threats will intensify, and new health threats will emerge as a result of climate change. Environmental justice communities would be vulnerable to disproportionate impacts from these threats based on factors such as socioeconomic status, race, and current level of health.

The specific level to which combustion of BFO coal contributes to disproportionate impacts on downstream environmental justice communities is difficult to quantify given the size of the downstream planning area, the fact that BFO coal combustion represents only a portion of coal combustion at power plants, and the varied factors which contribute to local baseline air quality.</td></tr>
</table>

Resources Brought Forward for Analysis	Impacts		
	Alternative A – No Leasing	**Alternative B – No Action**	**Alternative C – Limited Leasing**
Coal resources	Under Alternative A, the No Leasing Alternative, no coal would be available for leasing. Production of BLM-administered coal would continue until approximately 2041. Under this alternative, approximately 48.12 billion short tons of coal would remain undeveloped.	Under Alternative B, the No Action Alternative, 48.01 billion short tons of coal would be available for future consideration of leasing. This alternative would not restrict expected rates of future development or BLM-administered coal resources in the decision area. It also could allow for future nonthermal uses of coal.	Under Alternative C, the Limited Leasing Alternative, 1.24 billion short tons of coal would be available for consideration for leasing. This would be enough to extend production of BLM-administered coal until approximately 2048, but it would reduce long-term coal availability. Under this alternative, approximately 46.88 billion short tons of coal would remain undeveloped.
	Cumulative Impacts Actions that reduce coal availability for leasing and development would result in a reduction in the availability of coal for extraction and use for developing alternative uses, such as synthetic gas.		

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; BLM 2015a). This SEIS/RMPA is in response to a United States (US) District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. v. Bureau of Land Management* [4:20-cv-00076-GF-BMM]).

The BLM has prepared this SEIS/RMPA in accordance with NEPA; the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508); Department of Interior NEPA regulations (43 CFR 46); the requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008); the 2021 climate change executive order (Executive Order 14008); and the administration's long-term 2050 climate change strategy.

1.1 Purpose of and Need

The purpose of this SEIS/RMPA is to provide an additional analysis for land use planning that:

(1) Completes a new coal screening and analysis that considers a no-leasing and limited coal leasing alternatives; and
(2) Discloses the public health impacts, both climate and non-climate impacts, of burning fossil fuels (coal, oil, and gas) from the decision area.

1.2 Description of the Decision Area

The decision area is the coal development potential area (CDPA) identified under Alternative B in the 2019 Supplemental EIS. The decision area includes approximately 481,000 acres of subsurface federal mineral coal estate. The US Forest Service (USFS) allocates federal coal beneath its surface, while the BLM has the authority to determine the availability for the future consideration of leasing for the remaining federal coal (**Figure 1-1**). Coal allocation is discussed further in **Section 1.4.2**. The CDPA contains approximately 4.36 billion short tons of leased, unmined, recoverable federal coal (that is, BLM and USFS allocated) already leased and approved for mining activities. In addition, there are 48.12 billion short tons of unleased recoverable federal coal.

The 2019 Approved RMPA identified 39,780 acres as an expansion area that was not incorporated into the CDPA; rather, the area was identified as an area for the location of infrastructure only. Since there has been no new geological and economic information supporting the expansion area as an area likely to be mined in the future, it remains excluded from the CDPA in this SEIS/RMPA.

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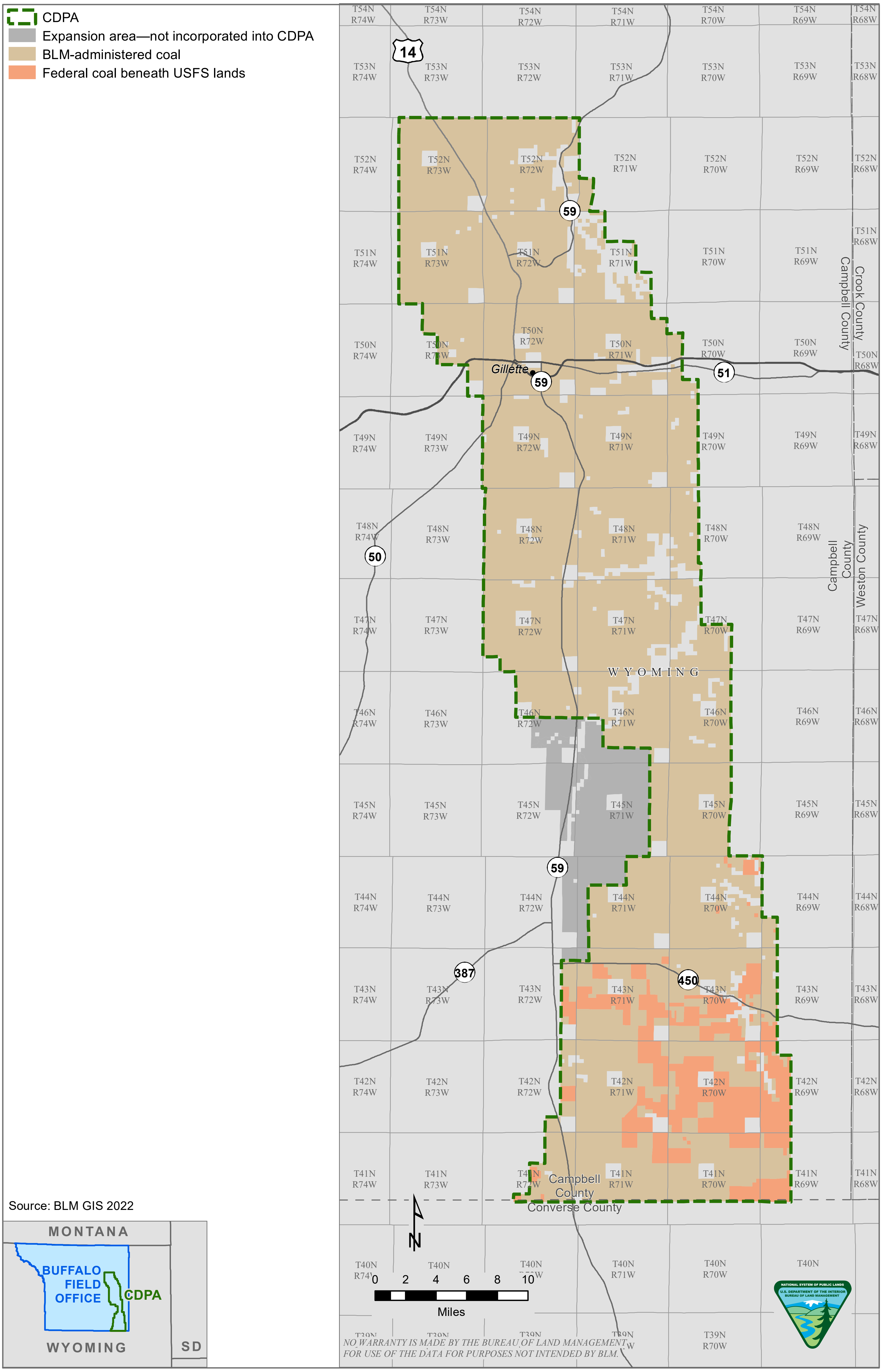
Figure 1-1
Coal Development Potential Area (CDPA)



Source: BLM GIS 2022

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1.3 Scoping Issues

The public scoping process for the Draft SEIS/Potential RMPA began on October 3, 2022, with the publication of the notice of intent (NOI) in the *Federal Register* (87 *Federal Register* 59818); it ended on November 2, 2022. On October 17, 2022, the BFO conducted a public scoping meeting in Gillette, Wyoming; eighteen people attended. The BLM announced the meeting through the NOI in the *Federal Register*, the BLM project website, and news releases. The BFO provided public access to information related to the Draft Supplemental EIS and Potential RMPA on its ePlanning website: https://eplanning.blm.gov/eplanning-ui/project/2021239/510.

The BFO received 18 unique written submissions that included 172 substantive comments in 26 issue categories. Most comments regarded the alternatives, FLPMA, best available science, and the following resource-specific issues: air quality, climate change, public health, and environmental justice. Detailed information can be found in the scoping report (BLM 2022a) on the 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 ePlanning website. **Table 1-1** aligns the planning issues identified for detailed consideration with the resources affected by the issues. **Chapter 3** discusses the issues as they pertain to the identified resources.

Table 1-1
Scoping Issues and the Resource Topics Affected

Issue	Resource Topics Affected
How will the BLM ensure transparency in the SEIS process?	The BLM will follow all requirements under NEPA and CEQ guidance regarding public notice, consultation, and coordination. **Chapter 4**, Consultation and Coordination, provides more information about engagement with Sovereign Tribal Nations, federal, state, and local governments. A scoping report with information regarding the scoping period can be found on the project ePlanning web page.
Will the BLM consult with the US Fish and Wildlife Service (USFWS) to review any direct, indirect, and cumulative impacts on listed wildlife species? How will the BLM consult with the USFWS to determine the indirect, direct, and cumulative impacts on Endangered Species Act?	No critical habitat for listed species occurs within the CDPA. Through coal screening, suitable habitat for listed species (that is, declared alluvial valley floors for the Ute ladies'-tresses orchid) has been excluded from leasing availability. Water quality sampling on the Powder River indicated that there were no water quality potential downstream effects from BLM BFO actions on the pallid sturgeon. If potential effects on a listed species are identified during the SEIS process, the BLM will initiate consultation with the USFWS. The BLM invited the USFWS to participate as a cooperating agency.
What agencies, organizations, and partnerships will the BLM consider consulting in its development of the SEIS/RMPA?	**Chapter 4**, Consultation and Coordination, provides information on consultation conducted as part of the SEIS development. Any agency, organization, or other interested party may submit comments on the project as part of the public engagement process.

Issue	Resource Topics Affected
How will the BLM adhere to Executive Order 13175 and consult with impacted Sovereign Tribal Nation communities?	**Chapter 4**, Consultation and Coordination, provides information on consultation and Sovereign Tribal Nations engagement conducted as part of the SEIS development.
How will the BLM engage with its cooperators and ensure they participate in the SEIS process?	**Chapter 4**, Consultation and Coordination, provides information on consultation conducted as part of the SEIS development.
Will the SEIS consider no-leasing or tapering-down-of-coal alternatives? What alternatives will be included in the SEIS?	The court ordered the BLM to consider no-leasing and limited leasing alternatives. See **Chapter 2** for the range of alternatives.
What methods will the BLM use to address the downstream impacts of fossil fuel leasing and its impacts on climate change?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change.
What new information will be referenced and incorporated into the SEIS?	Air resources (including greenhouse gases and climate change), public health, coal, and socioeconomics will all be updated, based on the following: • 2021 minerals production data and coal distribution data • New coal screening using current data • Updated (2021) reasonably foreseeable development (RFD) scenario for coal • Greenhouse gas emissions inventory and downstream emissions • Identification of downstream locations receiving federal coal, oil, and gas produced in the BFO and environmental justice populations near these locations
How will the BLM comply with the FLPMA's multiple-use mandate to ensure critical resources are protected?	This SEIS augments the existing RMP FEIS, meeting the multiple-use and sustained yield mandate of FLPMA. The BLM considered multiple uses during evaluation of Screen 3; see **Appendix A**.
Will the Proposed RMPA be consistent with Wyoming's local policies and laws?	Decisions in the proposed plan will be compatible with existing plans and policies of adjacent Sovereign Tribal Nations and local, state, and federal agencies, as long as the decisions are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands. See **Section 1.6**, Relationship to State and Local Plans, below.
Will the BLM ensure the Proposed RMPA is consistent with Johnson County's natural resource management plan (NRMP)?	See **Section 1.6**, Relationship to State and Local Plans, below.
How will the purpose and need incorporate the BLM's principles of multiple uses and sustained yield?	This SEIS augments the existing RMP FEIS, meeting the multiple-use and sustained yield mandate of FLPMA. The BLM considered multiple uses during evaluation of Screen 3; see **Appendix A**.
How will the BLM apply suitability criteria when considering the CDPA?	See **Appendix A**, Coal Screening Process.
How will the BLM review and analyze the indirect and direct impacts of fossil fuels on public health, air quality, climate change, and other critical resources?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change, and Public Health.

Issue	Resource Topics Affected
How will the BLM quantify and consider the cumulative impacts of greenhouse gas released due to fossil fuels leasing and incorporate them into the cumulative effects analysis?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change.
How will air pollution affect the regional air quality and how will the BLM analyze the criteria air pollutants? What are the direct, indirect, cumulative, downstream, and upstream air quality impacts resulting from mineral use?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change.
How will the BLM address downstream non-greenhouse gas emissions and impacts resulting from minerals available for extraction?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change.
What would be the short-term and long-term impact of climate change from additional coal leasing? How will the BLM quantify and analyze the project's greenhouse gas emissions?	See **Chapter 3**, Air Resources, Including Greenhouse Gases and Climate Change.
How does coal development impact human health and communities that are adjacent to coal mines and leases?	See **Chapter 3**, Public Health.
Will any alternatives contain the social cost of carbon?	See **Chapter 3,** Social and Economic Considerations.
How would closing or limiting fossil fuel development impact the local economies and economic well-being of the residents of Campbell County and Johnson County, as well as county revenue?	Johnson County is not in the CDPA; however, Johnson County does receive revenue from federal oil and gas development. The 2015 RMP oil and gas allocation decisions are not being affected by the alternatives; therefore, there is no oil and gas-related economic impact on Johnson County. Johnson County was not included within the economic analysis area because of declining coal employment opportunities and because in the economic data sets utilized, coal is combined with oil and gas. This makes it difficult to differentiate their respective contributions. For Campbell County, see **Chapter 3**, Social and Economic Considerations.
What are the social effects of greenhouse gas emissions that result from fossil fuel extraction and use?	See **Chapter 3**, Air Quality, Greenhouse Gases and Climate Change, and Social and Economic Considerations sections.
How will the BLM analyze how fossil fuel development's emissions and waste in the decision area disparately impact low-income and minority populations?	See **Chapter 3**, Environmental Justice.

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

The issues identified during public scoping (discussed above) refined the court-ordered 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 the BLM's jurisdiction or they are beyond the scope of the SEIS. A list of these issues and the rationale for not analyzing them further are provided below (**Table 1-2**).

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

Issue	Rationale
Will any alternatives contain requirements or lease stipulations requiring emission control technologies?	This is out of scope. The BLM lacks the authority to stipulate or mitigate downstream impacts; the BLM relies on the receiving states, which are subject to oversight by the US Environmental Protection Agency (EPA), to ensure emissions do not exceed or violate any state or federal air quality standard under the Clean Air Act.
How will the Inflation Reduction Act apply to this SEIS and will greenhouse gas projections be used in the analysis?	This is outside the scope. This SEIS/RMPA is being undertaken to meet the court order; it is not driven by the Inflation Reduction Act. Greenhouse gas (GHG) emissions are being projected and used in the analysis. Independent of the SEIS, funding is available through the Inflation Reduction Act, the Bipartisan Infrastructure Law, and the CHIPS and Science Act to assist the economies of energy transition communities to be stronger, more resilient, and more equitable.
How will the BLM consider and analyze the direct and indirect impacts on national historic landmarks?	There will be no direct effects on the identified national historic landmarks as none of the identified national historic landmarks fall within the CDPA or are located downwind of receiving electrical generating units (EGUs).
What are some potential mitigation measures the BLM can implement to reduce the proposed action's impacts on air quality and climate change?	The No Leasing and Limited Leasing alternatives described in **Chapter 2** reduce greenhouse gas emissions and climate change effects. The BLM can apply additional mitigation related to mining during the leasing stage. The BLM lacks the authority to stipulate or mitigate downstream impacts; the BLM relies on the receiving states, which are subject to oversight by the EPA, to ensure emissions do not exceed or violate any state or federal air quality standard under the Clean Air Act.
Why would additional mitigation measures be considered when previous reviews of the RMP already address mitigation?	The BLM is not considering additional mitigation measures; this is because the BLM lacks the authority to stipulate or mitigate downstream air quality impacts.
How will the BLM review the economic impacts of diversifying the local economies to include renewable energy development?	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD (BLM 2015a). Economic impacts of any renewable energy developments would be analyzed at the project level. There have not been any commercial scale renewable energy projects proposed within the Buffalo Field Office to date.
How will the BLM consider and address potential impacts on grazing lands?	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD (BLM 2015a).

Issue	Rationale
Will the BLM utilize a substitution analysis and if so, how will the BLM correct common pitfalls and inconsistencies with this analysis type?	The RFD for federal coal in Wyoming's Powder River Basin projects future development over the next 20 years based on forecasted market conditions (that is, supply, demand, and prices). As discussed in **Appendix B**, the RFD was developed from coal forecasts publicly available online from the Energy Information Administration (EIA) through the Annual Energy Outlook 2022 (EIA 2022a). 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 Annual Energy Outlook 2019 (EIA 2022a), 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 **Appendix B**. The RFD for federal coal production in the CDPA is the same under the alternatives; the market for coal is in decline based on existing and historical downward trends in demand for new coal leases. 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. Such effects are likely to occur in some combination when considering substitution away from federal fossil fuels, but the relative contribution of each depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis.
How will the BLM consider and review potential invasive vegetation in the decision area, and how will the BLM control them?	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD (BLM 2015a). Mineral authorizations include requirements for controlling invasive species at the implementation level.
How will indirect, direct, and cumulative impacts on pallid sturgeon, as required under the Endangered Species Act be determined?	No critical habitat for listed species occurs within the CDPA. The BLM and USFWS collected water quality samples on the Powder River at the Montana state line and downstream, during fall 2021 and spring 2022. These samples were analyzed for a variety of contaminants, including selenium. All water samples taken at the state line met water quality standards. Coalbed natural gas–produced water discharge was a large contributor of water discharge to the Powder River in the 2000s. However, any produced waters were required to meet WDEQ standards prior to release into the environment (https://deq.wyoming.gov/water-quality/water-wastewater/permitting/produced-water-disposal-treatment/). Coalbed natural gas has been in decline for more than a decade, many wells have been reclaimed, and today there are no WDEQ permits for produced water discharge to the Powder River.

Issue	Rationale
How will the BLM review coal development and operations' impacts on surface waters in the project area and develop a comprehensive baseline for an accurate analysis?	There would be no change in impacts from those discussed in the 2019 Supplemental EIS (BLM 2019).
How will the BLM consider the potential impacts of coal development on groundwater resources in the project area?	There would be no change in impacts from those discussed in the 2019 Supplemental EIS (BLM 2019).
How will the BLM review coal development and operations' impact on riparian areas in the project area and develop a comprehensive baseline for an accurate analysis?	There would be no change in impacts from those discussed in the 2019 Supplemental EIS (BLM 2019).
How will the BLM review potential adverse impacts on aquatic resources in the project area, and how will the BLM protect these resources?	Certain aquatic species were considered in the unsuitability coal screen (criteria 9 and 15) and the multiple-use screen and lands removed from consideration for leasing (in some cases with exception). See **Appendix A**. There would be no change in impacts from those discussed in the 2019 Supplemental EIS (BLM 2019).

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, the BLM would remove some resources from the potential for coal development, 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 any activity that would change the impacts disclosed in the 2015 Approved RMP/ROD; therefore, 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 CDPA.
Water resources – municipal watersheds and national resource waters	These resources do not exist in the CDPA.
Biological resources	There would be no change in impacts from the 2015 Approved RMP/ROD.
Biological resources brought forward under Coal Screens 2 or 3	There would be no change in impacts from those discussed in the 2019 Supplemental EIS (BLM 2019).
Wild horses and burros	This resource does not exist in the CDPA.
Wildland fire management	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.
Wilderness areas	This resource does not exist in the CDPA.
Forest and woodland products	No commercial forest or woodland communities are in the CDPA.
Travel and transportation management	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.
Recreation	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.

Resource	Rationale
Special recreation management areas	These areas are excluded, based on Screen 3's multiple-use conflicts.
Areas of critical environmental concern	This resource does not exist in the CDPA.
Lands and realty land tenure decisions	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.
Livestock grazing	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.
Leasable minerals: fluids	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD. The analysis required from the court order is included under air resources.
Locatable minerals	This resource use does not occur in the CDPA.
Mineral materials	There would be no change in impacts from those discussed in the 2015 Approved RMP/ROD.
Nonenergy leasable minerals	This resource use does not occur in the CDPA.
Renewable energy	This resource use does not occur in the CDPA.
National trails	This resource does not exist in the CDPA.
Wild and scenic rivers	This resource does not exist in the CDPA.
Backcountry byways	This resource does not exist in the CDPA.
Wilderness study areas	This resource does not exist in the CDPA.

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. According to 43 CFR 1610.4–2(b), 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 following are the planning criteria considered in the development of this document:

- The SEIS/RMPA complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy.
- Lands covered in the SEIS/RMPA will be those federal lands and federal mineral estate, including split-estate, managed by the BLM. No decisions will be made relative to non-BLM-administered lands; this includes federal minerals beneath surface lands managed by another federal agency (that is, the USFS).
- In the SEIS/RMPA, the BLM will make land use planning decisions to determine lands acceptable for further consideration for coal leasing.
- In the SEIS/RMPA, the BLM uses a collaborative and multijurisdictional approach to determine the desired future condition of public lands.
- Decisions in the plan will be compatible with existing plans and policies of adjacent Sovereign Tribal Nations, local, state, federal 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 SEIS/RMPA 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 addressing the US District Court's order. Due to the limited focus, the BLM did not address the full suite of issues and concerns that would normally be considered in a full RMP revision. The analysis in this SEIS will influence the BLM's decision on whether to amend the 2015 BFO Approved RMP/ROD.

1.4.2 Coal Screening Process

The BLM's authority to manage BLM-administered coal resources within the BFO's administrative boundaries 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 and set 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 changed resource conditions, the BLM could change the unsuitability determination of a given tract at the activity-planning stage.
3. Multiple-use conflict analysis—According to 43 CFR 3420.1-4e(3), ". . . 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." This screen also considers the judicially crafted multiple-use screen to reduce greenhouse gas and non-greenhouse gas emissions as a nexus for climate change. 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 and the ability of that preference to be grouped into a logical mining unit.

The BLM updated the 2019 coal screening to correct errors made in 2019 and to provide updated information on criteria resources. Federal lands determined to be acceptable for further consideration for leasing through coal screening in the CDPA are the subject of this SEIS analysis; results of the coal screening process, including the updates, are provided in **Appendix A**.

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

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

1.4.4 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 this SEIS/RMPA:

- NEPA
- Clean Air Act
- Energy Policy Act of 2005
- Clean Water Act
- Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis

See the 2015 Approved RMP/ROD 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 using the analysis in this Final SEIS; the BLM is required to follow the multiple-use and sustained yield mandate of FLPMA when making those decisions.

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

1.5 COLLABORATION

The BLM is engaging in ongoing collaboration with Sovereign Tribal Nations, federal, state, and local governments as part of this process. This collaboration includes continuing to engage Sovereign Tribal Nations for government-to-government consultation, the participation of cooperating agencies, and consultation with regulatory agencies, as required by law. **Chapter 4**, 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 as consistent with these plans as possible, as required by

FLPMA's consistency provisions (43 United States Code 1712(c)(9)) and the BLM's planning regulations at 43 CFR 1610.3-2.

The no-leasing and limited leasing alternatives are not consistent with the 2022 Campbell County Natural Resource Land Use Plan, which states the county's policy as ". . . federally managed lands shall remain open and available for mineral resource exploration, development and production, unless administrative withdrawal or other action is necessary to protect the national security and withdrawal procedures are fully followed." The BLM is not consistent with this section of the Campbell County Natural Resource Land Use Plan because the Campbell County policy statement is not consistent with the purposes, policies, and programs of federal laws and regulations applicable to BLM-administered lands.

As recognized in the 2020 Johnson County NRMP, the coal seams in Johnson County are too deep for strip mining. This is one reason why the CDPA does not include any of Johnson County; thus, the coal allocation decision within this SEIS/RMPA will not directly affect Johnson County. Coal mining does not currently occur and will not likely occur in the future within the county. However, the Johnson County NRMP contains several policy statements concerning the county's support and continued production of coal to provide a reliable and economical energy source to Johnson County. The no-leasing and limited leasing alternatives could be viewed as not consistent with these policy statements; however, the BLM does not currently have a model suitable to perform an impact analysis to consider whether those alternatives would increase energy costs or energy grid reliability after 2041.

Other plans considered during this supplemental analysis are consistent with and listed in the 2015 Approved RMP/ROD (BLM 2015a; Section 1.4.4, pp. 15 and 16).

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

As a result of public, stakeholder, and cooperating agency input and its internal review of the May 5, 2023, Draft SEIS/Potential RMPA, the BLM has developed this Final SEIS/Proposed RMPA for managing BLM-administered public lands in the decision area. 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 Final SEIS/Proposed RMPA, the BLM focused on addressing public comments, while continuing to meet its legal and regulatory mandates. Appendix H contains a summary of the public comment process and contains the BLM's responses to the comments received on the 2023 Draft SEIS/Potential RMPA. A report containing public comments and the summary of comments and responses is available on the project ePlanning website at https://eplanning.blm.gov/eplanning-ui/project/2021239/510. Based on public comments, some text was corrected or reworded for clarification of purpose and intent.

Changes in this Final SEIS/Proposed RMPA from the 2023 Draft SEIS/Potential RMPA are as follows:

- The BLM chose Alternative A as the Proposed Plan Amendment.
- The BLM added clarifications to better explain the analysis method and environmental consequences.

- A discussion on alternative coal uses was added to the coal affected environment section (**Section 3.5.5.1**).
- The BLM updated the downstream combustion emissions analysis to use the recently published EPA's 2020 National Emissions Inventory (NEI) instead of the 2017 NEI.
- The BLM provided additional information on the reasons for a qualitative analysis for the analysis of health effects due to downstream combustion.
- Emissions control and carbon capture discussions have been added to the GHG affected environment section (**Section 3.5.2.1**).
- Many figures and tables from the air quality and greenhouse gases and climate change sections (**Sections 3.5.1** and **3.5.2**) were moved to the Air Resources Technical Support Document (**Appendix C**).
- Production and combustion social and economic impacts, including environmental justice, were separated to clearly distinguish between the upstream production impacts and the downstream combustion impacts, recognizing that Wyoming and Campbell and Converse Counties, in particular, experience both production and combustion.
- The revenue subsection was restructured.
- Mineral production and value data were updated to include the most recent Wyoming Department of Revenue data. Additional data were provided on baseline federal mineral royalty distributions, state severance taxes, ad valorum taxes, and surface coal valuation.
- An additional discussion of public health considerations was added to **Section 3.5.3.1** and **3.5.4.2**.
- Additional EJScreen background information and data were added to **Section 3.5.4.2** and **Appendix E**.
- An additional discussion was added to the environmental justice impacts analysis related to impacts on public and social services, tribal impacts, and impacts on communities historically dependent on coal. Information was added on mitigation measures employed that reduce impacts on environmental justice communities.
- Federal programs for facilitating energy communities transitioning from fossil fuels were identified in **Section 3.5.3.1**.
- The BLM added **Appendix H**, which describes the comments on the Draft SEIS/Potential RMPA, and the BLM's responses to the comments.
- Updates, corrections, and clarifications were added to the Social and Economic Considerations and the Air Resources, including Greenhouse Gases and Climate Change sections.
- The BLM added a downstream oil and gas distribution map.
- Additional references were cited in the document.
- The BLM made minor corrections, such as typographical errors and figure updates.

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Chapter 2. Alternatives

2.1 Introduction

The BLM considered three alternatives in this SEIS/RMPA. The BLM developed these alternatives in coordination with cooperating agencies and interested stakeholders (including private landowners) and from comments received from the general public during the public scoping period.

2.2 Alternatives Development

The SEIS/RMPA alternatives focus solely on availability for future coal leasing in response to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, 4:20-cv-00076-GF-BMM (D. Mont. 2022). The range of alternatives meets the purpose of and need for the SEIS/RMPA and responds to issues raised during scoping (see **Chapter 1**, **Section 1.3**, and the BLM Buffalo Field Office RMP SEIS Scoping Report [BLM 2022a]).

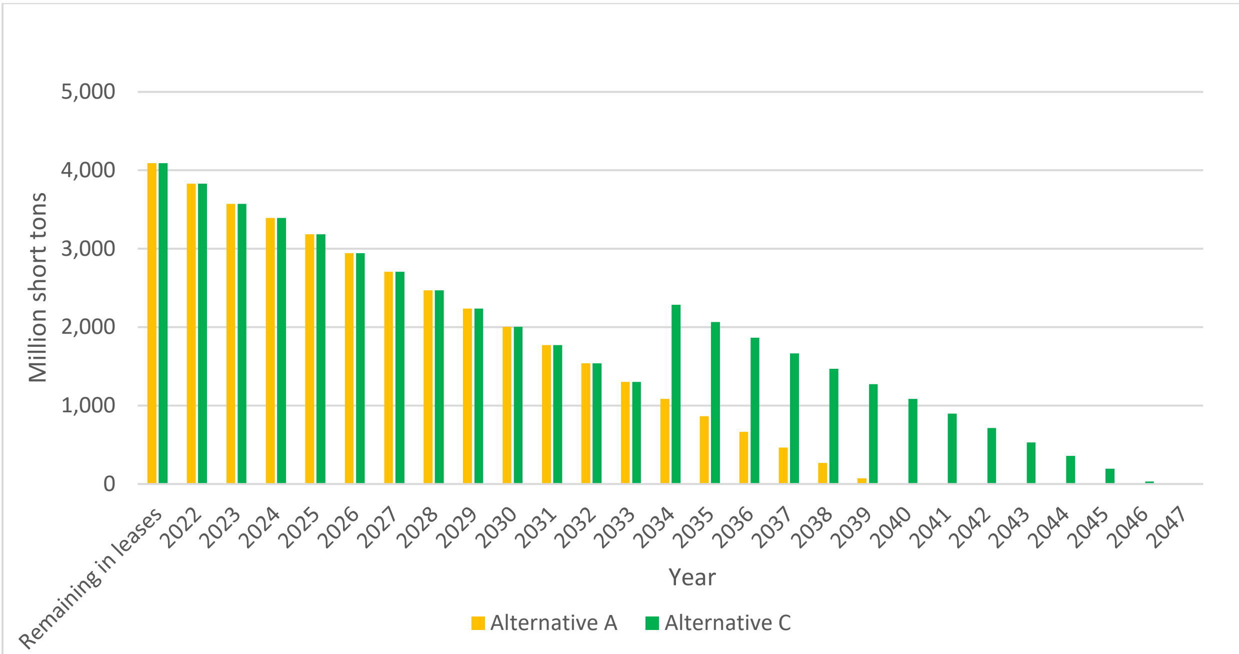
The BLM updated the 2019 SEIS coal screening (**Appendix A**) to determine a baseline for coal acceptability for further consideration for leasing. Screen 1, identification of coal with development potential, did not change. This is because the coal quality and stripping ratios used to evaluate the cost to production has not changed since 2019. Errors in data reporting (such as reporting hectares instead of acres) were corrected, and resource information was updated for Screen 2, application of unsuitability criteria. Surface owner consultation (Screen 4) was not substantially different than it was in 2019; therefore, it did not change the acceptability for coal leasing. The BLM varied the alternatives by refining the multiple-use coal screen (Screen 3) to consider greenhouse gas emissions as a nexus for climate change.

The alternatives focus on the volume of BLM-administered coal being made available for the future consideration of leasing; this coal volume varies among alternatives. The multiple-use coal screen contains the specific restraints per alternative that were applied during the coal screen process. The alternatives are described in detail in **Sections 2.2.1** through **2.2.3**. **Graph 2-1** and **Graph 2-2** show coal production for the life of the resource under each alternative.

2.2.1 Alternative A: No Leasing (Proposed Plan Amendment)

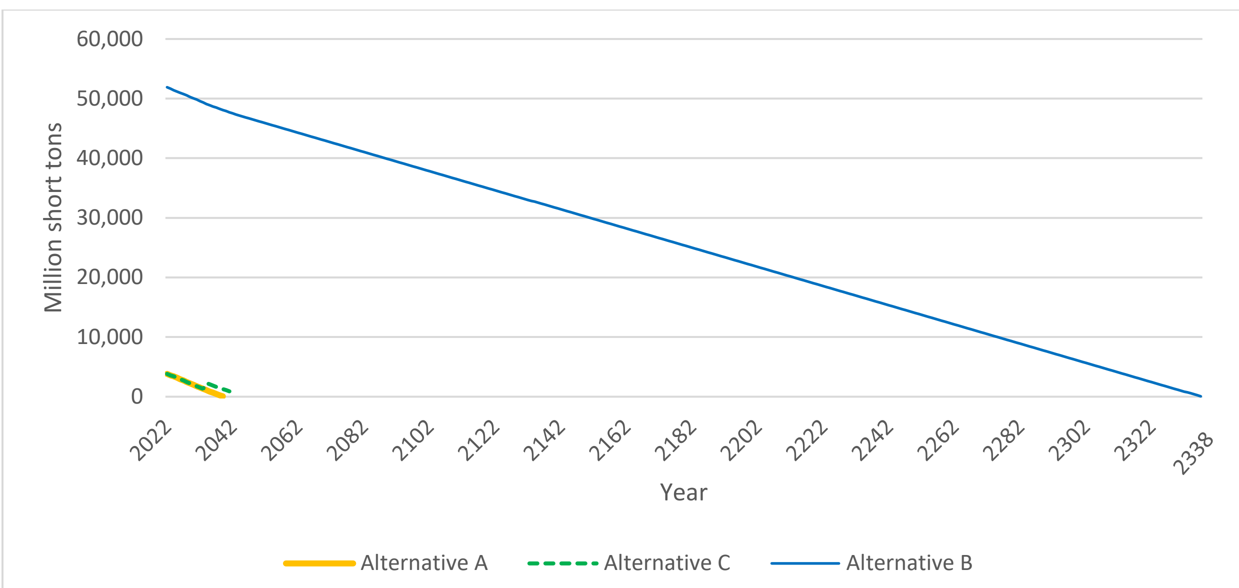
Under Alternative A, the No Leasing Alternative, the application of the multiple-use screen would result in the CDPA being unacceptable for future consideration of federal coal leasing throughout the duration of the planning period (through 2038). At the end of the planning period an RMP revision would reevaluate land use allocations. Under Screen 3, 48.12 billion short tons of coal were removed from consideration in order to reduce GHG emissions as a proxy for climate change in response to the court order. The BLM would not accept new coal lease applications, only existing leases could be developed. Existing coal leases would continue through their associated lease terms and could be developed. **Table 2-1** depicts the coal screening results for Alternative A, No Leasing.

Graph 2-1. Million Short Tons of Recoverable Coal under Alternative A–No Leasing and Alternative C–Limited Leasing



Source: EIA 2022a

Graph 2-2. Million Short Tons of Recoverable Coal under Alternative A–No Leasing, Alternative B–No Action, and Alternative C–Limited Leasing



Source: EIA 2022a

Table 2-1
Coal Screening Results for Alternative A, No Leasing

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-48.12
Acceptable for coal leasing	**0**

Source: BLM Geographic Information System (GIS) 2022

[1] See **Appendix A** for the full coal screening process.

[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface.

Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

2.2.2 Alternative B: No Action

Under Alternative B, the No Action Alternative, 48.01 billion short tons of BLM-administered recoverable coal would be available for the future consideration of leasing in the CDPA. **Table 2-2** depicts the coal screening results for Alternative B, No Action.

Table 2-2
Coal Screening Results for Alternative B, No Action

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-0.11
Acceptable for coal leasing	**48.01**

Source: BLM GIS 2022

[1] See **Appendix A** for the full coal screening results.

[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface. It also includes existing federal coal leases.

Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

2.2.3 Alternative C: Limited Leasing

Under Alternative C, the Limited Leasing Alternative, 1.24 billion short tons of BLM-administered recoverable coal within the CDPA would be available for the future consideration of leasing. **Table 2-3** depicts the coal screening results for Alternative C, Limited Leasing.

Table 2-3
Coal Screening Results for Alternative C, Limited Leasing

Coal Screening Criteria[1]	Billion Short Tons
CDPA (federal coal) (Screen 1)	61.30
Federal coal mined out	-8.63
Federal coal with development potential	52.66
Unsuitable for all methods of coal mining without exception (Screen 2)[2]	-4.54
Suitable for coal mining	48.12
Multiple-use screen (Screen 3) Unacceptable for all methods of coal mining without exception	-46.88
Acceptable for coal leasing	**1.24**

Source: BLM GIS 2022
[1] See **Appendix A** for the full coal screening results.
[2] Coal potential includes BLM-administered federal coal, excluding areas where the USFS manages the surface. It also includes existing federal coal leases.
Note: Coal volumes shown in each row are rounded and thus may not sum to the total in the Acceptable for Coal Leasing row.

Under Screen 3, 46.88 billion short tons of coal were removed from consideration in order to reduce GHG emissions as a proxy for climate change in response to the court order. Approximately 1.24 billion short tons would be necessary for the BLM to lease and for the US Office of Surface Mining Reclamation and Enforcement and WDEQ to permit during the planning period (2022–2038) and prior to 2041, which is when the EIA forecast predicts the currently leased reserves would be exhausted. This is the estimated minimum amount of coal that would allow the mines to be able to continue mining without interruption. At the end of the planning period an RMP revision would reevaluate land use allocations. Economics would be the driving factor determining whether and when lease actions would be pursued, allowing the existing mines to continue production. The BLM would evaluate Lease by Applications as they are received in determining where the available coal would be leased. The alternative does not identify a specific area, as it is not possible to define a geographic area for leasing without interfering with the competitive free-market environment of the 12 independent coal mines.

2.2.4 Reasonably Foreseeable Development (RFD)

The BLM used the 2022 EIA Annual Energy Outlook's forecast for coal as the RFD because it is the best available science for anticipated coal production. The EIA develops projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions. The BLM also reviewed production forecasts from the 12 individual coal mines within the Buffalo CDPA. Individual mine forecasts were lower than the EIA forecast over the planning period (2022–2038).

Because the mines possess—collectively—sufficient leased reserves to continue mining for the duration of the SEIS/RMPA's planning period, the RFD will be part of the affected environment. The alternatives, as identified above, disclose the volume of coal remaining following the planning period. They then calculate the emissions associated with the mining and combustion of that coal and analyze the direct and indirect effects related to the remaining BLM-administered coal volume available for potential future leasing actions.

2.2.5 Rationale for Identifying a Proposed Plan Amendment

BLM regulations, at 43 CFR, Subpart 1610, requires the BLM to identify its Proposed RMP Amendment in the Final Supplemental EIS. The BLM selected Alternative A, No Leasing, as the Proposed RMP Amendment making no BLM-administered coal available for leasing within the planning area. The Proposed Amendment does not affect the area with coal development potential (screen 1) or the area determined to be suitable for surface coal mining (screen 2). Collectively, the mines have sufficient federal coal leased to meet forecasted production levels into 2041.

The Proposed RMP Amendment 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 Proposed RMP Amendment become final decisions.

2.2.6 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 CFR 1502.14). Through their comments on the proposed action, the public suggested alternative methods for achieving the purpose and need.

2.2.6.1 Geographically Limited Leasing

Twelve independently operating mines are in Wyoming's portion of the Powder River Basin. The BLM considered defining a geographic area sufficient to contain the 1.24 billion short tons of coal necessary to continue uninterrupted coal mining within the basin past 2038; however, the coal quality varies across the CDPA; the individual mines' capacities and capabilities also vary. In addition, the consuming power plants typically purchase coal from multiple Powder River Basin mines, blending the coal for their individual needs, **Appendix F** identifies the PRB mines supplying coal to each receiving EGU. It is not possible to define a limited geographic area for leasing without interfering with the competitive free-market environment. Thus, such an alternative would have the effect of favoring individual mines over others, without affecting the total availability of coal. The court ordered a downstream analysis of public health effects; emission-related health effects are correlated with the volume of coal produced, not the acreage mined.

2.2.6.2 20-Year Limited Leasing

A 20-year volume of coal was recommended by a cooperating agency. The coal industry has historically used a 20-year economic prediction model for their production planning. The Limited Leasing Alternative provides sufficient coal for production through 2048, meeting the 20-year recommendation. If the Limited Leasing Alternative is selected, then coal mines would have approximately 23-years to plan, lease, and permit additional federal coal. In addition, the planning period of the Buffalo SEIS is 2022–2038. The 2038 end-date was selected to be consistent with the 2015 Approved RMP and 2019 RMP Amendment planning periods. The BLM will likely have begun preparing a new RMP revision by 2038, which will review coal allocation and leasing decisions.

2.2.6.3 1.5°C Limit on Global Temperature Rise (Net-zero Greenhouse Gas Emissions by 2050)

This alternative was recommended during public scoping and by a cooperating agency. The President's Executive Order on Tackling the Climate Crisis at Home and Abroad (Executive Order 14008, January 2021) and the United States' long-term climate strategy (November 2021) call for putting the US on a pathway to net-zero greenhouse gas emissions by 2050. Achieving net-zero emissions would keep a 1.5°C (2.7°F) limit on global temperature rise within reach, prevent unacceptable climate change impacts and risks, and meet the Paris Accord. The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction.

Table 3-33, **Table 3-35**, **Table 3-36** and **Table 3-37** show that fossil fuel production emissions total 6.75 MMT CO_2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.54 MMT CO_2e emissions. Thus, the BLM administratively has some level of control over only the approximately 1.5 percent of CO_2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.

2.2.7 Alternatives Suggested during the Public Scoping Period

- The BLM should consider an alternative that proposes alternate sources of energy to replace the energy from leased coal.
  - The BLM did not consider this proposed alternative further because the sources used to generate energy are outside the BLM's control; this alternative would not meet the purpose and need, and it is not required by the court order.
- The BLM should consider alternatives that restrict or eliminate new oil and gas leases throughout the planning area.
  - The BLM did not consider this proposed alternative further because management decisions regarding oil and gas leasing are beyond the court order's scope.
- The BLM should consider measures to counter any remaining emissions by increasing the total terrestrial carbon sequestration and maintaining existing carbon stocks through methods like administrative designations, or as a last resort, the remaining federal fossil fuel emissions should be accounted for and addressed through an agency-led compensatory mitigation fund.
  - The BLM did not consider this proposed alternative further because it is outside the court order's scope.
- The BLM should consider an emissions management framework alternative; this alternative would establish emissions screening criteria to avoid development decisions that run counter to greenhouse gas emissions' reduction targets and climate science.
  - None of the global carbon budgets are a hard line that countries have committed to stay within as part of the Paris Agreement or otherwise. Carbon budgets were originally envisioned as being a convenient tool to simplify communication of a complex issue and to assist policymakers considering options for reducing GHG emissions on a national and global scale. Carbon budgets have not yet been established on a national or subnational scale, primarily due to the lack of consensus on how to allocate the global budget to each nation, and as such the global budgets that limit warming to 1.5°C (2.7°F) or 2.0°C (3.6°F) are not useful for BLM decision-making, as it is unclear what portion of the budget applies to emissions occurring in the United States.

Chapter 3. Affected Environment and Environmental Consequences

3.1 INTRODUCTION

This chapter describes the existing biological, physical, and socioeconomic characteristics of the CDPA, including human uses that could be affected, as well as characteristics of downstream locations where fossil fuels produced in the BFO are used. It also evaluates the impacts of implementing the proposed alternatives. The 2015 Approved RMP/ROD described the baseline conditions in the BFO planning area (BLM 2015a). 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 Indigenous Knowledge

BLM acknowledges and incorporates the Indigenous knowledge provided to BLM from their engagement with Sovereign Tribal Nations into this SEIS/RMPA. Indigenous knowledge is a body of observations, oral and written knowledge, innovations, practices, and beliefs developed by Indigenous peoples through interaction and experience with the environment. It is applied to phenomena across biological, physical, social, cultural, and spiritual systems. Indigenous knowledge can be developed over millennia, continues to develop, and includes understanding based on evidence acquired through direct contact with the environment and long-term experiences, as well as extensive observations, lessons, and skills passed from generation to generation. The purpose of acquiring Indigenous knowledge is to promote the inclusion of Indigenous knowledge in the BLM's decision-making.

BLM received a letter from Jon Eagle, Tribal Historic Preservation Officer, for the Standing Rock Sioux Tribe in January 2023. The following is quoted from Tribal Historic Preservation Officer Eagle's letter:

> How can federal agencies properly assess the direct and indirect effects, much less the cumulative effects when they are limited to an area? The reviews are too narrow in scope. The map shared is misleading. Potential effect does not end at that arbitrary boundary. When I was a child birds used to blacken the sky and today I wonder, where have all the birds gone? As I travel throughout my ancestral lands I see dead or dying trees everywhere I go. I also see invasive species thriving and less and less native prairie.
>
> My parents drank water right out of rivers and lakes. My generation drank water from creeks and streams. We were taught that as long as it was moving it was safe. My children, grandchildren and yours, drink water out of plastic bottles because there is no clean water. It is well documented that coal production in this country has now poisoned the water ways of the United States. Coast to coast our waters are contaminated with mercury. That contamination will be here for millions of years, long after you and I are gone. Our environment is collapsing.

> What is alarming to me is that even though it is well documented in western science that the changes we are seeing in our environment is a direct and indirect effect of the extractive industries, industry continues to use a dead technology. President Biden in his Executive Order on Climate Change specifically mentioned Traditional Ecological Knowledge that tribal nations possess. I welcome the opportunity as we continue to engage one another to share that knowledge so that you and your agency can make better informed decisions.
>
> When your ancestors first came to these shores they found a Garden of Eden. Rivers, Lakes, and Streams of the purest water. When western expansion reached the Missouri River they found the great plains and a sea of grass full of wildlife. One of the most important species were the Pte Oyate, Buffalo Nation, which your office is named after. As Pte Oyate moved across the plains grazing they had a small ecological footprint on the land as did my ancestors.
>
> Buffalo wrap their tongues around grass and pull to eat. This actually stimulates new growth as they leave the roots intact. The shape of their hooves tilled the land and their droppings fertilized the land. Cattle are an invasive species that eat grass all the way down to the soil. In a pasture where cattle graze you will see trails, often times so deep they can no longer follow each other so they make new trails. You will never see that in a pasture of buffalo.
>
> My ancestors looked at everything in creation as a nation unto itself. Because they knew that everything in creation had a spirit and they also knew that everything in our environment had a symbiotic relationship to each other. Today the extractive industries are destroying that Garden of Eden your ancestors first encountered and my ancestors once flourished in. Once humans change the land it is changed forever and coal production has a huge cumulative effect to our environment that is now global.
>
> Mainstream society looks at the earth as a resource. My society looks at her as the source of life and still engages with a living universe.

3.2.2 Analytical Assumptions

The BLM made several assumptions to facilitate the analysis of potential effects and to ensure the analysis adheres to the court order. For most resources, the BLM applied the assumptions identified in the 2015 Approved RMP/ROD and 2019 SEIS.

The following are general assumptions that apply to all resources:

- Planning issues identified in **Chapter 1** provide the focus for the scope of effects analyzed in this chapter.
- The life of this SEIS/RMPA is from the current year until the end of 2038.
- The analysis considers the development, transportation, and combustion of the BLM-administered coal that is available for the future consideration of leasing under each alternative.
- The CDPA is not within Johnson or Sheridan Counties; therefore, the BLM does not anticipate surface impacts from coal development in these counties.

- There are approximately 48.0 billion short tons of recoverable BLM-administered coal reserves within the CDPA outside the current federal leases (see **Appendix A**).
- The BLM did not analyze any new mine starts. This is because new mine starts would require a separate EIS, due to the infrastructure requirement. At such time, the BLM would evaluate whether an RMP amendment is required.
- The analysis includes surface mines only. There are no underground mines in the CDPA.
- Mining will continue on the current leases and may progress farther to the west if new leases are issued.
- Using current production data, an average of 19 to 20 years of production are remaining on current leases. The reserves leased range from one mine with less than a year of reserves to four mines with reserves likely to last at least 30 years.
- The BLM updated baseline data from the 2015 Approved RMP/ROD and 2019 SEIS where new information was available.
- Effects are caused by the planning decision to determine areas as acceptable or unacceptable for consideration for coal leasing. Coal Screen 3 (Multiple Use) determines areas as acceptable or unacceptable for consideration for coal leasing based on projected greenhouse gas emissions.
- Indirect effects would be the result of foreseeable actions, including leasing, mining, transportation, and combustion of BLM-administered coal.
- Local indirect effects from coal leasing and mining would be similar for all surface resources, as identified in the Wright Area Coal Lease Application Final EIS (BLM/WY/PL-10/022+1320; BLM 2010) and the South Gillette Area Coal Lease Application Final EIS (BLM/WY/PL-09/029+1320; BLM 2009). These final EISs are available on the BLM's ePlanning website (https://eplanning.blm.gov/eplanning-ui/project/67033/510 and https://eplanning.blm.gov/eplanning-ui/project/67025/510, respectively).
- 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 three categories of resources/resource uses that fall under its NEPA handbook requirements:

- Resources that do not fall within the CDPA and are therefore dismissed from further analysis (see **Chapter 1** of this SEIS/RMPA)
- Resources that are in the 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)
- Resources in the CDPA that are acceptable for further consideration for leasing; impacts on these resources would be the same as identified in the 2019 Supplemental EIS and 2015 Approved RMP/ROD, but they would take place only in the CDPA (see **Table 3-1**, below).

Table 3-1
Resources with the Same Indirect and Cumulative Impacts Identified in the 2019 Supplemental EIS and 2015 Approved RMP/ROD, and Indirect Impacts Identified in the 2011 Wright Final EIS

Resource	Resource Indicator	On Federal Minerals within the CDPA with Mined-out Areas Removed (acres)
Soils See Section 4.1.3 of the 2015 Proposed RMP/Final EIS (FEIS) (BLM 2015b) See Section 3.8.2 of the Wright Final EIS (BLM 2010)	Severe erosion (wind and water)	38,840
	Slopes greater than 25 percent	6,200
	Poor reclamation suitability	147,060
	Low reclamation potential	28,720
Water Resources See Section 4.1.4 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Sections 3.5.1.2 and 3.5.2.2 of the Wright Final EIS (BLM 2010)	Surface waters	19,520
	Alluvial valley floors (declared)	1,700*
	Groundwater wells (number of)	977
Vegetation See Sections 4.4.1, 4.4.2, 4.4.3, and 4.4.4 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Section 3.9.2 of the Wright Final EIS (BLM 2010)	Agricultural	500
	Barren	6,420
	Short-grass prairie	179,970
	Mixed-grass prairie	53,960
	Sagebrush	168,790
	Riparian	130
	Conifer forest	1,250
	Wet meadow	2,110
	Water	320
Biological Resources See Sections 4.4.5, 4.4.6, and 4.4.8 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Sections 3.10 of the Wright Final EIS (BLM 2010) See Section 3.5.3 of the 2019 Supplemental EIS (BLM 2019)	Federally designated critical habitat for threatened and endangered species	0
	State-listed threatened and endangered species	N/A
	Bald eagle nest buffers	2,540
	Golden eagle nest buffers	11,650
	Bald and golden eagle roost and concentration areas	0
	Falcon nesting sites	0
	Migratory birds of high federal interest	N/A
	Greater sage-grouse lek buffers	34,560*
	Sharp-tailed grouse leks	650
	Burrowing owl habitat	5,370
	Elk crucial winter range	1,610
	Elk calving areas	30
	Swift fox habitat	41,420*

Resource	Resource Indicator	On Federal Minerals within the CDPA with Mined-out Areas Removed (acres)
Cultural Resources See Section 4.5.1 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Section 3.12.2 of the Wright Final EIS (BLM 2010)	Known resources (number of)	330
	Eligible for listing on the National Register of Historic Places (number of)	31
	Not eligible for listing on the National Register of Historic Places (number of)	284
	Not evaluated (number of)	15
	Known Native American features (number of)	30
Paleontological Resources See Section 4.5.2 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Section 3.3.3.2 of the Wright Final EIS (BLM 2010)	Potential Fossil Yield Classification (PFYC) Class 2 areas	12,060
	PFYC Class 3 areas	82,270
	PFYC Class 3A areas	319,110
Visual Resources See Section 4.5.3 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Section 3.13.2 of the Wright Final EIS (BLM 2010)	Visual resource inventory (VRI) Class III	16,640
	VRI Class IV	320,340
	Not rated	76,460
Lands and Realty See Section 4.6.2 of the 2015 Proposed RMP/FEIS (BLM 2015b) See Section 3.11.2 of the Wright Final EIS (BLM 2010)	Rights-of-way linear	120
	Rights-of-way nonlinear	290
	Agency roads	10
	Buildings	17,210
	Cemeteries	310
	Cities	13,390
	County roads	1,980
	Interstates	450*
	State highways	740
	US highways	310

Sources: BLM GIS 2022; Wyoming Game and Fish Department GIS 2018; Memorandum to Tom Bills, BLM project manager, BLM BFO, from Ardeth Hahn, lead archaeologist, BFO, on January 3, 2023.
*Incorporates updated data sources since the 2019 SEIS/RMPA
N/A=Information not available

3.4 Cumulative Impacts

3.4.1 Cumulative Analysis Method

Cumulative impacts are those impacts on the environment that result from implementing the alternatives, in combination with other actions outside the scope of this SEIS/RMPA. CEQ regulations require a cumulative impact analysis because environmental conditions result from many varied 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 BFO planning area of the 2015 Approved RMP/ROD. See Appendix G of that document for a list of RFFAs in the BFO planning area. In addition, the following projects are included in the cumulative effects analysis:

- Miles City Field Office Coal Leasing SEIS/Proposed Plan Amendment
- Converse County Oil and Gas EIS (DOI-BLM-WY-P060-2014-0135-EIS). The project area is adjacent to the southernmost coal mine and is in the same oil and gas play/basin as the CDPA.

3.5 Resources Brought Forward for Analysis

Resources that would have different impacts, based on the RFD, coal screening analysis, and updated data, are analyzed in detail in **Sections 3.5.1** through **3.5.4** of this SEIS/RMPA. They include air quality; greenhouse gases and climate change including the social cost of greenhouse gas emissions; social and economic considerations including public health; environmental justice; and coal resources.

3.5.1 Air Quality

3.5.1.1 Affected Environment

The analysis area for direct impacts on air quality and air quality related values (AQRVs; visibility and deposition) is defined as the BFO and select federal and Sovereign Tribal Nation Class I areas that are near and downwind of the BFO:

- Badlands National Park
- Northern Cheyenne Reservation
- Wind Cave National Park

Since coal produced in the CDPA could be combusted at numerous coal-fired power plants or, in the case of oil and gas, anywhere in the country, the indirect analysis area for air quality and AQRVs is all of those regions that combust federal minerals that originate from the BFO.

The analysis conducted for direct and indirect impacts is quantitative or qualitative depending on the availability of data and uncertainties in the data. In particular, a qualitative analysis is conducted for the indirect analysis area: the air quality and public health impacts of areas that receive federal coal or products of oil and gas from the BFO for reasons outlined in *Downstream Combustion Impacts on Air Quality and Public Health* under *Direct and Indirect Impacts*. The BLM also notes that power plants and oil and gas combustion sources in those areas would be subject to local, state, and federal regulations aimed at improving and maintaining air quality.

Figure 3-1 in the Air Resources Technical Support Document (ARTSD, **Appendix C**) shows the location of the BFO and the federal and Sovereign Tribal Nation Class I areas, monitoring stations for air quality and AQRVs, as well as the CDPA. Air quality data from these locations provide an overall summary of current air quality conditions within the BFO and in the surrounding regions.

Regulatory and Policy Framework

The Clean Air Act and its amendments mandate the control of air pollutants throughout the United States. It imposes an obligation on all state and federal agencies, including the BLM, to comply with all state and local air pollution requirements (42 USC Section 7401, et seq.). The Clean Air Act addresses criteria air pollutants (CAPs), state and National Ambient Air Quality Standards (NAAQS) for CAPs, AQRVs such as visibility and deposition, and the Prevention of Significant Deterioration program. The Clean Air Act also designates Class I areas, which are areas with special air quality protections, such as national parks and Wilderness areas designated in the 1964 Wilderness Act. The federal and Sovereign Tribal Nation Class I areas that are near and downwind of the BFO are listed above and shown in **Figure 3-1** of **Appendix C**. The Northern Cheyenne have designated their reservation as a Class 1 Area.

Under the Clean Air Act, the EPA has NAAQS for six CAPs: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ground-level ozone (O_3), lead, and particulate matter (PM; PM equal to or less than 10 microns in diameter [PM_{10}] and PM equal to or less than 2.5 microns in diameter [$PM_{2.5}$]). Primary standards provide public health protection, while secondary standards provide public welfare protection such as protection against decreased visibility and damage to vegetation and buildings.

States are also empowered to establish their own state-specific standards for CAPs. In Wyoming, these are the Wyoming Ambient Air Quality Standards, or WAAQS, and are regulated by the WDEQ. The State of Wyoming has an additional ambient air quality standard for PM_{10}. The current NAAQS and WAAQS are provided in **Section 3.2** of **Appendix C**.

The EPA assigns an attainment status to geographic areas based on compliance with the NAAQS. Ambient air quality monitoring data of criteria pollutants is used to derive a statistic referred to as a design value that describes air quality with respect to the NAAQS. The calculated design values are then used to officially designate the status of each area as either attainment (demonstrates compliance with NAAQS), nonattainment (exceeds the NAAQS), maintenance (in the process of redesignating to attainment by continuing to show compliance with the NAAQS after having initially been in nonattainment), or unclassifiable (insufficient data for compliance determination). Because attainment status is assigned separately for each criteria pollutant, an area can be in attainment for one criteria pollutant and in nonattainment for another. Once a nonattainment designation occurs, state and local air agencies must develop a federally enforceable State Implementation Plan with EPA approval to outline the control measures and strategies that will be used to attain and maintain compliance with the NAAQS (40 CFR 51).

The states that contain power plants receiving coal from mines in the CDPA can change from year to year. In 2021 the states with power plants receiving coal from the CDPA included Alabama, Arkansas, Arizona, Colorado, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Mississippi, Nebraska, Nevada, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Washington, Wisconsin, and Wyoming (EIA 2022b). The EPA allows states to set air quality standards that are stricter than the NAAQS; information on such standards, when established, are available from the individual state's environmental division. Information on receiving power plants is provided in *Downstream Combustion Impacts on Air Quality and Public Health* under *Direct and Indirect Impacts,* and in **Appendix F** Coal Distribution from Mines within the Buffalo Field Office.

On November 30, 2022, the BLM proposed new regulations (Waste Prevention Rule, 87 *Federal Register* 73588) to reduce the waste of natural gas from venting, flaring, and leaks during oil and gas production activities on federal and Indian leases. While the proposed rule is primarily focused on reducing waste of natural gas, the BLM also requested comments on appropriate methods for assessing the benefits of reducing air pollutants by decreasing natural gas emissions from pneumatic equipment and vapor recovery units and from the leak detection and recovery programs. Additional information on the proposed rule is provided in the *Regulatory and Policy Framework* section under *Greenhouse Gases and Climate Change*.

On November 11, 2022, the EPA issued a supplemental proposal that strengthens and expands its November 2021 proposal by reducing emissions from both new and existing oil and gas operations. While the proposed rule is primarily focused on reducing methane, it would also reduce volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions. Additional information on the proposed rule is provided in the *Regulatory and Policy Framework* section under *Greenhouse Gases and Climate Change*.

HAPs are air pollutants that may present a threat of adverse human health effects (such as cancer or other serious health problems, including chronic respiratory disease, reproductive disorders, or birth defects). They consist of 188 pollutants listed in or pursuant to Section 112(b) of the Clean Air Act. There are no federal ambient air quality standards for HAPs. The Clean Air Act includes National Emission Standards for Hazardous Air Pollutants (NESHAP) that define maximum achievable control technology (MACT) standards for each regulated source category. MACT standards are applicable to all major sources (sources with the potential to emit more than 10 short tons per year of a single HAP or 25 short tons per year of any combination of HAPs) and some area sources (any stationary source of HAPs not classified as a major source) in specific source categories (40 CFR 51).

On April 24, 2023, the EPA proposed to strengthen the NESHAP for coal- and oil-fired EGUs, referred to as the Mercury and Air Toxics Standards, by reducing the emission standards for filterable particulate matter (designed to control non-mercury HAP metals), reducing the emission limit for mercury from power plants burning lignite coal, and revising startup requirements. Additional information is available at 88 *Federal Register* 24854.

AQRVs, including visibility and deposition, are resources that may be affected by a change in air quality. Federal land managers are responsible for protecting AQRVs in Class I areas under the Clean Air Act (Federal Land Managers' Air Quality Related Values Work Group 2010).

Visibility describes how far an observer can see and how clear the view appears. Air pollution can impact visibility by causing light to be scattered or absorbed. Widespread visibility impairment caused by anthropogenic sources is referred to as regional haze (40 CFR 51.301). The Regional Haze Rule of the Clean Air Act (40 CFR 51, Subpart P) protects visibility in Class I areas with the goal of achieving natural visibility conditions by 2064. Under the Regional Haze Rule, visibility conditions are tracked relative to estimated natural conditions on the 20 percent most anthropogenically impaired days and the 20 percent clearest days using the deciview (dv) haze index. Deciviews are designed such that a uniform change in haziness corresponds to uniform incremental change in perceived visibility for the entire range of visibility conditions (that is, from pristine to highly impaired; 40 CFR 51.301).

Atmospheric deposition can negatively affect ecosystems and other AQRVs. Atmospheric deposition is the transfer of gases and particles to surfaces and can occur with precipitation (wet deposition) or without precipitation (dry deposition). Potential deposition impacts include, but are not limited to, acidification of soils and waterbodies and nutrient enrichment (Federal Land Managers' Air Quality Related Values Work Group 2010). Wet or dry deposition of acidic pollutants formed from emitted SO_2 and nitrogen oxides (NO_x) is referred to as acid rain. While there are no federal standards for atmospheric deposition, critical loads are used as indicators of impacts from atmospheric deposition. Critical loads are defined as the level of deposition below which no harmful effects to an ecosystem are expected.

The BLM lacks the authority to stipulate downstream emissions levels. The BLM leases coal to a producer to mine but does not regulate the producer's marketing of the coal. The BLM relies on the states where coal is used in steam electric stations, to ensure (subject to oversight by the EPA) that emissions do not exceed or violate any state or federal air quality standard under the Clean Air Act.

Current Conditions and Trends

Monitoring Data

This section evaluates the current conditions and recent trends in air quality and AQRVs by examining criteria pollutant, visibility, and deposition data collected at various monitoring sites. Regional air quality is a product of the concentrations of various air pollutants and is assessed through ambient air monitoring networks. To evaluate existing regional air quality and AQRVs, ambient monitoring data were acquired from a number of monitoring networks and databases, including the EPA's Air Quality System (AQS), the Interagency Monitoring of Protected Visual Environments (IMPROVE) network, and the Clean Air Status and Trends Network (CASTNET), as well as the National Trends Network (NTN) and Mercury Deposition Network that are part of the National Atmospheric Deposition Program (NADP).

Air Concentrations

Air quality data within the BFO are available for CAPs from the EPA's AQS. Monitors reporting to AQS from 2017 to 2022 are shown in **Figure 3-1** in **Appendix C** and listed in **Table 3-3** of **Appendix C**. Current values and recent trends in air concentrations of CAPs in the BFO are discussed in the following sections.

Carbon Monoxide (CO)

Motor vehicles and other internal combustion engines are the dominant source of carbon monoxide (CO) emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Carbon monoxide is also created during refuse, agricultural, and wood-stove burning and through mining, oil and gas development, and other industrial processes.

There are no CO nonattainment areas within Wyoming. There are no active CO monitors within the BFO. Available data from CO monitors in Wyoming are shown in **Table 3-4** and **Table 3-5** of **Appendix C**. CO concentrations averaged at 1-hour (**Table 3-4**) and 8-hour (**Table 3-5**) intervals met the NAAQS (35 ppm and 9 ppm, respectively) for all WDEQ stations within Wyoming from 2017 to 2021. CO concentrations in Wyoming demonstrate a consistently low background concentration compared to the NAAQS.

Lead (Pb)

The primary historical source of lead emissions has been certain types of industrial sources and lead in gasoline and diesel fuel. However, because lead in fuels has decreased substantially, the processing of metals containing trace amounts of lead is now the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturing plants.

There are no active lead monitors in Wyoming, due to low background concentrations of lead (WDEQ 2022). There are no lead nonattainment areas in Wyoming.

Nitrogen Oxides (NOx)

Nitrogen oxides (NO_x), including nitric oxide (NO) and nitrogen dioxide (NO_2), are formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuel, for example in mining activities, oil and gas development, automobiles, power plants, other industrial processes, and home and office heating. Within the atmosphere, NO_2 contributes to visibility impacts and may be visible as reddish-brown haze. NO_2 (and other NO_x compounds) also forms nitric acid, a component of atmospheric deposition (for example, acid rain).

NO_2 design values for counties within the BFO meet the 1-hour and annual NAAQS, as shown in **Table 3-6** in **Appendix C**. NO_2 1-hour design values (98th percentile of 1-hour daily maximum concentrations, averaged over 3 years) from 2017 to 2021 were 29–30 ppb, well below the 1-hour standard of 100 ppb. Similarly, county-level NO_2 annual design values shown in **Table 3-7** of **Appendix C** were well below the annual standard of 53 ppb, with values of 1–5 ppb (less than 10 percent of the NAAQS). NO_2 concentrations are relatively consistent year-over-year between stations, signifying that monitored values are likely representative of general background levels.

Ozone (O_3)

Tropospheric O_3 is not emitted directly into the atmosphere. Instead, it is formed by photochemical reactions of precursor air pollutants, including VOCs and NOx. These precursors are emitted by mobile sources, stationary combustion equipment, and other industrial sources. Ozone formation is enhanced by increased sunlight and higher air temperatures. Elevated O_3 concentrations may also occur during winter in snow-covered rural areas.

County-level O_3 concentrations display minor variability across time and space. All design values (calculated as the fourth highest daily maximum 8-hour O_3 concentration over a 3-year period) were below the NAAQS standard of 0.070 ppm, as shown in **Table 3-8** in **Appendix C**. The WDEQ cites exceptional events as driving continued ozone exceedances, namely wildfire smoke in the summer, as well as a winter ozone season during which precursor chemicals, snow cover, temperature inversions and low winds, and sunlight contribute to the increased likelihood of exceedance events (WDEQ 2022). O_3 concentrations display little to no trend over time.

Particulate Matter (PM)

Emissions of PM are generated by a variety of sources, including agricultural activities, industrial emissions, and road dust re-suspended by vehicle traffic. Within the BFO, primary sources of PM include smoke from wildland fire, residential wood burning, mining, oil and gas development, street sand, physically disturbed soils, and dust from unpaved roads. Impacts of PM include health effects, deposition on plants and surfaces (including soiling of snow, which can contribute to climate change), localized reductions in visibility, and potential corrosion. $PM_{2.5}$ also contributes to reduced visibility in nationally important areas such as national parks. $PM_{2.5}$ emissions are primarily generated by internal combustion diesel engines, soils with high silt and clay content, and secondary aerosols formed by chemical reactions in the atmosphere.

The county-level PM_{10} design values from 2017 to 2021 (calculated as the number of exceedances of the 150 μg/m^3 standard averaged over 3 years) within the BFO are shown in **Table 3-9** in **Appendix C**. For compliance with the 24-hour PM_{10} NAAQS, a monitor may only have one exceedance (a 24-hour average concentration greater than 150 μg/m^3) per year on average over a 3-year period. All counties were below the PM_{10} NAAQS from 2017 to 2021, with the exception of Campbell County which had design values above the PM_{10} NAAQS in 2017 and 2018. The PM_{10} design values in Campbell County were at or below the NAAQS in 2019, 2020, and 2021. PM_{10} design values are either decreasing or relatively constant over time within the BFO.

Wyoming also has a state-specific standard for annual PM_{10} concentrations (annual average of 50 μg/m^3, over 3 years). All sites monitored by WDEQ in the BFO were also in compliance with the PM_{10} WAAQS, as shown in **Table 3-10** in **Appendix C**. Annual concentrations at these sites are decreasing slightly over time.

$PM_{2.5}$ design values are shown in **Table 3-11** and **Table 3-12** in **Appendix C**. The design values in the form of the 24-hour $PM_{2.5}$ NAAQS (that is, the 98th percentile of 24-hour average concentrations) ranged from 15 to 27 μg/m^3 between 2017 and 2021, below the 24-hour $PM_{2.5}$ NAAQS of 35 μg/m^3. There is no clear trend between the monitored sites for the 24-hour average. Annual $PM_{2.5}$ averages ranged from 3.3 to 7.3 μg/m^3; all sites had design values below the February 2024 revised NAAQS standard of 9.0 μg/m^3. At the Sheridan air monitoring station, which is the only monitor with valid design values for 2017 to 2021, annual $PM_{2.5}$ concentrations decreased over time.

Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless gas with a pungent odor. It is emitted primarily from stationary sources that burn fossil fuels (that is, coal, oil, and gas) containing trace amounts of elemental sulfur. Some other human sources of SO_2 include metal smelters and petroleum refineries. SO_2 is also emitted from natural sources such as volcanoes. In the atmosphere, SO_2 converts to sulfuric acid, a component of atmospheric deposition (acid rain), and forms secondary aerosols, subsequently contributing to visibility impacts at Class I areas.

There are no EPA AQS SO_2 monitors within the BFO, and there are no SO_2 nonattainment areas within Wyoming. **Table 3-13** in **Appendix C** shows concentrations recorded at all WDEQ monitors in the state. SO_2 design values (99th percentile of 1-hour daily maximum concentrations, averaged over 3 years) were below the SO_2 1-hour NAAQS standard of 75 ppb. SO_2 concentrations have consistently decreased from 2017 to 2021.

Attainment Status

There are no nonattainment areas for any criteria pollutant within the BFO. Sheridan, Wyoming, which is within the BFO, was previously classified as moderate nonattainment for PM_{10} (1987 standard) but was reclassified in 2018 to maintenance (83 *Federal Register* 14373). This redesignation was based upon monitored air quality data for the PM_{10} NAAQS during the years 2014-2016, and the EPA fully approved the Limited Maintenance Plan, submitted by the State of Wyoming to the EPA on June 2, 2017. This air quality maintenance plan provided guidelines for reducing fugitive dust (which was the primary source of the PM_{10} issue) and voluntary curtailment of solid fuel combustion.

There is one area designated as nonattainment in Wyoming and two areas designated as nonattainment in Montana that are near but not within the BFO; these are shown in **Table 3-14** and **Figure 3-2** in **Appendix C**. The Upper Green River Basin Area, located in Sublette and Sweetwater Counties, Wyoming, was designated as a marginal nonattainment area for the 8-hour ozone (2008 Standard) in 2012. This nonattainment area is approximately 100 miles to the southwest of the BFO.

The Lame Deer, Montana area, approximately 50 miles to the north of the BFO, was designated as a moderate PM_{10} nonattainment area in 1990. Laurel, Montana was designated nonattainment in 1978 for the 1971 24-hour SO_2 NAAQS, but the Montana Department of Environmental Quality is in the process of a redesignation request and maintenance plan for the Laurel area. Laurel is approximately 65 miles northwest of the BFO.

The nonattainment status of regions with coal-fired power plants where downstream combustion of BFO coal could occur is shown in **Section 3.9.3** in **Appendix C**. In summary, some of the key regions that have power plants receiving BFO coal as well as nonattainment areas for one or more criteria pollutants (particularly O_3) include Alabama, Colorado, Georgia, Louisiana, Missouri, Texas, and the states around Lake Michigan. Some distinct O_3 nonattainment areas with power plants within or nearby that burn BFO coal include the Houston-Galveston-Brazoria area in Texas, San Antonio area in Texas, St. Louis area in Missouri-Illinois, the Denver-Boulder-Greeley-Ft. Collins area in Colorado, Chicago area in Illinois, and the Detroit area in Michigan. In the case of SO_2 and $PM_{2.5}$, states where receiving power plants are in or near nonattainment areas include Alabama, Arizona, Georgia, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Texas, and Wisconsin. The design values corresponding to the ambient air concentrations in these and other areas are available from EPA (https://www.epa.gov/air-trends/air-quality-design-values#report). The power plants typically receive both federal and nonfederal coal and may combust coal from sources outside the CDPA as well. The nonattainment areas present in urban regions commonly have a multitude of other emission sources also contributing to nonattainment. In general, the power plants and other sources in the regions are subject to local, state, and federal regulations aimed at improving local and regional air quality and making progress toward attainment.

More discussion on the receiving power plants and impacts of burning coal is presented in the section on *Downstream Combustion* under *Coal* and the section *Downstream Combustion Impacts on Air Quality and Public Health* under *Direct and Indirect Impacts*. Potential impacts on communities affected by the downstream combustion of coal from the CDPA are discussed in the *Environmental Justice* section.

Air Quality Related Values

To aid the implementation of the Regional Haze Rule, the visibility in Class I areas is monitored by the IMPROVE network. Monitors are located close to Class I areas across the country. The closest IMPROVE monitors to the BFO (Northern Cheyenne and Wind Cave) are shown in **Figure 3-1** of **Appendix C** and listed in **Section 3.6** of **Appendix C**. **Figure 3-3** and **Figure 3-4** of **Appendix C** present the annual haze index for the 20 percent most impaired, 20 percent clearest, and 20 percent haziest days at these two stations. The 20 percent haziest days include both anthropogenic and natural influences, while the most impaired days include only anthropogenic influences. At both sites, visibility on the 20 percent most impaired and 20 percent clearest days have either improved or remained relatively constant since monitoring began in the early 2000s.

Estimation of atmospheric deposition involves field measurements of atmospheric pollutant concentrations both in ambient air and dissolved in water, as well as modeled estimates of deposition velocities. These estimates and measurements are combined by the NADP using mathematical and statistical techniques to create deposition flux estimates in kilogram/hectare (kg/ha), as well as maps of deposition. Monitored nitrogen and sulfur (sulfate [SO_4]) deposition data are available at the NTN monitors. The sites near the BFO are shown in **Figure 3-1** in **Appendix C**.

While there are no federal standards for atmospheric deposition, critical loads are used as indicators of impacts from atmospheric deposition. Critical loads of deposition are an estimate of the deposition of a pollutant below which significant harmful effects are not expected to occur based on current knowledge (Federal Land Managers' Air Quality Related Values Work Group 2010). Relevant critical loads for nitrogen deposition in nearby Class I areas, determined from the EPA critical load mapper tool (EPA 2021a), are listed in **Section 3.7** of the ARTSD (**Appendix C**). Because multiple critical loads are available for nitrogen deposition, conservatively, the lowest nitrogen critical load representing the resource most sensitive to deposition at each Class I area is used in this analysis. A critical load of 5 kilograms sulfur per hectare per year (kg S/ha-year) is used for total sulfur deposition (Fox 1989).

Figure 3-5 of **Appendix C** shows total nitrogen deposition across the US, as a gradient map estimated by the NTN (NADP 2022). Spatially, total nitrogen deposition across the US in 2021 was highly variable, with deposition in Wyoming on the lower range of values. Deposition was highest in the western portion of the state and along the Wyoming-Idaho border, and total nitrogen deposition rates in the BFO are small relative to the rest of the US. The maximum and average total deposition of nitrogen across nearby Class I areas to the BFO are provided for the period 2017 to 2021 in **Table 3-19** of **Appendix C**. Average annual deposition values exceeded critical loads at Badlands National Park in 2019 and 2021, and at Wind Cave National Park from 2017 to 2021. Maximum total deposition was higher than critical loads at the Badlands National Park in 2019 and at Wind Cave National Park from 2017 to 2020. Annual average and maximum deposition values are variable and demonstrate little trend over the period shown. **Figure 3-6** of **Appendix C** presents annual wet nitrogen deposition between 2011 and 2021 at the monitored sites. Total nitrogen levels have remained relatively steady for the monitored sites within the analysis area.

The maximum and average total deposition of sulfur across nearby Class I areas to the BFO are provided in **Table 3-20** of **Appendix C** for the period 2017 to 2021. All average and maximum annual deposition values are below the critical load for sulfur deposition. Deposition rates in Wyoming and in the BFO are typically small relative to the rest of the US (**Figure 3-7** of **Appendix C**). Wet SO_4 deposition rates have generally decreased over the monitored period for all the monitored sites near the BFO (**Figure 3-8** of **Appendix C**).

The nearest monitored mercury wet deposition data are available from the Badger Peak Mercury Deposition Network monitor in Rosebud County, Montana (see **Figure 3-1** of **Appendix C**). In 2019, the most recent year of data, mercury deposition rates were relatively low in the BFO compared with the rest of the US (**Figure 3-9** of **Appendix C**). Mercury deposition rates in Wyoming are highest in the western portion of the state, which is not within the BFO. The deposition rates demonstrate no clear trend over the period on record; they typically remain between 4 and 7 $\mu g/m^2$.

Coal

Coal Mining. Coal mining generates emissions of criteria and hazardous air pollutants from various sources. Fugitive dust (PM_{10} and $PM_{2.5}$) emissions are generated from activities such as earth moving, coal processing, blasting, and vehicle travel on unpaved roads as well as wind erosion of stockpiles and other exposed areas. Gaseous (for example, NOx, CO, SO_2, and VOC) and PM emissions are released from tailpipe exhaust from nonroad and on-road mobile sources, explosives use, and stationary and portable engines. Additionally, coal mining emits HAPs such as diesel particulate matter (DPM) from diesel exhaust.

Coal production is in decline both in the west and nationally. The EIA forecasts that total US production will drop from over 610 million short tons in 2022 to 450 million short tons in 2040 (EIA 2022b), and production in the Western region (which includes the CDPA) will drop from 335 million short tons in 2022 to 224 million short tons in 2040 (EIA 2022b).

As of 2022, coal in the CDPA was produced at 12 surface mines: Dry Fork, Eagle Butte, Wyodak, Buckskin, Rawhide, Caballo, Belle Ayr, Cordero Rojo, Coal Creek, North Antelope Rochelle, Antelope, and Black Thunder (EIA 2022b).

The BLM forecasts that existing federal leases in the CDPA would allow for production until 2041 without any new leasing. Collectively the mines have sufficient reserves to meet the EIA forecast through 2040. **Table 3-2** shows the estimated federal, nonfederal, and total (federal plus nonfederal) emissions of CAPs and HAPs from coal mining in the CDPA in 2022. The technical approach for the estimation of these emissions is described in **Section 2.1** of the ARTSD (**Appendix C**).

The forecasted federal coal production from 2023 onwards from existing leases is highest in 2023 and then declines until reserves are exhausted in 2041. The peak federal coal production and emissions from existing leases in 2023 are provided in **Table 3-3** along with the corresponding nonfederal and total production and emissions. These emissions would lead to air quality and AQRV impacts associated with increased ambient air concentrations of $PM_{2.5}$, PM_{10}, NO_2, O_3, SO_2, CO, HAPs, and other related pollutants, as well as potential increases in visibility impairment and deposition of nitrogen, sulfur, mercury, and other compounds as discussed in the sections above. As federal production is forecasted to decrease after 2023, the corresponding federal emissions would be lower in all subsequent years.

Coal Transportation. Coal production in the CDPA in 2021 was transported via rail, truck, and/or conveyor to 104 different coal-fired power plants in 25 states. The power plants, supplying mine, and corresponding coal shipment amounts are provided in **Section 4.6** of the ARTSD (**Appendix C**) and in **Appendix F** Coal Distribution from Mines within the Buffalo Field Office. In 2021, 18.6 percent of the coal shipments from the CDPA went to Texas, 14.1 percent to Missouri, 6.6 percent to Illinois, and 6.3 percent to Wisconsin. The remaining states received between 0.1 and 5.7 percent of the total coal shipments. No coal is exported internationally from the CDPA (EIA 2022b, 2022c). In addition to power plants, coal from Black Thunder, North Antelope, and Antelope mines is also sent to rail, barge, and storage terminals in Kentucky (EIA 2022b). Three of the power plant destinations, Wygen 1, Wyodak, and Dry Fork, are located within the CDPA. Additionally, Dave Johnson power plant is located in Converse County, which is part of the local economics analysis area for this SEIS/Potential RMPA. Laramie River Station in Platte County is the only other Wyoming plant receiving coal from the CDPA.

Table 3-2
Coal Mining Emissions of Criteria and Hazardous Air Pollutants from the CDPA in 2022

Mineral Designation	Annual Production (tons*/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
Federal	262,197,857	11,509.1	1,974.6	12,933.1	16,344.3	1,123.6	4,541.1	746.8	112.4
Nonfederal	6,309,933	277.0	47.5	311.2	393.3	27.0	109.3	18.0	2.7
Total	268,507,790	11,786	2,022	13,244	16,738	1,151	4,650	765	115

Note: All tonnages in the table are in short tons.

Table 3-3
Coal Mining Emissions of Criteria and Hazardous Air Pollutants in the Peak Year* of Federal Coal Production from Existing Leases in the CDPA

Mineral Designation	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
Federal	256,582,534	11,295.1	1,933.3	12,445.0	16,110.1	1,097.9	4,445.0	730.1	109.8
Nonfederal	6,174,797	271.8	46.5	299.5	387.7	26.4	107.0	17.6	2.6
Total	262,757,331	11,567.0	1,979.8	12,744.5	16,497.8	1,124.4	4,551.9	747.7	112.4

Note: The peak federal coal production from existing leases from 2023 onwards occurs in 2023. All tonnages in the table are in short tons.

The estimated criteria and hazardous air pollutant emissions from the rail transport of federal, nonfederal, and total (federal plus nonfederal) coal in the CDPA in 2022 are shown in **Table 3-4**. The technical approach for the estimation of coal transportation emissions is described in **Section 2.4** of the ARTSD (**Appendix C**).

As with mining emissions, federal transportation emissions from existing federal leases are highest in 2023 and decline thereafter. These emissions are shown in **Table 3-5** along with the corresponding nonfederal and total emissions in that year.

Coal Downstream Combustion

Most coal in the US is combusted to generate electricity. In 2021, 91.9 percent of coal was used for electric power, 8.0 percent was used in the industrial sector (such as for coke plants, heat, and power), and 0.1 percent was used in the commercial sector. Minor amounts of coal are used for residential and transportation purposes (EIA 2022d). All coal mined in the CDPA is subbituminous, which is primarily used as fuel for steam-electric power generation. Downstream coal combustion emits CAPs, precursor pollutants (ammonia [NH_3] and VOCs), and HAPs that would impact air quality and public health. From an air quality perspective, some of the key pollutants emitted from downstream coal combustion are $PM_{2.5}$, PM_{10}, SO_2, NO_2, NH_3, and HAPs and other VOCs. From a public health perspective, some of the key pollutants emitted from downstream coal combustion are NOx, SO_2, $PM_{2.5}$, and $PM_{10\text{-}2.5}$[1] and the HAPs acrolein, arsenic, benzo(a)pyrene, cadmium, chlorine gas, hexavalent chromium), hydrochloric acid, mercury, manganese, nickel, and dioxins, as these could have either high exposure or high toxicity. Additional information about the HAPs chosen for this assessment is provided in **Section 4.6** of **Appendix C**.

Based on the EPA 2020 NEI, coal combustion in the US annually emits 2.8×10^5 short tons of CO, 6.2×10^6 short tons of NO_x, 7.8×10^4 short tons of PM_{10}, 5.3×10^4 short tons of $PM_{2.5}$, 8.9×10^5 short tons of SO_2, 21.1 short tons of lead, 2.6×10^3 short tons of NH_3, and 1.1×10^4 short tons of VOCs (EPA 2023b). National annual coal combustion emissions of criteria pollutants, precursors, and HAPs from individual source sectors are provided in **Table 3-6** and **Table 3-7**. Note that these emissions include sources that burn coal from both within and outside the CDPA as well as both federal and nonfederal coal. The data presented are for the most recent national inventory (2020); actual emissions may vary by year depending on the load at the power plant and the amount of coal combusted. All criteria pollutants and precursors have the highest coal combustion emissions from EGUs, which make up between 71 and 95 percent of the total coal combustion emissions. Industrial sources are also fairly important for PM_{10} and lead, contributing 19.2 percent and 27.1 percent of the annual coal combustion emissions in the US, respectively. All of the key HAPs listed above also have the highest coal combustion emissions from EGUs, which make up 65 to 94 percent of the total coal combustion emissions.

[1] $PM_{10\text{-}2.5}$ is the coarse fraction of PM_{10} (that is, PM_{10} minus $PM_{2.5}$)

Table 3-4
Emissions of Criteria and Hazardous Air Pollutants from Rail Transportation of Coal Produced in the CDPA in 2022

Mineral Designation	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
Federal	262,197,857	1,284.1	1,245.5	57,233.9	16,444.6	2,264.3	57.9	999.2
Nonfederal	6,309,933	30.9	30.0	1,377.4	395.7	54.5	1.4	24.0
Total	268,507,790	1,315.0	1,275.5	58,611.3	16,840.4	2,318.8	59.3	1,023.3

Note: All tonnages in the table are in short tons.

Table 3-5
Emissions of Criteria and Hazardous Air Pollutants Rail Transportation of Coal in the Peak Year* of Federal Coal Production from Existing Leases in the CDPA

Mineral Designation	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
Federal	256,582,534	1,192.7	1,156.9	52,949.9	16,079.7	2,084.4	56.6	919.9
Nonfederal	6,174,797	28.7	27.8	1,274.3	387.0	50.2	1.4	22.1
Total	262,757,331	1,221.4	1,184.7	54,224.2	16,466.7	2,134.6	58.0	942.0

Note: The peak federal coal production from existing leases from 2023 onwards occurs in 2023. All tonnages in the table are in short tons.

Table 3-6
US Annual Coal Combustion Emissions of Criteria Air Pollutants and Precursors by Percentage from Source Sector Groups

Emission Source Sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	NH_3	Total VOC
Commercial/Institutional	0.4%	0.3%	1.5%	0.7%	0.9%	1.2%	<0.1%	1.1%
Electric generation	94.5%	92.9%	79.3%	90.9%	86.6%	71.6%	86.8%	95.1%
Industrial	5.1%	6.8%	19.2%	8.4%	12.5%	27.1%	13.2%	3.7%
Total coal combustion emissions (short tons/year)	2.8E+05	6.2E+05	7.8E+04	5.3E+04	8.9E+05	21.1	2.6E+03	1.1E+04

Source: EPA 2023b
Note: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories.

Table 3-7
US Annual Coal Combustion Emissions of Hazardous Air Pollutants by Percentage from Source Sector Groups

Pollutant	Emission Source Sector			Total Coal Combustion Emissions (short tons/year)
	Commercial/ Institutional	Electric Generation	Industrial	
Acrolein	<0.1%	93.6%	6.4%	29.5
Arsenic	<0.1%	71.4%	27.2%	17.7
Benzo(a)pyrene	<0.1%	82.3%	17.7%	0.2
Cadmium	<0.1%	78.0%	21.2%	2.2
Chlorine gas	<0.1%	79.3%	20.1%	47.5
Hexavalent chromium	<0.1%	74.8%	24.8%	5.2
Hydrochloric acid	<0.1%	65.7%	32.1%	4696.2
Manganese	<0.1%	82.4%	16.7%	74.8
Mercury	<0.1%	92.4%	5.6%	3.9
Nickel	<0.1%	73.0%	26.5%	27.7
Dioxins/furans*	—	—	—	1.3E-12 to 1.2E-7*

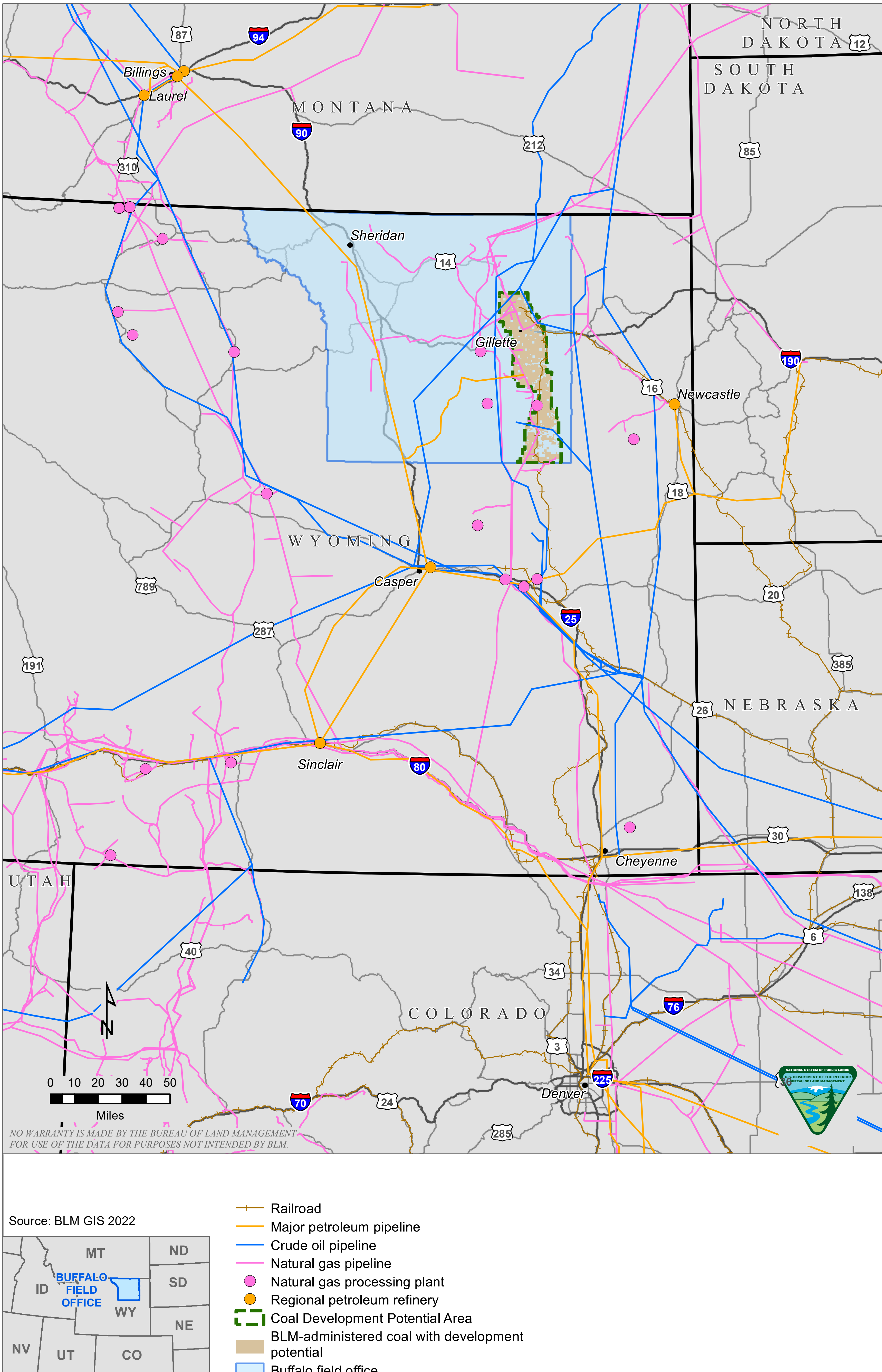
Sources: EPA 2023b; *Electric Power Research Institute 2018a
Note: Total emissions (in short tons/year), except for dioxins/furans, are for 2020 and are calculated as a sum of other categories reported in the EPA NEI. Dioxins/furans emissions are from Electric Power Research Institute 2018a and reported as the range across all power plants assessed for 2017. Dioxins/furans emissions are expressed in Electric Power Research Institute 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates so they are not included in the NEI (EPA 2021b).

Emissions of CAPs, precursors, and various HAPs from power plants that received coal from the CDPA are presented in **Table 3-19**.

Oil and Gas

Oil and natural gas are produced at wells throughout the BFO. A number of crude oil pipelines cross through the BFO, connecting to oil refineries within the state and in other states in the Rocky Mountain and Midwest regions (EIA 2022c, 2022e). Most of the oil from the BFO is initially sent to in-state refineries near Casper, Newcastle, and Rawlins, and refineries in Billings/Laurel in Montana. From here oil can continue to be distributed, so there is considerable uncertainty in the exact final destinations (that is, locations of downstream combustion) of BFO oil; see **Figure 3-1**, Downstream Oil and Gas, which shows the extensive regional transportation and distribution network for oil and gas.

Figure 3-1
Downstream Oil and Gas



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According to state data from the EIA, Wyoming consumes only about one-tenth of the natural gas it produces, and the remainder is transported by pipeline to other states (EIA 2022c). Since 2015, all Wyoming natural gas has been processed within the state, and then most is sent initially to Utah, Nebraska, and Colorado (EIA 2022f, 2022g). No natural gas is exported internationally directly from Wyoming. From these states, natural gas can continue to be transported to other regions. Distribution of natural gas produced in the BFO may be different from the statewide data, so there is considerable uncertainty in the exact current and future final destinations of BFO natural gas.

The federal and nonfederal production rates and emissions of criteria and hazardous air pollutants in 2022 from oil, conventional natural gas, and coalbed natural gas produced in the BFO are shown in **Table 3-8**, **Table 3-9**, and **Table 3-10**, respectively. The technical approach for the estimation of these emissions is described in **Section 2.2** of the ARTSD (**Appendix C**). It is important to note that these emissions were estimated for base year 2022 and forecast years from 2023 to 2038 using the same calculation methodology and oil and gas activity as the 2015 RMP/Final EIS and 2019 Final SEIS, and may not accurately represent actual rates of production.

<u>Oil and Gas Downstream Combustion</u>

Because the final destination and end use of oil and gas produced in the BFO is uncertain, national average data is used to estimate emissions from downstream combustion. The EIA reports the percent yield of individual petroleum products from US crude oil refineries on a yearly basis (EIA 2022h). Average product yield values over the 5-year period from 2017 to 2021 are presented in **Section 4.6** in **Appendix C**. Motor gasoline is the primary petroleum product manufactured, contributing an average of 46.7 percent of the total yield over the 5-year period. Distillate fuel oil and kerosene-type jet fuel follow in production, contributing 30.0 percent and 9.2 percent of the yield during that period, respectively. Together, these three products made up nearly 86 percent of total US refinery output and can be burned by a variety of sources, including on-road and off-road vehicles and stationary sources. More details on these sources are included in **Section 4.6** in **Appendix C**.

Most natural gas in the US is combusted to generate electricity and for the industrial sector. In 2021, 37 percent of natural gas was used for electric power, 33 percent was used in the industrial sector, 15 percent was used in the residential sector, 11 percent was used in the commercial sector, and 4 percent was used for transportation. Natural gas in the industrial sector is primarily used for process heating; in combined heat and power systems; as a feedstock for chemical, fertilizer, and hydrogen production; and as lease and plant fuel (EIA 2022i).

Downstream oil and gas combustion emits CAPs, precursors, and HAPs that would impact air quality and public health. O_3, $PM_{2.5}$, PM_{10}, SO_2, NO_2, HAPs, other VOCs, and NH_3 are the key pollutants that can impact air quality as a result of downstream oil and gas combustion. From a public health perspective, some of the key pollutants are O_3, NOx, SO_2, $PM_{10\text{-}2.5}$, $PM_{2.5}$, acrolein, 1,3-butadiene, benzene, formaldehyde, hexane, ethylbenzene, toluene, and xylenes.

Table 3-8
Oil Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2022

Mineral Designation	Production Rate (MMBO)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
Federal	4.7	271	62	979	228	41	115	4
Nonfederal	5.0	270	64	1,035	241	43	122	4
Total	9.7	541	125	2,014	469	83	237	8

Note: MMBO = millions of barrels of oil. All tonnages in the table are in short tons.

Table 3-9
Conventional Natural Gas Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2022

Mineral Designation	Production Rate (BCF)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
Federal	4.0	56	12	186	84	327	1	49
Nonfederal	3.3	56	12	184	84	326	1	48
Total	7.3	112	25	371	168	654	2	97

Note: BCF = billion cubic feet. All tonnages in the table are in short tons.

Table 3-10
Coalbed Natural Gas Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2022

Mineral Designation	Production Rate (BCF)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
Federal	58.9	235	28	64	31	4,701	1	475
Nonfederal	103.6	427	52	116	56	8,527	2	862
Total	162.5	662	80	180	86	13,228	3	1,337

Note: BCF = billion cubic feet. All tonnages in the table are in short tons.

Based on the EPA 2020 NEI (EPA 2023b), petroleum product combustion in the US annually emits 2.6 x 10^7 short tons of CO, 4.2 x 10^6 short tons of NO_x, 3.2 x 10^5 short tons of PM_{10}, 2.0 x 10^5 short tons of $PM_{2.5}$, 7.7 x 10^4 short tons of SO_2, 4.5 x 10^2 short tons of lead, 9.3 x 10^4 short tons of NH_3, and 2.0 x 10^6 short tons of VOCs. National annual petroleum product combustion emissions of CAPs, precursors, and HAPs from individual source sectors are provided in **Table 3-11** and **Table 3-12**. Note that these emissions include sources that burn oil from both within and outside the BFO as well as both federal and nonfederal oil. The data presented are for the most recent national inventory (2020); actual emissions may vary by year depending on the amount of petroleum products consumed (for example, due to the vehicle miles driven) and other factors, such as control technology implemented at the emission source. Off-road gasoline sources include vehicles and equipment used in the following categories: airport services, construction, farm, industrial, lawn and garden, light commercial, logging, railway maintenance, recreational, and recreational marine vessels (EPA 2023b). Diesel emissions also include DPM, which can lead to adverse health outcomes, such as cancer. DPM emissions, along with ultrafine particle emissions, are included in $PM_{2.5}$ emissions.

Table 3-11
US Annual Petroleum Product Combustion Emissions of Criteria Air Pollutants and Precursors by Percentage from Source Sector Groups

Petroleum Product and Source Sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO2	Lead	NH_3	Total VOC
Gasoline: On-road light duty	50.3%	20.3%	34.9%	16.1%	10%	—	82.9%	41.0%
Gasoline: On-road heavy duty	2.1%	0.7%	1.1%	0.5%	0.1%	—	2.3%	1.3%
Gasoline: Off-road mobile	41.6%	4.5%	12.5%	18.2%	0.3%	<0.1%	0.6%	45.9%
Fuel oil: On-road light duty	0.7%	3.4%	2.9%	3.3%	0.1%	—	1.2%	1.2%
Fuel oil: On-road heavy duty	2.2%	31.7%	21.2%	20.2%	1.7%	—	9.5%	3.4%
Fuel oil: Off-road mobile	1.2%	15.7%	14.3%	22.2%	0.4%	<0.1%	0.9%	2.8%
Fuel oil: Railroad	0.4%	11.1%	3.7%	5.8%	0.2%	<0.1%	0.1%	1.0%
Fuel oil: Commercial marine vessels	0.1%	5.8%	1.8%	2.7%	6.1%	0.1%	0.1%	0.5%
Fuel oil: Commercial/ institutional	0.1%	1.0%	1.0%	3.6%	3.7%	0.1%	0.2%	0.2%
Fuel oil: Electric generation	<0.1%%	1.3%	1.3%	1.7%	49.0%	0.3%	0.6%	0.1%
Fuel oil: Industrial	0.1%	1.8%	1.7%	2.4%	16.0%	3.3%	0.1%	0.3%
Fuel oil: Residential	<0.1%%	0.7%	1.1%	1.6%	0.7%	0.4%	1.5%	<0.1%%
Jet and aircraft fuel	1.3%	2.0%	2.6%	3.7%	11.7%	95.8%	—	2.5%
Total petroleum product combustion emissions (short tons/year)	2.6E+07	4.2E+06	3.2E+05	2.0E+05	7.7E+04	4.5E+02	9.3E+04	2.0E+06

Source: EPA 2023b
Note: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of the categories. $PM_{2.5}$ emissions include DPM and ultrafine particle emissions.

Table 3-12
US Annual Petroleum Product Combustion Emissions of Hazardous Air Pollutants by Percentage from Source Sector Groups

Petroleum Product and Source Sector	1,3-butadiene	Benzene	Formaldehyde	Hexane	Ethyl benzene	Toluene	Xylenes	Acrolein
Gasoline: On-road light duty	30.9%	38.6%	10.8%	60.3%	41.9%	49.6%	44.9%	9.3%
Gasoline: On-road heavy duty	0.8%	1.3%	0.7%	2.0%	1.3%	1.6%	1.4%	0.33%
Gasoline: Off-road mobile	55.7%	51.7%	18.1%	36.5%	53.8%	47.0%	50.6%	11.3%
Fuel oil: On-road light duty	0.8%	0.4%	4.4%	0.1%	0.3%	0.1%	0.2%	4.2%
Fuel oil: On-road heavy duty	1.8%	1.0%	12.1%	0.3%	1.1%	0.4%	1.6%	11.3%
Fuel oil: Off-road mobile	1.4%	4.3%	31.9%	0.2%	1.0%	0.8%	0.7%	29.1%
Fuel oil: Railroad	0.5%	0.9%	10.2%	0.2%	0.2%	0.2%	0.3%	9.1%
Fuel oil: Commercial marine vessels	0.1%	0.1%	0.9%	0.1%	<0.1%	<0.1%	<0.1%	0.5%
Fuel oil: Commercial/ Institutional	<0.1%	<0.1%	0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Fuel oil: Electric generation	<0.1%	0.1%	0.5%	0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Fuel oil: Industrial	<0.1%	0.1%	0.2%	<0.1%	<0.1%	<0.1%	<0.1%	0.1%
Fuel oil: Residential	—	<0.1%	0.1%	<0.1%	—	—	—	—
Jet and aircraft fuel	7.9%	1.4%	10.1%	<0.1%	0.3%	0.3%	0.2%	24.8%
Total petroleum product combustion emissions (short tons/year)	7.8E+03	4.8E+04	4.4E+04	3.7E+04	3.1E+04	1.8E+05	1.1E+54	3.5E+03

Source: EPA 2023b
Note: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of the categories.

Mobile sources make up the majority of petroleum product emissions for all CAPs (except SO_2), precursors, and the HAPs listed above. CO, NH_3, VOCs, 1,3-butadiene, benzene, hexane, ethyl benzene, toluene, and xylenes have the greatest petroleum product emissions from motor gasoline. Motor gasoline emissions are dominated by off-road mobile equipment for VOCs, 1,3-butadiene, benzene, ethyl benzene, and xylenes, while on-road light-duty gasoline emissions are highest for CO, NH_3, hexane, and toluene. The relative fraction of off-road and on-road emissions would vary by year, depending on the amount of fuel consumed and the activity of the emission source. NO_x, PM_{10}, $PM_{2.5}$, SO_2, formaldehyde, and acrolein have the greatest emissions from distillate fuel oil. On-road heavy-duty vehicles are the dominant distillate fuel emissions for NO_x and PM_{10} and off-road equipment dominate for $PM_{2.5}$, formaldehyde, and acrolein. The highest petroleum product emissions of lead are from jet fuel, and SO_2 emissions are dominated by EGUs.

Natural gas combustion in the US annually emits 6.4 x 10^5 short tons of CO, 1.1 x 10^6 short tons of NO_x, 6.1 x 10^4 short tons of PM_{10}, 5.8 x 10^4 short tons of $PM_{2.5}$, 2.2 x 10^4 short tons of SO_2, 7.0 short tons of lead, 6.9 x 10^4 short tons of NH_3, and 9.6 x 10^4 short tons of VOCs (EPA 2023b). National annual natural gas combustion emissions of CAPs, precursors, and HAPs from individual source sectors are provided in **Table 3-13** and **Table 3-14**. Note that these emissions include sources that burn gas from both within and outside the BFO as well as both federal and nonfederal gas. The largest emissions from natural gas combustion for CO, NO_x, SO_2, lead, and total VOCs come from the industrial sector, which makes up between 52 and 65 percent of the total natural gas emissions for these pollutants. For PM_{10} and $PM_{2.5}$, electricity generation produces the highest annual emissions, contributing 50 to 51 percent of total emissions. NH_3 emissions from natural gas combustion are dominated by residential burning. All the HAPs discussed in this analysis also have the highest natural gas combustion emissions from either the industrial sector or EGUs. Benzene, 1,3-butadiene, formaldehyde, hexane, and acrolein have the largest emissions from industrial sources, whereas ethyl benzene, toluene, and xylenes have the largest emissions from EGUs.

Table 3-13
US Annual Natural Gas Combustion Emissions of Criteria Air Pollutants and Precursors by Percentage from Source Sector Groups

Emission Source Sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	NH_3	Total VOCs
Commercial/ institutional	18.1%	12.6%	7.2%	7.1%	5.2%	30.2%	1.7%	9.5%
Residential	14.7%	19.4%	4.4%	4.3%	5.8%	<0.1%	64.8%	13.1%
Electric generation	13.1%	16.0%	50.3%	51.1%	26.5%	21.3%	21.5%	12.9%
Industrial	54.2%	52.0%	38.1%	37.5%	62.4%	48.4%	12.0%	64.5%
Total natural gas combustion emissions (short tons/year)	6.4E+05	1.1E+06	6.1E+04	5.8E+04	2.2E+04	7.0	6.9E+04	9.6E+04

Source: EPA 2023b
Note: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of other categories.

Table 3-14
US Annual Natural Gas Combustion Emissions of Criteria Air Pollutants and Precursors by Percentage from Source Sector Groups

Emission Source Sector	1,3-buta diene	Benzene	Formal-dehyde	Hexane	Ethyl benzene	Toluene	Xylenes	Acrolein
Commercial/ institutional	0.5%	2.9%	2.8%	16.7%	3.7%	3.3%	3.4%	1.4%
Residential	—	1.0%	1.2%	<0.1%	—	<0.1%	—	—
Electric generation	2.2%	10.7%	13.4%	30.3%	65.5%	54.7%	56.1%	2.4%
Industrial	97.3%	85.3%	82.6%	53.0%	30.8%	42.0%	40.5%	96.2%
Total natural gas combustion emissions (short tons/year)	2.8E+02	4.9E+02	1.4E+04	2.8E+03	2.0E+02	9.5E+02	4.6E+02	2.0E+03

Source: EPA 2023b
Note: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of other categories.

3.5.1.2 Direct and Indirect Impacts

Analysis Methods

The coal RFD scenario developed by BLM projects anticipated coal resource development in the CDPA using the US EIA 2022 Annual Energy Outlook forecast for coal. Collectively the coal mines in the BFO CDPA possess sufficient leased reserves to meet the EIA forecasted demand during the planning period of this SEIS/Potential RMPA (that is, 2023 to 2038), and so BLM projects that reduction in coal production due to restrictions on federal leasing will not occur until after that period. The updated coal production forecasts for the three alternatives for the coal mines in the CDPA and data from WDEQ, BLM, EIA, and other literature are used to estimate emissions separately for existing leases and potential new leases under the alternatives. Coal mining and transportation emissions of CAPs and precursors (NOx, CO, $PM_{2.5}$, PM_{10}, SO_2, and VOC) and HAPs are quantified. The methodology for estimating emissions is described in **Section 2.1.1** and **Section 2.4.1** of the ARTSD (**Appendix C**).

Under Alternative A (No Leasing), the BLM projects that leased coal reserves would be exhausted during 2041 due to no new leasing and coal production would stop and fall below the EIA forecast during that year. Therefore, emissions are estimated from 2023 through 2041. Under Alternative B (No Action), the BLM projects that coal production would continue uninterrupted until approximately 2338 when the BLM-administered coal from the CDPA is estimated to be exhausted by projecting the 2048 EIA production forecast forward. Criteria and HAP emissions are quantified from 2023 to 2048 and qualitatively discussed beyond 2048 (note that GHGs are quantified beyond 2048, see *Greenhouse Gases and Climate Change*). Under Alternative C, limited leasing would allow for coal mining to continue at the rate projected by EIA until 2047 with reduced production in 2048 due to exhaustion of leased reserves during that year. Therefore, emissions are estimated from 2023 to 2048.

The oil and gas emission calculators for CAPs and HAPs from the 2015 EIS and 2019 SEIS/RMPA are used to estimate annual federal and nonfederal oil and gas development emissions of criteria pollutants and HAPs for the remainder of the planning period (2023 to 2038) using the same calculation methodology and RFD activity as the 2015 EIS/RMP and 2019 SEIS/RMPA.

Impacts on air quality and AQRVs are also assessed by tiering to regional photochemical source apportionment modeling conducted separately by BLM.

A qualitative analysis of the air quality and public health effects due to downstream combustion of coal, oil, and gas from the BFO is conducted using location, source, emissions, and health data from EPA, BLM, and peer-reviewed and other literature.

The annual emissions of CAPs and HAPs from other BLM-authorized activities (that is, locatable minerals, salable minerals, fire and fuels management, forest products, and land resources) for the year 2024 from the 2015 EIS are incorporated as is.

<u>Assumptions</u>

- The coal RFD is the same as the EIA 2022 Outlook forecast (EIA 2022a).
- Future oil and gas production rates would be the same as that used in the 2015 EIS/RMP and the 2019 SEIS/RMPA.

- Historical coal mining emissions intensities (that is, ton of pollutant per ton of coal) are representative of future emission intensities, and coal mining emissions scale linearly with production.
- Other BLM-authorized activity emissions from the 2015 EIS/RMP are representative of the planning period and do not vary by year.
- The photochemical modeling that is tiered to represents a future year (circa 2028) projection for a specific set of activity levels and not any of the specific alternatives. A separate emissions assessment was performed based on the projected production rate and time period under each alternative.
- Only 1 year of photochemical modeling is tiered to, with the meteorology representative of 2014. One year of modeling also means that metrics for the NAAQS are approximate for those pollutants that are based on observations of multiyear values.
- The near-field air quality analysis discussed in 2015 EIS/RMP for oil and gas development approximately represents impacts during the remainder of the planning period.

<u>Indicators</u>

- Air concentrations with respect to the NAAQS and WAAQS and federal attainment status
- Emissions of criteria pollutants, VOCs, and HAPs from coal production and transportation
- Emissions of criteria pollutants, VOCs, and HAPs from oil and gas production and midstream sources
- Qualitative assessment of downstream coal, oil, and gas combustion
- Visibility impairment
- Critical loads of total atmospheric deposition for nitrogen and sulfur deposition

Impacts Common to all Alternatives

<u>Coal</u>

Impacts for coal vary by alternative and for existing versus potential new leases depending on the time period. However, since the methodology for impact assessment is similar across alternatives (that is, they all tier to the BLM regional photochemical modeling for circa 2028), a brief overview of the modeling is presented here.

The regional photochemical modeling was performed separately by the BLM to assess the potential coal and oil and gas production impacts in the Intermountain West states. The advanced photochemical model Comprehensive Air Quality Model with Extensions (CAMx) was applied at 12-kilometer resolution with a series of "source apportionment" groups for which emission contributions were tracked. This included federal coal production in individual states, new (wells drilled from 2020 onwards) and existing (wells drilled prior to 2020) oil and gas production in a state, coal EGUs combined for all Western Regional Air Partnership states, other coal combustion for all Western Regional Air Partnership states combined, nonfederal coal, nonfederal oil and gas development, natural sources, and other anthropogenic sources. Modeling was assessed to identify impacts on criteria pollutants and precursors as well as deposition and visibility. Note that an individual field office was not modeled as a source apportionment group. The modeling is based on assumed levels of coal production forecast in the CDPA and elsewhere in the state (see **Section 4.2.1.1** of the ARTSD (**Appendix C**)). Thus, the production rates modeled for the state (for coal, oil, or gas) and corresponding modeled impacts are used as a surrogate to predict potential impacts due to production from just the field office under each alternative by comparing the two production values and examining the modeled impacts.

An overview of the regional modeling study and corresponding results may be found in **Sections 4.1** and **4.2** of the ARTSD (**Appendix C**).

Oil and Gas

Impacts are presented following the annual reasonably foreseeable production forecast for the remaining planning period (2023–2038). The oil and gas production and therefore associated emissions and air quality impacts do not change by alternative. The annual federal production and emissions of criteria and hazardous air pollutants from oil, conventional natural gas, and coalbed natural gas production in the BFO from 2023 to 2038 are shown in **Table 3-15**, **Table 3-16**, and **Table 3-17**, respectively. The method used to estimate emissions is described in **Section 2.2** of the ARTSD (**Appendix C**). Information on nonfederal oil and gas production and emissions during the planning period is provided in **Section 4.4** of the ARTSD (**Appendix C**).

The modeled federal production in the BFO was 63 million barrels of crude oil and 132 billion cubic feet of gas. The peak federal oil and gas production under all alternatives is much lower than the productions levels that were modeled: 6.7 million barrels of oil (see **Table 3-15**) and 83.5 billion cubic feet of gas (conventional plus coalbed gas) (see **Table 3-16** and **Table 3-17**). Note that the peak production for oil and gas is projected to be the same under all alternatives. Because the forecast federal oil and gas production rates in the BFO for all alternatives are much lower than the production used in modeling, air quality impacts under any alternative would be lower than those modeled, as discussed in the ARTSD (**Appendix C**).

Table 3-15
Federal Oil Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2023–2038

Year	Production Rate (MMBO)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023	5.1	249	56	883	206	37	104	4
2024	5.6	225	50	773	180	32	91	3
2025	5.8	233	52	801	187	33	94	3
2026	6.3	253	56	870	203	36	102	4
2027	6.3	253	56	870	203	36	102	4
2028	6.7	269	60	925	216	38	109	4
2029	6.7	269	60	925	216	38	109	4
2030	6.7	269	60	925	216	38	109	4
2031	6.7	269	60	925	216	38	109	4
2032	6.7	269	60	925	216	38	109	4
2033	6.7	269	60	925	216	38	109	4
2034	6.7	269	60	925	216	38	109	4
2035	6.7	269	60	925	216	38	109	4
2036	6.7	269	60	925	216	38	109	4
2037	6.7	269	60	925	216	38	109	4
2038	6.7	269	60	925	216	38	109	4
Total	102.8	4,178	925	14,370	3,354	596	1,687	59

Note: All table tonnages are in short tons.

Table 3-16
Federal Conventional Natural Gas Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2023–2038

Year	Production Rate (BCF)	PM_{10} (tons/ year)	$PM_{2.5}$ (tons/ year)	NOx (tons/ year)	CO (tons/ year)	VOC (tons/ year)	SO_2 (tons/ year)	HAP (tons/ year)
2023	4.5	54	12	180	82	319	1	47
2024	10.1	50	11	167	76	297	1	44
2025	10.6	52	12	175	80	312	1	46
2026	11.0	54	12	181	82	322	1	48
2027	10.9	54	12	179	82	319	1	47
2028	10.5	52	11	173	79	307	1	45
2029	10.5	52	11	173	79	307	1	45
2030	10.5	52	11	173	79	307	1	45
2031	10.5	52	11	173	79	307	1	45
2032	10.5	52	11	173	79	307	1	45
2033	10.5	52	11	173	79	307	1	45
2034	10.5	52	11	173	79	307	1	45
2035	10.5	52	11	173	79	307	1	45
2036	10.5	52	11	173	79	307	1	45
2037	10.5	52	11	173	79	307	1	45
2038	10.5	52	11	173	79	307	1	45
Total	162.3	833	183	2,782	1,266	4,946	17	733

Note: All table tonnages are in short tons.

Table 3-17
Federal Coalbed Natural Gas Production and Midstream Emissions of Criteria and Hazardous Air Pollutants from the BFO in 2023–2038

Year	Production Rate (BCF)	PM_{10} (tons/ year)	$PM_{2.5}$ (tons/ year)	NOx (tons/ year)	CO (tons/ year)	VOC (tons/ year)	SO_2 (tons/ year)	HAP (tons/ year)
2023	65.8	191	24	56	26	3,567	1	361
2024	66.9	132	17	45	20	2,059	1	209
2025	70.2	139	18	47	21	2,161	1	219
2026	72.5	143	18	49	22	2,233	1	227
2027	71.8	142	18	48	21	2,211	1	224
2028	69.1	136	18	47	21	2,129	1	216
2029	69.1	136	18	47	21	2,129	1	216
2030	69.1	136	18	47	21	2,129	1	216
2031	69.1	136	18	47	21	2,129	1	216
2032	69.1	136	18	47	21	2,129	1	216
2033	69.1	136	18	47	21	2,129	1	216
2034	69.1	136	18	47	21	2,129	1	216
2035	69.1	136	18	47	21	2,129	1	216
2036	69.1	136	18	47	21	2,129	1	216
2037	69.1	136	18	47	21	2,129	1	216
2038	69.1	136	18	47	21	2,129	1	216
Total	1,107.6	2,248	288	757	338	35,644	17	3,617

Note: All table tonnages are in short tons.

Federal oil and gas development is not anticipated to contribute to regional exceedances of the NAAQS and WAAQS and deposition critical load thresholds (**Sections 4.2.1.2** and **4.2.1.3** of the ARTSD (**Appendix C**)). Nitrogen deposition critical loads are predicted to be exceeded (**Table 4-7** of the ARTSD (**Appendix C**)); the corresponding contribution from federal oil and gas production is relatively very small (**Table 4-7** and **Figures 4-31** and **4-32** of the ARTSD (**Appendix C**)). However, elevated concentrations of 1-hour NO_2 and 24-hour PM_{10} could occur in the vicinity of well pads. The BLM will continue to implement the mitigation measures for air quality discussed in the Air Resource Management Plan (Appendix N) in the 2015 RMP.

As oil and gas production does not vary by alternative, the downstream impacts on emissions, air quality, and public health from combustion of oil and gas produced in the BFO would be the same for all alternatives. The indirect impacts of burning the oil and natural gas from the BFO are discussed in *Downstream Combustion Impacts on Air Quality and Public Health*.

<u>Other BLM-authorized Activities</u>

This section discusses the air quality impacts of BLM-authorized activities other than oil and gas development and coal mining in the BFO. The emissions and air quality impacts analysis of other BLM-authorized activities from the 2015 RMP are incorporated by reference and summarized below for the selected alternative of the 2015 RMP (Alternative D). The activities assessed in the 2015 RMP were:

- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Minerals
- Fire and Fuels Management
- Forestry and Woodland Management
- Land Resources – Rights-of-Way and Renewable Energy Projects
- Land Resources – Comprehensive Trails and Travel Management
- Livestock Grazing Management

BLM estimated emissions for these activities for the years 2015 and 2024. The emissions estimates for 2024 are incorporated here. Note that BLM expects that the 2024 annual activity rates and corresponding emissions for these activities from the 2015 RMP remain representative of expected activity levels and emissions for the remaining plan life. The annual emissions from other BLM-authorized activities are shown in **Table 3-18**.

Table 3-18
Annual Emissions of Criteria and Hazardous Air Pollutants and Precursors from other BLM-Authorized Activities in the BFO

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOCs	HAP
Locatable Minerals – Bentonite Mining	1,448	230	17	1	43	5	-
Locatable Minerals – Uranium Mining	45	7	33	1	14	3	3
Salable Minerals – Sand, Gravel, and Other Minerals	1,549	170	44	6	29	14	1
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest and Woodlands Management	85	9	-	-	2	1	-
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	3	-	2	1	-
Land Resources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	-	-	-	3	-	-
Total	**3,603**	**584**	**170**	**23**	**3,004**	**470**	**49**

Source: BLM 2015b

Downstream Combustion Impacts on Air Quality and Public Health

Downstream combustion of coal, oil, and gas produced in the BFO would lead to emissions of criteria and hazardous air pollutants that are known to impact air quality and public health. This section provides an analysis of these impacts. Due to the numerous uncertainties in such an assessment as discussed further below, a qualitative analysis has been conducted. We note that the sources combusting minerals from the BFO would be subject to local, state, and/or federal regulations to protect air quality and public health. Additional supporting information is provided in **Appendix C**, Air Resources Technical Support Document.

Air quality impacts affecting public health include changes to pollutant concentrations in the air and changes to deposition of pollutants to soils and water that may indirectly affect human health. Increased pollutant concentrations, particularly PM, could lead to degraded visibility, but visibility does not directly affect human health. From an air quality perspective, some key pollutants resulting from downstream coal, oil, and gas combustion are O_3, $PM_{2.5}$, PM_{10}, SO_2, NO_2, HAPs, and other VOCs. Downstream combustion could also result in the deposition of one or more compounds, such as mercury and other species. Compared with other forms of coal that have higher sulfur content, the relatively lower sulfur content of the Powder River Basin coal from the planning area results in lower SO_2 emissions and therefore lower sulfur deposition and lower particulate sulfate concentrations. From a public health perspective, some key pollutants are O_3, NO_x, SO_2, PM_{10}, $PM_{2.5}$, acrolein, arsenic, benzo(a)pyrene, cadmium, chlorine gas, hexavalent chromium, hydrochloric acid, mercury, manganese, nickel, dioxins, 1,3-butadiene, benzene, formaldehyde, hexane, ethylbenzene, toluene, and xylenes, as these could have either high exposure or high toxicity.

The specific coal-fired power plants that received coal from the CDPA in 2021 have been identified by the US EIA (EIA 2022b) and are presented in **Table 4-92** in **Section 4.6** of the ARTSD (**Appendix C**) and in **Appendix F** Coal Distribution from Mines within the Buffalo Field Office. **Figure 3-2** shows the corresponding national coal distribution figure. Emissions of CAPs, precursors, and various HAPs, summed over all power plants that receive BFO coal, are presented in **Table 3-19**. Emissions from the individual power plants are provided in **Table 4-94** through **Table 4-102** in **Section 4.6** of the ARTSD (**Appendix C**). Power plant destination data are for 2021 and emissions data are for 2020 (the most recent year for which complete NEI data are available). In addition to BFO coal, the power plants may also burn coal produced outside the CDPA as well as nonfederal coal sourced from the CDPA. Therefore, the emissions presented are not necessarily due only to the combustion of BFO coal.

Table 3-19
Annual Combustion Emissions, Summed Over All Power Plants That Received Coal from the CDPA

Pollutant	Pollutant Type	Total annual emissions from all power plants that received BFO coal (short tons/year)
NH_3	CAP precursor	1.4E+03
CO	CAP	1.6E+05
NO_x	CAP	2.6E+05
PM_{10}	CAP	2.8E+04
$PM_{2.5}$	CAP	1.9E+04
SO_2	CAP	3.8E+05
VOCs	CAP precursor	5.9E+03
Lead	CAP/HAP	4.5
Acrolein	HAP	10.3
Arsenic	HAP	3.8
Benzo(a)pyrene	HAP	—
Cadmium	HAP	0.9
Chlorine gas	HAP	4.1
Chromium	HAP	13.9
Hydrochloric acid	HAP	871.6
Manganese	HAP	10.0
Mercury	HAP	1.4
Nickel	HAP	7.0
Dioxins/furans	HAP	2.3E-06

Source: EPA 2023b; EIA 2022b; Electric Power Research Institute 2018a
Notes: Power plant destination data are from the EIA for 2021, and emissions data are for 2020 from the EPA NEI and 2017 from Electric Power Research Institute 2018a (dioxins/furans only). Emissions presented here are summed across all power plant destinations for each pollutant. Emissions may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in Electric Power Research Institute 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021b). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

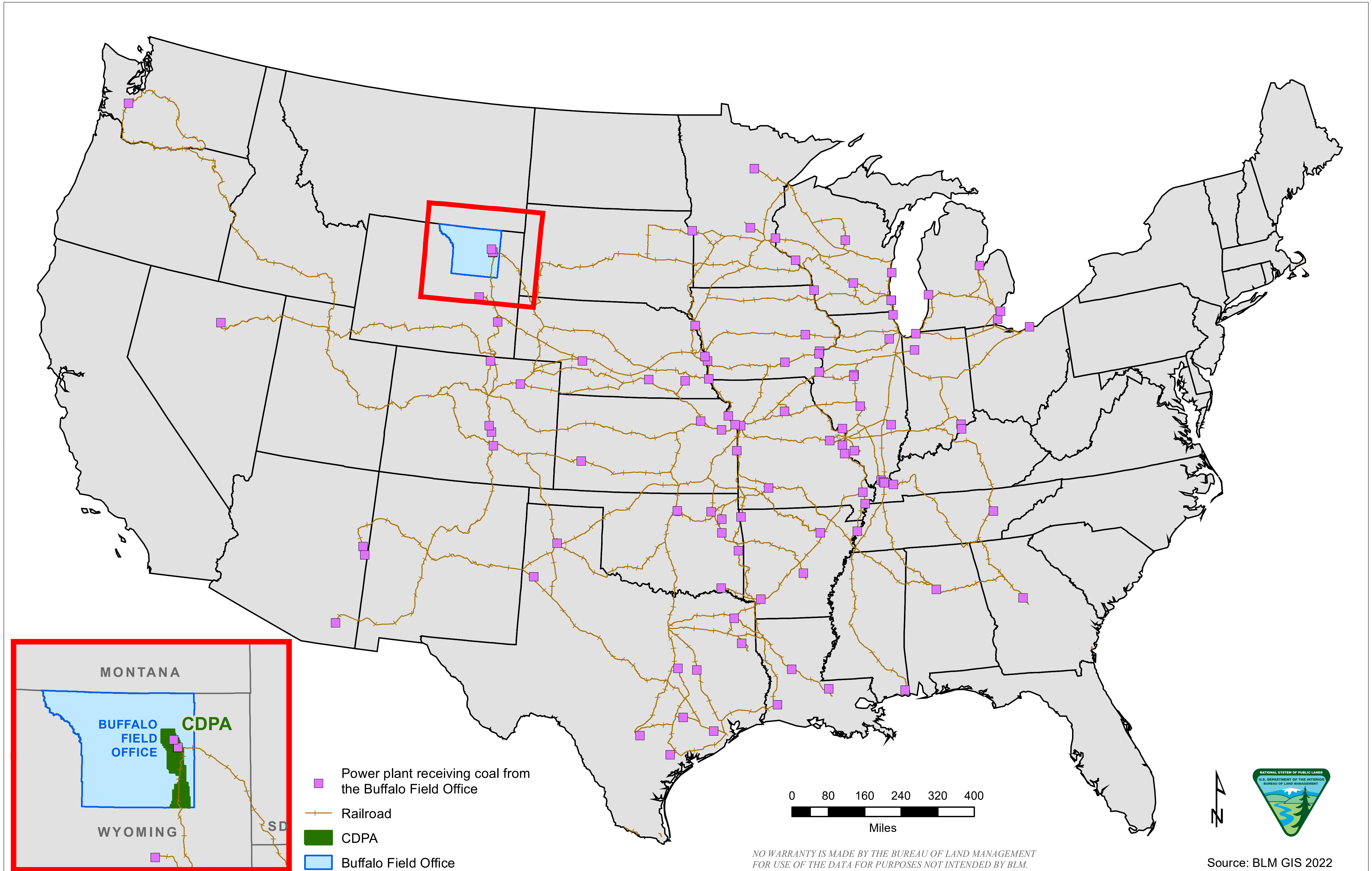


Figure 3-2
Buffalo Field Office Coal Usage

The exact future destinations and corresponding coal shipment amounts from the CDPA are unknown. The current destinations of coal produced in the CDPA are based on data from 2021 (EIA 2022b) and will likely change during the planning period and beyond due to power plant and mine closures. For example, 152 EGUs in 32 states received CDPA coal in 2008, while 104 EGUs in 25 states received CDPA coal in 2021. Closures of power plants would remove emissions and impacts from those sources. Eleven of the receiving power plants in 2021 closed before this SEIS/RMPA was published, and another 48 are scheduled for closure prior to the end of the planning period in 2038 (**Appendix F**). Future downstream combustion emissions from CDPA coal are therefore uncertain.

The emissions presented in **Table 3-19** are for 2020, which is the most recent EPA NEI data; actual emissions may vary by year depending on the load at the power plant and amount of coal combusted. As discussed previously in the *Affected Environment* section, coal production nationally and in the West is in decline. This decreasing trend is expected regardless of alternative and would likely lead to lower downstream coal combustion emissions compared with existing conditions. Consequently, the impacts on air quality and public health discussed below would likely be reduced during the planning period and beyond as coal emissions decline.

The final destinations (that is, locations of downstream combustion) of the petroleum products and natural gas from the BFO are innumerable and highly uncertain. The general distribution of BFO oil and gas, typical combustion uses, and 2020 annual US combustion emissions were discussed previously in the *Affected Environment* section and are used in this downstream combustion assessment. As noted previously, actual emissions may vary by year depending on the amount of petroleum products consumed and other factors, such as control technology implemented at the emission source. The emission sources may burn fuels produced outside the BFO as well as nonfederal minerals sourced from the BFO. Therefore, the emissions presented and the resulting impacts on air quality and public health are not necessarily due only to the combustion of federal oil and gas in the BFO.

The impact of combustion is highly dependent on source operational and control configurations, local and regional policies and requirements, and local conditions, so it is uncertain how downstream combustion emissions may change in the future. For example, power plants may implement additional emissions mitigation infrastructure or modify the types of fuels that are combusted. Future changes in energy demands and uses will also affect downstream combustion emissions. Any changes in emissions will likely affect the air quality and public health impacts discussed below. Due to these uncertainties, a qualitative analysis of the effect of downstream combustion on local and regional air quality and public health is more appropriate and is provided below.

Air Quality Impacts

Since combustion of all fossil fuels emit criteria and hazardous air pollutant emissions, local ambient concentrations of these pollutants would likely increase in areas where BFO coal, oil, and gas are combusted. This may contribute to an area exceeding national or state air quality standards. Increased pollutant concentrations would also likely enhance local and regional atmospheric deposition. Deposition of mercury and other HAPs emitted from combustion may be followed by uptake in other media and eventual intake by humans. Deposition of nitrogen and sulfur species can lead to acidification of water and affect biological diversity. The consumption of fish from waters contaminated due to mercury deposition poses a potential health risk.

Air quality involves complex physical and chemical transformations at a local or regional level, so impacts would vary considerably depending on background concentrations, meteorology, and other local pollutant sources. If any pollutant concentration is near or above its standard in a particular area, the combustion of BFO petroleum products, natural gas, and coal may contribute to or exacerbate nonattainment. Potential pollutant concentration change resulting from combustion is therefore often a key driver of public policy to mitigate air quality and public health impacts in such areas.

Because the majority of refined petroleum products are combusted in mobile sources, the impacts of CAPs and HAPs emissions from BFO oil combustion would likely be greatest in areas with heavy vehicle usage and high roadway density (Henneman et al. 2021). Motor gasoline is the dominant product from crude oil and is used predominantly in densely populated urban centers. Transportation corridors, such as railroads, diesel truck routes, and marine ports, are also expected to see a greater influence from petroleum product combustion than other remote or rural areas. Downstream combustion of oil would likely have the greatest overall impact in these areas. Emissions vary from vehicle to vehicle, however, and are not constant over the entire drive cycle (Wallingford et al. 2022); therefore, the impact of emissions from downstream combustion of BFO oil on local air quality would depend on the specific vehicle fleet in use, driving and traffic patterns, and existing local and regional air quality.

Natural gas and coal are combusted primarily in stationary sources in the industrial sector or in EGUs. Emissions of CAPs, HAPs, and precursors would therefore have the largest impact on air quality near these sources. The greatest air quality impacts typically occur within a 31- to 62-mile (50- to 100-kilometer) radius of stationary sources (Baker and Kelly 2014; Burney 2020; Kelly et al. 2015), but this can vary due to a number of factors, including site-specific emissions controls, local meteorology, and background pollutant concentrations. Regions with a high density of stationary sources (both EGUs and industrial) would likely experience greater air quality impacts than those with relatively few sources. The specific EGUs that receive BFO coal are listed in **Table 4-92** in **Section 4.6** of the ARTSD (**Appendix C**) and in **Appendix F** Coal Distribution from Mines within the Buffalo Field Office. The greatest air quality impacts from coal combustion would likely occur near these sites, but as discussed above, the future destination of BFO coal is uncertain and will likely vary.

Air quality impacts related to specific pollutants are provided in the sections below.

<u>Ozone Pollution</u>. Both NO_x and VOCs are emitted by downstream combustion of BFO coal, petroleum products, and natural gas which would potentially increase O_3 concentrations. The magnitude of any O_3 change due to combustion is subject to background NO_x and VOC concentrations (and whether a region has limited NO_x or VOCs), their local sources, and other local conditions, which would cause considerable variation from region to region. Combustion occurring under conditions more favorable to O_3 formation (for example, warm temperatures, high solar radiation) would cause a larger impact on O_3 concentrations.

Heavy-duty on-road diesel vehicles are the largest source of NOx emissions from petroleum product combustion. Gasoline-powered off-road equipment is the largest source of VOCs. Light-duty on-road gasoline vehicles are also important sources of NOx and VOCs. The relatively large fraction of mobile source emissions, in addition to motor gasoline being the dominant product from crude oil, implies that ambient levels of NO_x and VOCs would be most impacted in regions with high vehicle use, such as densely populated urban centers. Throughout much of the US, the mobile sector provides the greatest source of precursor NO_x that leads to O_3 formation (Foley et al. 2015). O_3 levels would consequently see the largest increases in these regions (especially if the regions have less NO_x to begin with), particularly in areas with high levels of direct sunlight. A small amount of petroleum products are also burned in stationary sources, primarily distillate fuel used in power plants, which would cause similar downwind impacts in O_3. Most petroleum products are burned in mobile sources, however, which are dispersed over a larger area, causing broader regional changes to O_3 levels.

NO_x and VOC emissions from natural gas combustion occur primarily in the industrial sector, including in process heating; in combined heat and power systems; as a feedstock for chemical, fertilizer, and hydrogen production; and as plant fuel. Impacts on O_3 concentrations would therefore likely be greatest downwind of these stationary industrial sources. Generally, O_3 impacts from stationary sources tend to be greater near sources with higher NO_x and VOC emissions (Baker et al. 2016).

Since coal is primarily used in power plants, the largest NO_x and VOC emissions from combustion of BFO coal would occur from EGUs that receive shipments from the CDPA. O_3 concentrations would likely be most impacted downwind of these EGUs. O_3 impacts are strongly dependent on NO_x emissions, which vary significantly between power plants due to the technological controls implemented at each site. Regional variability of O_3 sensitivity to NO_x, which is determined by local concentrations and emission sources, plays a large role in O_3 chemistry (Strasert et al. 2019). Similar to natural gas stationary sources, the largest O_3 impacts would again be greatest near sources with high NO_x and VOC emissions.

While many other pollutants show a clear trend of decreasing concentrations with increasing distance from the EGU source, O_3 trends are more variable. Baker and others (2016) found that peak O_3 impacts typically occur within 50 kilometers downwind of stationary sources, and the impact decreases moving further from the emission source. O_3 formation associated with EGU emissions, however, is nonlinear and may not be confined to the area surrounding the EGU (Burney 2020). Close to the source, there may be a decrease in O_3 levels due to reaction with NO_x emissions (Baker and Kelly 2014; Kelly et al. 2015).

<u>Particle Pollution.</u> PM_{10} and $PM_{2.5}$ are both directly emitted from coal, petroleum product, and natural gas combustion. Secondary particle precursor species, including SO_2, NO_x, NH_3, and VOCs, are also emitted from fossil fuel combustion so the downstream burning of BFO coal, oil, and natural gas would likely lead to an increase in both primary (emitted directly) and secondary (formed in the atmosphere) particle concentrations. Since particles are deposited more quickly and have a shorter atmospheric lifetime than most gaseous pollutants, the greatest impact on ambient concentrations would likely occur close to emission sources. Generally, secondary PM impacts from stationary sources tend to be larger downwind from sources with higher NO_x and SO_2 emissions (Baker et al. 2016).

In the US, petroleum product emissions of PM_{10} are dominated by light-duty gasoline-powered vehicles, while emissions of $PM_{2.5}$ are dominated by off-road diesel fuel-powered sources. The greatest influence of direct emissions from BFO oil combustion on ambient concentrations of PM_{10} would therefore be in areas with high on-road vehicle use, such as in cities and along roadways. $PM_{2.5}$ concentrations would be most impacted by direct emissions where off-road diesel vehicles and equipment are used, such as at construction sites or where recreational vehicles are driven. Direct $PM_{2.5}$ emissions from on-road heavy-duty diesel vehicles and on-road light-duty gasoline vehicles are comparable to off-road diesel emissions, so cities and transportation corridors would also see increased $PM_{2.5}$ concentrations as a result of downstream combustion of BFO oil.

The relatively high petroleum product emissions from mobile sources likely lead to high secondary PM levels in regions with high vehicle use. NO_x, NH_3, and VOCs in particular have high petroleum product combustion emissions in the US from on-road vehicles. VOCs emitted in diesel exhaust are also particularly efficient at producing particles (Srivastava et al. 2022). SO_2 is emitted from on-road vehicles, but its largest petroleum product emission is from EGUs. The influence of SO_2 emissions on concentrations of secondary particles would therefore likely be greatest downwind of power plants.

For natural gas combustion, EGUs are the greatest source of primary PM_{10} and $PM_{2.5}$ annual emissions in the US, contributing 50.3 percent and 51.1 percent of total natural gas emissions, respectively. This is followed by industrial sector emissions, which make up 38.1 percent and 37.5 percent of the PM_{10} and $PM_{2.5}$ emissions from natural gas combustion. Since EGUs and industrial sources are both stationary sources, the impacts on particle pollution from both will show similar trends. In particular, the impact of direct emissions on ambient particle concentrations will likely be largest close to these sources.

Annual natural gas combustion emissions of NO_x, SO_2, and VOCs in the US are highest from industrial stationary sources, so the greatest formation of secondary PM formation from these species will likely occur near these sites. Most NH_3 emissions from natural gas combustion are from residential sources. The chemical makeup of secondary PM formed from natural gas combustion will therefore be different between residential areas and regions with a greater number of industrial sources. There is also variability in fuel sources used for home heating, so the impact of NH_3 emissions on particle pollution will not be consistent among all residential communities.

The largest emissions of PM_{10}, $PM_{2.5}$, and secondary particle precursors (SO_2, NO_x, NH_3, and VOCs) from coal combustion in the US occur at EGUs. Particle pollution as a result of combustion of coal from the CDPA would therefore be most impacted near EGUs that receive coal from the CDPA. The relatively short atmospheric lifetime of particles generally confines the greatest impacts to the area 50 to 125 kilometers downwind of the EGU (Baker et al. 2016; Burney 2020). These impacts decrease as the distance from the source increases.

Secondary formation of PM from power plants is strongly dependent on SO_2 emissions. For example, Strasert and others (2019) found in a study of 13 Texas power plants that the largest $PM_{2.5}$ formation occurred from plants with the largest SO_2 emissions. SO_2 emissions from EGUs that receive coal from the CDPA are variable, and it is expected that $PM_{2.5}$ formation will be greatest downwind of the plants with the highest SO_2 emissions. As noted previously, the relatively lower sulfur content of the coal from the planning area will result in lower SO_2 emissions and therefore lower particulate sulfate concentrations compared to other forms of coal that have higher sulfur content. High emissions of other particle precursors will also likely contribute to $PM_{2.5}$ formation. Secondary PM formation also is influenced by ambient pollutant levels and local meteorology, which will vary by region.

Differences in emissions of secondary particle precursor species from region to region would cause the chemical makeup of particles to differ across the country. Seasonal changes in fuel use also would contribute to PM composition and concentration variations. SO_2 emissions from power plants are particularly variable throughout the year due to electricity demands for residential and commercial heating and cooling purposes.

$\underline{NO_x \text{ and } SO_2}$. The impact of NO_x and SO_2 on O_3 and secondary particle formation is discussed above, both are also criteria pollutants regulated by the EPA. Direct emissions of NO_x and SO_2 from downstream coal, petroleum product, and natural gas combustion would increase ambient levels of these pollutants and may cause exceedances of national or local standards. The impacts would likely be greatest near the emission sources.

In the US, annual NO_x emissions from petroleum product combustion are greatest from heavy-duty on-road diesel vehicles. The greatest risk of exceedance would likely be in regions with high vehicle use, such as along transportation routes and in densely populated urban centers. EGUs dominate SO_2 petroleum product emissions and would consequently lead to the greatest increases in ambient SO_2 levels near these power plant locations.

Industrial sector sources provide the highest natural gas combustion emissions of NO_x and SO_2 in the US. The greatest potential for NO_x and SO_2 increases from downstream natural gas combustion would likely occur near these sources.

Annual US emissions of NO_x and SO_2 from coal combustion are predominantly from EGUs. The greatest impact of downstream combustion of coal on NO_x and SO_2 concentrations would likely occur near the EGUs that receive coal from the CDPA.

<u>Mercury</u>. Mercury is emitted from coal combustion, primarily from EGUs, which make up 92.4 percent of the total mercury emissions from coal combustion. The greatest impact of downstream coal combustion on mercury concentrations would likely occur near the EGUs that receive coal from the CDPA. Inorganic mercury is emitted from coal-fired power plants in three forms: gaseous elemental mercury (Hg^0), gaseous oxidized mercury (Hg^{II}), and particulate mercury (Hg^P). Concentrations of Hg^{II} and Hg^P would be highest near the power plant source, whereas Hg^0 would be dispersed over large distances due to its long residence time.

Mercury in the air is a public health concern at relatively high concentrations and is discussed in the public health section. A frequent concern over mercury is its deposition to soils and waterways and the resulting bioaccumulation. Among the three forms of inorganic mercury emitted from EGUs, Hg^0 can be deposited via dry deposition, but wet deposition is negligible, and it undergoes long-range transport; Hg^{II} can be deposited via dry and wet deposition near the emission source; and Hg^P deposition is variable. In water and sediment, Hg^{II} is converted to the toxic organic form of mercury (methylmercury), which bioaccumulates in fish and other organisms. This could result in adverse health impacts, as discussed below under *Public Health Impacts*. Environmental justice concerns are addressed in **Section 3.5.4**, Environmental Justice.

<u>Other Hazardous Air Pollutants</u>. The downstream combustion of oil, natural gas, and coal may result in localized increases in ambient air concentrations of HAPs. Increased deposition of HAPs such as arsenic can affect water and soil concentrations which may then affect human health through non-inhalation pathways. Specific HAPs that are emitted from each type of combustion and are most important to air quality and public health are listed in the section *Downstream Combustion Impacts on Air Quality and Public Health*. Potential health impacts of these HAPs are discussed below under *Public Health Impacts.*

<u>Nitrogen and Sulfur Deposition</u>. Deposition resulting from the downstream combustion of oil, natural gas, and coal produced in the CDPA would follow a similar trend discussed in the NO_x and SO_2 section above. Increased NO_x and SO_2 concentrations resulting from combustion emissions would consequently lead to increased deposition. The rate of deposition and the specific compounds deposited would vary from region to region depending on local air quality and meteorology.

Public Health Impacts

There are several possible approaches to understanding the potential public health impacts of the downstream combustion of coal, oil, and natural gas. The first is to examine evidence that directly studies the impact of burning coal, oil, or gas. However, there are few situations where these combustion products can be studied in isolation as opposed to exposure to the effect of pollution from multiple sources. The second approach examines potential health impacts of the components of oil, gas, or coal combustion. There are a large number of chemicals generated from the burning of fossil fuels; this analysis focuses on the subset which are likely, either due to their concentration or their toxicity, to contribute the most to potential health effects. All of the criteria pollutants (CO, $PM_{2.5}$, PM_{10}, NO_2, SO_2, ozone, and lead) are examined due to their generation or secondary production from the combustion categories. HAPs are also produced by combustion of fossil fuels as outlined in the *Affected Environment* section above and in **Section 4.6** of the ARTSD (**Appendix C**). Some of the health information about these substances is derived from epidemiological studies, and other information comes from toxicology studies. Both provide useful information individually, but often our understanding of the health effects literature comes from an integration of both types of studies, particularly for chemicals such as these where there is a large amount of available information.

Epidemiology studies are observational studies that examine how often various diseases occur in different populations of people and examine the strength of the statistical association between exposure (in this case to combustion products) and individual diseases. Since exposures are not controlled, participants in epidemiology studies often have exposures to other substances that may also be responsible for the observed disease (known as potential confounders). Statistical techniques may be used to differentiate between the exposure of interest and potential confounders if sufficient data were collected as part of the study. In studies examining the health effects of air pollutants, such as combustion products, potential confounders include age and other risk factors for the health effect being considered, the underlying health of the populations being studied, their exposure to other health hazards, and the composition of the air pollutants in question. In addition, these factors differ between studies, which confounds the calculation of definitive, quantitative results linking an exposure to a health outcome.

Toxicology studies use controlled exposure conditions to examine health effects outcomes. Toxicology studies are often performed in laboratory animals, and exposures are carefully controlled (duration of exposure and concentration of tested agent). If the health endpoint is not extreme, toxicology studies can also be performed in people where individuals are contained in an exposure chamber for relatively short durations (minutes to hours) and the exposures in the chambers are carefully controlled. Examples of acceptable health endpoints are mild, reversible irritation, as well as blood markers of a process that might lead to a disease.

This section summarizes epidemiology evidence for associations between oil, gas, and coal combustion products in terms of short-term and long-term health effects. Findings were considered for this section if they focused on exposure to the fuel combustion itself, or exposure to air pollutants that the authors believe originated primarily from the fuel combustion processes. Public health impacts on disproportionately impacted communities are discussed in **Section 3.5.4**, Environmental Justice, and the public health effects due to GHG from the downstream combustion of BFO coal and oil and gas are monetized in the social cost of GHG analysis in **Section 3.5.2**.

In a study examining the impacts of different types of electricity generation in Europe, air pollution from gas combustion was found to have lower health impacts compared to combustion of oil or coal per unit of energy generated (Markandya and Wilkinson 2007). Health effects from gas combustion (for example, deaths, serious illness, and minor illness) are estimated as lower than those from coal, largely due to lesser generation of primary and secondary particles. Calculated health burdens associated with oil combustion are higher than those from gas combustion but lower than for coal combustion. As long as the technologies used to control emissions from the combustion of coal, oil, and gas in the US (and specifically federal coal, oil, and gas from the planning area) are comparable to those in Europe, the relative results (that is, the relative ranking of impacts of coal versus gas versus oil) should be similar. However, calculating quantitative estimates of health impacts from the combustion of federal fossil fuels from the planning area is not appropriate due to the large uncertainties in the concentration-response functions, which can span orders of magnitude and potential uncertainties in destination and end use.

Oil Combustion. A major use of oil is as a fuel of the refined product for motor vehicles. As such, its combustion products are part of the complex mixture that comprises traffic-related air pollution. Traffic-related air pollution is a combination of tailpipe emissions, non-tailpipe emissions, and the associated mixture of gases and particles, including NO_x, elemental carbon, $PM_{2.5}$ and ultrafine particles), heavy metals, VOCs, and polycyclic aromatic hydrocarbons. There is high confidence in an association between long-term exposure to traffic-related air pollution and premature death (all-cause mortality, and specific deaths related to circulatory and ischemic heart disease), and moderate-to-high confidence on associations with lung cancer mortality, asthma onset in adults and children, and acute respiratory infections in children (Health Effects Institute Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution 2022). Short-term exposures are associated with a series of pre-clinical outcomes (changes in inflammatory markers, blood pressure, endothelial function), exacerbation of respiratory and cardiovascular disease, and premature death (Health Effects Institute Panel on the Health Effects of Traffic-Related Air Pollution 2010; Health Effects Institute Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution 2022).

Oil is also used as fuel for diesel vehicles after refining. There have been numerous studies and reviews of the health effects of diesel emissions, particularly with respect to cancer (Garshick et al. 2004; Attfield et al. 2012; Silverman et al. 2012; Health Effects Institute Diesel Epidemiology Panel 2015; Silverman 2018). Many of these studies examine occupationally exposed individuals (truck drivers, railway workers, miners), but the findings in these populations are generally relevant for individuals exposed to diesel emissions in the ambient air. Diesel emissions include DPM, which is a HAP and is considered an important component responsible for the cancer observed in these studies.

Another sector that uses oil for fuel is the aviation industry. In recent years, researchers have recognized that aircraft engine exhaust emissions may be a source of ultrafine particles at and downwind of airports, with exposures correlating with aviation activities such as takeoffs and landings (Hudda et al. 2018; Stacey 2019). The influence of ultrafine particles from airports was seen at nearby residences, as well as inside the residences, indicating the small particles infiltrate homes and other indoor spaces (Hudda et al. 2018). Although ultrafine particles also originate from traffic-related sources, ultrafine particles that originate from aircraft were found further away from their sources. These particles are believed to originate from the aircraft, with downward transport plumes appearing to distribute the particles further away from the source without losses to coagulation into larger particles (Austin et al. 2019). This may have implication for nearby residences. Mild respiratory effects were observed in the general population exposed to ultrafine particles from aircraft (Habre et al. 2018; Lammers et al. 2020).

A few epidemiological studies directly measure exposure to oil combustion. While some of these studies examine populations believed to be occupationally exposed to PM dominated by oil combustion sources, most studies instead measure PM and its components and apply statistical methods to attribute pollutants back to their sources (a technique known as source apportionment). Note that although many of these studies involve occupational exposures, the findings point to health effects that might be present in the ambient air, where concentrations are anticipated to be lower. Taken together, these studies suggest that there may be various health impacts from exposure to oil combustion including impacts on asthma/allergic symptoms, oxidative deoxyribonucleic acid (DNA) damage, birthweight, heart rate variability, mortality and hospitalizations, and inflammatory markers.

Gas Combustion. While there are numerous studies addressing the health impacts of exposure to gas, such as for communities living near gas development sites, as reviewed by Health Effects Institute (Health Effects Institute Energy Research Committee 2019) very few epidemiological studies directly measure exposure to gas combustion products. In searching for relevant publications, papers discussing exposures to sour gas were deemed not to be relevant, as sour gas from the BFO is less common.

Many of the studies of gas combustion come from use of gas as a heating source in homes or other dwellings. For example, fumes from gas-fueled cooking were found to be associated with higher indoor air concentrations of NO_2, lower respiratory function (measured as the percentage of predicted forced expiratory volume in the first second, FEV1) and higher inflammatory markers (measured as interleukin-6, IL-6) in a Danish cohort of 5,199 men and women (Lim et al. 2022). In this study, exposure to outdoor ambient air pollution and secondhand smoke were found to have greater impacts than exposure to gas cooking fumes.

In addition to NO_2, CO emissions can be emitted from gas cooking sources, and to a lesser extent, produced as a byproduct of cooking. Several studies examined indoor NO_2 from gas cooking and compared observed health effects as compared to homes using electric cook tops (Lin et al. 2013; Willers et al. 2006). NO_2 is not the only pollutant present in these homes, as cooking itself is a well-recognized source of PM in homes. This PM will be produced due to the cooking process itself (for example, frying, sautéing, toasting) and is similar whether the energy source is gas or electric (Abt et al. 2000; Sun et al. 2018). NO_2 concentrations in indoor air have decreased substantially over the years, due in part to the introduction of pilot-less gas stoves (Belanger et al. 2006, 2013; Lee et al. 1998; Spengler et al. 1994; Department of Energy 2009).

Coal Combustion. Downstream coal combustion results in release of a variety of particulate, semi-volatile, and volatile pollutants, including a range of metals (mercury, arsenic, nickel, chromium (IV), and lead) and gaseous pollutants such as NO_x, SO_2 and CO. When burned in coal-fired power plants, fly ash, bottom ash (boiler slag), and flue gas desulfurization material are formed (Tishmack and Burns 2004), collectively known as coal combustion residuals (EPA 2014). The HAPs associated with coal combustion residuals generally also are found in coal combustion emissions but are concentrated in the coal combustion residuals; the health effects of these are discussed below. In addition to air emissions from coal-fired power plants, these waste products are often disposed of in landfills, or stored in ponds at coal-fired power plants, leading to potential risk of groundwater or surface water pollution. In general, these power plants are subject to local, state, and federal regulations aimed at environmental protection.

A systematic review of epidemiology studies examining public health impacts of coal-fired power plant emissions on children's health reported 17 studies showing statistically significant associations of exposure with adverse pediatric neurodevelopment (motor, language, and total average developmental quotients), preterm births, lower birth weights, and pediatric respiratory disease (Amster and Lew Levy 2019).

Another systematic review more broadly examining the public health impacts of coal-fired power plant emissions on health identified 40 relevant studies (Amster 2021). These studies included impacts on children's health as well as adult populations. In addition to the impacts on children discussed in their earlier review (Amster and Lew Levy 2019), authors found studies that identified respiratory symptoms and disease, declines in pulmonary function, cardiovascular disease, and cancer in nearby populations. Authors point to limitations in the studies reviewed, including possible confounding by inadequate control for socioeconomic status of communities living closest to coal-fired power plants. However, several of the studies reviewed include "intervention" studies where the same population is examined during periods where coal-fired power plants are shut down, or where coal-based power generation is transitioned to other fuel sources (such as natural gas). These studies are less impacted by residual confounding.

A review of the public health impacts across the life cycle of coal production (extraction, processing, use, and waste) concludes that use of coal results in respiratory illness, cancer, cardiovascular disease, preterm birth, and premature death (Hendryx et al. 2020). Authors also discuss impacts on child development from waste products.

<u>Criteria Air Pollutants</u>. The following sections briefly review evidence for associations between short-term or long-term inhalation exposures to criteria pollutants (CO, lead, O_3, PM, NO_2, and SO_2) and adverse health impacts. This information was summarized from the associated Integrative Science Assessment documents prepared by EPA in support of the NAAQS (EPA 2010, 2013, 2016, 2017b, 2019, 2020, 2022c). Each document also discusses potentially susceptible populations, which may be important for understanding environmental justice concerns in disproportionally impacted communities. The primary peer-reviewed literature, which includes both epidemiological and toxicological studies (including controlled human exposure studies), is reviewed in depth in individual EPA documents.

Most epidemiology studies of criteria pollutants involve studying large populations who are exposed to the pollutant in the ambient air. This means that individuals are exposed to a mixture of many different chemicals, including a set associated with various combustion sources. This makes it more difficult to tease out the impact of one criteria pollutant from another, but it may be possible using statistical tools. Key to supporting the epidemiology studies is supporting evidence from toxicology studies. Furthermore, since large populations are examined in these epidemiology studies, exposures are often estimated using measurements at central monitoring sites. These concentrations are then applied to an entire location (for example, a city), even though the pollutant concentration may vary within that location. Finally, different averaging times are often applied to the measurements, so associations are examined compared to short-term averages or long-term averages.

When EPA evaluates criteria pollutants for health effects, they look at all streams of scientific evidence, including epidemiology studies and toxicology studies (including both controlled human exposure studies in people and studies in laboratory animals) and come up with a set of determinations. These determinations are causal relationship; likely to be causal relationship; suggestive of but not sufficient to infer a causal relationship; inadequate to infer the presence or absence of a causal relationship; or not likely to be a causal relationship. **Table 4-103** in **Section 4.6** of the ARTSD (**Appendix C**) outlines the criteria for each determination. **Table 3-20** summarizes the health impacts associated with exposure to criteria pollutants and the various health effects, along with the weight of evidence, as summarized by the EPA Integrated Science Assessments. Additional information about each pollutant is also provided below.

Exposure to PM_{10} and $PM_{2.5}$ can impact human health in a variety of ways. When inhaled, $PM_{2.5}$ can cause inflammation in the lungs (EPA 2019). Short-term exposure to PM_{10} or $PM_{2.5}$ can increase risk of myocardial infarction, with risks being stronger for the smaller $PM_{2.5}$ (Luo et al. 2015; EPA 2019) and are associated with increased risk of arrhythmias in people with heart disease (EPA 2019). Short-term Exposure to $PM_{2.5}$ can lead to a variety of respiratory-related health effects, including worsening asthma or worsening symptoms of chronic obstructive pulmonary disease, leading to emergency room visits and hospital admissions (EPA 2019). Exposure of women during pregnancy to $PM_{2.5}$ is associated with lower birth weights, decreased fetal growth, and preterm births, and may contribute to respiratory-related postneonatal deaths and potentially higher rates of infant mortality (Chen et al. 2002; Woodruff et al. 2008; EPA 2019; Kihal-Talantikite et al. 2020). Long-term exposure to $PM_{2.5}$ has been associated with higher morbidity and mortality from respiratory, cardiovascular, pulmonary, and cerebrovascular diseases, and lung cancer (Romieu et al. 2012; Liu et al. 2013; EPA 2019, 2022c).

McDuffie and co-investigators (McDuffie et al. 2021a; McDuffie et al. 2021b) examine different sources of $PM_{2.5}$ in the United States and other countries to simulate $PM_{2.5}$ concentrations in different geological regions and estimate total disease burden for six mortality endpoints and two neonatal disorders associated with exposure to ambient $PM_{2.5}$. $PM_{2.5}$ was examined because it is believed to be the driver of air pollution-related mortality and morbidity. They then estimated the contribution from various sources of origin, including the categories "Liquid Oil and Natural Gas" which contains light oil, heavy oil, and diesel oil, and "Coal" (hard coal, brown coal, coal coke; includes electricity and heat production, residential heating, and cooking). This study estimates that in 2017, 3.85 million deaths occur worldwide each year from total $PM_{2.5}$ exposure in its evaluation of the contribution from anthropogenic and manmade sources in different regions. Of these, they estimate one million deaths globally from combustion of fossil fuels (coal, oil, and natural gas). This study allows us to address the potential contribution of the "liquid oil and natural gas" and "coal" sectors to global disease, both domestically and internationally. Dominant combustion fuel types across the globe are shown in **Figure 3-3**.

In the United States, total population-weighted $PM_{2.5}$ concentrations from all source sectors were modeled as 7.8 μg/m^3, which the investigators estimate would be associated with 47,000 deaths a year or 13.2 percent of the total global burden of disease. These deaths were largely estimated to be from stroke and ischemic heart disease. Of these deaths, the combined sector "oil and gas" were the dominant contributor, with approximately 25 percent of the deaths attributable to that fuel source. Globally, total population-weighted $PM_{2.5}$ concentrations from all source sectors were modeled as 41.7 μg/m^3, which the investigators estimate would be associated with 3,833,000 activities, with an additional 20 percent attributable to solid biomass fuel, particularly for residential heating and cooking activities.

Note that population-weighted exposures to $PM_{2.5}$ are not directly proportional to deaths. For example, while $PM_{2.5}$ concentrations were relatively lower in the United States compared with many other countries, the United States had high burdens of disease because of demographic differences (for example, older populations) and lower prevalence of infectious diseases.

Table 3-20
Health Impacts from Criteria Pollutants

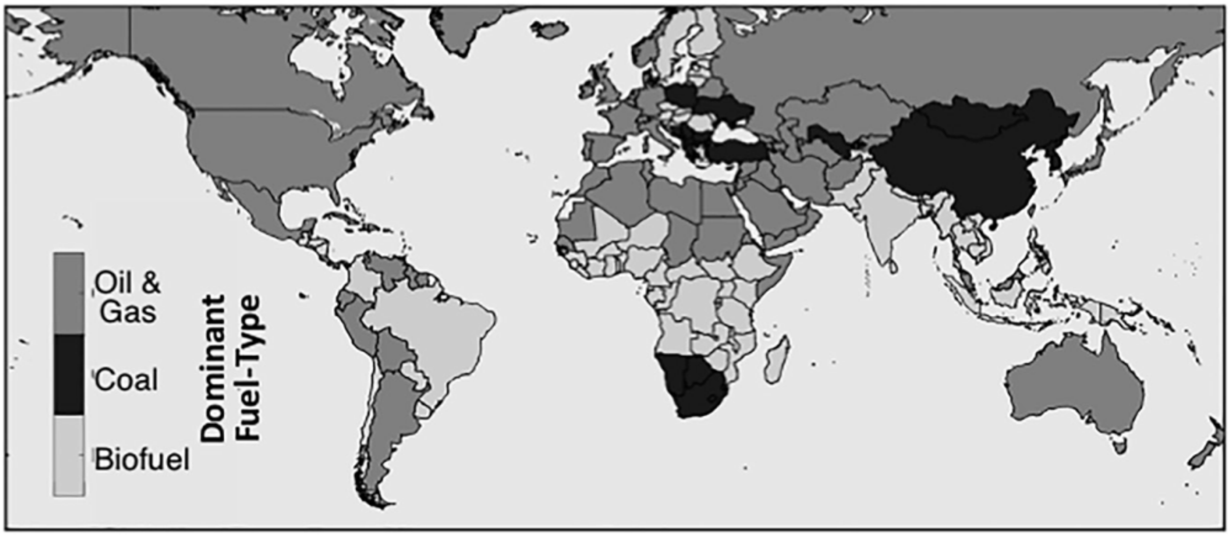
Health Impact	Exposure Duration	CO EPA (2010)	NO_2 EPA (2016)	SO_2 EPA (2017b)	Ozone EPA (2020)	$PM_{2.5}$ EPA (2019, 2022c)	$PM_{10-2.5}$ EPA (2019, 2022c)
Respiratory	Short term	Suggestive	Causal	Causal	Causal	Likely	Suggestive
	Long term	Inadequate	Likely	Suggestive	Likely	Likely	Inadequate
Cardiovascular	Short term	Likely	Suggestive	Inadequate	Suggestive	Causal	Suggestive
	Long term	Suggestive	Suggestive	Inadequate	Suggestive	Causal	Suggestive
Central Nervous System	Short term	Suggestive	*	*	Suggestive	Suggestive	Inadequate
	Long term	Suggestive	*	*	Suggestive	Suggestive	Suggestive
Birth Outcomes and Developmental	Consider a wide range of exposure durations	Suggestive	Suggestive /Inadequate	Inadequate	Suggestive	Suggestive	Inadequate
Total Mortality	Short term	Suggestive	Suggestive	Suggestive	Suggestive	Causal	Suggestive
	Long term	Not likely	Suggestive	Inadequate	Suggestive	Causal	Suggestive
Cancer	Long term	*	Suggestive	Inadequate	Inadequate	Likely	Suggestive
Metabolic Effects	Short term	*	*	*	Likely	Suggestive	Inadequate
	Long term	*	*	*	Suggestive	Suggestive	Suggestive

Health Impact	Exposure Duration	CO EPA (2010)	NO_2 EPA (2016)	SO_2 EPA (2017b)	Ozone EPA (2020)	$PM_{2.5}$ EPA (2019, 2022c)	$PM_{10-2.5}$ EPA (2019, 2022c)
Susceptible Populations	Long term or short term	People with underlying coronary artery disease, and possibly the elderly, fetuses, people with anemia, people with obstructive lung disease, and people with diabetes	People with asthma, children, and older adults	People with preexisting asthma, particularly children	People with preexisting asthma, children, older adults, individuals with reduced intake of certain nutrients (that is, vitamins C and E), and outdoor workers	Strong evidence: Children, minorities (specifically Black), and people of low socioeconomic status. Suggestive evidence: people with preexisting cardiovascular or respiratory disease, overweight or obese, with particular genetic variants, current or former smokers. Inadequate evidence: preexisting diabetes, older life stages, residential location, gender, or diet.	Strong evidence: Children, minorities (specifically Black), and people of low socioeconomic status. Suggestive evidence: people with preexisting cardiovascular or respiratory disease, overweight or obese, with particular genetic variants, current or former smokers. Inadequate evidence: preexisting diabetes, older life stages, residential location, gender, or diet.

Source: EPA 2010, 2016, 2017b, 2019, 2020, 2022c

Notes: *Causal determination not presented. Causal determination for lead is available in the EPA Integrated Science Assessment for Lead (EPA 2013).

Figure 3-3. Dominant Combustion Fuel Type



Source: McDuffie et al. 2021b

Exposure to SO_2 can also irritate the nose, throat, and respiratory tract. Breathing SO_2 can cause coughing, wheezing, and shortness of breath, and exacerbate respiratory symptoms of other medical conditions (Greenberg et al. 2016, 2017; EPA 2017b). Studies have found that exposure to SO_2 is associated with increased severity and frequency of asthma attacks (Greenberg et al. 2016, 2017; EPA 2017b) and has been correlated with higher rates of asthma hospitalization, particularly among children and adults over 65 years old. Even relatively low levels of SO_2 concentrations (<10 ppb 24-hour average) are associated with increased risk of cardiovascular and respiratory deaths (EPA 2017b).

Exposure to NO_x can also irritate the eyes, nose, throat, and respiratory tract. Exposure to NO_x reportedly can lead to coughing and choking, shortness of breath, tiredness, nausea, and headache (US Department of Health and Human Services 2014) and can exacerbate respiratory diseases like asthma (Greenberg et al. 2016, 2017; EPA 2016a). Studies have found that even exposures to low concentrations may be associated with increases in respiratory infections and emergency hospital visits (M. Lin et al. 2003; EPA 2016a). Long-term exposure to NO_x has been associated with decreases in lung function, increased risk of developing respiratory conditions, and increased responses to allergens (Barck et al. 2002; EPA 2016a). People with asthma, especially children and the elderly, are most susceptible to adverse health effects from NO_x (EPA 2016a).

CO, like oxygen, binds hemoglobin, the protein that transports oxygen through the bloodstream and releases it to cells and tissues. Hemoglobin is much more likely to bind CO compared to oxygen, so even small amounts present in the blood can impact oxygenation in the body (US Department of Health and Human Services 2012). Exposure to CO is associated with heart disease, especially among individuals with existing heart or lung disease (Chaitman et al. 1992; Bell et al. 2009; US Department of Health and Human Services 2012). It can also lead to headaches, dizziness, and cognitive difficulties, particularly at higher exposures (US Department of Health and Human Services 2012). CO exposure during pregnancy can be dangerous for the development of the fetus and may cause preterm birth and cardiac birth defects (Salam et al. 2005; US Department of Health and Human Services 2012).

Exposure to O_3 is associated with a variety of respiratory issues, including chest pain, coughing, throat irritation, and congestion (EPA 2020). O_3 can reduce pulmonary function and worsen existing chronic respiratory diseases such as bronchitis and emphysema and can also bring on asthma attacks in those with preexisting disease. Exposure to O_3 can also increase the risk of respiratory infections. Children are at greatest risk from exposure to O_3 because their lungs are still developing, and exposures may be particularly high when they are active outdoors and ozone levels are high. Repeated exposure to O_3 can inflame the lining of the lungs, potentially leading to scarring of the pulmonary tissue.

Exposure to lead is associated with a variety of neurobehavioral issues (EPA 2013). Exposure of children to any amount of lead can cause cognitive function decrements, such as reduced IQ, decreased academic performance, and poor performance on tests of executive function. Exposure to lead is also associated with decreased attention, increased impulsivity and hyperactivity, and possibly conduct disorders in children and young adults. Exposure of children or adults to lead may cause hypertension and harmful effects on sperm, the blood and blood-forming organs, and the immune system.

<u>Hazardous Air Pollutants (HAPs)</u>. Unlike for criteria pollutants, HAPs are evaluated under the EPA Integrative Risk Information System (IRIS) and have toxicological review documents prepared. The toxicological review is a critical review of the physicochemical and toxicokinetic properties of the chemical and its toxicity in humans and experimental systems. The assessment presents reference values for non-cancer effects of a chemical (reference concentration for inhalation exposure) and a cancer assessment (including both a qualitative and quantitative risk), where supported by available data.

To select the most important HAPs for gas, oil, and coal combustion, a combination of expert judgment and publications examining risks in such mixtures was used. For example, Electric Power Research Institute conducted a multi-pathway risk assessment of pollutants from coal-fired power plants and found that arsenic, chromium, and nickel were risk drivers for cancer risk, and hydrogen chloride, arsenic, and acrolein were risk drivers for non-cancer effects from inhalation exposures (Electric Power Research Institute 2018a, b). Benzene, toluene, ethylbenzene, and xylenes are commonly emitted from combustion of fuel from mobile sources. **Table 3-21** summarizes the most sensitive non-cancer endpoint, the cancer assessment, and the benchmark health values for acrolein, arsenic, benzo(a)pyrene, benzene, 1,3 butadiene, cadmium, chlorine, chromium (VI), dioxins and furans, ethylbenzene, formaldehyde, n-hexane, hydrogen chloride, mercury, manganese, nickel, toluene, and xylenes. Further information about these pollutants is discussed in the ARTSD (**Appendix C**).

Public health impacts from fossil fuel combustion will be experienced more acutely in susceptible sub-populations (see **Table 3-20**). This is particularly important in disproportionately impacted communities. This is discussed further in **Section 3.5.4**, Environmental Justice. The public health effects due to GHG from the downstream combustion of BFO coal and oil and gas are monetized in the social cost of GHG analysis in **Section 3.5.2**.

Table 3-21
Health Impacts from Select Hazardous Air Pollutants Found in Combustion Products of Coal, Oil, and Natural Gas

Chemical (Data Source)	Non-Cancer Endpoints (most sensitive)	Reference Concentration (mg/m^3)	Cancer Assessment*	Cancer Potency (per $\mu g/m^3$)
Acrolein (EPA 2003a, 1999)	Respiratory System (nasal lesions)	2×10^{-5}	Inadequate information to assess cancer potential	Inadequate information to assess carcinogenic potential
Arsenic (EPA 1986, 1995a)**	Respiratory System	Not assessed under the IRIS Program	Human carcinogen (Lung Cancer)	4.3×10^{-3}
Benzo(a)pyrene (EPA 2005a, 2017a)	Developmental System	2×10^{-6}	Carcinogenic to humans (Respiratory, Gastrointestinal)	6×10^{-4}
Benzene (EPA 1986, 1996, 2002a)	Immune – hematotoxicity	3×10^{-2}	Known human carcinogen (Leukemia)	2.2×10^{-6}
1,3-Butadiene (EPA 1999, 2002b)	Reproductive System	2×10^{-3}	Known human carcinogen (Lymphohematopoietic System)	3×10^{-5}
Cadmium (EPA 1986, 1987)	Not assessed under the IRIS program	Not assessed under the IRIS program	Probable human carcinogen	1.8×10^{-3}
Chlorine (EPA 1994)	Not assessed under the IRIS program	Not assessed under the IRIS program	Not assessed under the IRIS program	Not assessed under the IRIS program
Chromium (VI) (EPA 1986, 1996, 1998)*	Respiratory System	8×10^{-6} (Chromic acid mists and dissolved hexavalent chromium aerosols)	Human Carcinogen (EPA 1986) Known/likely human carcinogen (EPA 1996) (Lung Cancer)	1×10^{-2}
	Respiratory System	1×10^{-4} (hexavalent chromium particulates)		
Dioxins and Furans	Not assessed under the IRIS program	Not assessed under the IRIS program	Not assessed under the IRIS program	Not assessed under the IRIS program
Ethylbenzene (EPA 1986, 1991a)*	Developmental	1	Not classifiable as to human carcinogenicity	Inadequate information to assess carcinogenic potential
Formaldehyde (EPA 1986, 1991b, 1999; Kaden et al. 2010)	Irritation at site of contact (for example, skin, eyes, upper respiratory)	Not assessed under the IRIS program	Probable human carcinogen	1.3×10^{-5}

Chemical (Data Source)	Non-Cancer Endpoints (most sensitive)	Reference Concentration (mg/m^3)	Cancer Assessment*	Cancer Potency (per $\mu g/m^3$)
n-Hexane (EPA 2005a, 2005b)	Nervous system	7×10^{-1}	Inadequate information to assess cancer potential	Inadequate information to assess carcinogenic potential
Hydrogen Chloride (EPA 1995b)	Respiratory System	2×10^{-2}	Not assessed under the IRIS program	Not assessed under the IRIS program
Mercury, elemental (EPA 1986, 1995c)	Nervous System	3×10^{-4}	Not classifiable as to human carcinogenicity	Not assessed under the IRIS program
Methylmercury (EPA 2001)*	Nervous System	Not assessed under the IRIS program	Possible human carcinogen	Not assessed under the IRIS program
Manganese (EPA 1986, 1995c)	Nervous System	5×10^{-5}	Not classifiable as to human carcinogenicity	Not assessed under the IRIS program
Nickel (Nickel subsulfide) (EPA 1986, 1987)	Respiratory System	Not assessed under the IRIS program	Human Carcinogen (Lung Cancer)	4.8×10^{-4}
Toluene (EPA 2005a, 2005c)	Nervous System	5	Inadequate information to assess cancer potential	Inadequate information to assess carcinogenic potential
Xylenes (EPA 1999, 2003b)	Nervous System	1×10^{-1}	Inadequate information to assess cancer potential	Inadequate information to assess carcinogenic potential

Sources: Referenced information for each pollutant is indicated in the first column.
Notes: *Chemicals assessed under the EPA's 1986, draft 1996, or 2005 Guidelines for Carcinogenic Risk Assessment have different cancer assessment notations, as the EPA has restructured the cancer assessment categories when updating the guidelines. **Reviews of these HAPs are currently (2023) being updated by the EPA.

Alternative A (No Leasing)

Coal production and therefore downstream impacts would vary among the alternatives depending on the year. During 2023–2040, all three alternatives (A [No Leasing], B [No Action], and C [Limited Leasing]) would have the same federal production from valid existing rights from approved federal leases, and therefore would have comparable downstream air quality and public health impacts due to these existing leases, similar to the types of impacts discussed above.

Under Alternative A (No Leasing), the production and emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur. However, coal production in the CDPA would end mid-2041 since new coal lease applications would not be accepted. For this reason, there would be no mining, transportation, or downstream combustion emissions from federal coal under this alternative due to no potential new leases as shown in **Table 3-22**, **Table 3-23**, and **Table 3-24**. Therefore, there would be no additional air quality or public health impacts from production, transportation, or downstream combustion of coal due to the federal action (that is, potential new leases) under Alternative A (No Leasing).

Table 3-22
Annual Coal Mining Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative A (No Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
2023–2048	0	0	0	0	0	0	0	0	0

Note: All table tonnages are in short tons.

Table 3-23
Annual Emissions of Criteria and Hazardous Air Pollutants from Rail Transportation of Federal Coal from Potential New Leases in the CDPA under Alternative A (No Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023–2048	0	0	0	0	0	0	0	0

Note: All table tonnages are in short tons.

Table 3-24
Coal Downstream Combustion Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative A (No Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023–2048	0	0	0	0	0	0	0	0

Note: All table tonnages are in short tons.

Alternative B (No Action)

Alternative B (No Action) would allow leasing to continue until the reserve of approximately 48.01 billion short tons has all been mined. The production and emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur. Then, potential future leases would allow for production and emissions to continue. Emissions of criteria and hazardous air pollutants from the mining, transportation, and downstream combustion of coal from potential new federal leases under Alternative B (No Action) are shown in **Table 3-25**, **Table 3-26**, and **Table 3-27**, respectively. Forecasted federal production and the corresponding emissions are highest in 2042 and lower in subsequent years.

The annual federal coal production in the CDPA used in the BLM regional photochemical modeling for circa 2028 was 173.7 million short tons based on data from the mine operators compiled previously by BLM. Thus, the EIA projected peak annual federal coal production (occurring in 2042) is 4 percent higher than that modeled, so federal coal production and downstream combustion impacts are expected to be correspondingly slightly higher than that modeled. Impacts beyond 2048 would be lower than those modeled (due to lower production rates), as described in **Section 4.0** of the ARTSD (**Appendix C**). Downstream combustion-related public health impacts due to potential new federal leases under Alternative B (No Action) would be similar to the types of impacts discussed in the section *Downstream Combustion Impacts on Air Quality and Public Health*. As the coal production in the CDPA declines with time, the corresponding downstream combustion-related public health impacts would also decrease, impacts of this change specific to environmental justice communities can be found in **Section 3.5.4**, Environmental Justice.

Under Alternative B (No Action), coal mining could potentially continue after 2048 until the coal reserve is exhausted, predicted to be 2338. This would result in emissions of both criteria pollutants and HAPs and consequent air quality and public health impacts of production, transportation, and downstream combustion. Impacts across alternatives would be highest under Alternative B, No Action, beyond 2048.

Alternative C (Limited Leasing)

Alternative C (Limited Leasing) would allow a limited amount of leasing through 2038 to provide sufficient coal for mining through 2048. Coal production, transportation, and downstream impacts would not occur after 2048 in Alternative C, Limited Leasing.

Emissions of criteria and hazardous air pollutants from the mining, transportation, and downstream combustion of coal from potential new federal leases under Alternative C (Limited Leasing) are shown in **Table 3-28**, **Table 3-29**, and **Table 3-30**, respectively. There would be no emissions and impacts from mining, transportation, or downstream combustion under this federal action during 2023–2040 because all mining would happen under existing leases. Emissions and impacts of all pollutants would be lower in 2048 than the 2041–2047 period reflecting the drop in production in that year after coal reserves are projected to be exhausted.

Table 3-25
Annual Coal Mining Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative B (No Action)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0	0
2041–2047 (peak year shown*)	180,648,019	8,149.1	1,377.2	8,466.0	11,163.1	760.4	3,127.4	509.2	76.0
2048	156,976,818	7,653.9	1,259.1	8,052.8	7,780.2	619.6	2,697.1	427.5	62.0

Note: *The peak year of federal production from 2041 to 2048 is 2042. All table tonnages are in short tons.

Table 3-26
Annual Emissions of Criteria and Hazardous Air Pollutants from Rail Transportation of Federal Coal from Potential New Leases in the CDPA to Power Plants under Alternative B (No Action)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0
2041–2047 (peak year shown*)	180,648,019	183.1	177.7	12,378.7	11,232.8	486.0	39.6	213.5
2048	156,976,818	154.7	150.0	10,454.0	9,486.2	410.4	33.4	180.3

Note: *The peak year of federal production from 2041 to 2048 is 2042. All table tonnages are in short tons.

Table 3-27
Coal Downstream Combustion Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative B (No Action)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0	0
2041–2047	Qualitatively addressed in section on *Downstream Combustion Impacts on Air Quality and Public Health*								
2048									

Note: All table tonnages are in short tons.

Table 3-28
Annual Coal Mining Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative C (Limited Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	Other HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0	0
2041–2047 (peak year shown*)	180,648,019	8,149.1	1,377.2	8,466.0	11,163.1	760.4	3,127.4	509.2	76.0
2048	32,024,466	1,561.5	256.9	1,642.8	1,587.2	126.4	550.2	87.2	12.6

Note: *The peak year of federal production from potential new leases from 2041 to 2048 is 2042. All table tonnages are in short tons.

Table 3-29
Annual Emissions of Criteria and Hazardous Air Pollutants from Rail Transportation of Federal Coal from Potential New Leases in the CDPA under Alternative C (Limited Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0
2041–2047 (peak year shown*)	180,648,019	183.1	177.7	12,378.7	11,232.8	486.0	39.6	213.5
2048	32,024,466	31.6	30.6	2,132.7	1,935.3	83.7	6.8	36.8

Note: *The peak year of federal production from potential new leases from 2041 to 2048 is 2042. All table tonnages are in short tons.

Table 3-30
Coal Downstream Combustion Emissions of Criteria and Hazardous Air Pollutants due to Federal Production from Potential New Leases in the CDPA under Alternative C (Limited Leasing)

Years	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NO_x (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	HAP (tons/year)
2023–2040 (same for all years)	0	0	0	0	0	0	0	0
2041–2047	Qualitatively addressed in the text in this section and the section on *Downstream Combustion Impacts on Air Quality and Public Health*							
2048								

Note: All table tonnages are in short tons.

The EIA projected peak annual federal coal production (occurring in 2042) is 4 percent higher than that modeled, so federal coal production and downstream combustion impacts are expected to be correspondingly slightly higher than that modeled, as discussed in **Section 4** of the ARTSD (**Appendix C**). Impacts beyond 2048 would be lower than those modeled and that during the 2041–2047 period. Downstream combustion-related public health impacts due to potential new federal leases under Alternative C (Limited Leasing) would be similar to the types of impacts discussed in the section *Downstream Combustion Impacts on Air Quality and Public Health*.

In summary, during 2041–2047, impacts under Alternative C (Limited Leasing) would be the same as Alternative B (No Action) and higher than Alternative A (No Leasing). In 2048, impacts under Alternative C, Limited Leasing, would be lower than Alternative B, No Action, and higher than Alternative A, No Leasing. Beyond 2048, there would be no impacts under Alternative C, Limited Leasing.

3.5.1.3 Cumulative Impacts

Cumulative emissions are presented for criteria pollutants and HAPs in the peak year of total (federal plus nonfederal) coal production in the CDPA in **Table 3-31**. As the peak year (2023) of production occurs when only existing leases are being developed, the cumulative emissions are the same across all alternatives. Cumulative emissions would be lower in all future years.

Because the BLM regional photochemical modeling study uses all known cumulative sources in the US and background contributions from outside the country, it represents a cumulative analysis. The modeling shows that contributions from federal coal and oil and gas development are unlikely to result in exceedances of the standards; however, elevated concentrations or deposition may be present near sources such as mines, well pads, and power plants. The BLM will continue to follow its Air Resource Management Plan outlined in the 2015 RMP to mitigate potential impacts.

Cumulative impacts in and around the BFO in the circa-2028 BLM regional photochemical modeling study are predicted to be below the NAAQS for O_3, NO_2, and SO_2. Cumulative impacts for $PM_{2.5}$, and PM_{10} exceed the NAAQS at isolated areas throughout the state, mostly due to the modeled natural source group that includes fires, biogenic emissions, windblown dust, and lightning NOx. The contributions from federal oil and gas and federal coal development are generally less than 3 percent at the location of these exceedances. Modeled cumulative nitrogen deposition is below the lowest critical load for nitrogen deposition at all Class I areas in the analysis. Contributions are minimal at these locations from the federal coal and oil and gas, and never exceed more than 2 percent of the total deposition. Modeled cumulative sulfur deposition is below the critical load for sulfur deposition at all Class I areas. The coal EGU sector is the largest anthropogenic contributor to visibility impairment at all three Class I areas in the analysis. See **Appendix C** for maps and additional information.

Table 3-31
Coal Mining Emissions of Criteria and Hazardous Air Pollutants in the Peak Year (2023)* of Total (Federal plus Nonfederal) Coal Production in the CDPA

Mineral Designation	Annual Production (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)	NOx (tons/year)	CO (tons/year)	VOC (tons/year)	SO_2 (tons/year)	DPM (tons/year)	HAP (tons/year)
Existing Federal Leases	256,582,534	11,295.1	1,933.3	12,445.0	16,110.1	1,097.9	4,445.0	730.1	109.8
New Federal Leases	0	0	0	0	0	0	0	0	0
Total Federal	256,582,534	11,295.1	1,933.3	12,445.0	16,110.1	1,097.9	4,445.0	730.1	109.8
Nonfederal	6,309,933	271.8	46.5	299.5	387.7	26.4	107.0	17.6	2.6
Total	268,507,790	11,567.0	1,979.8	12,744.5	16,497.8	1,124.4	4,551.9	747.7	112.4

Notes: * The peak year of total (federal + nonfederal) production during 2023 to 2048 occurs in 2023. All table tonnages are in short tons.

3.5.1.4 Summary

During 2023–2040, mining would occur from only existing coal leases and thus there would be no incremental effects from new emissions or air quality and public health impacts from the production, transportation or downstream combustion of coal produced in the CDPA.

During 2041–2047, impacts under Alternative C (Limited Leasing) would be the same as Alternative B (No Action) and higher than Alternative A (No Leasing). In 2048, impacts under Alternative C, Limited Leasing, would be lower than Alternative B, No Action, and higher than Alternative A, No Leasing. Beyond 2048, there would be no impacts under Alternative C, Limited Leasing.

All three alternatives have the same projected oil and gas production. Consequently, the impacts from production or combustion of oil and gas produced in the BFO would be the same for all alternatives.

Cumulative source modeling performed for 2028 as part of the BLM regional modeling study indicates that federal coal or oil and gas production would not contribute to exceedances of air quality standards. Some elevated concentrations occur at or near locations of coal mining, oil and gas production, or downstream combustion. Similarly, exceedance of critical load of nitrogen deposition is possible at Wind Cave National Park, although federal contributions, including those from the BFO, are expected to be negligible. The BLM will follow the Air Resource Management Plan described in the 2015 RMP to mitigate potential impacts from federal development.

Downstream combustion of oil, natural gas, and coal produced in the BFO would lead to emissions of criteria and hazardous air pollutants, which may impact air quality and public health. Air quality impacts affecting public health include changes to pollutant concentrations in the air and changes to deposition of pollutants to soils and water which may indirectly affect human health. Due to the numerous uncertainties in such an assessment, a qualitative analysis was performed to assess the air quality and public health impacts from downstream combustion of BFO coal, oil, and natural gas. From an air quality perspective, some of the key pollutants resulting from downstream oil, gas, and coal combustion are O_3, $PM_{2.5}$, PM_{10}, SO_2, NO_2, NH_3, HAPs such as mercury, and VOCs. Adverse public health effects could occur for O_3, NOx, SO_2, $PM_{10\text{-}2.5}$, $PM_{2.5}$, acrolein, benzene, 1,3-butadiene, ethylbenzene, formaldehyde, hexane, hydrochloric acid, toluene, xylenes, arsenic, hexavalent chromium, mercury, benzo(a)pyrene, cadmium, chlorine gas, dioxins, manganese, and nickel due to their high exposure or high toxicity.

Natural gas and coal are primarily burned in stationary EGUs or industrial sources, whereas oil is mostly burned in mobile sources. National annual emissions from the EPA's NEI indicate that coal combustion emissions of CAPs and the HAPs listed above are dominated by EGUs. Petroleum product combustion emissions of CO, NH_3, VOCs, 1,3-butadiene, benzene, hexane, ethyl benzene, toluene, and xylenes are dominated by motor gasoline use in light-duty vehicles and emissions of NO_x, PM_{10}, $PM_{2.5}$, SO_2, formaldehyde, and acrolein are dominated by distillate fuel use in heavy-duty vehicles, commercial marine vessels, or off-road equipment. Natural gas combustion emissions of CO, NO_x, SO_2, lead, and total VOCs are dominated by industrial sources, and PM_{10} and $PM_{2.5}$ are dominated by EGUs.

The impact of combustion emissions on air quality and public health was assessed using information from a variety of sources, including peer-reviewed literature and the EPA. Air quality involves complex physical and chemical transformations at a local and regional level, so impacts would vary considerably depending on background concentrations, meteorology, and other local pollutant sources, making a qualitative analysis more appropriate. Changes to air concentrations and deposition of the pollutants listed above may result in short-term and long-term health effects, including asthma and allergic symptoms, oxidative DNA damage, birthweight, heart rate variability, mortality and hospitalizations, and inflammatory markers. Calculated health burdens associated with coal combustion are higher than those from oil and gas combustion. Although the most recent data were used in this assessment, the exact final destinations (that is, locations of downstream combustion) and emissions rates over the planning period and beyond are variable and uncertain. Any changes in emissions will likely affect the air quality and public health impacts discussed in this analysis.

All three alternatives have the same projected oil and gas production. Consequently, the downstream impacts on air quality and public health from combustion of oil and gas produced in the BFO would be the same for all alternatives. Coal production and therefore downstream impacts would vary among the alternatives depending on the year. During 2023–2040, all three alternatives are projected to have the same federal coal production and therefore would have comparable air quality and public health impacts during this period from downstream combustion.

Under Alternative A (No Leasing), federal coal production in the CDPA would end mid-2041 since new coal lease applications would not be accepted. This would result in less downstream combustion emissions in 2041 and reduced downstream air quality and health impacts in Alternative A, No Leasing, compared with Alternatives B, No Action, and C, Limited Leasing. There would be no coal production and therefore no air quality and public health impacts beyond 2041 due to downstream coal combustion in Alternative A (No Leasing).

Alternative B (No Action) would allow leasing to continue until the reserve of approximately 48.01 billion short tons has all been mined. Alternative C (Limited Leasing) would allow a limited amount of leasing, which would allow for coal to be mined through 2048, and there would be no production or downstream impacts past 2048. Because Alternative B, No Action, would allow the greatest coal production, it would have the highest downstream coal combustion emissions and the greatest downstream impacts on air quality and health. The decreased coal production under Alternative A (No Leasing) and Alternative C (Limited Leasing) would likely lead to less overall downstream combustion and emissions, resulting in reduced downstream air quality and health impacts.

The nonattainment status of regions with coal-fired power plants where downstream combustion of BFO coal could occur is shown in **Section 3.9.3** of the ARTSD (**Appendix C**). In summary, some of the key regions that have power plants receiving BFO coal as well as nonattainment areas for one or more criteria pollutants (particularly O_3) include Alabama, Colorado, Georgia, Louisiana, Missouri, Texas, and the states around Lake Michigan. Some distinct O_3 nonattainment areas with power plants within or nearby that burn BFO coal include Houston-Galveston-Brazoria in Texas, San Antonio area in Texas, St. Louis area in Missouri-Illinois, the Denver-Boulder-Greeley-Ft. Collins area in Colorado, Chicago area in Illinois, and Detroit area in Michigan. In the case of SO_2 and $PM_{2.5}$, states where receiving power plants are in or near nonattainment areas include Alabama, Arizona, Georgia, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Texas, and Wisconsin. The power plants typically receive both federal and nonfederal coal and may combust coal from sources outside the BFO as well. The nonattainment areas present in urban regions commonly have a multitude of other emission sources also contributing to nonattainment. In general, the power plants and other sources in the regions are subject to local, state, and federal regulations aimed at improving local and regional air quality and making progress toward attainment. Note that general conformity regulations in these nonattainment areas do not apply to the BFO as the BFO federal action is outside the nonattainment areas per 43 CFR 95.153(b) (“*total direct and indirect emissions of the criteria pollutant or precursor in the nonattainment or maintenance area”*).

The potential impacts on environmental justice communities are discussed in **Section 3.5.4**, Environmental Justice.

3.5.2 Greenhouse Gases and Climate Change

3.5.2.1 Affected Environment

The Intergovernmental Panel on Climate Change (IPCC) describes climate change as “a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use” (IPCC 2013, 2021).

Current ongoing global climate change is caused, in part, by the atmospheric buildup of 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, preventing it from escaping out into space. As a result, the buildup of GHGs 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), methane (CH_4), and nitrous oxide (N_2O)) associated with the production, transportation, and downstream combustion of coal, oil, and gas from the BFO. In addition, GHG emissions are also summarized in terms of carbon dioxide equivalents (CO_2e) using the global warming potential (GWP) of each GHG from the Sixth Assessment Report (AR6) of the IPCC (IPCC 2021). More information on GWPs is provided in **Section 2.6** of the ARTSD (**Appendix C**).

Because climate change is a global issue, the analysis area for GHGs cannot be restricted to one region. Thus, the GHG/climate change analysis is focused on the BFO, state, national, and global scales.

This section incorporates by reference the description of the affected environment in the 2015 Final EIS/Proposed RMP (BLM 2015b; Section 3.1.1.6, Climate Change, pages 318–324) and the 2019 Final SEIS/Proposed RMPA (Air Resources, Including Greenhouse Gases and Climate Change – Affected Environment, pages 3-7 through 3-11). A summary of the information from these documents is provided below along with discussion of new and updated information. Additionally, the national BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2022b, herein referred to as the national BLM Specialist Report) is incorporated by reference, specifically the discussion of relevant policy and regulations (Section 2.0), global, national, and state emissions (Section 6.0), climate change science and trends (Section 8.0), and projected climate change (Section 9.0). The national BLM Specialist Report provides estimated emissions of GHGs attributable to development and consumption of federal fossil fuels produced on lands and mineral estate managed by the BLM across the US. It is available at https://www.blm.gov/content/ghg/2022.

Regulatory and Policy Framework

GHGs are considered air pollutants under the Clean Air Act (42 USC 7401, et seq.). In 2009, the EPA published a rule for the mandatory reporting of GHGs (40 CFR Part 98, Subpart C) referred to as the Greenhouse Gas Reporting Rule (GHGRP). It generally requires large emitters (any facility emitting over 25,000 metric tons of CO_2e annually) to report their emissions annually. The facility-level emission information reported under the GHGRP are published and accessible through the Facility Level Information on Greenhouse Gases Tool (FLIGHT; EPA 2022d). FLIGHT data reported by large emitters is estimated to represent 85 to 90 percent of the total US emissions (EPA 2022d).

President Biden issued two executive orders in January 2021 to address the climate crisis and focus on GHG emission reductions:

- Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (January 25, 2021): Directs all executive departments and agencies to commence work on confronting the climate crisis to improve public health and the environment. Among other things, it established the Interagency Working Group on the Social Cost of Greenhouse Gas Emissions to develop and promulgate costs for agencies to apply during cost-benefit analysis and rescinded the 2019 CEQ Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions (84 *Federal Register* 30097).
- Executive Order 14008, Tackling the Climate Crisis at Home and Abroad (January 27, 2021): Reaffirms the United States' decision to rejoin the Paris Agreement and its commitment to achieve net-zero emissions by no later than 2050. It also establishes a National Climate Task Force. Specific directives for the Department of the Interior (DOI) and BLM include increasing renewable energy production on public lands and waters, performing a comprehensive review of potential climate and other impacts from oil and natural gas development on public lands, establishing a civilian climate corps, and working with key stakeholders to achieve a goal of conserving at least 30 percent of the nation's lands and waters by 2030.

Pursuant to Executive Order 13990, the CEQ issued *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* on January 9, 2023 (86 *Federal Register* 1196). It builds upon and updates CEQ's 2016 Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, highlighting best practices for analysis grounded in science and agency experience.

Consistent with Executive Order 14008, the US has established an economy-wide target of reducing its net GHG emissions (including anthropogenic and natural GHG emissions as well as GHG removals by sinks) by 50 to 52 percent below 2005 levels in 2030 in its Nationally Determined Contribution under the Paris Agreement (United Nations Framework Convention on Climate Change 2021). The net emissions (including sinks) in 2005 were 6,635 million metric tons (MMT) CO_2e (United Nations Framework Convention on Climate Change 2021). So far, the US is anticipated to have met and surpassed the 2020 target of 17 percent reduction in net economy-wide emissions below 2005 levels and is broadly on-track to meet the 2025 goal of 26 to 28 percent emissions reductions below 2005 levels (United Nations Framework Convention on Climate Change 2021).

In November 2022, the BLM proposed new regulations (Waste Prevention Rule, 87 *Federal Register* 73588) to reduce the waste of natural gas from venting, flaring, and leaks during oil and gas production activities on federal and Indian leases. This proposed rule would replace the BLM's current requirements governing venting and flaring, which are contained in Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases: Royalty or Compensation for Oil and Gas Lost ("NTL-4A") (44 *Federal Register* 76600). Operators must use all reasonable precautions to prevent the waste of oil or gas developed from the lease. Requirements are proposed for venting and flaring from oil and gas wells. For example, flares or combustion devices would be required to have automatic ignition systems for continuous combustion. New requirements would be established under the rule for leak detection and upgrades to equipment such as pneumatic controllers and pumps. The BLM also proposes several exceptions in which natural gas would be considered unavoidably lost. Additional information is available in the *Federal Register* (87 *Federal Register* 73588) at https://www.govinfo.gov/content/pkg/FR-2022-11-30/pdf/2022-25345.pdf.

Also, in November 2022, the EPA issued a supplemental proposal that strengthens and expands its November 2021 proposal by reducing emissions of methane from both new and existing oil and gas operations. This would include leak monitoring, strengthen requirements for flares, require owners/operators of oil wells with associated gas to implement alternatives to flaring the gas, continue monitoring at abandoned and unplugged wells until wells are plugged, require zero-emission pneumatic pumps, and implement several other measures to mitigate emissions. The updated requirements EPA is proposing would apply to both the agency's New Source Performance Standards for new, modified, and reconstructed sources and as presumptive standards to assist states in developing plans under the proposed emissions guidelines for existing sources. Additional information is available at https://www.epa.gov/system/files/documents/2022-11/OIl%20and%20Gas%20Supplemental.%20Overview%20Fact%20Sheet.pdf.

In May 2023, the EPA proposed new GHG emission standards under Section 111 of the Clean Air Act for fossil fuel-fired power plants to reduce the amount of GHG emissions from both new and existing EGUs (88 *Federal Register* 33240). The proposed rule would require existing coal-fired power plants to capture 90 percent of their carbon dioxide emissions by 2030 based on cost-effective and available control technologies. The proposed standards include technologies such as carbon capture and sequestration. Additional information is available at https://www.epa.gov/stationary-sources-air-pollution/greenhouse-gas-standards-and-guidelines-fossil-fuel-fired-power.

Additional discussion of laws and policies relevant to GHGs and climate change can be found in the national BLM Specialist Report (BLM 2022b).

Current Conditions and Trends

Changes in climate and the potential effects of climate change were described in the 2015 Final EIS/Proposed RMP, and the 2019 Final SEIS/Proposed RMPA discussed new findings from the Fourth National Climate Assessment (NCA; US Global Change Research Program 2018) and other sources. This information is incorporated by reference and summarized below. Major findings from more recently published reports such as the IPCC (2021) AR6 are also summarized in the following sections.

<u>Observed Climate Trends and Impacts</u>

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, 2021).

The IPCC (2021) has concluded that human activities such as the burning of fossil fuels have caused GHG concentrations to increase since the mid-18th century and that “it is unequivocal that human influence has warmed the atmosphere, ocean and land.” The IPCC’s (2021) best estimate of the human-caused increase in global surface temperatures between 1850-1900 and 2010-2019 is 1.07°C (1.93°F), and it is “very likely” that well-mixed GHGs were the main driver of this warming since 1979. Evidence of the observed change and the human influence in extreme events such as heat waves, heavy precipitation, and droughts has strengthened since the IPCC Fifth Assessment Report (IPCC 2013). For example, it is “virtually certain” that the frequency and intensity of extreme heat events have increased across most regions since the 1950s and cold extremes have become less extreme and less severe, and there is “high confidence” that human-induced climate change is the main driver of these changes (IPCC 2021).

Across the United States annual average temperatures have increased by 1.8°F since the beginning of the 20th century and by 1.2°F over the last few decades (BLM 2022b; US Global Change Research Program 2018). According to the Fourth National Climate Assessment (NCA; US Global Change Research Program 2018), the largest increases in annual average temperatures since the beginning of the 20th century were observed in the western United States (including the Northern Great Plains), while the southeastern United States had the least warming. Annual precipitation has increased in northern and eastern United States since the beginning of 20th century and decreased in most of the southern and western United States (US Global Change Research Program 2018). The frequency and intensity of heavy precipitations have increased in most parts of the United States since the 20th century (US Global Change Research Program 2018).

The National Oceanic and Atmospheric Administration publishes annual climate summaries for each state. The 2022 state climate summary for Wyoming (National Oceanic and Atmospheric Administration 2022) reports that:

- Temperatures in the state have risen by almost 2.5°F since the beginning of the 20th century, which is higher than the rate of warming across the contiguous US as a whole. Warming in Wyoming is more evident in the winter due to the lower-than-average number of very cold days since 2020.
- The highest number of very hot days (with a maximum temperature of 95°F or higher) per year was during the 2000s and early 2010s.
- In 2012, the state experienced the driest year on record dating back to 1985. This resulted in severe drought across 90 percent of the state by October 2012 and more than 350,000 acres of lands burned by wildfires.

<u>Projected Climate Trends and Impacts</u>

Over the contiguous United States, the annual average temperature is expected to increase by 2.5°F over the next few decades compared to present day, regardless of future emissions (US Global Change Research Program 2018). By the end of the 21st century, the annual average temperature for contiguous United States is expected to increase by 3°F to 12°F depending on future emissions scenarios, and high temperature extremes are expected to increase accordingly (US Global Change Research Program 2018). The frequency and intensity of heavy precipitation are projected to continue to increase over the coming century in the United States, and winter and spring precipitation are projected to increase significantly over the Northern Great Plains, the Upper Midwest, and the Northeast (US Global Change Research Program 2018).

As reported in the Fourth NCA (US Global Change Research Program 2018) and summarized in the 2019 Supplemental EIS, 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 future 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. 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 very hot days (those with maximum temperatures above 90°F) is expected to increase. There are projected to be many fewer cool days (those with minimum temperatures less than 28°F) with a decrease of 30 days or more per year by midcentury (US Global Change Research Program 2018).

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 (US Global Change Research Program 2018). 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 midcentury, 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).

Wyoming is projected to continue to warm in all geographic locations, seasons, and under all emission scenarios throughout the twenty-first century. Even under a lower emission scenario, the annual average temperatures are projected to most likely exceed historical record levels by the middle of the century and the intensity of heat waves is projected to increase, while the intensity of cold waves is projected to decrease (National Oceanic and Atmospheric Administration 2022). Winter and spring precipitation is projected to increase in Wyoming, which can potentially lead to drier summer months and decreasing summer precipitation (National Oceanic and Atmospheric Administration 2022). While winter and spring precipitation is projected to increase across the state, the intensity of future droughts is projected to increase as rising temperatures increase the rate of soil moisture evaporation during dry spells. Thus, summer droughts are likely to become more intense and may potentially increase the frequency and severity of wildfires. Heavier spring precipitation and earlier snow melt, combined with a shift from snow to rain, could also increase the potential for flooding.

Global and US Emissions and Trends

GHG emissions are reported at a number of spatial scales, including globally, nationally, and at the state level. In addition to these scales, GHG emissions from fossil fuels produced on federal lands and emissions reported in the three BFO counties are described below.

The United Nations Environment Programme (2022) reports that total global GHG emissions in 2019 reached a record high of 56.4 metric gigatons of CO_2e (Gt CO_2e), before dropping 4.7 percent in 2020 to 50.8 Gt CO_2e due to the global response to the coronavirus (COVID-19) pandemic. While the average rate of growth in global GHG emissions was lower from 2010 to 2019 than 2000 to 2009 (a 1.1 and 2.6 percent per year, respectively), average global GHG emissions were still the highest on record. The reasons for the slower rate of growth in the past decade include a global reduction in coal capacity additions, steady substitution of coal by natural gas for power generation in developed counties, and the increasing pace of renewable energy deployments globally (United Nations Environment Programme 2022). While the United Nations Environment Programme (2022) could not estimate total global GHG emissions in 2021 because estimates of emissions from land use, land-use change, and forestry were not yet available, the preliminary estimates of total global emissions excluding land use, land-use change, and forestry for 2021 exceeds the comparable emissions in 2019 by 0.2 percent, suggesting that 2021 emissions will be similar to or higher than the record emissions in 2019.

The IPCC (2021) AR6 estimates that global GHG emissions would need to be approximately 43 percent lower than 2019 emissions by 2030 in order to limit global warming to 1.5°C (2.7°F) with no or limited overshoot. The United Nations Environment Programme (2022) estimates that current unconditional national commitments under the Paris Agreement would only reduce global GHG emissions in 2030 by 5 percent relative to emissions under current policies, while 30 and 45 percent reductions are needed to limit warming to 2.0°C (2.7°F) and 1.5°C (3.6°F), respectively.

The EPA estimates current total US emissions in its annual Inventory of US Greenhouse Gases and Sinks (EPA 2022c). It is intended to represent all GHG emissions in the US, including those sources that are not required to report annual emissions under the GHGRP. The latest report was published by EPA in 2022 and provides emissions estimates for 1990 to 2020. The EPA (2022c) estimates that total gross US GHG emissions (excluding land use, land-use change, and forestry emissions and sinks) were 5,981.4 MMT of CO_2e in 2020. This represents a decrease of approximately 9 percent from 2019 and a decrease of approximately 20 percent from the peak emissions in 2007. The EPA reports that the decrease in total GHG emissions between 2019 and 2020 was largely due to the impacts of the COVID-19 pandemic on travel and economic activity, but that the decline also reflects the combined impacts of many long-term trends, including population, economic growth, energy market trends, technological changes that include energy efficiency, and the carbon intensity of energy fuel choices. Approximately 81 percent (4,854.7 MMT CO_2e) of the total US emissions in 2020 were from the energy sector, primarily fossil fuel combustion for transportation and electricity generation. Note that the emissions presented in this paragraph were calculated by the EPA using GWPs from the IPCC's AR4. More information on recent trends in US GHG emissions can be found in the national BLM Specialist Report (BLM 2022b).

Wyoming Emissions and Trends

The EPA also publishes an Inventory of US Greenhouse Gas Emissions and Sinks by State that is derived from the annual NEI and uses the same methodologies (EPA 2022e). In 2020, the gross total emissions from Wyoming were approximately 79.2 MMT CO_2e, which is approximately a 7 percent reduction from

2019 levels and a 24 percent reduction from peak emissions in 2008. The electric power industry and industry are the largest sources of GHG emissions in the state followed by agriculture and transportation. Between 1990 and 2019, industry, agriculture, and transportation emissions in the state increased by approximately 30.5 percent, 24.2 percent, and 39.9 percent, respectively, while emissions from the electric power industry decreased by approximately 8.2 percent.

Emissions and Trends in the BFO

GHG emissions from major sources in the BFO that report annual emissions under the GHGRP are shown in **Table 3-32** for 2017 to 2021. As noted previously, the EPA estimates that the emissions reported under the GHGRP account for 85 to 90 percent of total GHG emissions nationally. Between 2017 and 2019, total reported emissions from Campbell, Johnson, and Sheridan Counties decreased by around 1.38 MMT of CO_2e from 9.94 MMT in 2017 to 8.56 MMT of CO_2e in 2019. In 2020, total reported emissions increased by around 552 thousand metric tons of CO_2e to 9.11 MMT, driven by an increase in emissions from petroleum and natural gas systems. In 2021, the emissions fell by around 750 thousand metric tons of CO_2e to 8.36 MMT, driven by a decrease in emissions from chemical production facilities.

Table 3-32
Annual Greenhouse Gas Emissions from Major Facilities in the BFO from 2017 to 2021

Facility Name	2017 (metric tons of CO_2e)	2018 (metric tons of CO_2e)	2019 (metric tons of CO_2e)	2020 (metric tons of CO_2e)	2021 (metric tons of CO_2e)
Dry Fork Station (coal-fired power plant)	3,308,636	3,067,896	2,726,517	3,305,904	2,925,450
Wyodak (coal-fired power plant)	3,090,760	2,732,562	2,239,503	2,137,935	2,122,796
Wygen III (coal-fired power plant)	854,900	969,300	836,972	924,747	908,052
Neil Simpson II (coal-fired power plant)	700,443	844,843	868,196	875,763	811,382
Wygen II (coal-fired power plant)	857,281	895,828	853,456	852,888	780,968
Wygen I (coal-fired power plant)	874,670	757,847	815,228	837,982	645,553
50 Buttes Gas Plant (gas processing plant)	57,105	77,649	109,781	72,244	59,459
Hilight-Reno Junction Gas Plant (gas processing plant)	71,057	69,447	63,777	57,289	58,435
Campbell County Landfill No. 2 (solid waste facility)	29,398	31,392	32,812	34,299	35,675
Neil Simpson II (CT2) (coal-fired power plant)	4,333	6,566	9,758	9,118	9,217
Bison Gas Treating Facility (gas processing plant)	89,799	157,466	-	-	-
Total	**9,938,382**	**9,610,796**	**8,556,000**	**9,108,169**	**8,356,987**

Source: EPA 2022d; CO_2e are based on 100-year global warming potential values from IPCC AR4 (IPCC 2013).
Note: 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.

Of the sources that report under the GHGRP, Dry Fork Station and Wyodak are the largest sources of GHG emissions in the BFO. Emissions at both facilities dropped between 2017 and 2019, falling by 582 thousand metric tons of CO_2e at Dry Fork Station and by 851 thousand metric tons at Wyodak. Between 2019 and 2021, emissions continued to decrease at Wyodak, falling by a total of approximately 117 thousand metric tons of CO_2e. Dry Fork Station emissions increased by 579 thousand metric tons in 2020 before dropping by 380 thousand metric tons in 2021.

Coal. The BLM forecasts that existing leases in the CDPA would allow for coal mining until 2041. Total and federal production from these existing leases peaks in 2022 and then declines thereafter. **Table 3-33** shows GHG emissions from the mining, transportation, and downstream combustion of federal, nonfederal, and total coal produced in the CDPA in 2022. **Table 3-34** presents the GHG emissions from mining, transportation, and downstream combustion of coal from existing federal leases in the CDPA from 2023 to 2048. Federal production and corresponding emissions are highest during this period in 2023 and then decline until federal coal from existing leases is exhausted in 2041. Emissions from existing leases from 2042 to 2048 are zero. The technical approach for the estimation of these emissions is provided in the ARTSD (**Appendix C**) along with the emissions for individual GHGs.

Table 3-33
Estimated Greenhouse Gas Emissions from Mining, Transportation, and Downstream Combustion of Coal from in the CDPA in 2022

Mineral Designation	Annual Production (short tons)	Coal Mining Emissions (MMT CO_2e)	Coal Rail Transportation Emissions (MMT CO_2e)	Coal Downstream Combustion Emissions (MMT CO_2e)	Total Coal Emissions (MMT CO_2e)
Federal	262,197,857	5.65	5.79	445.57	19.31
Nonfederal	6,309,933	0.14	0.14	10.72	17.08
Total	268,507,790	5.79	5.93	456.29	36.39

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-34
Greenhouse Gas Emissions from Mining, Transportation, and Downstream Combustion Coal from Existing Federal Leases in the CDPA from 2023 to 2048

Year	Annual Production (short tons)	Coal Mining Emissions (MMT CO_2e)	Coal Rail Transportation Emissions (MMT CO_2e)	Coal Downstream Combustion Emissions (MMT CO_2e)	Coal Total Emissions (MMT CO_2e)
2023	256,582,534	5.5	5.7	436.0	447.2
2024	248,266,712	5.3	5.5	421.9	432.7
2025	176,946,217	3.8	3.9	300.7	308.4
2026	204,626,556	4.4	4.5	347.7	356.7
2027	234,334,400	5.0	5.2	398.2	408.4
2028	232,224,312	5.0	5.1	394.6	404.7
2029	232,303,676	5.0	5.1	394.8	404.9
2030	227,034,696	4.9	5.0	385.8	395.7
2031	226,909,180	4.9	5.0	385.6	395.5
2032	227,340,225	4.9	5.0	386.3	396.3

Year	Annual Production (short tons)	Coal Mining Emissions (MMT CO_2e)	Coal Rail Transportation Emissions (MMT CO_2e)	Coal Downstream Combustion Emissions (MMT CO_2e)	Coal Total Emissions (MMT CO_2e)
2033	227,628,869	4.9	5.0	386.8	396.8
2034	229,128,952	4.9	5.1	389.4	399.4
2035	211,712,085	4.6	4.7	359.8	369.0
2036	214,126,733	4.6	4.7	363.9	373.2
2037	197,366,566	4.3	4.4	335.4	344.0
2038	195,028,670	4.2	4.3	331.4	339.9
2039	192,431,579	4.1	4.3	327.0	335.4
2040	190,100,367	4.1	4.2	323.1	331.3
2041	71,249,813	1.5	1.6	121.1	124.2
2042–2048	0	0.0	0.0	0.0	0.0
Total 2023–2038	**3,541,560,383**	**76.3**	**78.2**	**6,018.4**	**6,172.9**
Total 2023–2048	**3,995,342,143**	**86.1**	**88.2**	**6,789.6**	**6,963.9**

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and using the 100-year GWPs from AR6 are provided in the ARTSD (**Appendix C**).

Oil and Gas. The GHG emissions from the production, transportation/processing, and downstream combustion of federal, nonfederal, and total oil, conventional natural gas, and coalbed natural gas produced in the BFO in 2022 are shown in **Table 3-35**, **Table 3-36**, and **Table 3-37**.

Table 3-35
Greenhouse Gas Emissions from Production, Transportation, Processing, and Downstream Combustion of Federal, Nonfederal, and Total Oil from in the BFO in 2022

Mineral Designation	Annual Production (MMBO)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
Federal	4.7	0.10	0.28	2.04	2.43
Nonfederal	5.0	0.10	0.30	2.17	2.58
Total	9.7	0.21	0.58	4.21	5.00

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-36
Greenhouse Gas Emissions from Production, Transportation, Processing, and Downstream Combustion of Federal, Nonfederal, and Total Conventional Natural Gas from in the BFO in 2022

Mineral Designation	Annual Production (BCF)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
Federal	4.0	0.23	0.09	0.22	0.54

Mineral Designation	Annual Production (BCF)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
Nonfederal	3.3	0.23	0.08	0.18	0.48
Total	7.3	0.46	0.17	0.40	1.02

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-37
Greenhouse Gas Emissions from Production, Transportation, Processing, and Downstream Combustion of Federal, Nonfederal, and Total Coalbed Natural Gas from in the BFO in 2022

Mineral Designation	Annual Production (BCF)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
Federal	58.9	0.77	1.33	3.21	5.31
Nonfederal	103.6	1.61	2.33	5.65	9.59
Total	162.5	2.38	3.66	8.87	14.90

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Monetized Impacts of Greenhouse Gas Emissions from Existing Leases

The social cost of carbon, social cost of N_20, and social cost of methane—together, the social cost of greenhouse gases (SC-GHG)—are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year. It includes the estimated value of all climate change impacts, including but not limited to public health effects, changes in net agricultural productivity, property damage from increased flood risk, natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services (Interagency Working Group on the Social Cost of Greenhouse Gases [IWG] 2021).

On January 20, 2021, President Biden issued Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.[2] Section 1 of Executive Order 13990 establishes an administration policy to, among other things, listen to the science; improve public health and protect our environment; ensure access to clean air and water; reduce GHG emissions; and bolster resilience to the impacts of climate change.[3] Section 2 of the order calls for federal agencies to review existing regulations and policies issued between January 20, 2017, and January 20, 2021, for consistency with the policy articulated in the order and to take appropriate action.

Consistent with Executive Order 13990, the CEQ rescinded its 2019 "Draft National Environmental Policy Act Guidance on Considering Greenhouse Gas Emissions" and issued interim NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change.[4] This guidance, effective upon

[2] 86 *Federal Register* 7037 (January 25, 2021)
[3] 86 *Federal Register* 7037 (January 25, 2021), Section 1
[4] *Federal Register*: National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change

publication, builds upon and updates the CEQ's 2016 Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. While the CEQ works on updated guidance, it has instructed agencies to consider and use all tools and resources available to them in assessing GHG emissions and climate change effects, including recommending that agencies provide additional context for GHG emissions through the use of social cost of GHG estimates.

Regarding the use of social cost of carbon or other monetized costs and benefits of GHGs, the CEQ 2016 GHG Guidance noted that NEPA does not require monetizing costs and benefits (CEQ 2016). It also noted that "the weighing of the merits and drawbacks of the various alternatives need not be displayed using a monetary cost-benefit analysis and should not be when there are important qualitative considerations."

Section 5 of Executive Order 13990 emphasized how important it is for federal agencies to "capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account" and established the IWG.[5] In February 2021, the IWG published Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990 (IWG 2021). This is an interim report that updated previous guidance from 2016.

For federal agencies, the best currently available estimates of the SC-GHG are the interim estimates of the social cost of carbon dioxide, methane, and N_20 developed by the IWG on the SC-GHG. Select estimates are published in the IWG's technical support document (IWG 2021) and the complete set of annual estimates are available on the Office of Management and Budget's website[6]. The IWG's SC-GHG estimates are based on complex models describing how GHG emissions affect global temperatures, sea level rise, and other biophysical processes; how these changes affect society through, for example, agricultural, health, or other effects; and monetary estimates of the market and nonmarket values of these effects. One key parameter in the models is the discount rate, which is used to estimate the present value of the stream of future damages associated with emissions in a particular year. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (that is, future benefits or costs are a less significant factor in present-day decisions). The current set of interim estimates of SC-GHG have been developed using three different annual discount rates: 2.5 percent, 3 percent, and 5 percent (IWG 2021).

As expected with such a complex model, there are multiple sources of uncertainty inherent in the SC-GHG estimates. Some sources of uncertainty relate to physical effects of GHG emissions, human behavior, future population growth and economic changes, and potential adaptation (IWG 2021). To better understand and communicate the quantifiable uncertainty, the IWG method generates several thousand estimates of the social cost for a specific gas, emitted in a specific year, with a specific discount rate. These estimates create a frequency distribution based on different values for key uncertain climate model parameters. The shape and characteristics of that frequency distribution demonstrate the magnitude of uncertainty relative to the average or expected outcome.

[5] Executive Order 13990, Section 5

[6] https://www.whitehouse.gov/omb/information-regulatory-affairs/regulatory-matters/#scghgs

To further address uncertainty, the IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average damages from the multiple simulations at each of the three discount rates. The fourth value represents higher-than-expected economic impacts from climate change. Specifically, it represents the 95th percentile of damages estimated, applying a 3 percent annual discount rate for future economic effects. This is a low probability, but high damage scenario, that represents an upper bound of damages within the 3 percent discount rate model. The estimates below follow the IWG recommendations.

The SC-GHGs described below are associated with estimated emissions from existing federal leases as described in the *Emissions and Trends in the BFO* section. These estimates represent the present value of future market and nonmarket costs associated with CO_2, CH_4, and N_2O emissions. Estimates are calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and BLM's estimates of emissions in each year. They are rounded to the nearest $100.

Table 3-38 provides annual SC-GHG estimates for the for total coal lifespan emissions associated with existing federal leases. Detailed tables with social cost specific to CO_2, CH_4, and NO_2 are included in **Appendix D**, **Table D-8**.

Table 3-38
Social Cost of Greenhouse Gas Emissions from Mining, Transportation, and Downstream Combustion of Coal from Existing Federal Leases in the CDPA from 2023 to 2041 (2023$)

Year	Average Value, 5% Discount Rate ($)	Average Value, 3% Discount Rate ($)	Average Value, 2.5% Discount Rate ($)	95th Percentile Value, 3% Discount Rate ($)
2023	7,098,054,000	24,073,494,900	35,598,073,600	71,790,280,100
2024	6,741,986,400	23,061,355,000	34,152,954,400	68,904,297,100
2025	4,712,508,400	16,266,527,500	24,129,323,300	48,691,768,400
2026	5,340,480,600	18,610,172,500	27,653,852,700	55,805,772,500
2027	5,988,387,000	21,076,946,600	31,376,627,300	63,309,687,800
2028	5,806,504,500	20,649,662,200	30,800,353,300	62,127,862,600
2029	5,678,981,700	20,415,485,100	30,513,211,700	61,520,229,800
2030	5,423,070,300	19,713,309,300	29,526,537,600	59,494,946,800
2031	5,318,044,500	19,484,448,400	29,231,340,300	58,915,844,300
2032	5,223,548,000	19,300,729,900	29,006,017,000	58,467,209,600
2033	5,123,115,400	19,098,806,500	28,755,319,700	57,957,563,400
2034	5,047,231,300	18,993,627,600	28,652,583,500	57,736,062,000
2035	4,561,330,000	17,333,828,400	26,201,701,400	52,777,031,300
2036	4,508,881,700	17,310,622,000	26,221,937,200	52,789,730,700
2037	4,059,352,400	15,750,168,700	23,910,609,700	48,104,162,300
2038	3,915,391,200	15,358,855,200	23,369,881,600	46,978,223,400
2039	3,768,877,500	14,951,212,500	22,803,161,600	45,796,385,700
2040	3,630,085,300	14,567,903,800	22,272,467,700	44,683,852,900
2041	1,328,996,800	5,384,125,000	8,249,812,500	16,512,882,400
2023–2041 total cost	93,274,826,966	341,401,281,065	512,425,766,020	1,032,363,793,145

Source: GHG emission calculation and IWG 2021

Emissions Control and Carbon Capture

Development of carbon capture, utilization, and storage (CCUS) technologies have the potential to mitigate emissions from coal combustion. Currently the Petra Nova carbon capture and sequestration project at the W.A. Parish Generating station is the only commercial-scale CCUS project operating in the US (DOE 2017), the project recently became operational again after a multi-year shutdown (Reuters 2023). However, there are several small-scale coal-based research CCUS projects in operation, with additional projects under development (National Energy Technology Laboratory 2023). If all these projects are developed, they could capture up to an additional 35 MMT of CO_2 each year by 2030 on top of the 5 MMT captured by existing projects.

The U.S. Department of Energy's (DOE) Office of Clean Energy Demonstrations awarded a grant in February 2024, to test a sorbent-based carbon capture system at the Wyoming Integrated Test Center (ITC), near Gillette. The project will test carbon capture, utilization and storage technologies using flue gas directly from the power plant; with the goal to develop sorbent-based technology, which could be scaled up for use at coal fired power plants around the world (Univ Wy 2024).

The University of Wyoming and Basin Electric are seeking a grant from the US Department of Energy's (DOE's) CarbonSAFE program to research the feasibility of commercial-scale geologic CO_2 storage north of Gillette, Wyoming. Approximately 57.5 MMT of CO_2 would be injected into subsurface pore space over a period of 30 years. Membrane capture is the preferred and probable method; an alternative capture method proposed is an amine-based capture approach. If selected, construction would be initiated in 2025 and operations in 2027. Similar carbon storage projects are being proposed in southwest Wyoming. The DOE's environmental assessment of the project for public review was published January 20, 2024 and is available at https://energy.gov/nepa/doeea-2194-wyoming-carbonsafe-phase-iv-project-gillette-wyoming.

3.5.2.2 Direct and Indirect Impacts

Analysis Methods

This section analyzes the three main GHGs (CO_2, N_2O, and CH_4) associated with the production, transportation, and downstream combustion of coal, oil, and gas and other BLM-authorized activities. Emissions from the production, transportation/processing, and downstream combustion of oil, gas, and coal from the BFO are estimated using BLM (oil and gas) and EIA (coal) forecasted production rates and emission factors from the EPA and National Energy Technology Laboratory of the DOE. Descriptions of the approaches used to estimate GHG emissions are provided in **Section 2.0** of the ARTSD (**Appendix C**). The emissions shown under each alternative represent the increment over the existing emissions presented in the Affected Environment.

Emissions in CO_2e are calculated using 20-year and 100-year time horizon GWPs from IPCC AR6 (IPCC 2021). GHG emissions are presented in this section as 20-year CO_2e unless otherwise noted. Emissions by individual GHG and as 100-year CO_2e are presented in the ARTSD (**Appendix C**).

Assumptions

- Coal mining emission factors from National Energy Technology Laboratory and transportation and downstream combustion emission factors from EPA are representative of the direct and indirect emissions of coal development in the CDPA.
- The GHG impact analysis is performed both annually for GHG emissions through 2048 as well as cumulatively beyond 2048.

- Emissions factors used for coal combustion assume all coal is combusted in US energy-generating units.
- The 2022 EIA Annual Energy Outlook reference case as applied in the national BLM Specialist Report (BLM 2022b) is representative of cumulative long-term onshore federal mineral production emissions.

Indicators

The following indicators are used in the analysis of GHGs and climate change:

- Statistical descriptions of climate variables (for example, mean annual temperature) as indicators of climate change
- Emissions (in MMT) of CO_2, CH_4, N_2O, and CO_2e from coal production, transportation, and downstream combustion annually and cumulatively
- Emissions (in MMT) of CO_2, CH_4, N_2O, and CO_2e from oil and gas production, gathering/boosting, and downstream combustion annually and cumulatively

Impacts Common to all Alternatives

Oil and Gas

Impacts for oil and gas are presented following the annual reasonably foreseeable production forecast through the end of the planning period (that is, 2038). The oil and gas production and therefore associated GHG emissions do not change by alternative. The GHG emissions from the production, transportation and processing, and downstream combustion of federal oil, conventional natural gas, and coalbed natural gas from the BFO from 2023 to 2038 are shown in **Table 3-39**, **Table 3-40**, and **Table 3-41**, respectively.

Table 3-39
Federal Oil Production and Midstream Emissions of Greenhouse Gases from the BFO in 2023–2038

Year	Annual Production (MMBO)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
2023	5.1	0.09	0.31	2.22	2.62
2024	5.6	0.08	0.34	2.43	2.85
2025	5.8	0.09	0.35	2.52	2.96
2026	6.3	0.09	0.38	2.74	3.21
2027	6.3	0.09	0.38	2.74	3.21
2028	6.7	0.10	0.40	2.91	3.42
2029	6.7	0.10	0.40	2.91	3.42
2030	6.7	0.10	0.40	2.91	3.42
2031	6.7	0.10	0.40	2.91	3.42
2032	6.7	0.10	0.40	2.91	3.42
2033	6.7	0.10	0.40	2.91	3.42
2034	6.7	0.10	0.40	2.91	3.42
2035	6.7	0.10	0.40	2.91	3.42
2036	6.7	0.10	0.40	2.91	3.42
2037	6.7	0.10	0.40	2.91	3.42
2038	6.7	0.10	0.40	2.91	3.42
Total	102.8	1.57	6.20	44.66	52.42

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-40
Federal Conventional Natural Gas Production and Midstream Emissions of Greenhouse Gases from the BFO in 2023–2038

Year	Annual Production (BCF)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
2023	4.5	0.23	0.10	0.24	0.57
2024	10.1	0.21	0.23	0.55	0.99
2025	10.6	0.22	0.24	0.58	1.04
2026	11.0	0.23	0.25	0.60	1.08
2027	10.9	0.23	0.24	0.59	1.07
2028	10.5	0.22	0.24	0.57	1.03
2029	10.5	0.22	0.24	0.57	1.03
2030	10.5	0.22	0.24	0.57	1.03
2031	10.5	0.22	0.24	0.57	1.03
2032	10.5	0.22	0.24	0.57	1.03
2033	10.5	0.22	0.24	0.57	1.03
2034	10.5	0.22	0.24	0.57	1.03
2035	10.5	0.22	0.24	0.57	1.03
2036	10.5	0.22	0.24	0.57	1.03
2037	10.5	0.22	0.24	0.57	1.03
2038	10.5	0.22	0.24	0.57	1.03
Total	162.3	3.51	3.65	8.86	16.02

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-41
Federal Coalbed Natural Gas Production and Midstream Emissions of Greenhouse Gases from the BFO in 2023–2038

Year	Annual Production (BCF)	Production Emissions (MMT CO_2e)	Transportation/ Processing Emissions (MMT CO_2e)	Downstream Combustion Emissions (MMT CO_2e)	Total Emissions (MMT CO_2e)
2023	65.8	0.59	1.48	3.59	5.66
2024	66.9	0.34	1.50	3.65	5.49
2025	70.2	0.36	1.58	3.83	5.77
2026	72.5	0.37	1.63	3.96	5.96
2027	71.8	0.37	1.62	3.92	5.90
2028	69.1	0.35	1.55	3.77	5.68
2029	69.1	0.35	1.55	3.77	5.68
2030	69.1	0.35	1.55	3.77	5.68
2031	69.1	0.35	1.55	3.77	5.68
2032	69.1	0.35	1.55	3.77	5.68
2033	69.1	0.35	1.55	3.77	5.68
2034	69.1	0.35	1.55	3.77	5.68
2035	69.1	0.35	1.55	3.77	5.68
2036	69.1	0.35	1.55	3.77	5.68
2037	69.1	0.35	1.55	3.77	5.68
2038	69.1	0.35	1.55	3.77	5.68
Total	1,107.6	5.88	24.91	60.42	91.21

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from the from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual gas and for 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Other BLM-authorized Activities

The GHG emissions impacts analysis of other BLM-authorized activities from the 2015 RMP are incorporated by reference and summarized below for the selected alternative of the 2015 RMP (Alternative D). The activities assessed in the 2015 RMP were:

- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Minerals
- Fire and Fuels Management
- Forestry and Woodland Management
- Land Resources – Rights-of-Way and Renewable Energy Projects
- Land Resources – Comprehensive Trails and Travel Management
- Livestock Grazing Management

The BLM estimated emissions for these activities for the years 2015 and 2024. The emissions estimates for 2024 are incorporated here. Note that the BLM expects that the 2024 annual activity rates and corresponding emissions for these activities from the 2015 RMP remain representative of expected activity levels and emissions for the remaining plan life under all alternatives. The annual emissions from other BLM-authorized activities are shown in **Table 3-42**. Salable minerals and livestock grazing are the largest source of emissions from these other activities, comprising approximately 36 percent and 30 percent of the total 20-year CO_2e emissions from these activities, respectively.

To the extent that the BLM or other entities authorize any CCUS in the future, the net annual GHG emissions due to BLM-authorized actions and/or net cumulative GHG emissions would be lower due to carbon capture and sequestration.

Table 3-42
Annual Emissions of Greenhouse Gases from Other BLM-Authorized Activities in the BFO

Resources	Greenhouse Gases (metric tons/year)				
	CO_2	CH_4	N_2O	CO_2e (AR6 100-year)[1]	CO_2e (AR6 20-year)[1]
Locatable Minerals – Bentonite Mining	9,556.28	—	—	9,556.28	9,556.28
Locatable Minerals – Uranium Mining	1,631.12	—	—	1,631.12	1,631.12
Salable Minerals – Sand, Gravel, and other Minerals	34,288.86	—	—	34,288.86	34,288.86
Fire and Fuels Management	8.16	71.67	4.54	3,382.17	7,159.05
Forest and Woodlands Management	26.31	—	—	26.31	26.31
Land Resources – Rights-of-Way and Renewable Energy Projects	1,849.75	—	—	1,849.75	1,849.75
Land Resources – Comprehensive Trails and Travel Management	11,913.15	5.44	—	12,075.35	12,362.21

Resources	Greenhouse Gases (metric tons/year)				
	CO_2	CH_4	N_2O	CO_2e (AR6 100-year)[1]	CO_2e (AR6 20-year)[1]
Livestock Grazing Management	70.76	352.89	—	9,669.50[2]	28,584.67[2]
Total Other BLM Activities	**59,344.40**	**430.01**	**4.54**	**72,479.34**	**95,458.24**

Source: BLM 2015b

Notes:

[1] CO_2e for other BLM activities (except for livestock grazing management) are calculated using 100-year and 20-year GWPs designated for fossil origin GHG emissions from the IPCC AR6 (IPCC 2021)

[2] CO_2 equivalents for livestock grazing management are calculated using 100-year and 20-year GWPs designated for non-fossil origin GHG emissions from the IPCC AR6 (IPCC 2021)

Monetized Impacts of Greenhouse Gases from BFO Oil and Natural Gas and Other BLM-authorized Activities

This subsection monetizes the greenhouse gas emissions as presented above in **Table 3-39**, **Table 3-40**, **Table 3-41**, and **Table 3-42**. Such analysis should not be construed to mean a cost determination is necessary to address potential impacts of GHGs associated with specific alternatives. These numbers were monetized; however, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document. SC-GHG is provided only as a useful measure of the benefits of GHG emissions reductions to inform agency decision-making. Additional details related to the methods utilized for SC-GHG calculations and BLM SC-GHG policy are included in the affected environment discussion for this resource.

Under all alternatives, emissions from federal oil and natural gas and other sources would be consistent, as discussed in the section above. Estimated social cost of greenhouse gases for the planning period of 2023–2038 are included below in **Table 3-43**.

Table 3-43
BFO Oil and Natural Gas and Other Emissions Social Cost of Greenhouse Gas Emissions 2023–2038

	Average Value, 5% Discount Rate ($)	Average Value, 3% Discount Rate ($)	Average Value, 2.5% Discount Rate ($)	95th Percentile Value, 3% Discount Rate ($)
Federal Oil	709,167,000	2,613,784,000	3,931,999,000	7,890,087,800
Federal Conventional Natural Gas	189,809,900	655,127,100	971,051,800	1,948,348,600
Federal Coal Bed Natural Gas	1,093,339,200	3,851,175,800	5,735,365,400	11,509,460,000
Other Emissions	18,290,400	61,477,300	90,586,200	181,318,900

Source: GHG emission calculation and IWG 2021

Note: Social cost estimates for emissions years beyond 2050 are estimated using an annual growth rate equal to the average annual growth in social cost estimates for the last 5 years of available estimates from the TSD (2046–2050).

Alternative A (No Leasing)

Under Alternative A (No Leasing), the production and GHG emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* (see **Table 3-10**) would occur from 2023 to 2041. Coal production in the CDPA is anticipated to end during

2041 under this alternative when existing federal leases are exhausted since no new coal lease applications would be accepted. Therefore, there would be no coal-related GHG emissions under this alternative as shown in **Table 3-44**, and the GHG emissions would be the lowest of all alternatives.

Table 3-44
Greenhouse Gas Emissions from Mining, Transportation, and Downstream Combustion of Federal Coal from Potential New Leases in the CDPA under Alternative A (No Leasing)

Year	Annual Federal Production (short tons)	Federal Coal Mining Emissions (MMT CO_2e)	Federal Coal Rail Transportation Emissions (MMT CO_2e)	Federal Coal Downstream Combustion Emissions (MMT CO_2e)	Federal Coal Total Emissions (MMT CO_2e)
2023–2048	0	0	0	0	0
Total from 2023–2038	**0**	**0**	**0**	**0**	**0**
Total from 2023–2048	**0**	**0**	**0**	**0**	**0**

Table 3-45 shows the number of coal-fired power plants, gasoline-powered passenger vehicles, and other more readily understandable sources that would result in the equivalent amount of annual emissions (produced, avoided, or sequestered) as the annual average coal-related emissions from 2041 to 2048 under each alternative. As there are zero emissions from future federal coal leases under Alternative A (No Leasing), the equivalent GHG emissions are also zero and thus lower than Alternatives B, No Action, and C, Limited Leasing.

Table 3-45
Comparison of the Annual Average Coal-Related Greenhouse Gas Emissions during 2041–2048 from Potential New Federal Leases under Alternatives A (No Leasing), B (No Action), and C (Limited Leasing) to Equivalent Annual GHG Emissions Produced, Avoided, or Sequestered from other Common Activities

Alternative	Average Annual Federal Coal-Related Emissions* (MMT CO_2e)	Number of Coal-fired Power Plants†	Number of Gasoline-Powered Passenger Vehicles†	Number of Homes' Electricity Use†	Number of Wind Turbines§	Acres of US Forests¶
A, No Leasing	0	0	0	0	0	0
B, No Action	282.5	75.6	60,868,486	54,965,894	76,786	334,311,869
C, Limited Leasing	255.3	68.3	55,005,255	49,671,237	69,390	302,108,871

Source: Calculated using the EPA Greenhouse Gas Equivalencies Calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator) with the 100-year CO_2e emissions from coal-related activities (direct, transportation, and downstream combustion) from potential new future federal leases under each alternative.
Notes: CO_2e are calculated using the 100-year time horizon global warming potentials from the IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 29.8; N_2O = 273.
* The average annual emissions from potential new future leases were calculated for the period 2041 to 2048 to allow for a consistent comparison between alternatives. The coal-related emissions include direct, transportation, and downstream combustion emissions. Note that Alternative B, No Action, emissions occur beyond 2048.
† Annual equivalent emissions produced by
§ Annual equivalent emissions avoided
¶ Annual equivalent emissions sequestered

Monetized Impacts of Greenhouse Gas Emissions under the No Leasing Alternative

Under Alternative A (No Leasing), the social costs of greenhouse gases would be as discussed under *Affected Environment* and would occur from 2023 to 2041 (see **Table 3-38**). Coal production in the CDPA under this alternative is anticipated to end during 2041 when existing federal leases are exhausted, because new coal lease applications would not be accepted.

Alternative B (No Action)

Alternative B (No Action) would allow for federal coal leasing to continue until the reserve of approximately 48.01 billion short tons has all been mined. The production and GHG emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur until these leases are exhausted during 2041. Then, potential future leases would allow for production and emissions to continue beyond that year.

Emissions of GHGs from the mining, transportation, and downstream combustion of coal from potential new federal leases under Alternative B (No Action) are shown in **Table 3-46**. Forecasted federal production and the corresponding GHG emissions from future leases are highest in 2042 and lower in subsequent years. Compared with Alternative A (No Leasing), future leasing under Alternative B, No Action, would result in approximately an additional 2,260 MMT of CO_2e from mining, transportation, and downstream combustion of federal coal from 2041 to 2048.

Table 3-46
Greenhouse Gas Emissions from Mining, Transportation, and Downstream Combustion of Federal Coal from Potential New Leases in the CDPA under Alternative B (No Action)

Year	Annual Federal Production (short tons)	Federal Coal Mining Emissions (MMT CO_2e)	Federal Coal Rail Transportation Emissions (MMT CO_2e)	Federal Coal Downstream Combustion Emissions (MMT CO_2e)	Federal Coal Total Emissions (MMT CO_2e)
2023–2040	0	0.00	0.00	0.00	0.00
2041	112,288,770	2.42	2.47	190.82	195.71
2042	180,648,019	3.89	3.96	306.99	314.84
2043	180,097,552	3.88	3.95	306.05	313.88
2044	180,427,291	3.89	3.99	306.61	314.49
2045	165,876,958	3.57	3.66	281.89	289.12
2046	161,284,537	3.47	3.55	274.08	281.11
2047	159,152,407	3.43	3.42	270.46	277.31
2048	156,976,818	3.38	3.34	266.76	273.48
Total from 2023–2038	**0**	**0.00**	**0.00**	**0.00**	**0.00**
Total from 2023–2048	**1,296,752,352**	**27.94**	**28.34**	**2,203.66**	**2,259.94**

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Table 3-45 shows the number of coal-fired power plants, gasoline-powered passenger vehicles, and other more readily understandable sources that would result in the equivalent amount of annual emissions (produced, avoided, or sequestered) as the annual average coal-related emissions from 2041 to 2048 under each alternative. The annual average coal-related GHG emissions and equivalencies under

Alternative B (No Action) are higher than those under both Alternative A (No Leasing) and Alternative C (Limited Leasing).

Under Alternative B, No Action, coal mining could continue after 2048 until the approximate 48.01 billion short ton reserve is exhausted. At the total (federal plus nonfederal) 2048 production rate of approximately 160.75 million short tons per year, the reserves would allow for coal mining to continue until approximately 2338 (see **Section 2.2**). Although it is unrealistic that this would occur (due to changing energy policies and decline in coal usage), if the remaining amount of coal available for future leasing after 2048 (approximately 46.7 billion short tons) under Alternative B (No Action) is all combusted, this would result in an estimated 79.33 billion metric tons of CO_2e (based on IPCC AR6 [IPCC 2021] 20-year GWPs) of additional GHG emissions. These additional emissions would not occur under Alternatives A (No Leasing) or C (Limited Leasing), and thus the emissions under Alternative B (No Action) are the highest of all alternatives.

The emissions from the mining, transportation, and downstream combustion of coal from potential future leases under Alternative B (No Action) would contribute incrementally to global climate change and the climate impacts discussed under *Affected Environment*.

<u>Monetized Impacts of Greenhouse Gas Emissions from New Coal Leases after 2041 under Alternative B, No Action</u>

This subsection monetizes the greenhouse gas emissions as presented above in **Table 3-44**, **Table 3-45**, and **Table 3-46**. Under this alternative, the production and emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur. BFO coal mining could continue until approximately 2338 based on estimated rates of production and available reserves. The rate of emissions would be the same as in 2048, and the associated social costs of greenhouse gases would continue at a decreasing annual rate. SC-GHG calculations are included below for 2041 to 2048 (**Table 3-47**). Specific estimates are not available for the time period to 2338 due to limitations of EIA and IWG 2021 social cost estimates, however, estimated average annual costs over this time period are provided below.

Table 3-47
Alternative B, No Action, Social Cost of Greenhouse Gas Estimates 2041–2048

Years	Average Value, 5% Discount Rate ($)	Average Value, 3% Discount Rate ($)	Average Value, 2.5% Discount Rate ($)	95th Percentile Value, 3% Discount Rate ($)
2041	2,094,481,500	8,485,310,200	13,001,596,100	26,024,085,800
2042	3,289,323,800	13,457,899,300	20,667,892,100	41,270,409,800
2043	3,199,534,900	13,224,993,400	20,357,822,000	40,552,154,700
2044	3,125,878,800	13,057,740,100	20,149,049,400	40,035,452,000
2045	2,800,643,300	11,827,043,000	18,295,627,000	36,259,161,700
2046	2,652,541,000	11,327,307,400	17,567,268,900	34,723,784,600
2047	2,547,527,600	11,004,493,000	17,111,192,200	33,731,218,700
2048	2,444,854,200	10,685,863,100	16,659,963,500	32,751,735,600
Total from 2041–2048	22,154,785,000	93,070,649,500	143,810,411,300	285,348,002,800
Average Annual 2049-2338	2,769,348,127	11,633,831,186	17,976,301,411	35,668,500,356

Source: GHG emission calculation and IWG 2021
Note: Social cost estimates for emissions years beyond 2050 are estimated using an annual growth rate equal to the average annual growth in social cost estimates for the last 5 years of available estimates from the technical support document (2046–2050).

Alternative C (Limited Leasing)

As with the other alternatives, the production and GHG emissions due to existing coal leases under Alternative C (Limited Leasing) and the associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur from 2023 to 2041. After that point, Alternative C, Limited Leasing, would allow a limited amount of leasing through 2038 and production through 2048.

Emissions of GHGs from the mining, transportation, and downstream combustion of potential new federal leases under Alternative C (Limited Leasing) are shown in **Table 3-48**. As with Alternative B (No Action), forecasted federal production and the corresponding GHG emissions from future leases are highest in 2042 and lower in subsequent years. Compared with Alternative A (No Leasing), future leasing under Alternative C (Limited Leasing) would result in approximately an additional 2,042 MMT of CO_2e emissions from mining, transportation, and downstream combustion of federal coal from 2041 to 2048. The total federal coal-related CO_2e emissions from future leases during that period are approximately 9.6 percent lower than Alternative B (No Action) due federal coal being exhausted during 2048 and lower coal production and emissions during that year. There would be no coal production from future leases after 2048, and so GHG emissions from mining, transportation, and downstream combustion of federal coal after 2048 would be zero under Alternative C (Limited Leasing).

Table 3-45 shows the number of coal-fired power plants, gasoline-powered passenger vehicles, and other more readily understandable sources that would result in the equivalent amount of annual emissions (produced, avoided, or sequestered) as the annual average coal-related emissions from 2041 to 2048 under each alternative. The annual average coal-related GHG emissions and equivalencies under Alternative C (Limited Leasing) are higher than those under Alternative A (No Leasing) and lower than those under Alternative B (No Action), as discussed above.

The emissions from the mining, transportation, and downstream combustion of coal from potential future leases under Alternative C (Limited Leasing) would contribute incrementally to global climate change and the climate impacts discussed under *Affected Environment*.

Table 3-48
Greenhouse Gas Emissions from Mining, Rail Transportation, and Downstream Combustion of Federal Coal from Potential New Leases in the CDPA under Alternative C (Limited Leasing)

Year	Annual Federal Production (short tons)	Federal Coal Mining Emissions (MMT CO_2e)	Federal Coal Rail Transportation Emissions (MMT CO_2e)	Federal Coal Downstream Combustion Emissions (MMT CO_2e)	Federal Coal Total Emissions (MMT CO_2e)
2023–2040	0	0.00	0.00	0.00	0.00
2041	112,288,770	2.42	2.47	190.82	195.71
2042	180,648,019	3.89	3.96	306.99	314.84
2043	180,097,552	3.88	3.95	306.05	313.88
2044	180,427,291	3.89	3.99	306.61	314.49
2045	165,876,958	3.57	3.66	281.89	289.12
2046	161,284,537	3.47	3.55	274.08	281.11
2047	159,152,407	3.43	3.42	270.46	277.31

Year	Annual Federal Production (short tons)	Federal Coal Mining Emissions (MMT CO_2e)	Federal Coal Rail Transportation Emissions (MMT CO_2e)	Federal Coal Downstream Combustion Emissions (MMT CO_2e)	Federal Coal Total Emissions (MMT CO_2e)
2048	32,024,466	0.69	0.68	54.42	55.79
Total from 2023–2038	**0**	**0.00**	**0.00**	**0.00**	**0.00**
Total from 2023–2048	**1,171,800,000**	**25.25**	**25.68**	**1,991.32**	**2,042.25**

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and 100-year CO_2e are provided in the ARTSD (**Appendix C**).

Monetized Impacts of Greenhouse Gas Emissions from New Coal Leases under Alternative C (Limited Leasing)

This subsection monetizes the greenhouse gas emissions as presented above in **Table 3-48**. Under Alternative C (Limited Leasing), federal coal emissions in BFO would be the same as under Alternative B (No Action) until 2048, when coal reserves would be exhausted. There would be no coal production from future leases after 2048, and so GHG emissions and associated social costs from mining, transportation, and downstream combustion of federal Powder River Basin coal after 2048 would be zero. Social cost of greenhouse gas estimates for 2041–2048 are displayed in **Table 3-49**.

Table 3-49
Alternative C, Limited Leasing, Social Cost of Greenhouse Gas Estimates 2041–2048

Years	Average Value, 5% Discount Rate ($)	Average Value, 3% Discount Rate ($)	Average Value, 2.5% Discount Rate ($)	95th Percentile Value, 3% Discount Rate ($)
2041	2,094,481,500	8,485,310,200	13,001,596,100	26,024,085,800
2042	3,289,323,800	13,457,899,300	20,667,892,100	41,270,409,800
2043	3,199,534,900	13,224,993,400	20,357,822,000	40,552,154,700
2044	3,125,878,800	13,057,740,100	20,149,049,400	40,035,452,000
2045	2,800,643,300	11,827,043,000	18,295,627,000	36,259,161,700
2046	2,652,541,000	11,327,307,400	17,567,268,900	34,723,784,600
2047	2,547,527,600	11,004,493,000	17,111,192,200	33,731,218,700
2048	498,768,900	2,179,997,400	3,398,759,400	6,681,603,300
Total from 2041–2048	20,208,699,700	84,564,783,800	130,549,207,100	259,277,870,600

Source: GHG emission calculation and IWG 2021
Note: Social cost estimates for emissions years beyond 2050 are estimated using an annual growth rate equal to the average annual growth in social cost estimates for the last 5 years of available estimates from the TSD (2046–2050).

3.5.2.3 Cumulative Impacts

The production, transportation and processing, and downstream combustion of federal oil, gas, and coal produced in the BFO along with other BLM-authorized activities would result in the emission of GHGs that would contribute to global warming and the climate change impacts discussed under *Affected Environment.*

Table 3-50 shows the cumulative GHG emissions from federal and nonfederal coal-related activities, including mining, transportation, and downstream combustion. Total emissions are shown for the 2023 to 2038 planning period as well as through 2048, which is the extent of the coal RFD scenario. These cumulative coal emissions during the remaining planning period (that is, 2023–2038) total approximately

6,321 MMT CO_2e and are the same across all alternatives. From 2023–2048, the total (federal plus nonfederal) coal-related GHG emissions are highest under Alternative B (No Action) and lowest under Alternative A (No Leasing). The total coal-related emissions under Alternative A (No Leasing) and Alternative C (Limited Leasing) during that period are approximately 24.5 percent and 2.4 percent lower than Alternative B (No Action), respectively. Downstream coal combustion comprises more than 97 percent of the emissions in all cases. In the absence of federal coal, mines would be unlikely to be economically viable and would likely close. As a result, both nonfederal coal production and the corresponding air and GHG emissions would likely stop after all available federal coal is mined out under each alternative.

Table 3-50
Cumulative Greenhouse Gas Emissions from Federal and Nonfederal Coal-related Activities in the CDPA

Period	Alternative	Coal Mining Emissions (MMT CO_2e)	Coal Rail Transportation Emissions (MMT CO_2e)	Coal Downstream Combustion Emissions (MMT CO_2e)	Total Coal Emissions (MMT CO_2e)
2023–2038	A, No Leasing	78	80	6,163	6,321
	B, No Action	78	80	6,163	6,321
	C, Limited Leasing	78	80	6,163	6,321
2023–2048	A, No Leasing	88	90	6,953	7,131
	B, No Action	117	119	9,210	9,446
	C, Limited Leasing	114	117	8,992	9,223

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and using the 100-year GWPs from AR6 are provided in the ARTSD (**Appendix C**).

Table 3-51 shows the cumulative GHG emissions from BFO federal activities related to coal, oil, and gas and other BLM-authorized activities during the planning period (that is, through 2038). The federal coal emissions shown here represent the sum of mining, transportation, and downstream combustion of coal produced in the CDPA. The federal oil and gas emissions represent the sum of production, transportation and processing, and downstream combustion of oil, conventional natural gas, and coalbed natural gas produced in the BFO. These emissions total approximately 6,334 MMT CO_2e and are the same under all alternatives. Federal coal-related emissions comprise more than approximately 97 percent of the total federal emissions. **Table 3-52** presents the cumulative GHG emissions due to BFO federal activities and nonfederal activities, including direct emissions, processing, transportation, and downstream combustion from 2023 to 2038. Nonfederal activities add approximately 385 MMT CO_2e to the federal emissions discussed above, resulting in a total of approximately 6,719 MMT CO_2e.

Table 3-51
Cumulative Greenhouse Gas Emissions from Buffalo Field Office Federal Activities from 2023 to 2038

Alternative	Federal Coal-related Emissions (MMT CO_2e)	Federal Oil and Gas-related (MMT CO_2e)	Other BLM-Authorized Activities (MMT CO_2e)	Total Federal Emissions (MMT CO_2e)
A, No Leasing	6,173	160	2	6,334
B, No Action	6,173	160	2	6,334
C, Limited Leasing	6,173	160	2	6,334

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and using the 100-year GWPs from AR6 are provided in the ARTSD (**Appendix C**).

Table 3-52
Cumulative Greenhouse Gas Emissions due to Buffalo Field Office Federal Activities and Nonfederal Activities from 2023 to 2038

Alternative	Federal Emissions (direct + processing + transportation + downstream combustion) (MMT CO_2e)	Nonfederal Emissions (direct + processing + transportation + downstream combustion) (MMT CO_2e)	Total Emissions (direct + processing + transportation + downstream combustion) (MMT CO_2e)
A, No Leasing	6,334.1	385.2	6,719.3
B, No Action	6,334.1	385.2	6,719.3
C, Limited Leasing	6,334.1	385.2	6,719.3

Notes: CO_2e are calculated using the 20-year time horizon global warming potentials from IPCC AR6 (IPCC 2021): CO_2 = 1; CH_4 = 82.5; N_2O = 273. Emissions by individual GHG and using the 100-year GWPs from AR6 are provided in the ARTSD (**Appendix C**).

Major non-BLM sources of GHG emissions in the BFO are shown in **Table 3-32** in the *Affected Environment* section and include coal-fired power plants, gas plants, agricultural processing facilities, and infrastructure associated with mineral development. The EPA reported emissions of approximately 8.4 MMT CO_2e (based on 100-year GWPs from the IPCC Fourth Assessment Report) for large emitters of GHGs (greater than 25,000 metric tons/year) in the BFO in 2021.

The national BLM Specialist Report provides an estimate of GHG emissions attributable to onshore federal mineral estate across the US. It estimates that approximately 913.9 MMT CO_2e were produced from the extraction, processing, transportation, and end use of fossil fuels on federal mineral estate in the US in fiscal year 2021 (BLM 2022b). The report also estimates long-term onshore federal oil, gas, and coal production and emissions; the cumulative emissions estimate from 2022 to 2050 is approximately 24,299 MMT of CO_2e (BLM 2022b). This is based on the 2022 EIA Annual Energy Outlook reference case projection.

Using the Model for the Assessment of Greenhouse Gas Induced Climate Change, the BLM (2022b) estimated that nationally "30-plus years of projected federal emissions would raise average global surface temperatures by approximately 0.0158°C (0.0284°F)" or 1 percent of the temperature target of limiting global warming to 1.5°C (2.7°F). The long-term federal emissions projections used in the Model for the

Assessment of Greenhouse Gas Induced Climate Change run were developed using EIA Annual Energy Outlook reference case projection (BLM 2022b).

3.5.2.4 Summary

Existing federal leases are anticipated to allow for federal production to continue until reserves are exhausted during 2041. As these leases are previously approved actions, the GHG emissions from these existing leases were evaluated under the *Affected Environment* and do not vary by alternative. The GHG emissions from the mining, transportation, and downstream combustion of coal from existing federal leases in the CDPA from 2023 to 2041 are estimated to total approximately 6,963.9 MMT CO_2e (**Table 3-34**). As existing leases are not forecasted to be exhausted until 2041, there would be no GHG emissions from the mining, transportation, and downstream combustion of coal from future federal leases during the remaining planning period (that is, 2023 to 2038) under any alternative.

Under Alternative A (No Leasing), no new coal lease applications would be accepted, and therefore, coal production in the CDPA would stop in 2041 and there would be no coal-related GHG emissions from development of future federal leases (**Table 3-44**). For this reason, the coal-related GHG emissions under Alternative A (No Leasing) are the lowest of all alternatives.

Future federal leasing under Alternatives B (No Action) and C (Limited Leasing) would allow for coal mining to continue after 2041. Between 2041 and 2048, future leasing under Alternative B (No Action) would result in approximately 2,260 MMT of CO_2e from mining, transportation, and downstream combustion of federal coal (**Table 3-46**). Under Alternative B (No Action), federal coal leasing could potentially continue until the reserve of approximately 48.01 billion short tons is exhausted. Although it is unrealistic that this would occur (due to changing energy policies and decline in coal usage), if the remaining amount of coal available for future leasing after 2048 (approximately 46.7 billion short tons) under Alternative B (No Action) is all combusted, this would result in an estimated 79.33 billion metric tons of CO_2e (based on IPCC AR6 [IPCC 2021] 20-year GWPs) of additional GHG emissions that would not occur under Alternative A (No Leasing) or Alternative C (Limited Leasing).

Alternative C (Limited Leasing) would allow a limited amount of leasing 2038 and mining through 2048. Between 2041 and 2048, the additional leasing would result in approximately 2,042 MMT of CO_2e emissions from mining, transportation, and downstream combustion of federal coal (**Table 3-48**). The total federal coal-related CO_2e emissions from future leases under Alternative C (Limited Leasing) are approximately 9.6 percent lower than Alternative B (No Action) due federal coal being exhausted during 2048 and lower coal production and emissions during that year. There would be no coal production from future leases after 2048, and so GHG emissions from mining, transportation, and downstream combustion of federal coal after 2048 would be zero.

Under Alternative A (No Leasing) and Alternative C (Limited Leasing), there would be no federal coal leasing or anticipated mining beyond 2048 based on the EIA forecast.

The forecasted activity levels from oil and gas and other BLM-authorized activities are the same across all alternatives, and thus the GHG emissions and resulting climate change impacts from these federal activities would also be the same.

The public health effects due to GHG from the downstream combustion of BFO coal and oil and gas are monetized in the social cost of GHG analysis. Impacts to environmental justice communities from emissions are discussed in **Section 3.5.4**, Environmental Justice.

3.5.3 Social and Economic Considerations

This section incorporates by reference the affected environment described in the 2015 Approved RMP/ROD (Section 3.8, Socioeconomic Resources, p. 607). Updated baseline data are provided below for information relevant to the decisions to be made in this SEIS/RMPA.

3.5.3.1 Affected Environment

The BFO administers public lands and resources in Campbell, Johnson, and Sheridan Counties. Proposed management actions in this SEIS RMPA, however, are limited to the decisions about future leases for the associated coal mines producing federal coal within Campbell County (one mine also overlaps the northern boundary of Converse County). The 2015 Approved RMP/ROD (BLM 2015a) socioeconomic analysis area included additional counties due, in part, to commuting patterns for mine employees. Since 2015, however, coal employment has decreased (Mine Safety Health Administration [MSHA] 2022), and most commuter buses to other counties from mines are no longer in service. While some commuting from adjacent counties still occurs, the primary immediate economic connections are now only within Campbell and Converse Counties. As a result, the BFO's local socioeconomic analysis area is defined as the two-county area displayed in **Figure 3-4**, BFO Local Socioeconomic Analysis Area. However, Wyoming communities, associated counties, and the state as a whole rely heavily on revenues from coal production for funding general state and K-12 operations. These direct and indirect economic connections are considered and analyzed alongside the more immediate socioeconomic connections of Campbell and Converse Counties with respect to federal Powder River Basin coal.

People have strong attitudes, values, and beliefs associated with natural resources, and these attitudes, values, and beliefs shape the way they view natural resource issues and public land management. Attitudes, values, and beliefs associated with coal and the BFO's management of federal coal resources are equally diverse and are held by those who live in the region as well as across the country. Attitudes, values, and beliefs 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.

This BFO local socioeconomic analysis area is within the Powder River Basin, which historically has produced roughly 40 percent of the coal used in power generation nationally. The section below provides a summary of baseline socioeconomic conditions relevant to the coal mining industry in this area and greater Wyoming. In addition, this section provides data about the historical and cultural importance of this industry as well as an overview of trends in the industry's production and employment. Additional baseline information that updated the data provided in the 2015 Approved RMP/ROD is included in **Appendix D**, Socioeconomic Technical Support Document.

As shown in **Figure 3-2**, Buffalo Field Office Coal Usage, coal extracted from BFO coal mines is utilized at downstream combustion points throughout the US. Due to the large number of locations included in this downstream area, the socioeconomic overview data are not included for the downstream analysis area. General information on the economic contributions from power plants is included in the discussion below.

Socioeconomic Conditions

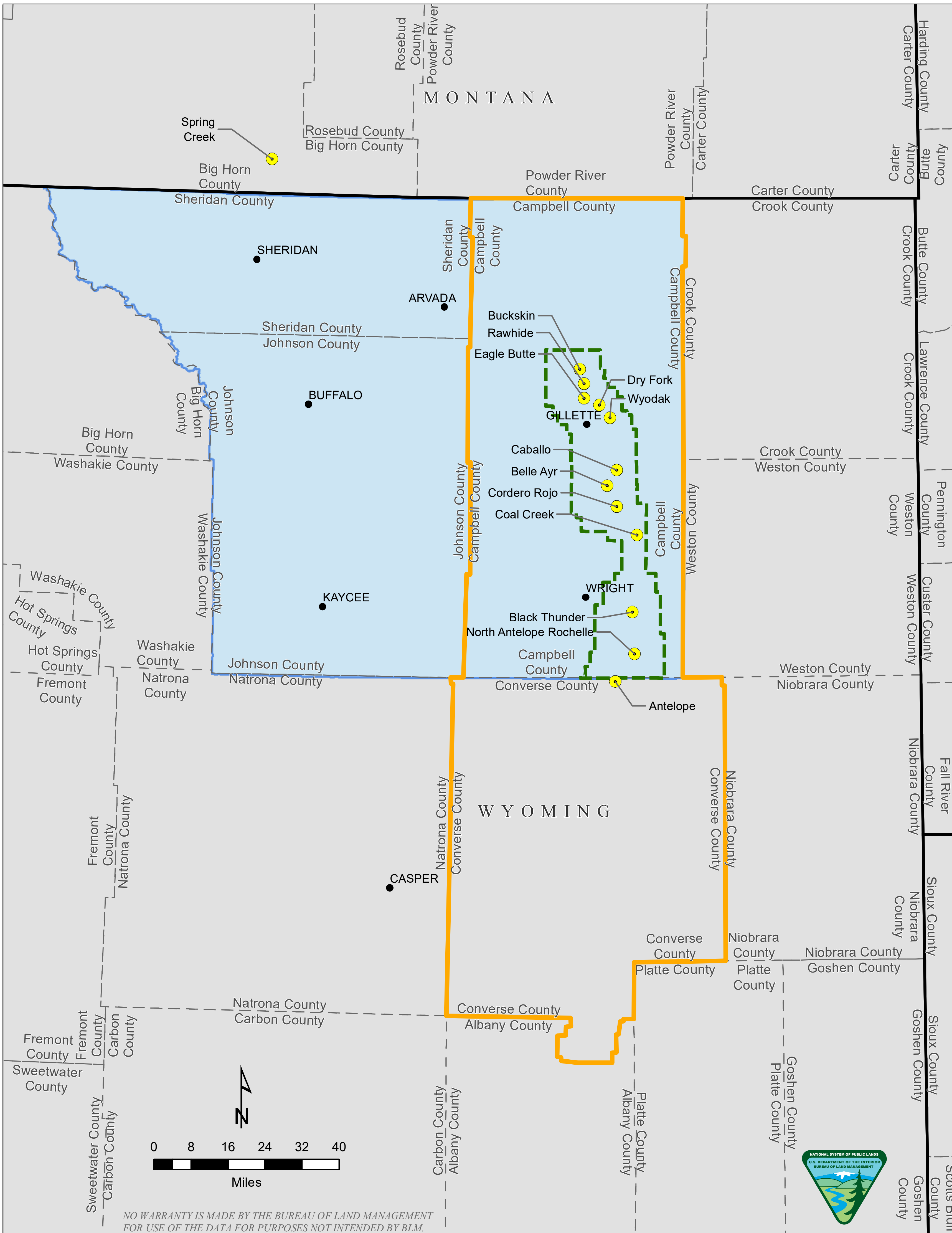
Wyoming has led the nation in coal production since 1986, and coal provides an important source of income and employment in the state (Wyoming Mining Association 2021). Campbell County leads the state in coal production, and in 2021, mining, quarrying, and oil and gas extraction represented a significant source of employment and income in both Campbell and Converse Counties (see **Appendix D,** Socioeconomic Technical Support Document) relative to Wyoming. However, coal employment and income represent a decreasing portion of the counties' total employment and income. Trends in employment and income over the past 20 years are displayed in **Table 3-53** and **Table 3-54**, below. Coal mining in Campbell County decreased from 19.8 percent of private employment in 2001 to 17.6 percent in 2021. Coal support activities also decreased (1.4 percent of private employment in 2001 to 0.6 percent in 2021; Bureau of Labor Statistics 2022). For comparison, in Wyoming, coal mining jobs represented 2.2 percent of total private employment in 2021 while coal support activity jobs represented 0.1 percent of total private employment.

Table 3-53
Coal Sector Employment

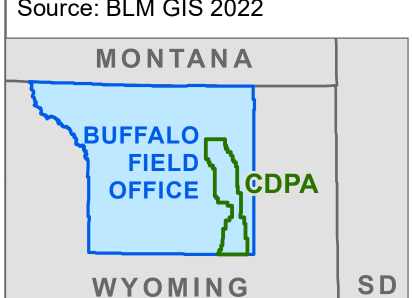
Year	Campbell County			Wyoming		
	Coal Mining[1]	Coal Support Activities[2]	All Private Employment	Coal Mining[1]	Coal Support Activites[2]	All Private Employment
2001	3,310	227	16,746	4,285	390	180,685
	19.8%	1.4%	-	2.4%	0.2%	-
2010	(ND)	(ND)	23,599	6,932	292	205,226
	(ND)	(ND)	-	3.4%	0.1%	-
2020	3,510	(ND)	18,851	4,781	152	196,823
	18.6%	(ND)	-	2.4%	0.1%	-
2021	3,256	107	18,477	4,371	147	201,580
	17.6%	0.6%	-	2.2%	0.1%	-

Source: Bureau of Labor Statistics 2022
Notes:
[1] North American Industry Classification System code 2121
[2] North American Industry Classification System code 213113
Employment represents total number of jobs.
Percent represents the percentage of all private employment within Campbell County and Wyoming. Percent of private employment with respect to itself (100 percent) is indicated with a dash (-).
(ND) = not disclosable; data do not meet Bureau of Labor Statistics or state agency disclosure standards.
The table does not include Converse County because coal sector data are not disclosed or not available for all time periods examined.

Figure 3-4
BFO Local Socioeconomic Analysis Area



Source: BLM GIS 2022



BFO local socioeconomic analysis area
Coal mine
CDPA
Buffalo Field Office

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Table 3-54
Estimated Coal Sector Average Annual Pay

Year	Campbell County			Wyoming		
	Coal Mining[1] ($)	Coal Support Activities[2] ($)	All Private Employment ($)	Coal Mining[1] ($)	Coal Support Activities[2] ($)	All Private Employment ($)
2001	62,124	43,842	37,469	61,817	47,560	27,630
	165.8%	117.0%	-	223.7%	172.1%	-
2010	(ND)	(ND)	56,057	78,806	61,076	41,258
	(ND)	(ND)	-	191.0%	148.0%	-
2020	92,609	(ND)	59,296	91,780	58,350	50,236
	156.2%	(ND)	-	182.7%	116.2%	-
2021	94,299	58,465	59,763	94,807	57,475	52,549
	157.8%	97.8%	-	180.4%	109.4%	-

Source: Bureau of Labor Statistics 2022
Notes:
[1] North American Industry Classification System code 2121
[2] North American Industry Classification System code 213113
Percent represents the percentage with respect to average annual pay for all private employment within Campbell County and Wyoming. Percent of average annual pay for private employment with respect to itself (100 percent) is indicated with a dash (-).
(ND) = not disclosable; data do not meet Bureau of Labor Statistics or state agency disclosure standards.
The table does not include Converse County because coal sector data are not disclosed or not available for all time periods examined.

Coal jobs continue to pay higher annual wages on average when compared with all private sector employment (Bureau of Labor Statistics 2022). As a result, reductions in coal employment may have a higher level of economic impacts on the regional economy compared with reductions in other sectors that typically produce less labor income. According to 2021 data from Bureau of Economic Analysis (Bureau of Economic Analysis 2021b), Converse and Campbell Counties both had higher average earnings per job than the average earnings per job for the state of Wyoming; this may be due, in part, to coal sector employment (see **Table D-6** in **Appendix D**).

Unemployment rates in both counties have historically been lower than that of the state of Wyoming. This likely relates in part to coal-related direct and indirect employment (see **Table D-7** in **Appendix D**).

Changes in coal mining sector employment are linked with changes in production. As shown in **Table 3-55**, coal production has decreased over the last decade. Between 2009 and 2020, coal production in Wyoming dropped 49 percent; it dropped 47 percent in Campbell County and 96 percent in Converse County. Following these trends, the mineral value for coal has also decreased 46 percent in Wyoming since 2009, as displayed in **Table 3-56**, resulting in a decrease in coal employment and related contributions.

Table 3-55
Estimated Mineral Production

Geographic Area	Coal (short tons)			Oil (barrels sold)			Gas (thousand cubic feet)		
	2009	2014	2020	2009	2014	2020	2009	2014	2020
Campbell County	395,774,201	358,196,669	209,255,318	7,443,471	18,661,893	19,322,651	138,280,879	99,419,520	79,610,749
Converse County	21,858,235	23,798,965	908,541	1,858,464	12,767,677	31,423,521	7,533,938	33,894,077	84,362,786
Wyoming	427,940,932	392,418,629	218,733,756	50,493,822	75,355,546	88,507,057	2,365,186,657	1,834,211,487	1,327,105,636

Source: Wyoming Department of Revenue 2010, 2015, 2021

Table 3-56
Estimated Mineral Value ($2022)

Geographic Area	Coal			Oil			Gas		
	2009	2014	2020	2009	2014	2020	2009	2014	2020
Campbell County	3,369,006,127	3,348,921,099	1,754,836,464	364,821,149	1,406,213,219	614,016,476	340,034,433	355,242,927	96,739,513
Converse County	229,733,212	249,943,735	8,745,143	91,648,453	940,033,433	1,008,279,722	25,990,268	139,330,599	91,652,846
Wyoming	3,834,477,312	3,983,594,226	2,061,662,835	2,439,657,555	5,566,695,197	2,835,951,116	5,861,051,297	5,803,100,895	1,736,580,580

Source: Wyoming Department of Revenue 2010, 2015, 2021

During the same period, with the advancements in horizontal drilling technology, shale gas and oil production increased while coalbed natural gas production dropped. More specifically, coalbed natural gas plays significantly reduced production due to diminished gas supply resulting from reduced development investment caused by low natural gas prices and increased shale gas development. In Wyoming gas production dropped 44 percent while oil production increased 75 percent between 2009 and 2020. Similarly, in Campbell County oil production more than doubled while gas production dropped 42 percent during the same time period. Converse County experienced production growth in both oil and gas between 2009 and 2020; Converse County's oil production volume increased by 16 times and its gas production volume increased by 10 times. Overall, however, the mining sector (including coal development, and oil and gas extraction) decreased from 25 percent to 20 percent of total employment between 2001 and 2021 for the two-county area, reflecting both mining sector decline and oil and gas sector volatility (Headwater Economics 2023).

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 (for example, mineral development, agriculture, and outdoor recreation); thus, management of natural resources can disproportionately affect economic opportunities and employment in rural communities, as well as impact any social, cultural, or heritage values associated with the natural resource upon which the communities depend.

Campbell County is one example of a community historically dependent on mineral development for direct and indirect economic contributions. Jobs and revenue supported by coal production, as well as oil and gas development, have supported relatively high-income levels, have attracted additional amenities and other commercial operations, and funded a large portion of public services for the area (Campbell County 2022). Such dependence is also observed across Wyoming.

Currently, 12 operating mines are in the CDPA. All are in Campbell County aside from the Antelope Mine, which is also in Converse County. All existing mining operations are surface coal mines that use truck/shovel or dragline mining methods. **Table 3-57** shows the production at existing area mines from 2017 to 2021. Overall, production has declined by approximately 25 percent in the past 5 years, although year to year change has been variable.

Table 3-57
Coal Mine Production 2017–2021 (Short Tons)

Mine Name	County	2017	2018	2019	2020	2021
Buckskin	Campbell	14,517,853	13,508,689	17,633,296	9,699,282	10,639,487
Dry Fork	Campbell	6,045,618	6,304,022	6,102,072	3,924,629	3,728,004
Eagle Butte	Campbell	17,264,483	17,055,796	11,642,248	12,303,698	13,549,294
Rawhide	Campbell	10,346,144	9,504,750	10,090,441	9,494,090	11,601,736
Wyodak	Campbell	4,182,800	4,085,044	3,716,480	3,736,695	3,503,112
Belle Ayre	Campbell	15,826,344	18,467,405	10,219,206	11,174,953	14,449,608
Caballo	Campbell	11,125,949	11,333,467	12,595,735	11,626,318	13,860,353
Codero Rojo	Campbell	16,393,569	12,609,413	11,906,683	9,773,845	12,867,638
Coal Creek	Campbell	8,963,048	7,987,838	2,549,671	2,141,507	1,994,359
Black Thunder	Campbell	70,513,365	71,134,606	71,976,643	50,188,766	59,359,967
N. Antelope/Rochelle	Campbell	101,595,323	98,315,794	85,340,711	66,111,840	62,799,005
Antelope	Converse	28,503,504	23,155,741	23,243,371	19,809,826	21,738,381
Total	—	305,278,000	293,462,565	267,016,557	209,985,449	230,090,944
Annual Percent Change	—	—	-2.3	-9.8	-22.0	9.6

Source: MSHA 2022
[1]Antelope Mine is listed under Converse County in MSHA data, but mine boundaries extend into Campbell County. Production totals represent total mine production.
Note: Includes active mines.

Employment in the coal industry fluctuates annually with production levels. **Table 3-58**, below, shows employment by mine from 2017 to 2021.

Table 3-58
BFO Coal Mine Employment 2017–2021

Mine Name	County	2017	2018	2019	2020	2021
Buckskin	Campbell	198	191	237	176	177
Dry Fork	Campbell	82	83	91	69	59
Eagle Butte	Campbell	303	306	216	229	222
Rawhide	Campbell	108	110	121	117	131
Wyodak	Campbell	63	66	64	62	59
Belle Ayr	Campbell	244	256	207	252	256
Caballo	Campbell	157	167	187	184	211
Codero Rojo	Campbell	367	318	356	303	272
Coal Creek	Campbell	149	143	60	64	102
Black Thunder	Campbell	1,223	1,187	1,223	1,078	949
N. Antelope/Rochelle	Campbell	1,347	1,308	1,263	1,058	997
Antelope	Converse	536	567	591	514	441
Total	**—**	**4,777**	**4,702**	**4,616**	**4,106**	**3,876**
Percent annual change	—	—	-2.5	-2.7	-10.8	-4.4

Source: MSHA 2022
[1]Antelope Mine is listed under Converse County in MSHA data, but mine boundaries extend into Campbell County. Employment totals represent total mine employment.
Note: Includes active mines

Relative to other natural resource-dependent industries in the US, production and 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. Wyoming's production represented 43 percent of all coal production in the nation in 2021 (EIA 2022a). Relative to total county employment, jobs supported by these 12 mines accounted for 12.6 percent of all employment opportunities in Campbell County and 8.1 percent in Converse County in 2017. This decreased to 10.7 and 5.0 percent, respectively, in 2021 (MSHA 2022; Bureau of Economic Analysis 2021a). **Table 3-59** displays a summary of jobs associated with BFO coal mines compared with total employment by county.

Table 3-59
BFO Coal Mine Employment Ratio 2017 and 2021

Year	County	Coal Employment	Total Employment	Percentage Coal Employment
2017	Campbell	4,241	33,628	12.6%
	Converse	536	6,631	8.1%
2021	Campbell	3,445	32,069	10.7%
	Converse	441	8,763	5.0%

Sources: MSHA 2022; Bureau of Economic Analysis 2021a

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, such as mining equipment (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, such as restaurants and retail stores (induced employment and labor income). Because federal coal estate accounts for approximately 90 percent of all coal in Wyoming's Powder River Basin, the majority of these jobs and income supported by coal development were attributable to the development of federal coal administered by the BLM. See **Appendix D**, Socioeconomic Technical Support Document, for additional details related to direct, indirect, and induced economic contributions.

Downstream Economic Opportunities and Employment from Existing Federal Coal Leases

Based on EIA data, 104 power plants received BFO coal in 2021 in 25 states. This is a reduction from 152 plants in 32 states in 2008 (EIA 2022d). It is estimated that on average, 0.18 people are supported per megawatt in operations and maintenance at a coal-powered power plant on a permanent basis (Singh and Fehrs 2001). As a result, an average 300-megawatt coal-fired power plant would directly employ 54 people on an ongoing basis. This estimate is supported by analysis of EIA rate-regulated, coal-fired power plants (Union of Concerned Scientists 2013). Direct employment at the 104 power plants would support additional indirect employment in the regional economy around each power plant. It should be noted that the combustion points identified are supported by coal from other mines in addition to those within the BFO local analysis area. As a result, employment supported by combustion of coal originating in the BFO decision area would represent only a portion of jobs and income at each downstream power plant.

Revenues and Funding for Public Services from Existing Mineral Production, Including Federal Coal Leases

Taxable value of minerals in Wyoming have ranged from 7.1 to 11.9 billion annually over the past 5 years (Wyoming Department of Revenue 2022). Revenue sources tied to mineral extraction represent a significant portion of state funds, with mineral severance taxes and federal royalty revenue representing 18 and 12 percent of general fund revenue respectively in 2021. Sales and use tax, which represents 32 percent of general fund revenue, also has a portion of revenue tied with the mineral sector and sectors containing mining support services (Wyoming Consensus Revenue Estimating Group 2022). Because 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, local ad valorem taxes, and others. Revenues generated through these mechanisms, and disbursed according to legal statutes, are substantial and account for a large share of total state, county, and municipality 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 felt across the state.

Concerns about future revenue decreases are leading to the review of the structure of funding support for some services. For example, the Wyoming School Capital Construction Account has been historically funded through federal coal lease bonuses. However, coal lease bonuses that once peaked at $229.6 million in 2012–2013 have declined to $0 in recent years with no foreseeable return through at least 2026 (Wyoming Legislative Service Office 2022; Wyoming Consensus Revenue Estimating Group 2022). In 2023, the Wyoming 67th legislature considered legislation to restructure school construction and maintenance funding due, in major part, to the disappearance of coal lease bonus revenues to the state and its school districts (Wyoming Legislative Service Office 2022).

Royalties and Rents

Annual mineral revenues generated from leased federal coal are derived from federal mineral royalties (FMRs), rents, and bonuses, among other revenue sources. The US Office of Natural Resources Revenue collects all federal mineral revenues, and 49 percent of these receipts are disbursed back to the state in which they were generated. In 2021, the 12 mines operating in the BFO's administrative boundaries 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 collected by the federal government in 2021 (Office of Natural Resources Revenue 2022). These mines are also required to pay royalties on the value of minerals extracted from their federal mineral leases. In 2021, coal mined from the surface of federal tracts was subject to royalties assessed at 12.5 percent of the minerals' gross market value. Total coal royalties collected by the federal government in calendar year 2021 were over $305 million in Campbell County and $400,000 in Converse County (**Table 3-60**).

Table 3-60
Estimated FMRs Collected from Coal Production

Year	Campbell County ($)	Converse County ($)	Wyoming ($)
2022	399,056,616	757,490	413,104,334
2021	305,038,803	400,643	322,104,456
2020	280,589,496	2,512,939	299,528,648
2019	332,131,635	4,936,141	360,406,432
2018	358,119,848	17,312,273	402,572,051

Year	Campbell County ($)	Converse County ($)	Wyoming ($)
2017	377,066,213	33,631,354	427,495,146
2016	335,536,935	41,603,464	397,070,066

Source: Office of Natural Resources Revenue 2022

Revenue for both the general operations of government and public K–12 education is also derived from the state's share of FMR revenue from extractive industry production of minerals on federal lands in Wyoming. After payment of any fees, FMRs received by Wyoming's state government are distributed to major coffers, cities and towns, and the University of Wyoming (Wyoming Consensus Revenue Estimating Group 2022). Historical FMR revenue distributions made by the state government are presented in **Table 3-61**, below. FMR revenue presented is total FMRs, where FMRs from federal coal production constitute only a portion of the total FMRs presented.

Table 3-61
Example Wyoming FMR Revenue Distributions

Fiscal Year	School District Capital Construction ($)	School Foundation Program ($)	Cities and Towns ($)	Cities, Towns, Counties, and Special District Capital Construction ($)	Highway Fund, including County Roads ($)	University of Wyoming ($)	Budget Reserve Account ($)
2016	5,346,000	182,837,225	18,562,500	7,425,000	64,597,500	13,365,000	188,209,982
2017	5,346,000	215,474,656	18,562,500	7,425,000	64,597,500	13,365,000	253,465,266
2018	5,346,000	220,019,057	18,562,500	7,425,000	64,597,500	13,365,000	215,632,223
2019	5,346,000	281,953,516	18,562,500	7,425,000	64,597,500	13,365,000	246,624,758
2020	5,346,000	184,847,004	18,562,500	7,425,000	64,597,500	21,365,000	184,286,008
2021	5,346,000	178,045,869	18,562,500	7,425,000	64,597,500	21,365,000	170,683,739

Source: Wyoming Consensus Revenue Estimating Group 2022
Note: FMR revenues presented are total FMRs, where FMRs from federal coal production constitute only a portion of the total FMRs presented.

The School Foundation Program serves as the checking account to fund instructional and operational resources for all Wyoming K–12 school districts. The Budget Reserve Account serves as a secondary general checking account, against which the state's General Fund draws upon for the general operations of Wyoming government (WY Legislative Service Office 2022). FMR distributions to these accounts fluctuate based on the increase or decrease in associated annual mineral production, including, but not limited to, the production of coal on federal lands.

Severance and Ad Valorem Taxes

Severance and ad valorem tax revenues associated with Powder River Basin coal production have allowed Campbell County and the state of Wyoming as a whole to invest in public infrastructure projects and other non-mining-related ventures to maintain and improve quality of life, including educational, recreational, and social opportunities for Wyoming residents (Campbell County 2022).

Severance taxes are paid by extractive industries to the State of Wyoming for the removal, extraction, severance, or production of minerals (Wyoming Statutes 39-14-101 through 711). Severance tax rates imposed are assessed on the taxable value of production at between 2 percent and 7 percent. Collected severance tax revenues are distributed such that allocations include approximately 62 percent to Wyoming's General Fund, 9 percent to Wyoming cities and towns, 4 percent to the Wyoming Highway Fund, 4 percent to Wyoming counties, and a combined 5 percent to the County Road Construction Fund plus city, town, and county capital construction[7]. **Table 3-62**, below, presents historical coal severance tax distributions made by the State of Wyoming to all sources, including coffers described previously.

Table 3-62
State of Wyoming Coal[1] Severance Tax Distributions to All Accounts

Fiscal Year	Coal ($)	Total (All Minerals) ($)	Estimated Proportion of Coal Severance Taxes to Total Severance Taxes (%)
2016	217,752,042	533,620,938	41
2017	218,013,154	580,338,767	38
2018	198,835,870	631,473,492	31
2019	183,195,325	677,800,990	27
2020	153,954,756	500,711,303	31
2021	147,074,423	537,132,992	27
2022	172,026,379	896,083,249	19
2016–2022	1,290,851,949	4,357,161,731	30

Source: Wyoming Consensus Revenue Estimating Group 2022
[1] Includes mineral severance taxes from both federal and nonfederal coal.

Another form of state and county tax revenue from coal production is ad valorem, or property, taxes. Ad valorem taxes collected from mineral production comprise the majority of all ad valorem tax revenue collected in Wyoming, where other levied property taxes are nominal in comparison. Coal extracted from federally leased tracts is also subject to ad valorem taxes, which are property taxes assessed at 100 percent of the market value of gross production and then calculated based on varying county and district mill levies. Mill levies determine the percentage of value that is assessed by the county for mineral production. Average mill levy rates applied to mineral production for Wyoming counties ranged from 55.979 to 73.680 in 2022 (Wyoming Department of Revenue 2022). Proceeds from ad valorem taxes are retained by the county where production occurs. **Table 3-63** displays total estimated ad valorem taxes levied on statewide coal production from 2016 to 2022.

While all mines considered in this SEIS are in Campbell County, the southernmost mine (Antelope) straddles the Campbell County and Converse County border. Approximately one-third of this mine's production comes from minerals in Converse County; thus, both counties receive ad valorem tax revenues from the production of federal coal at the Antelope Mine (MSHA 2022). **Table 3-64** presents 2022 total ad valorem mineral production taxes assessed in Campbell and Converse Counties.

[7] Wyoming Statutes 39-14-101 through 711

Table 3-63
Wyoming Coal Taxable Production, Valuation, and Estimated Ad Valorem Taxes[1]

Year[2]	Units of Taxable Valuation	Taxable Valuation	Estimated Ad Valorem Taxes Levied
2016	375,667,983	$3,743,608,369	$225,020,753
2017	296,973,144	$2,916,684,373	$175,548,218
2018	316,471,118	$3,050,426,425	$184,304,973
2019	304,122,976	$2,843,015,238	$172,756,893
2020	276,975,900	$2,530,834,432	$154,403,861
2021	218,733,756	$2,061,662,835	$126,367,881
2022	239,735,375	$2,239,399,153	$141,543,372
2016–2022 Total	2,028,680,252	$19,385,630,825	$1,179,945,951

Source: Wyoming Department of Revenue 2016–2022 annual reports
[1] Includes units of taxable valuation for federal and nonfederal coal production from both surface and underground coal mining.
[2] Taxable production, valuation, and taxes for a given year are based on production occurring the year prior.

Table 3-64
2022 Ad Valorem Mineral Production Taxation based on 2021 Total Mineral Production in the Powder River Basin[1]

County	Total Mineral Taxable Valuation ($)	Percentage of Statewide Total	Total Ad Valorem Mineral Production Taxes Assessed ($)	Percentage of Statewide Total
Campbell	3,554,034,160	29.9	222,317,028	29. 3
Converse	2,098,743,311	17.6	125,440,467	16.5

Source: Wyoming Department of Revenue 2022
[1] Includes units of taxable valuation from all mineral production sources, including, but not limited to, coal, oil, and gas production.

In 2022, $759.5 million in county ad valorem taxes on mineral production were collected statewide. This represents a 23.8 percent reduction since 2015 ($996.8 million). Campbell County collected $222.3 million in ad valorem taxes from mineral production in 2022. This is a reduction of 27.3 percent from those collected in 2015 ($305.6 million); however, Campbell County ad valorem taxes on mineral production still comprised nearly 30 percent of all 2022 ad valorem mineral production tax revenues collected in Wyoming. Converse County collected $125.4 million in ad valorem taxes from total mineral production, an increase of 57.5 percent from 2015 ($79.6 million), which has resulted almost exclusively from increased oil and gas activity (Wyoming Department of Revenue 2015, 2022).

Surface coal mining represented nearly 17 percent of total ad valorem taxes levied on mineral production in Wyoming in 2022, with 98 percent of surface coal production and associated ad valorem taxes occurring in Campbell County (Wyoming Department of Revenue 2022). Historically in Campbell County, as much as 79 percent of total assessed valuation has been attributable to mineral production, with coal representing the majority of this valuation (75 percent of mineral production valuation; Campbell County 2017). **Table 3-65** presents 2022 surface coal valuations compared with total mineral valuations between Campbell County and Wyoming as a whole.

Table 3-65
2022 Surface Coal Valuation based on 2021 Production

Location	Taxable Surface Coal Units	Total Surface Coal Taxable Valuation	Total Mineral Taxable Valuation
Campbell County	231,053,655	$1,928,316,014	$3,554,034,160
Wyoming	236,540,476	$2,125,943,357	$11,901,549,361

Source: Wyoming Department of Revenue 2022

While a portion of federal and state mineral revenues generated from federal coal production is distributed back to Campbell and Converse Counties, these counties, the municipalities, and special districts within the counties also rely on ad valorem taxes to fund services such as schools, roads, hospitals, community colleges, sheriff's departments, fire departments, and other public health services. Changes in collected tax revenue often have disproportionate effects on rural economies given the importance to overall state and local budgets.

Forecast Regional Economic Contributions from Existing Federal Leases

The 12 mines operating in the BFO have federal coal leases that grant them certain rights to the recoverable reserves associated with their leases. While the initial terms of federal coal leases are for 20 years, leases demonstrating 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 in the US electric fuel energy mix and mine mouth prices for low-sulfur subbituminous coal from Wyoming's Powder River Basin. Coal production is driven by the market demand in the US electric fuel energy mix[8]. 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 costly coal-fired electricity generation and the eventual retirement of less efficient coal plants (EIA 2022a). In addition, the reduced cost of using renewable energy and added federal incentives, as well as the long-term US energy strategy to transition from coal to gas and renewable energy power are expected to contribute further to making coal less competitive in the energy sector. Longer-term production decisions are still heavily influenced by market conditions and forecasts; however, they are also influenced 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 decision area 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 forecasted by the EIA, see **Appendix B**, RFD.

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's Powder River Basin coal to decline. The 2022 Annual Energy Outlook projections for Wyoming's Powder River Basin show that production is anticipated to fall by approximately 1 percent annually between 2023 and 2038 (EIA 2022a). The RFD, which was updated based on the 2022 Annual Energy Outlook forecasts

[8] 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.

for the region, projects that 226.7 million short tons of coal will be mined from the BFO decision area on an annual average over the planning period from 2023 to 2038; of these short tons, 213 million short tons will be produced from federally leased coal tracts (**Appendix B**). Current leases provide sufficient reserves to support development at EIA forecast levels through the 2022–2038 planning period. Starting in 2041, coal from existing leases would be insufficient to meet EIA production estimates.

Affected environment economic contributions and associated revenue impacts from the production of existing leases are examined for averaged annual estimates for 2023–2027, 2028–2032, and 2033–2038. Details on contribution estimation assumptions and methodology are included in **Appendix D**, Socioeconomic Technical Support Document. This breakdown is included in **Table 3-66** to **Table 3-68**, which show how annual changes in coal production result in a decrease in associated economic contributions over the planning period. Economic contribution metrics reported include:

- Employment: Employment is an annual average of the number of full-time, part-time, and seasonal employees. Jobs do not equal full-time equivalents.
- Labor Income: Labor income includes employee wages, salaries, and benefits; it also includes income earned by sole proprietors.
- Output: Output is the market value of production of a good or service. Output can also be expressed in terms of total sales value or in terms of the cost to produce a good or service.

Due to near-term fluctuations in EIA's coal production forecasts, annual economic effects vary across the years within each time period. While the variations across each year are not captured in the average annual estimates, the overall reduction in economic output from coal production is observed when comparing estimated economic impacts from existing federal leases in **Table 3-66** through **Table 3-68**.

From 2023 to 2038, total employment supported by BFO local analysis area mines is anticipated to decline from an annual average of 5,278 to 4,937 (6.4 percent). Labor income ($530 million to $496 million) and output ($2,509 million to $2,374 million) would show similar declines. Studies indicate the demand for coal is decreasing nationally due to a number of factors, including the technology that have brought lower-cost generation from natural gas and renewable energy, and a structure decline in the US market for coal used for electricity generation (Institute for Energy Economics and Financial Analysis 2019). The potential for reduced demand varies across the BFO local analysis area. The highest vulnerability for future reductions is identified for mines with lower-quality coal and narrow customer bases (Institute for Energy Economics and Financial Analysis 2019). While coal exportation has the potential to counteract domestic demand reductions, exports are limited by foreign competition and transportation costs, as well as a high degree of variability in demand (Institute for Energy Economics and Financial Analysis 2019). No coal from the BFO local analysis area is presently exported, and no future exportation is reasonably foreseeable.

Declining coal production and employment in the coal industry, whether projected or realized, can be concerning to rural communities; this is because local employment opportunities can be more limited and because nonmanagement wages in the coal industry are often higher than those in other local industries. 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 cause economic instability in rural communities, and the stress

Table 3-66
Average Annual Economic Impacts from Existing Federal Leases 2023–2027

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	2,982	400,172,817	1,972,512,742
Indirect effect[2]	1,163	86,286,190	365,519,942
Induced effect[3]	1,133	43,561,127	170,862,261
Total effect[4]	5,278	530,020,134	2,508,894,945

Source: Calculated based on the RFD using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table 3-67
Average Annual Economic Impacts from Existing Federal Leases 2028–2032

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	3,049	409,119,095	2,016,610,308
Indirect effect[2]	1,189	88,215,207	373,691,520
Induced effect[3]	1,159	44,534,981	174,682,064
Total effect[4]	5,397	541,869,283	2,564,983,892

Source: Calculated based on the RFD using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table 3-68
Average Annual Economic Impacts from Existing Federal Leases 2033–2038

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	2,789	374,251,690	1,869,970,492
Indirect effect[2]	1,088	80,697,017	341,843,450
Induced effect[3]	1,060	40,739,462	161,979,885
Total effect[4]	4,937	495,688,169	2,373,793,827

Source: Calculated based on the RFD using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

of financial uncertainty and instability can negatively affect the well-being of residents. During periods of economic downturns from reduced mineral development, increased rates of depression have been reported. In addition, demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, has also been observed to increase during economic downturns following slowed activity and lower employment in mineral extraction industries (Shandro et al. 2011). Collectively, these factors can adversely affect community cohesion and the quality of life in affected communities (Klasic et al. 2022).Existing leases would support continued contributions from federal, local, and state revenues, described previously in this document. Contributions for the planning period are estimated in **Table 3-69**, below.

Table 3-69
Estimated Revenues from Existing Federal Leases (2022$)

Time Frame	2023–2038 ($)
Federal Royalty Revenue	338,529,710
Federal Royalty Disbursements to Wyoming	165,879,558
Wyoming Severance Tax Distributions	189,576,638

Source: Calculated based on the RFD and EIA 2022a forecast prices

Forecast production of federal coal under the RFD will continue to generate ad valorem tax revenue in these counties; however, production in Converse County is anticipated to taper off over the next 10 years. Future declines in coal production based on forecasted market conditions are likely to cause Wyoming local governments and special districts to face budget deficits. The timing of these budget shortfalls further adversely strains Wyoming, its local governments, and special districts when funding shortages overlap with an increasing demand for public services as a result of rising unemployment. The likelihood of such events is expected to increase as energy communities in Wyoming experience future reductions in coal production associated with forecasted market condition transitions.

Energy Communities in Transition

As discussed previously, communities within the BFO are at the forefront of energy sector transitions. Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, established the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization (Energy Communities IWG). The Energy Communities IWG was tasked with the identification and delivery of federal resources to revitalize the economies of coal, oil and gas, and power plant communities. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the IWG's American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition.

Several Bipartisan Infrastructure Law provisions either require or give preference to communities with existing fossil energy industries, and give priority to projects that hire displaced fossil energy workers. The CHIPS and Science Act supports research on utilizing coal waste and other carbon materials, as well as science, technology, engineering, and math training programs focused on displaced fossil workers.

To help navigate the transition, the Energy Communities IWG and federal agencies worked with Wyoming state and local leaders to create the first Rapid Response Team in the fall 2021. Investments by the US Economic Development Administration (EDA), US Department of Agriculture Rural Development, DOE, and EPA were deployed to address economic development planning needs, healthcare access, identification and technical assistance on the cleanup and reuse of previously developed sites, and opportunities for new energy development. A few examples of Wyoming Rapid Response Team activities in eastern and greater WY include:

- The EDA awarded $2.8 million to Campbell County to fund phase 1 infrastructure improvements supporting business growth and job creation at a heavy industrial business park. This project is expected to create and retain 90 jobs and generate $25 million in private investment.
- The Gillette College Foundation won a $580,000 award from the EDA to establish an Office of Economic Transformation to develop an economic diversification plan and implementation strategy for the regional coal extraction-based economy. This project seeks to consolidate existing diversification strategies, workforce studies, and planning efforts to develop a comprehensive transformation strategy and implementation plan with new regional partners and existing stakeholders.
- The EDA also awarded the Wyoming Energy Authority $595,000 to establish a statewide Regional Economic Coordination Office to research and identify energy projects supporting job creation, business development, inclusive growth, and regional collaboration as coal sector trends continue. The project will also develop road maps and strategies for developing hydrogen and advanced nuclear plants, as well as carbon capture, energy efficiency, and conservation opportunities.

Another example of economic transitioning is Campbell County's efforts to re-purpose coal mine infrastructure. In January 2024, Campbell County re-zoned a portion of the Coal Creek mine to allow for post-mining use of existing industrial infrastructure such as buildings, electrical power lines, railroad loadout facilities, water wells and sewer systems (Bleizeffer 2024). Several industrial companies have expressed interest in repurposing the Coal Creek facilities, as well as similar infrastructure at other northeast Wyoming coal mines. The Coal Creek facilities were identified in a 2023 state-wide inventory of coal mines and coal-power plant facilities that may eventually be retired but that might also attract new businesses (Bleizeffer 2024, Nature Conservancy 2023). The DOE's Clean Energy on Mine Lands program has $500 million available for mine land re-use proposals (Nature Conservancy 2023).

Public Health and Other Socioeconomic Resource Considerations

During public scoping, the public expressed attitudes, values, and beliefs associated with other resources, specifically concerns about adverse impacts of coal leasing and fossil fuel combustion on wildlife, aquatic species, and water resources. These other socioeconomic resource considerations are detailed in **Appendix E**.

Many individuals, both those living in and outside the BFO's social and economic analysis area, also expressed attitudes, values, and beliefs 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 the climate will change and how many people may be affected, many Americans believe that climate change is a critical challenge impacting both local and global communities (Pew Research Center 2019). Climate change and other natural and human-made health stressors influence human health and disease in numerous ways. Some existing health threats will intensify, and new health threats will emerge as a result of climate change.

Key weather and climate drivers of health impacts include increasingly frequent, intense, and longer-lasting extreme heat, which worsen drought, wildfire, and air pollution risks; increasingly frequent extreme precipitation, intense storms, and changes in precipitation patterns that lead to drought and ecosystem changes; and rising sea levels that intensify coastal flooding and storm surges. Key drivers of vulnerability include the attributes of certain groups (age, socioeconomic status, race, and current level of health) and of place (floodplains, coastal zones, and urban areas), as well as the resilience of critical public health infrastructure. Health effects of these disruptions include increased respiratory and cardiovascular disease, injuries, and premature deaths related to extreme weather events; changes in the prevalence and geographical distribution of foodborne and waterborne illnesses and other infectious diseases; and threats to mental health.

Pollutants from coal combustion have been documented to have adverse impacts on the environment and public health outcomes in surrounding areas. Impacts from coal combustion on public health and climate change are discussed further in the air quality section (**Section 3.5.1**), as well as **Sections 3.5.2**, **3.5.3**, and **3.5.4**.

3.5.3.2 Direct and Indirect Impacts

Analysis Assumptions and Methodology

By 2038, the BLM would likely initiate a new RMP revision to examine future leasing decisions. Under Alternative A, the No Leasing Alternative, leased reserves would be exhausted in 2041; therefore, no contributions are estimated beyond the planning period. Alternative B, No Action, and Alternative C, Limited Leasing, include a quantitative discussion of impacts from 2041 to 2048, and Alternative B, the No Action Alternative, includes a qualitative discussion of impacts beyond this period. This is due to the level of uncertainty related to forecast levels of production and market price increases for an analysis beyond this period.

A summary of assumptions and indicators used to estimate impacts on regional economic contributions from the socioeconomic analysis area is included below. Additional methodology details are included in **Appendix B**, Reasonably Foreseeable Development, and **Appendix D**, Socioeconomic Technical Support Document. Future coal production is based on the RFD scenario estimates. Under all alternatives, annual levels of production are based on EIA forecasts from the 2022 Annual Energy Outlook. Note that current leases provide sufficient reserves to support development at EIA forecast levels through the planning period of 2022–2038. As a result, economic contributions from existing coal development over this time period in the analysis area would not vary by alternative; these contributions are discussed under **Section 3.5.3.1** (*Forecast Production and Economic Contributions from Existing Federal Leases*).

<u>Assumptions</u>

- All future production of federal coal in the BFO decision area will occur at mines currently operating in the CDPA.
- Without federal coal, the mines are unlikely to continue.
- There will be no disruptive changes to technology currently used for coal extraction or transportation.
- Forecast mine mouth prices for low-sulfur subbituminous coal from Wyoming's Powder River Basin produced by the EIA for its 2022 Annual Energy Outlook are representative of the future market value of coal extracted from the CDPA.

- The pace and timing of coal development will continue to depend on many factors outside the BLM's control, most notably the price and demand for coal products on regional, national, and international markets and on national and world market conditions.
- Federal, state, and local taxes will continue to be levied on coal extracted from the CDPA at current royalty and tax rates.

Indicators

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

For this analysis, direct effects are the direct jobs and incomes associated with federal coal production. Indirect effects are the economic changes associated with backward-linked industries, such as the purchases made by suppliers to coal production in the planning area. Induced effects are the economic changes resulting from household spending from changes in household income. Taken together, these combined economic effects describe the contribution of employment shocks from changes in the level of coal production. Estimated regional economic contributions are then described in terms of output, income, and jobs. Economic output is converted to a consistent dollar year (2022$).

Data are reported as annual averages for multiyear increments due to changes in the annual forecast production. Production from existing federal and nonfederal leases would continue to support jobs and income as described and presented in **Section 3.5.3.1**, above. Additional details about methodology are included in **Appendix D**.

Alternative A, the No Leasing Alternative

Estimated Regional Economic Contributions

Under the No Leasing Alternative (Alternative A), economic contributions would be limited to existing leases, as described in the **Section 3.5.3.1.** After approximately 2041, no further coal production would occur, and jobs and income directly and indirectly supported by this activity would significantly decrease to those needed for reclamation of facilities and the land, which would take several years. Economic impacts prior to 2039 are captured in the *Affected Environment* section.

Mineral Revenues and Funding for Public Services

Under Alternative A, the No Leasing Alternative, revenue would be as described in the *Affected Environment.* After federal coal production ceases around 2041, federal revenue contributions from coal would no longer occur; in the absence of private production, state severance taxes would also be reduced. This would result in impacts on services supported by this revenue, such as schools, roads, and other community infrastructure.

A reduction in coal-related economic contributions in the local communities that are historically dependent on this economic sector would result in associated adverse economic and social impacts in the absence of economic diversification. Declining coal production and employment in the coal industry, whether projected or realized, concern rural communities. This is not only because local employment opportunities can be more limited but because nonmanagement wages in the coal industry are often higher than those in other local industries. Also, coal revenue supports services throughout the state (not just the immediately surrounding areas).

A loss of coal jobs associated with a cease in production after 2041 could 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. Public services directly funded by coal revenue, such as education and infrastructure maintenance, would also be significantly impacted in the absence of the associated revenue sources discussed previously. Increases in unemployment often cause economic instability in rural communities, and the stress of financial uncertainty and instability can negatively affect residents' well-being.

During periods of economic downturns from reduced mineral development, increased rates of depression have been reported (Shandro et al. 2011). In addition, demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, has also been observed to increase during economic downturns following slowed activity and lower employment in mineral extraction industries (Shandro et al. 2011). Collectively, these factors can adversely affect community cohesion and the quality of life in affected communities (Klasic et al. 2022).

Alternative B, the No Action Alternative

<u>Estimated Regional Economic Contributions</u>

Under the No Action (Alternative B) and Limited Leasing (Alternative C) Alternatives, future leasing could occur, allowing for development and economic contributions past the planning period (2038). The Limited Leasing Alternative (Alternative C) provides for 1.24 billion short tons to be leased prior to 2038, while the No Action Alternative (Alternative B) allows for 48.01 billion short tons to be leased until the CDPA is depleted of recoverable coal, estimated to be approximately 2338. Quantitative estimates for continued development of leases are shown below for 2039–2048 in **Table 3-70**. The actual level of leasing and development each year would vary based on market conditions, regulatory settings, and other factors.

Table 3-70
Average Annual Economic Effects 2039–2048 (Alternative B – No Action Alternative)

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	2,329	312,519,364	1,540,455,528
Indirect effect[2]	908	67,386,150	285,456,821
Induced effect[3]	885	34,019,541	133,436,763
Total effect[4]	4,122	413,925,055	1,959,349,112

[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Under Alternative B, the No Action Alternative, based on future reserves of coal, leasing and production could continue until 2338 before all recoverable coal is depleted. Beyond this time period, estimates for production are limited due to uncertainty due to a lack of EIA forecast for coal price and production beyond 2050.

Mineral Revenues and Funding for Public Services

Forecast production of federal coal under the RFD will continue to generate annual revenues associated with federal coal production. **Table 3-71**, below, shows the estimated revenue associated with decision area leases from 2039 to 2048 under Alternative B, No Action, compared with Alternative C, Limited Leasing. After 2048, continued revenue contributions would be limited to Alternative B, No Action. Under Alternative B, coal mining could potentially continue at the same production rate until approximately 2338, supporting continued revenue contributions to Wyoming public services and infrastructure, as presented in the *Affected Environment*.

Table 3-71
Estimated Average Annual Federal Mineral Revenue (2022$)

Time Frame	Federal Royalty Revenue ($)	Federal Royalty Disbursements ($)	State Severance Taxes ($)
2039–2048 (Alternative B - No Action Alternative)	266,267,647	130,471,147	133,355,715
2039–2048 (Alternative C - Limited Leasing Alternative)	218,297,960	106,966,000	122,246,858
Percent change from Alternative C in average annual contributions	18%	18%	8%

Source: RFD data and EIA 2022a price estimates
Note: Under Alternative C, Limited Leasing Alternative, EIA-projected levels of production and related revenue would continue through 2046 based on available reserves. Due to a reduction in production in 2047–2048, annual average revenue is decreased for the time period examined.

Alternative C, the Limited Leasing Alternative

Estimated Regional Economic Contributions

Under Alternative C, the Limited Leasing Alternative, additional leases of 1.24 billion short tons would provide sufficient reserves to allow for production at EIA forecast levels of demand until approximately 2048. **Table 3-72** displays the estimates for contributions from 2039 to 2048.

Table 3-72
Average Annual Economic Effects 2039–2048 (Alternative C – Limited Leasing Alternative)

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	1,908	256,081,444	1,262,264,427
Indirect effect[2]	744	55,216,875	233,906,130
Induced effect[3]	725	27,875,947	109,339,397
Total effect[4]	3,377	339,174,266	1,496,170,557

Source: calculated based on RFD using IMPLAN 2021.
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Alternative C, Limited Leasing Alternative, shows a reduction in annual economic contributions to regional jobs and labor income of approximately 18 percent from 2039 to 2048 as compared with Alternative B, the No Action Alternative. This change is a result of the reduced production under Alternative C from 2047 to 2048; production prior to that time period would be the same for both alternatives, following EIA production estimates, as detailed in the RFD and **Appendix B**.

Mineral Revenues and Funding for Public Services

Forecast production of federal coal under the RFD will continue to generate annual revenues associated with federal coal production.

Table 3-73, below, shows the estimated revenue associated with decision area leases from 2039 to 2048 under Alternative B, No Action, and Alternative C, Limited Leasing. After 2048, continued revenue contributions would be limited to Alternative B, No Action.

Under Alternative C, Limited Leasing, production would continue at the same level as Alternative B, No Action, until 2047, after which it would decrease due to the lack of continued federal production. Thus, after 2048, impacts would be as noted for Alternative A, No Leasing.

Table 3-73
Estimated Average Annual Federal Mineral Revenue (2022$)

Time Frame	Federal Royalty Revenue ($)	Federal Royalty Disbursements ($)	State Severance Taxes ($)
2039–2048 (Alternative B - No Action Alternative)	266,267,647	130,471,147	133,355,715
2039–2048 (Alternative C - Limited Leasing Alternative)	218,297,960	106,966,000	122,246,858
Percent change from Alternative B in average annual contributions	-18%	-18%	-8%

Source: RFD data and EIA 2022a price estimates
Note: Under Alternative C, Limited Leasing Alternative, EIA-projected levels of production and related revenue would continue through 2046 based on available reserves. Due to a reduction in production in 2047–2048, annual average revenue is decreased for the time period examined.

A reduction in coal-related economic contributions in the local communities that have historically been dependent on this economic sector would result in associated adverse economic and social impacts in the absence of economic diversification. Declining coal production and employment in the coal industry, whether projected or realized, concerns rural communities. This is not only because local employment opportunities can be more limited but because nonmanagement wages in the coal industry are often higher than those in other local industries. In addition, coal revenue supports services throughout the state, not just the immediately surrounding areas.

A loss of coal jobs associated with a cease in production after 2048 could 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. Public services directly funded by coal revenue, such as education and infrastructure maintenance, would also be significantly impacted in the absence of the associated revenue sources discussed previously.

During periods of economic downturns from reduced mineral development, increased rates of depression have been reported (Shandro et al. 2011). In addition, demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, has also been observed to increase during economic downturns following slowed activity and lower employment in mineral extraction industries (Shandro et al. 2011). Collectively, these factors can adversely affect community cohesion and the quality of life in affected communities (Klasic et al. 2022).

3.5.3.3 Cumulative Impacts

Past, present, and RFFAs in and near the BFO decision area have the potential to affect coal production outside of BLM management decisions.

Nonfederal coal accounts for approximately 10 percent of total coal production in Campbell County. Direct spending and employment from nonfederal coal producers have additional direct, indirect, and induced economic effects that ripple throughout the state and local economies. Nonfederal coal production is not subject to federal royalty rates or federal rent; however, coal companies must pay severance taxes, corporate income taxes, and a coal excise tax on mining. For surface mines, current coal excise rates are $0.55 per ton of coal or 4.4 percent of the sale price, whichever is lower (Internal Revenue Service 2023). The Internal Revenue Service transfers collected funds to the Black Lung Disability Trust Fund (Internal Revenue Service 2023). In the absence of federal coal, mines would be unlikely to be economically viable; they would likely close. As a result, a further reduction in coal production and the economic losses associated with reduced nonfederal coal productions would have additional effects not quantified under *Environmental Consequences*.

Coal market demand has the potential to vary from the 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 as well as the increase in renewable energy sources are expected to reduce the demand for coal production for energy generation and lead to the retirements of less efficient coal plants through 2050 (greater than 100 power plants). Since each plant burns a unique mix of coals, the concentrations of chemicals in the emissions and residuals vary at each plant. Regardless of concentrations, emissions from coal-fired plants are known to contain fine particulate matter, SO_2, and NO_x. The residuals of coal combustion are known to contain traces of heavy metals. All these pollutants from coal combustion have been documented to have adverse impacts on the environment and public health outcomes in surrounding areas. Impacts from coal combustion on public health and climate change are discussed further in the air quality section (**Section 3.5.1**), as well as **Sections 3.5.2**, **3.5.3**, and **3.5.4**.

When burned at a power plant, the coal mined would indirectly contribute to criteria pollutant emissions, HAP and other toxic air pollutant emissions, and acid or mercury deposition impacts, in addition to the GHG emissions estimated in **Section 3.5.2**. Domestic power plants are required to obtain air permits to operate; these permits restrict criteria and HAP pollutant emissions and require appropriate pollutant control technology to protect public health and the environment. These power plants must maintain compliance with the NAAQS and any other applicable regulations (such as mercury). If a power plant accepts coal from a new source, it would still have to maintain compliance with its air permit, any associated requirements, and emission limitations as it burned the coal.

The SEIS is a planning action, and the ultimate disposition of the coal is unknown. It is reasonable to assume that the coal would be burned at a power plant under its existing air permit and with appropriate pollutant control technology.

3.5.4 Environmental Justice

3.5.4.1 Affected Environment

Executive Order 12898 requires federal agencies to identify and address as appropriate, disproportionately high, and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Following this executive order, the CEQ issued guidance for considering environmental justice within the NEPA process (CEQ 1997). This guidance defines minorities as individuals who identify as being one or more of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. The guidance further defines a minority population as follows: "Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis" (CEQ 1997). The CEQ guidance does not define what constitutes meaningfully greater.

For minority populations, meaningfully greater populations were determined using BLM 2022 environmental justice guidance (BLM 2022c). For this analysis, the BLM used a threshold analysis and meaningfully greater analysis. The 50 percent threshold analysis involves identifying any block groups with a total Indigenous population 50 percent or greater. For the meaningfully greater analysis, the BLM uses 110 percent of the minority percentage of the geographic reference area as the threshold for meaningfully greater (BLM 2022c). More detailed information on these two thresholds are provided in **Appendix E**. The average state minority population is multiplied by 110 percent to obtain a value of 18.7 percent for the state of Wyoming. The counties and block groups were compared with this calculated value. Any counties and block groups that have a minority population at or above 18.7 percent meet the meaningfully greater threshold and are considered environmental justice communities.

For Indigenous communities, any counties or block groups with Indigenous populations equal to or greater than the state value, in this case 3.67 percent, meet the meaningfully greater threshold and are considered environmental justice communities.

Low-income populations are defined relative to the annual statistical poverty thresholds from the US Census Bureau (CEQ 1997). The CEQ guidance on environmental justice (CEQ 1997) defines low-income populations based on the US Census Bureau's annual statistical poverty thresholds. CEQ guidance does not provide criteria for determining low-income populations as specifically as it does for minority populations; however, the BLM defines low-income individuals as people whose income is less than or equal to twice (200 percent of) the federal "poverty level" (BLM 2022c). For this analysis, the BLM used a 50 percent threshold analysis and low-income threshold analysis.

The BLM identified low-income populations according to the BLM 2022 environmental justice guidance. A county has a meaningfully greater low-income population if it has a low-income population at or above the state population (27 percent in Wyoming).

The BFO local analysis area for environmental justice consists of the block groups within Campbell and Converse Counties, including block groups surrounding current mines with federal coal leases and the associated downstream combustion points (power plants) they ship to. Block groups are statistical, geographic divisions of census tracts and are generally defined to contain between 600 and 3,000 people. A block group usually covers a contiguous area. Each census tract contains at least one block group, and block groups are uniquely numbered within the census tract.

The BLM collected data on low-income, minority, and Native American populations for both counties and all block groups within the counties. Data were also collected from the state of Wyoming, which was used as the reference population.

An overview of census block groups is included in **Figure 3-5**, Environmental Justice Overview. Low-income and minority population by block group are shown in **Figure 3-6** through **Figure 3-8** (**Figure 3-6**, BFO Local Analysis Area Low-Income Population; **Figure 3-7**, BFO Local Analysis Area Minority Population; and **Figure 3-8**, BFO Local Analysis Area Indigenous Population). **Figure 3-5** through **Figure 3-7** have legends that were developed considering the respective thresholds described above. These legends can be referenced to see which block groups meet the environmental justice criteria compared with the state reference area.

Table 3-74, below, shows the local analysis area counties and block groups and associated identified environmental justice community types using the respective thresholds described above. According to 2021 Census Bureau data, Converse County had a low-income population above the state threshold of 27 percent. While minority and Indigenous populations did not meet the thresholds at the county level, in total 67.5 percent of block groups in both Campbell and Converse Counties met the criteria for further consideration for environmental justice impacts based on one or more categories. Of the 40 block groups located within Campbell and Converse Counties, 27 block groups met the criteria for environmental justice communities for at least one of the three demographic indicators. Additional details of analysis are provided in **Appendix E**, Environmental Justice Technical Support Document.

Table 3-74
Local Analysis Area Environmental Justice Screening Results

Block Group Community Type Identified As	Total Identified Counties of Potential Concern	Total Identified Block Groups of Potential Concern
Minority	None	10
Low Income	Converse County	14
Indigenous	None	12
Both Low Income and Minority	None	1
Both Low Income and Indigenous	None	5
Both Minority and Indigenous	None	3
Low Income, Minority, and Indigenous	None	1

Source: EPA 2022f; US Census Bureau 2021

In addition to screening criteria for minority, low-income, and Native American populations, the BLM also examined data for environmental factors that may result in increased sensitivity to impacts from coal mine emissions. The BLM used the EPA's environmental justice screen to examine these factors, such as air toxics respiratory health indices, and air toxics cancer risk in comparison with state levels. **Appendix E** includes data for environmental factors by block group.

In addition to reviewing block groups near BFO coal mines with producing federal coal leases, an analysis was conducted to determine the occurrence of populations for environmental justice consideration in block groups overlapping or near (generally within 1 mile) one of the 104 downstream combustion points located in 25 states. **Table 3-75**, below, shows the downstream analysis area powerplants and block groups and associated identified environmental justice community types using the respective thresholds described above. Of the block groups identified (315), 63.5 percent meet the criteria for consideration as an environmental justice community for at least one of the three demographic indicators. In total, the BLM identified 200 block groups to be considered as potential environmental justice populations in the downstream analysis area. **Appendix E**, Environmental Justice Supporting Document, includes details for each combustion point.

Table 3-75
Downstream Analysis Area Environmental Justice Screening Results

Powerplant/Block Group Community Type Identified As	Identified Powerplants of Potential Concern	Total Identified Block Groups of Potential Concern
Minority	36	76
Low Income	67	131
Indigenous	65	101
Both Low Income and Minority	7	49
Both Low Income and Indigenous	22	47
Both Minority and Indigenous	2	29
Low Income, Minority, and Indigenous	24	17

Source: EPA 2022g; EIA 2022b

Figure 3-9 shows the power plants receiving coal from the BFO and the percentage of block groups within 1 mile of the powerplants that have populations which meet at least one of the three criteria (minority, low-income, and Indigenous status) for further environmental justice consideration.

Meaningful Engagement

Environmental Justice guidance for federal agencies stresses the importance of providing disproportionately and adversely affected minority, Indigenous, and low-income populations with meaningful engagement in environmental review processes (BLM 2022c; EPA 2016b). Press releases sent to newspapers, websites, television stations, social media, and radio stations in the region announced public involvement opportunities. The BLM hosted one in-person public scoping meeting in Gillette, Wyoming and a virtual meeting. The BLM also facilitated an in-person public comment meeting in Gillette and a virtual public meeting for the Draft Supplemental EIS. **Chapter 4**, Coordination and Consultation, summarizes the public involvement efforts. BLM staff are also available to meet with interested organizations and individuals.

Campbell County was invited and has been participating as a cooperating agency in the Supplemental EIS process on behalf of its citizenry. Campbell County possesses jurisdiction by law and special expertise on subject matters including but not limited to health, safety, welfare, custom, culture, and socioeconomics. Campbell County has been an active participant throughout this Supplemental EIS and Previous NEPA process.

Figure 3-5
Environmental Justice Overview

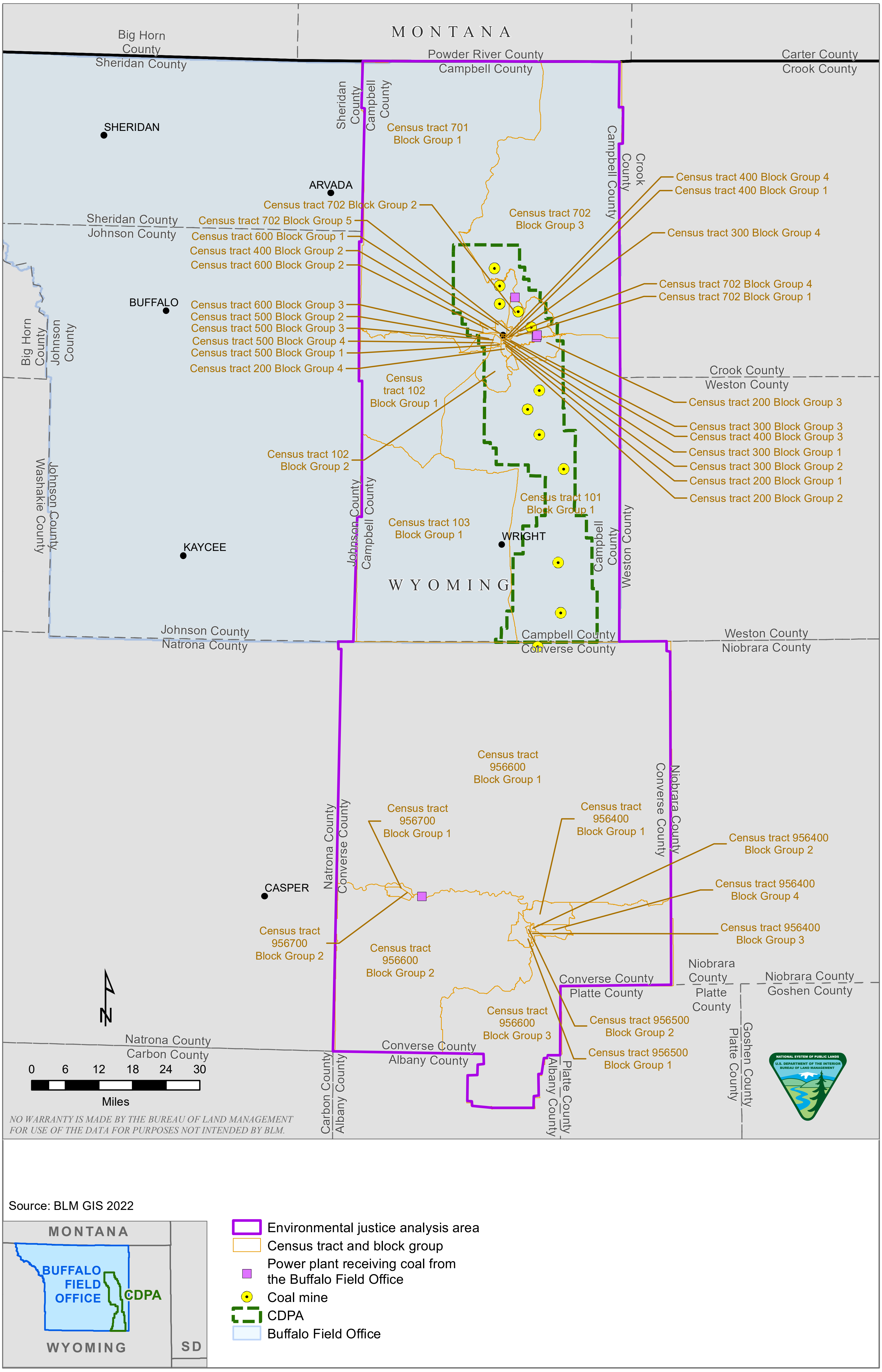


Figure 3-6
BFO Local Analysis Area Low Income Population

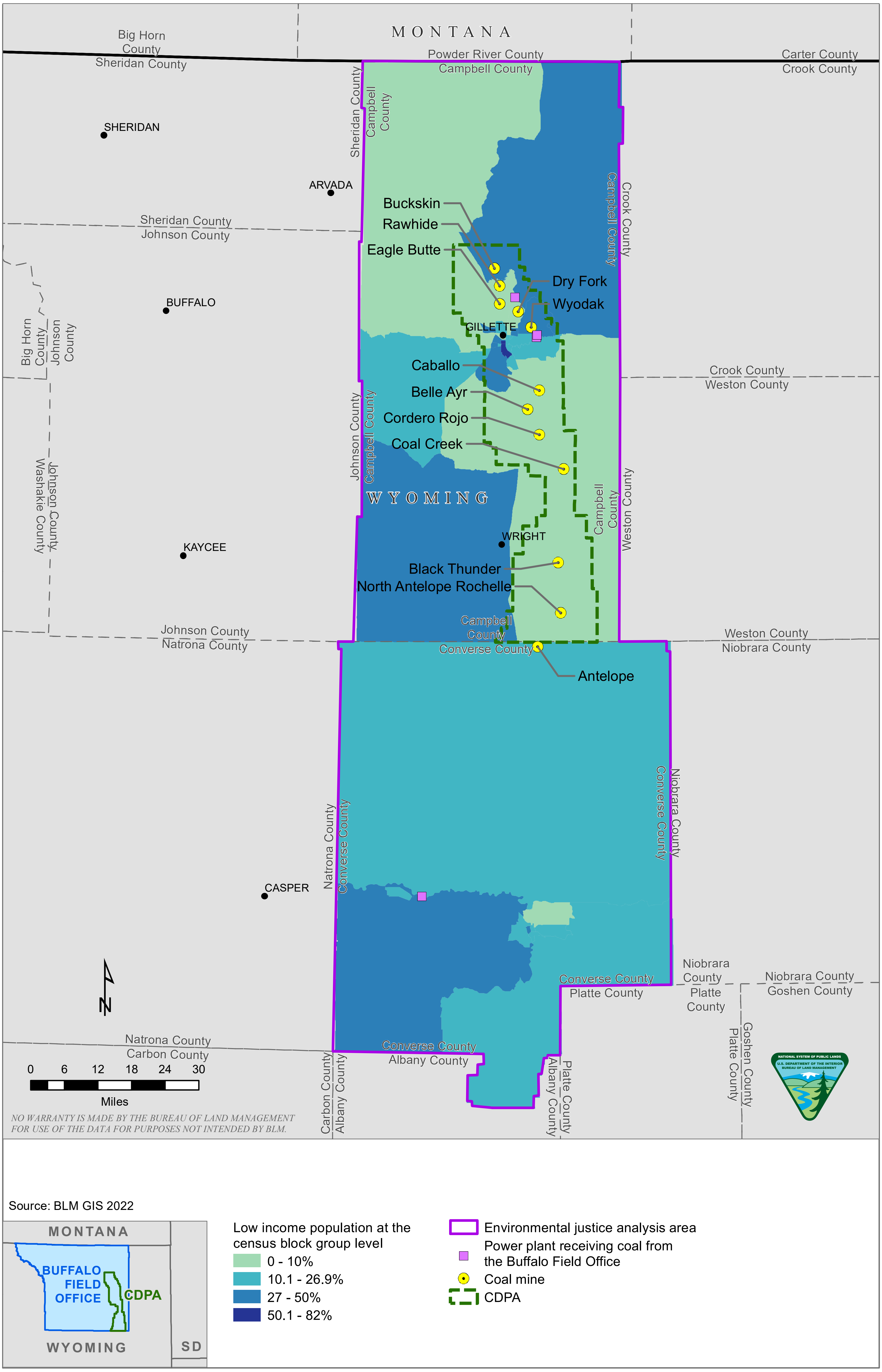


Figure 3-7
BFO Local Analysis Area Minority Population

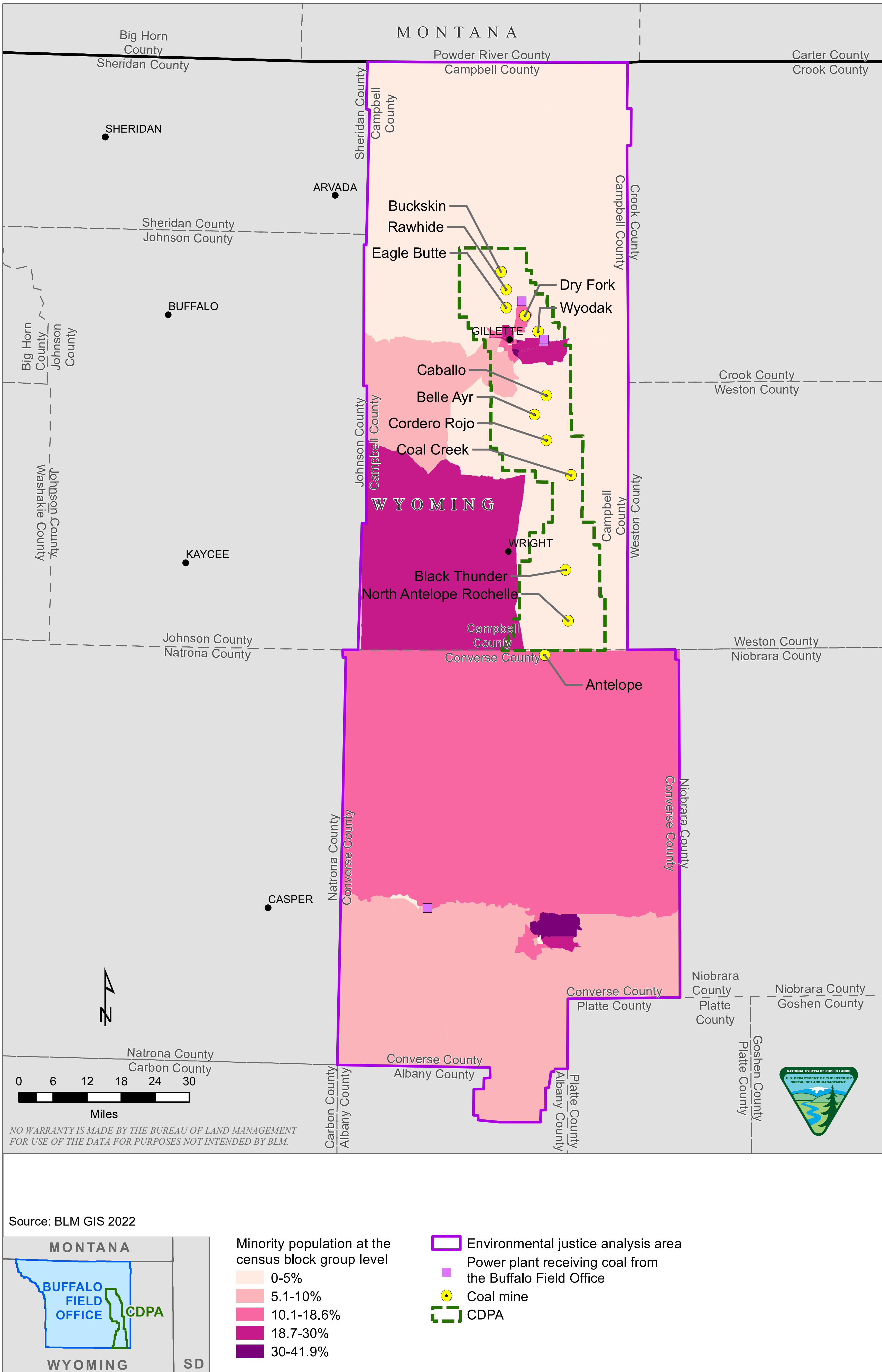
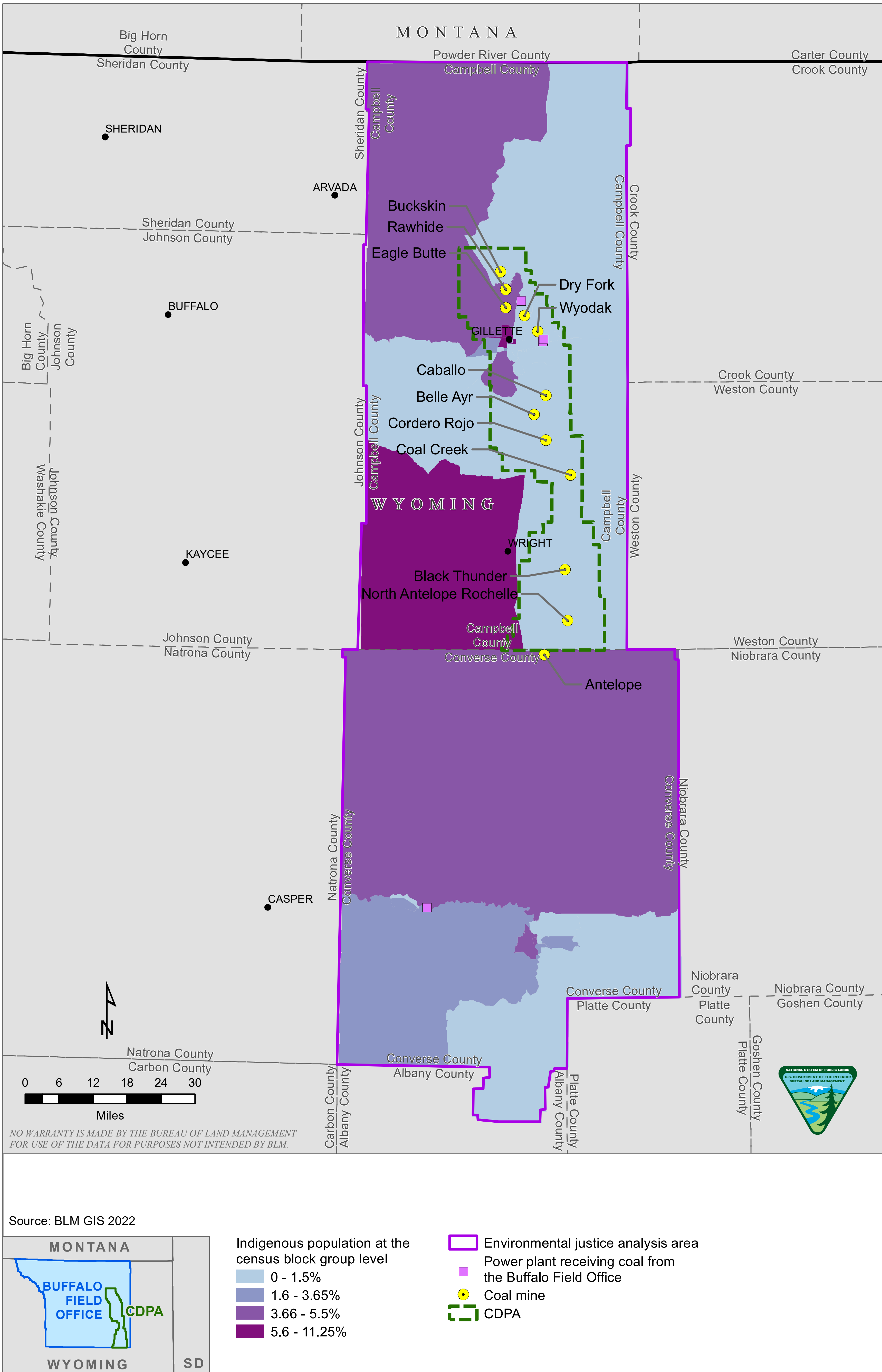


Figure 3-8
BFO Local Analysis Area Indigenous Population



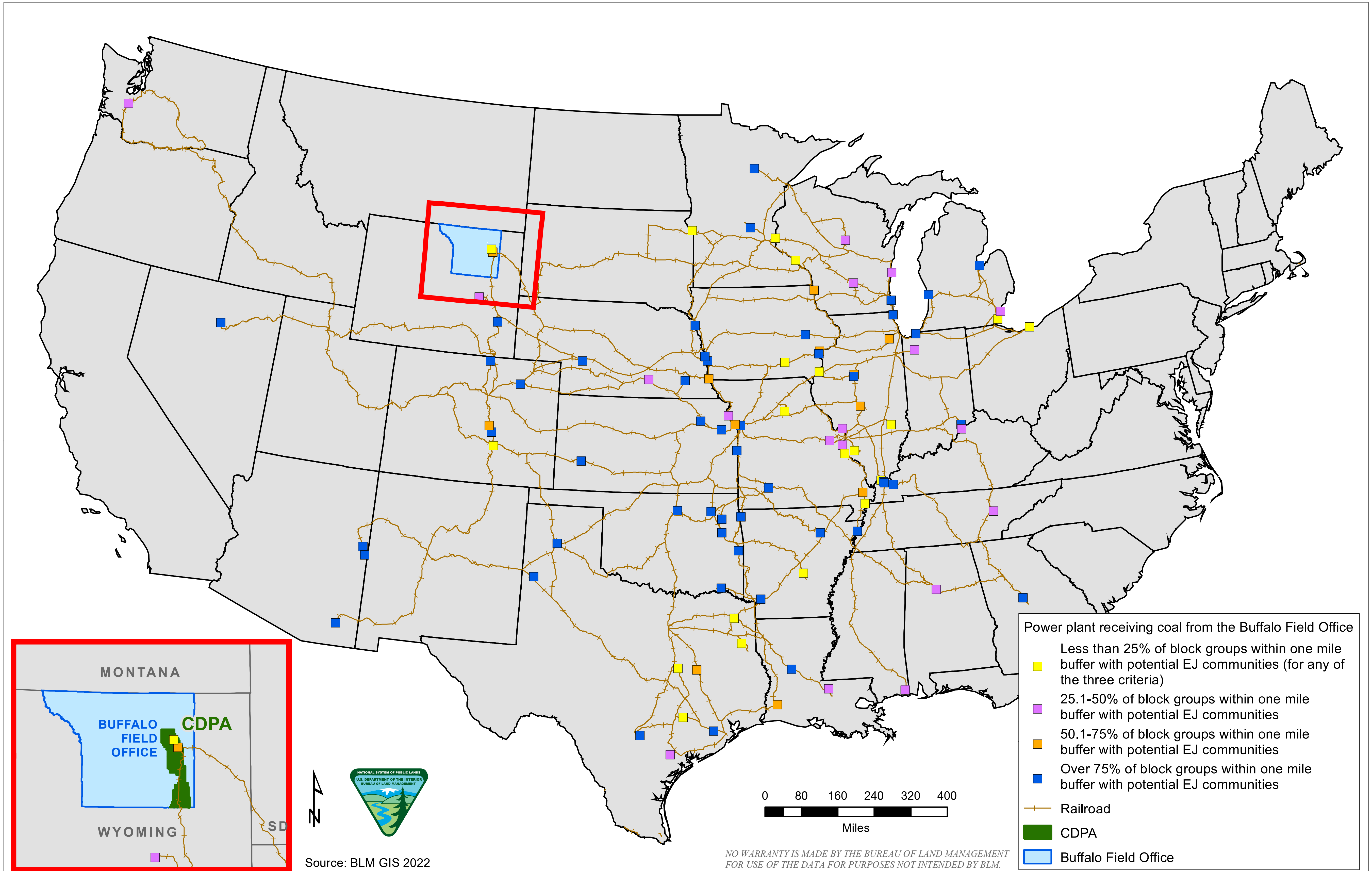


Figure 3-9
Potential Environmental Justice Populations in the Downstream Analysis Area

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Coordination and consultation with Sovereign Tribal Nations has occurred throughout the Supplemental EIS development. The BLM sent letters to 17 Sovereign Tribal Nations, prior to scoping, asking if the Tribes wanted to initiate formal government-to-government consultation. The letters were followed up with emails and telephone calls. While this process is considered ongoing, the Fort Peck Assiniboine and Sioux Tribal Historic Preservation Officer and Standing Rock Tribe Tribal Historic Preservation Officer have participated in the Supplemental EIS to date.

The BLM's engagement efforts targeted local residents of all income and racial classes within Campbell County as well as interested Sovereign Tribal Nations. From this effort, several individuals and entities have provided input and expressed environmental justice concerns related to the potential project impacts (both adverse and positive) on public health, climate change, socioeconomics, cumulative effects, air quality and water quality. Key points made by comment type are summarized in **Table 3-76**, below.

Table 3-76
Key Environmental Justice Issues Identified in Submitted Public Comment Letters

Comment Issue	Comment Source	Summary of Comments
Public Health	Local residents	• Healthy people living or working in proximity to coal mines are getting cancer. • Both my sons have asthma and we attribute it to the air pollution from the power plant.
Climate Change	Local residents	It has been unbelievably dry this year and we attribute that to burning coal and its huge impact for our country's contribution to the increasingly dire speed of climate change.
Socioeconomics	Campbell County	Coal production is a critical component of the county's economic base and also has a direct impact on school districts and the overall socioeconomics of the area. Continued coal leasing and development is essential to the long-term health of our county and the state of Wyoming.
Cumulative Effects	Standing Rock Tribe	How can federal agencies properly assess the direct and indirect effects, much less the cumulative effects when they are limited to an area? The reviews are too narrow in scope. The map shared is misleading. Potential effect does not end at that arbitrary boundary.
Air Quality	Local residents	Coal companies not abiding by air quality standards. North East Wyoming Regional Airport travelers are greeted with a noxious burning coal smell. The air outside of my house was laden with a pungent coal smoke fire was Why? Why is that happening more frequently?
Water Quality	Standing Rock Tribe	My children, grandchildren and yours, drink water out of plastic bottles because there is no clean water. It is well documented that coal production in this country has now poisoned the water ways of the United States. Coast to coast our waters are contaminated with mercury.

Note: Individual comment submitter names have been redacted to protect personal privacy.

3.5.4.2 Direct and Indirect Impacts

As discussed in the 2015 Approved RMP (BLM 2015a), coal mining and development can contribute to environmental impacts with potential implications for public health if not mitigated, including those associated with water quality and air quality and hazardous material exposure. This discussion examines the potential for disproportionate adverse impacts to identified environmental justice populations from coal mining and transportation, as well as downstream coal combustion and oil and gas emissions.

Impacts Common to All Alternatives

Federal production from existing leases, and related emissions with potential for health impacts on environmental justice communities, would be present under all alternatives; this is because existing BFO leases are anticipated to support federal coal production until 2041. Historically, low-income populations have been found to have disproportionately higher levels of exposure to air pollution (American Lung Association 2001). In addition, racial-ethnic minorities in the US have been found to be exposed to disproportionately high levels of ambient fine particulate air pollution ($PM_{2.5}$). However, it is unknown which emission sources drive this disparity and whether differences exist by emission sector, geography, or demographics. (Tessum et al. 2021). In addition, environmental justice populations have been shown to be more vulnerable to health impacts from pollutants, in part due to reduced resources, such as comprehensive health care, to combat potential impacts (Bell and Dominici 2008; Zeger et al. 2008).

In the BFO local analysis area, the potential for direct impact from mine operations would be concentrated in communities adjacent to mining operations and combustion points, as well as other, non-proximal Wyoming environmental justice communities utilizing public services and infrastructure funded by coal production revenue. Census block groups within 1 mile of mining operations and combustion points are identified in **Figure 3-5**, Environmental Justice Overview.

Identified potential environmental justice communities throughout the local analysis area could be impacted by emissions from mining and transportation. The *Public Health Impacts* section of the Air Quality analysis describes public health impacts associated with the life cycle of coal production. As noted in that section, coal combustion emits CAPs, precursors (NH_3 and VOCs), and HAPs that are known to impact air quality and public health (see **Table 3-20**, Health Impacts from Criteria Pollutants). Some key pollutants include $PM_{2.5}$, PM_{10}, SO_2, NO_2, NH_3, HAPs, and other VOCs. Public health impacts of coal-fired power plant emissions include, but are not limited to, respiratory symptoms and disease, declines in pulmonary function, cardiovascular disease, and cancer in nearby populations (see, for example, Amster 2021 and Amster and Lew Levy 2019).

A review of the public health impacts across the life cycle of coal production (extraction, processing, use, and waste) concludes that use of coal results in respiratory illness, cancer, cardiovascular disease, preterm birth, and premature death (Hendryx et al. 2020). Long-term exposure to $PM_{2.5}$ has also been associated with higher morbidity and mortality from respiratory, cardiovascular, pulmonary, and cerebrovascular diseases, and lung cancer (Romieu et al. 2012; Liu et al. 2013; EPA 2019, 2022g). The likelihood of such impacts also depends on variables such as residential proximity and population density.

Based on environmental data from the EPA EJScreen tool the identified populations in the local analysis area may have a higher level of existing risk factors that may make them more vulnerable to health-related impacts from coal development and associated combustion. **Appendix E**, **Table E-3** notes which block groups could be predisposed to a higher risk of additional health impacts by presenting a selection of the EPA's environmental justice index indicators across local analysis area populations as compared with state and national averages. Indicators presented include air toxics cancer risk, air toxics respiratory health index, $PM_{2.5}$, ozone, traffic proximity, hazardous waste proximity, and wastewater discharge. These populations may be more susceptible to disproportionate public health impacts from coal combustion, as identified in public health discussions, due to preexisting, additional health risks from the aforementioned indicators. For example, over 50 percent of the 40 block groups within the local analysis area met or exceeded Wyoming's 80th percentile for one or more of the environmental justice index indicators described above. Such prevalence of underlying risk factors should be considered alongside potential direct impacts on public health from coal combustion, as these indicators and criteria are additional to those met in **Appendix E**, **Table E-2**. See **Appendix E** for a detailed discussion on the EPA's EJScreen Tool and environmental justice index indicators.

Coal development and associated combustion also have the potential to impact air quality for environmental justice communities near combustion points. **Appendix E**, **Table E-4** identifies block groups adjacent to downstream combustion points that meet qualifications as environmental justice communities. As reported under the Public Health Impacts subsection in **Section 3.5.1**, oil, gas, and coal combustion products as a whole are linked with various short-term and long-term health effects. As discussed in **Section 3.5.3.3**, emissions from coal-fired power plants contain pollutants have been documented to have adverse impacts on the environment and public health outcomes in surrounding areas. Health outcomes identified have included asthma, allergy symptoms, and other respiratory illness; oxidative DNA damage; cancer; cardiovascular disease; preterm birth and low birthweight; inflammatory markers; and premature death (see **Table 3-21**, Health Impacts from Select Hazardous Air Pollutants Found in Combustion Products of Coal, Oil, and Natural Gas).

In addition, **Appendix C**, **Figures 3-11** through **3-17** display nonattainment areas in association with the receiving power plants. As previously noted, environmental justice communities may experience disproportionate levels of these health impacts and more adverse health outcomes. Domestic power plants are, however, required to obtain air permits to operate; these permits restrict criteria and HAP pollutant emissions and require appropriate pollutant control technology to protect public health and the environment. These power plants must also maintain compliance with the NAAQS and any other applicable regulations (such as mercury).

As discussed in **Section 3.5.2**, BFO-related coal development would contribute to global GHG emission increases. Studies have indicated that the most severe harms from climate change fall disproportionately upon low-income and minority populations, who are least able to prepare for, and recover from, heat waves, poor air quality, flooding, and other impacts (EPA 2021c).

As discussed in **Section 3.5.3**, national and state coal market trends indicate a reduced demand for coal production. In the absence of economic diversification, reduced coal demand would result in a related decrease in economic contributions and government revenue for the local analysis area coal-dependent communities under all alternatives. Potential environmental justice communities, as identified in the *Affected Environment* discussion, represent communities that meet identified criteria for consideration based on the best available information at the time of document preparation. Changes to economic conditions or population demographics over time may change the communities that are identified as those for potential environmental justice consideration. For example, a reduction in jobs and income as a result of coal-related jobs losses could result in more populations meeting the criteria for consideration as potential environmental justice communities with respect to low-income criteria. Recent trends in employment, income, and other economic indicators show that economic downturns may already be occurring in Campbell County, in part due to reduced coal contributions (Campbell County 2022).

Collected fiscal revenues associated with coal production would also be reduced, and revenue losses could have disproportionate effects on counties in the socioeconomic analysis area that rely on coal revenues to support public and social services. Continued coal market downturn under these alternatives over time may change or more strongly skew the communities that are identified as those for potential environmental justice consideration. A reduction in jobs and income from associated coal-related job losses result in more coal-reliant populations meeting the criteria for additional consideration as environmental justice communities, specifically with respect to low-income and Indigenous population criteria.

Such impacts would be additive in nature to the known environmental justice population characteristic of disproportionate risk for adverse health impacts resulting from changes in air quality and climate. Such stacked and interrelated impacts are of particular importance for associated populations and communities who garner economic security directly from the mining sector, such as local and downstream communities discussed previously. This also includes area, and tribal populations directly or indirectly benefitting from federal coal production. In 2019, Navajo Transitional Energy Company, LLC (NTEC) acquired the assets of Cloud Peak Energy through a bankruptcy auction process. This included three coal mines in the Powder River Basin of Wyoming and Montana (Antelope, Cordero Rojo, and Spring Creek). The Navajo Nation created the NTEC under Navajo statute in 2013 as an autonomous commercial entity to "promote the development of the Navajo Nation's resources and new sources of energy, power, transmission and attendant resources to develop the economic, financial, social and cultural well-being of the Navajo People and the Navajo Nation," with the Navajo Nation as the sole shareholder (NTEC 2023). Opportunities like the acquisition of Cloud Peak Energy assets have allowed NTEC to establish greater access to international coal markets for the Navajo Nation through collaboration with Westshore Terminals on the Pacific coast of British Columbia, in addition to providing tax revenue, merit-based scholarships, and a free coal distribution program to provide essential heating across the Navajo Nation and to the Hopi communities from other owned mines.

While the impacts of coal leasing decisions may be directly felt by the NTEC and indirectly impact coal-related revenue delivered to the Navajo Nation as a result, it is important to also consider the diversity of perspectives, worldviews, and values of all potentially impacted tribal (and non-tribal) environmental justice populations. Adverse impacts on environmental justice populations whose economic vitality is also embedded in the livelihood of coal production are vast and complex, with adverse impacts occurring on economic contributions of mineral production potentially at the same time as adverse impacts occurring on other equally important socioeconomic values, such as those associated with the nonmarket values of cultural resources, Indigenous traditional ecological knowledges, and nonuse of sacred and heritage landscapes.

The analysis below discusses incremental impacts from federal leasing decisions starting in 2041. Alternatives vary in terms of the time frame in which BFO coal-related impacts would continue to occur as a result of future leasing, rather than due to estimated changes in annual production or emission by alternative for a given year. Differences in alternatives are described in terms of this impact-governing time frame, below.

Alternative A, No Leasing

Under Alternative A, the No Leasing Alternative, no new leases would be issued. Existing potential for environmental justice health-related impacts from ongoing coal production at existing leases and associated transportation and downstream combustion would continue until 2041. After 2041, no future leases would be issued and no additional contributions to local or downstream emissions from development of BFO coal would occur. For downstream combustion points, BFO coal represents only a portion of total coal utilized. Impacts would therefore vary by power plant area depending on the availability of alternative coal sources to use in the absence of BFO coal. However, almost 40 percent of the total coal burned for electricity generation comes from the Wyoming Powder River Basin (Wyoming State Geological Survey 2023; Wyoming Mining Association 2019); therefore, changes to the availability of coal from this region would have widespread impacts throughout the downstream analysis area.

Under this alternative and in the absence of economic diversification, disproportionately adverse impacts on populations directly or indirectly benefiting from coal revenues, employment, or income would likely occur after 2041. However, after 2041, there would also be no additional air quality impacts on environmental justice communities or the general population specifically from federal Powder River Basin coal mining, transportation, and downstream combustion due to pending or potential future subsequent federal lease applications within the BFO planning area. This point, however, must also be considered in tandem with the potential for combustion of lower-quality coal in the absence of Powder River Basin coal.

A reduction in coal-related economic contributions in the local communities that have been historically dependent on this economic sector would also result in associated adverse economic and social impacts in the absence of economic diversification. Declining coal production and employment in the coal industry, whether projected or realized, concerns rural communities. This is not only because local employment opportunities can be more limited but because nonmanagement wages in the coal industry are often higher than those in other local industries. Also, coal revenue supports services throughout the state (not just the immediately surrounding areas). A loss of coal jobs associated with a cease in production after 2041 could 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. Public services directly funded by coal revenue, such as education and infrastructure maintenance, as detailed in **Section 3.5.3**, would also be significantly impacted in the absence of the associated revenue sources discussed previously.

Alternative B, No Action

Alternative B, No Action, production and emissions due to existing coal leases and associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur. Under Alternative B, No Action, emissions of criteria and HAPs from development of BFO coal would have the potential to continue until 2338, given the available coal reserves. However, corresponding continued production potential until 2338 would also more resiliently sustain mineral revenue-dependent populations through any associated regional economic contributions. Forecasted federal production and the corresponding emissions are highest in 2042 and lower in subsequent years.

Potential for impacts on environmental justice communities from mine, transportation, and downstream combustion as discussed in *Impacts Common to All Alternatives,* would be present throughout this time period. This alternative represents the longest time frame for potential exposure to contaminants from BFO coal development, with the greatest potential for disproportionate adverse impacts to environmental justice communities. As the coal production in the CDPA declines with time, the corresponding downstream combustion-related public health impacts, and the associated potential for impacts on environmental justice communities, would also decrease.

Alternative C, Limited Leasing

As with the other alternatives, the production and GHG emissions due to existing coal leases under Alternative C (Limited Leasing) and the associated mining, transportation, and downstream combustion discussed under *Affected Environment* would occur from 2023 to 2041. Alternative C (Limited Leasing) would allow a limited amount of leasing through 2038 and mining through 2048. Potential for impacts on environmental justice communities as discussed in *Impacts Common to All Alternatives,* would be present throughout this time period. There would be no coal production from future leases after 2048, and so GHG emissions and related potential for health impacts and disproportionate impacts on environmental justice communities from mining, transportation, and downstream combustion of federal Powder River Basin coal after 2048 would be zero under Alternative C (Limited Leasing).

As discussed under Alternative A, a reduction in coal-related economic contributions in the local communities that have been historically dependent on this economic sector would also result in associated adverse economic and social impacts in the absence of economic diversification. A loss of coal jobs associated with a cease in production after 2048 could 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. Public services directly funded by coal revenue would also be significantly impacted in the absence of the associated revenue sources discussed previously.

Mitigation

The BLM incorporated mitigation into the alternatives; these mitigations address the issues identified by environmental justice populations, as shown in **Table 3-77**, below.

Table 3-77
Environmental Justice-Related Mitigation Measures Incorporated into the Alternatives

Mitigation	Issues Addressed
All Alternatives	
Coal Screen 2 - Unsuitability Assessment: Exclude coal leasing: incorporated cities, occupied dwellings, churches, public parks, and cemeteries	Public health, socioeconomics, cumulative effects
Coal Screen 2 - Unsuitability Assessment: Exclude declared alluvial valley floors	Water quality
Clean Air Act Compliance: National and Wyoming Ambient Air Quality Standards Best available control technology Prevention of significant deterioration program Buffalo RMP Air Resources Management Plan (BLM 2015a Appendix L)	Public health, socioeconomics, cumulative effects, air quality, water quality
Clean Water Act Compliance: Stormwater prevention plans Wyoming pollutant discharge elimination system Buffalo RMP Water Resources Management Plan (BLM 2015a Appendix N)	Public health, socioeconomics, cumulative effects, air quality, water quality

Mitigation	Issues Addressed
Alternative A – No Leasing and Alternative C – Limited Leasing	
Coal Screen 3 – Multiple Use Reduce GHG emissions	Public health, climate change, socioeconomics, cumulative effects, air quality

Note: Cultural resources in the form of national historic sites are also one of the defined coal screening unsuitability criteria, as detailed in **Appendix A**, **Table A-2**. No national historic sites were identified within the coal planning area. Mitigation of cultural resources can also be considered under the Multiple Land Use screen during leasing.

3.5.4.3 Cumulative Impacts

Local and downstream analysis area emissions and pollutants emitted through coal mining and combustion would continue to have potential impacts on identified environmental justice communities. As discussed in **Section 3.5.3.3**, emissions from coal-fired plants are known to contain fine particulate matter, SO_2, and NO_x. The residuals of coal combustion are known to contain traces of heavy metals. All these pollutants have been documented to have adverse impacts on the environment and public health outcomes in surrounding areas, which would disproportionately impact any existing environmental justice populations. Required air permits to operate power plants would restrict criteria and HAP pollutant emissions and require appropriate pollutant control technology to protect public health and the environment.

The contribution to cumulative impacts would be greatest under Alternative B, No Action, where impacts would have the potential to continue until 2338, given the available coal reserves. Under Alternative C, Limited Leasing, impacts would occur until 2048. Under Alternative A, No Leasing, potential environmental justice health-related impacts would be reduced for the local analysis area following the cessation of federal coal production around 2041. Continued coal market downturn under these alternatives over time may change the communities that are identified as those for potential environmental justice consideration. A reduction in local jobs and income from associated coal related job losses may result in more coal-reliant populations meeting the criteria for additional consideration as potential environmental justice communities, specifically with respect to low-income criteria.

Forecasted reductions in coal demand for the fuel generation energy mix have the potential to reduce coal production in the socioeconomic analysis area. Collected fiscal revenues associated with coal production would also be reduced, and revenue losses would have disproportionately adverse effects on Wyoming counties that rely predominantly on coal mineral revenues to support public and social services and infrastructure. Continued coal market downturn under these alternatives over time could change or more strongly skew the communities that are identified as those for potential environmental justice consideration. As stated previously, a reduction in local jobs and income from associated coal-related job losses would result in more coal-reliant populations meeting the criteria for additional consideration as potential environmental justice communities, specifically with respect to low-income and Indigenous population criteria.

In response to disproportionately adverse impacts faced by transitioning energy communities like those residing in the socioeconomic analysis area, Executive Order 14008 – Tackling the Climate Crisis at Home and Abroad[9] established the IWG on Coal and Power Plant Communities and Economic Revitalization.

[9] Executive Order 14096 of April 21, 2023. 88 FR 25251. https://www.federalregister.gov/documents/2023/04/26/2023-08955/revitalizing-our-nations-commitment-to-environmental-justice-for-all

Resources and opportunities such as the Bipartisan Infrastructure Law[10], CHIPS and Science Act[11], and Inflation Reduction Act[12] have greatly increased the amount of federal funding available to meet the needs of energy communities through the observed energy transition. Several Bipartisan Infrastructure Law provisions either require or give preference to communities with existing fossil industries, and/or give priority to projects that hire displaced fossil energy workers. The CHIPS and Science Act supports research on utilizing coal waste and other carbon materials, as well as STEM training programs focused on displaced fossil workers. Such existing assistance opportunities could help bolster state and academic efforts surrounding coal research, innovation, and development stage technologies and associated alternatives.

Mining of BFO coal would continue to contribute to GHG gas emissions, which add to ongoing impacts from climate change on human health and disease in numerous ways, as detailed in previous SEIS sections. Some existing health threats will intensify, and new health threats will emerge as a result of climate change. Factors such as age, economic resources, and location are likely to impact specific threats, making identified environmental justice populations more susceptible to associated adverse health impacts than the general population considered. In the US, public health can be affected by disruptions of physical, biological, and ecological systems. Some health effects from physical, biological, and ecological disruptions may include increased respiratory and cardiovascular disease, injuries and premature deaths related to extreme weather events, changes in the prevalence and geographic distribution of food- and waterborne illnesses and other infectious diseases, and threats to mental health (US Global Change Research Program 2016). Environmental justice communities would be vulnerable to disproportionate impacts from these threats based on factors such as socioeconomic status, race, the current level of health, and others.

3.5.5 Coal Resources

3.5.5.1 Affected Environment

The Powder River Basin in Wyoming and Montana contains some of the largest accumulations of low-sulfur subbituminous coal in the world with among the lowest emissions footprint of any coal resource used for power generation (DOE 2023). As part of the Federal Coal Management Program, the Powder River Basin in Wyoming and Montana was designated a federal coal production region in the 1970s. On January 9, 1990, the BLM formally decertified the Powder River Coal Production Region as a coal production region, which had the effect of replacing the regional leasing process with the leasing-by-application process in that area.[13] The majority of the coal activity within Wyoming's Powder River Basin lies within the BFO's administrative boundary.

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

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[10] H.R.3684 - Infrastructure Investment and Jobs Act. Public Law No: 117-58. https://www.congress.gov/bill/117th-congress/house-bill/3684

[11] H.R.4346 - Chips and Science Act. Public Law No: 117-167. https://www.congress.gov/bill/117th-congress/house-bill/4346

[12] H.R.5376 - Inflation Reduction Act of 2022. Public Law No: 117-169. https://www.congress.gov/bill/117th-congress/house-bill/5376

[13] See "Decertification of the Powder River Coal Production Region." *Federal Register* 55, no. 6, (January 9, 1990): 784–785. Internet website: https://www.govinfo.gov/content/pkg/FR-1990-01-09/pdf/FR-1990-01-09.pdf.

the BLM's coal program management and set requirements for land use planning, leasing, and post-lease maintenance. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing be excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted).

The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

Thick coal deposits occur at or near the surface along a north–south trend situated east of both Gillette and Wright. Coal occurs at shallow depth, below the surface, throughout most of the remainder of the CDPA. Due to its low-sulfur content, coal from the Powder River Basin in Wyoming is valued for its clean-burning properties and transported to a number of coal-fired power-generating facilities for use in meeting sulfur emissions requirements. 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 CDPA produce coal that burns in the 8,200 to 8,400 Btu range, the mines in the central part of the CDPA produce coal in the 8,400 to 8,600 Btu range, and the mines in the southern part of the CDPA produce coal in the 8,600 to over 8,800 Btu range.

Coal production from the Powder River Basin has been on a declining trend since reaching a peak in 2008 when annual production was approximately 496 million short tons. In 2021, the most recent year for which complete data are available, reported production was 251 million short tons (EIA 2022j). The decline in coal production is generally attributed to several factors, including the hydraulic fracturing boom beginning in the late 2000s, which prompted generating units to switch from coal to lower-cost natural gas as a fuel source; competition from other power sources, such as natural gas and renewable energy, which forced older and less efficient generating units out of business; and increasingly stringent emissions regulations that forced some generating unit retirements and prompted others to switch away from coal as a fuel source (Institute for Energy Economics and Financial Analysis 2019). These factors are expected to continue to impact demand for thermal coal in the future.

Coal produced in the CDPA is distributed to electrical generating units within the US. In 2021, coal from existing leases in the CDPA was used at 104 electrical generating units in 25 states (see **Appendix F**, Coal Distribution from Mines within the Buffalo Field Office, for a list). This is a decline from 2008 when coal was used at 152 electrical generating units in 32 states (EIA 2009).

Alternative Coal Uses

Several entities, including the State of Wyoming, are researching potential nonthermal uses for coal resources, such as extracting rare earth minerals from coal or using coal as a carbon feedstock in the manufacturing of carbon fiber. Research on carbon capture and storage technologies is also ongoing. These technologies have the potential to extend the life of coal mining in the CDPA if they become technically and economically viable on a large scale.

Campbell County coal is subbituminous (approximately 35 to 45 percent carbon), which has low to moderate heating values and moderate water content. Coal gasification offers a versatile and clean method of converting low-carbon coals, such as lignite and subbituminous, into hydrogen and other valuable products, including synthetic gas or syngas. GHGs become a raw material, from which substitutes for gasoline, diesel, and natural gas can be produced from coal. Syngas can be further processed to produce chemical building blocks, such as methanol, ammonia, and urea.

Coal used for steel making (metallurgical coal) needs to be high in carbon content (greater than 45 percent) and low in moisture content. The manufacture of many high carbon content items such as water-filtration systems, graphite, and carbon fiber, which is used in things ranging from lightweight bicycles to bullet-proof Kevlar vests, require coal with high carbon content. Wyoming's Powder River Basin coal with a carbon content of approximately 35 to 45 percent carbon is ill suited for such high carbon uses. The University of Wyoming recently received a DOE grant to research converting the Powder River Basin's subbituminous coal into graphene, which has several uses, such as improving the performance of sodium ion battery anodes and strengthening additives for concrete (National Energy Technology Laboratory 2022).

Research and development stage technologies are also successfully extracting rare earth elements from coal and coal refuse. Deposits of magnetic rare earth elements, including neodymium, praseodymium, and samarium, have been found at the Brook Mine northwest of Sheridan (Cision PR Newswire 2023). A rare earth element extraction and separation demonstration plant is to be built in Upton, just east of the Campbell County coal mines. Plant design, permitting, and licensing are underway (Rare Element Resources 2023). The University of Kentucky is in the second phase of studying the commercial, economic viability of extracting rare earth elements from coal (National Energy Technology Laboratory 2021; University of Kentucky 2018).

Other uses require the coal to be combusted first. The resulting coal ash can be used in a variety of products, including drywall, cement, abrasives, and in roofing materials. Coal tar is used primarily for the production of refined chemicals, pharmaceuticals, explosives, plastics, paint, creosote, and coal-tar pitch. In addition to the emissions created from combustion, the ash can contain toxic elements and compounds, such as cadmium, silicon dioxide, arsenic, and calcium oxide. The reuse of coal ash can isolate these toxins from the natural environment.

The State of Wyoming and Campbell County are also partnering to support additional research and development projects for alternative uses of coal that include (Campbell County 2023):

Asphalt binder: Coal-derived asphalt binder for paving and roofing products emits 72 kilograms CO2e/ton of product; petroleum-derived asphalt emits 376 kilograms CO2e/ton of product. The University of Wyoming is building a field demonstration plant in Gillette to field test the coal asphalt product, the plant is slated to be running by the fall of 2024 (University of Wyoming 2023).

Carbon char bricks: These bricks are less expensive than standard clay bricks. They weigh about one-third of standard bricks, have a class "A" fire rating, and they have lower VOC emissions than standard clay bricks (University of Wyoming 2023).

Agricultural soil amendment: Coal char soil amendments promote increased crop yields, improve the soil fertility, and retain carbon. The soil amendment is currently being evaluated in field trials at two Wyoming locations (University of Wyoming 2023).

3.5.5.2 Direct and Indirect Impacts

Under all alternatives, the BLM anticipates that existing leases would be sufficient to allow mining of BLM-administered coal to continue until 2041. As long as lease conditions are being met, the BLM cannot cancel or terminate existing leases. As a result, leasing decisions made under this SEIS/RMPA that restrict leasing could not result in significant changes to production of BLM-administered coal resources until the year 2041.

Alternative A, No Leasing

Under Alternative A, No Leasing, the entire CDPA would be unavailable for future consideration of BLM-administered coal leasing. The BLM would not accept new coal lease applications, and the BLM would deny or return current lease applications that have not been finalized. Under this alternative, mining of BLM-administered coal on existing leases would continue until reserves are exhausted, but no new BLM-administered coal would be leased. Making approximately 48.01 billion short tons of recoverable coal unavailable for consideration for leasing would result in a long-term reduction in the production of BLM-administered coal in the CDPA. This would also prevent use of BLM-administered coal resources beyond 2041 for possible nonthermal uses, such as extracting rare earth minerals from coal deposits, or the use of coal as a source of carbon feedstock. However, at this time, nonthermal uses of coal are largely speculative, they are not considered reasonably foreseeable, and a NEPA analysis of these uses would likely be required prior to authorization.

Alternative B, No Action

Under Alternative B, No Action, the full CDPA would be available for the future consideration of leasing with approximately 48 billion short tons of recoverable coal available for consideration for leasing. Under this alternative, BLM-administered coal resources would be available long term for extraction for use as thermal coal, as well as for other potential uses, such as extracting rare earth minerals and for use as a feedstock. However, at this time, nonthermal uses of coal are speculative, they are not considered reasonably foreseeable, and a NEPA analysis of these uses would likely be required prior to authorization.

Compared with Alternative A, No Leasing, approximately 48 billion more short tons of recoverable BLM-administered coal would be available for leasing under Alternative B, No Action. This amount of coal available for the future consideration of leasing would represent reserves for continued extraction of BLM-administered coal far beyond the end of the planning period. These reserves would be sufficient to continue mining for over 300 years at the rate of production from 2048 (the last year of the EIA forecast). This is only an estimate of the size of available reserves; this alternative is not permitting coal leasing for the next 300 years. Coal allocation decisions would be periodically evaluated in BLM RMPs, as required by FLPMA.

Alternative C, Limited Leasing

Under Alternative C, Limited Leasing, leasing in the CDPA would be limited to approximately 1.24 billion short tons of BLM-administered recoverable coal. Under this alternative, coal BLM-administered recoverable coal available for leasing would be reduced by approximately 46.77 billion short tons. Limited BLM-administered coal resources would continue to be available for extraction for use as thermal coal, as well as for other potential uses, such as extracting rare earth minerals and for use as a feedstock through 2048. However, at this time, nonthermal uses of coal are largely speculative, they are not considered reasonably foreseeable, and a NEPA analysis of these uses would likely be required prior to authorization.

Based on EIA (2022k) projections of coal production from the CDPA, the approximately 1.24 billion short tons of coal made available for lease under this alternative would be sufficient to extend production of BLM-administered coal in the CDPA until approximately 2048; when coal under existing leases and additional coal reserves made available for lease under this alternative would be exhausted. This alternative would result in a long-term reduction in production of BLM-administered coal in the CDPA. Compared with Alternative A, No Leasing, approximately 1.24 billion more short tons of BLM-administered coal would be available for leasing under Alternative C, Limited Leasing. Under Alternative C, Limited Leasing, approximately 46.76 billion short tons of BLM-administered coal would be unavailable for leasing compared with Alternative B, No Action. Under this alternative, allowing the leasing of 1.24 billion short tons of BLM-administered recoverable coal would provide sufficient reserves for coal extraction in the CDPA to continue to occur beyond 2038, the end of the planning period.

3.5.5.3 Cumulative Impacts

Cumulative impacts are those impacts that result from implementing any of the alternatives, in combination with other actions outside the scope of this SEIS/RMPA. 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. Evaluating potential impacts includes considering incremental impacts that could occur from the alternatives, as well as impacts from past, present, and RFFAs. The RFFA area includes the BFO planning area from the 2015 Approved RMP/ROD. See Appendix G of that document for a list of RFFAs in the BFO planning area. In addition, the Converse County Oil and Gas EIS and the Miles City Field Office Supplemental EIS and Proposed Plan Amendment are included in the cumulative effects analysis.

Management actions that reduce coal availability for leasing and development would result in a reduction in the availability of coal for extraction and use for productive uses, such as power generation and generation of employment opportunities and revenues.

3.6 UNAVOIDABLE ADVERSE IMPACTS

Section 102l 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; this is because of unknown impacts from 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, the loss of vegetation cover, the spread of noxious weeds, disturbance to and displacement of wildlife, visual intrusions on the landscape, and the potential loss of cultural or paleontological resources. The combustion of coal would result in impacts on air quality and public health surrounding the locations of combustion some of which may be disproportionately experienced by environmental justice populations. The combustion of coal would also generate GHGs which would contribute to global climate impacts.

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 (through 2038).

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

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Chapter 4. Coordination and Consultation

4.1 Introduction

This chapter describes the public outreach and participation opportunities associated with developing this SEIS/RMPA. As part of the process, the BLM consulted and coordinated with Sovereign Tribal Nations, 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 the 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 via *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.

4.2 Public Collaboration and Outreach

Public involvement is a vital and legal component of the NEPA 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 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 the NEPA analysis to determine the scope of issues and alternatives to be addressed in the Draft Supplemental EIS and Potential RMPA
- Development of alternatives to be considered in the Draft Supplemental EIS and Potential RMPA
- Collaboration with Sovereign Tribal Nations, federal, state, and local governments, and cooperating agencies
- The Draft Supplemental EIS and Potential RMPA public comment period
- Governor's consistency review
- The 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://eplanning.blm.gov/eplanning-ui/project/2021239/510.

4.3 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 2022 BFO Draft SEIS/Potential RMPA Scoping Report, available on the project's ePlanning website: https://eplanning.blm.gov/eplanning-ui/project/2021239/510.

4.3.1 Notice of Intent

The formal public scoping process for the Draft SEIS/Potential RMPA began with the publication of the NOI in the *Federal Register* on October 3, 2022 (87 *Federal Register* 59818); the BLM also posted the NOI on the project website (https://eplanning.blm.gov/eplanning-ui/project/2021239/510). The BLM notified the public of its intent to prepare the SEIS/RMPA for the 2015 Approved RMP/ROD, as amended. It is in response to a United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. v. Bureau of Land Management*; 4:20-cv-00076-GF-BMM; August 3, 2022). The NOI included a call for coal and other resource information and identified SEIS/RMPA topics. The scoping period lasted 30 days, ending on November 2, 2022.

4.3.2 ePlanning Website

The BLM maintains a project website with information related to the development of the SEIS/RMPA: https://eplanning.blm.gov/eplanning-ui/project/2021239/510. The website includes background documents, maps, public meeting information, and contact information.

4.3.3 News Releases

During the public scoping period, the BLM sent press releases to newspapers, websites, television stations, and radio stations in the region. These press releases announced public involvement opportunities, scoping meetings, and educational forums. The following is a complete list of media outlets:

- *Afton-Star Valley Independent*
- Associated Press
- Basin Radio (KAML/KIML, Gillette)
- *Basin-Republican Rustler*
- Bigfoot 99 Radio (KTGA)
- Big Horn Mountain Radio (KBBS, Sheridan Office)
- Big Horn Radio Network (KWOR)
- *Bloomberg Business Report*
- *Bridger Valley Pioneer*
- *Buffalo Bulletin*
- *Casper Star Tribune*
- Casper News Now (KCWY13)
- Cody Enterprise
- County 10
- Cowboy State News Network
- *Daily Rocket-Miner*
- *Denver Post*
- *Dubois Frontier*
- EE News
- *Glenrock Bird*
- *Greybull Standard Tribune*
- *Guernsey Gazette*
- *Gillette News Record*
- *Green River Star*
- *Jackson Hole News and Guide*
- K2 Radio
- K-9 Radio
- KASL
- Kaycee Voice
- *Kemmerer Gazette*
- KBFS/KY–T - The Country Twins
- KYCN/KZEW
- KGOS-AM/KERM-FM
- KPIN (“K-Pine” Pinedale)
- KOVE/KDLY (Fremont County)
- *Lusk Herald*
- *Lander Journal*
- *Laramie Daily Boomerang*
- *Lovell Chronicle*
- *Moorcroft Leader*
- *Newcastle Newsletter Journal*

- *Northern Wyoming Daily News*
- Northern Broadcasting System
- *Pine Bluffs Post*
- Pinedale Online
- *Pinedale Roundup*
- *Powell Tribune*
- *Rapid City Journal*
- *Rocky Mountain Oil Journal*
- *Salt Lake Tribune*
- Sheridan Media (KROE/KWYO/KYTI/KZWY/KLQQ)
- *Sublette Examiner*
- *Sundance Times*
- Townsquare Media
- *Torrington Telegram*
- *Weston County Gazette*
- Wind River Radio Network (KTAK)
- *Wyoming Business Report*
- *Wyoming Livestock Roundup*
- Wyoming News Now (KWGN)
- *Wyoming Tribune Eagle*
- Wyoming Public Radio
- Wyofile

4.3.4 Other Notifications

The BLM directly notified the plaintiffs, the cooperating agencies, and Sovereign Tribal Nations of the official start of the public scoping period. In addition, the BLM notified the public about the scoping process via the BLM Wyoming's social media Facebook and Twitter pages.

4.3.5 Scoping Meetings

Following publication of the NOI for the Draft SEIS/Potential RMPA, the BLM conducted one scoping meeting in Gillette, Wyoming, on October 17, 2022. The meeting began with a PowerPoint presentation describing the purpose of the Draft SEIS/Potential RMPA, the project approach, and the opportunities for public involvement. The presentation was followed with a question-and-answer session and an opportunity for the public to discuss the project with BLM specialists individually. Materials presented and additional information can be found in the 2022 BFO Draft SEIS/Potential RMPA Scoping Report (BLM 2022a), available on the project's ePlanning website: https://eplanning.blm.gov/eplanning-ui/project/2021239/510.

4.3.6 Scoping Comments Received

During the public scoping period, the BLM received 18 unique written submissions containing 172 substantive comments. Detailed information about the comments and the public outreach process can be found in the Buffalo Draft SEIS/Potential RMPA Scoping Report (BLM 2022a), available on the project's ePlanning website: https://eplanning.blm.gov/eplanning-ui/project/2021239/510. The issues identified during public scoping and outreach helped the BLM refine the list of planning issues, which guided the development of alternative management strategies for the Draft SEIS/Potential RMPA.

4.4 Public Comments on the Draft SEIS/Potential RMPA

The BLM published a notice of availability for the Draft SEIS/Potential RMPA in the *Federal Register* on May 5, 2023, which initiated the 90-day comment period. On May 31, the BLM hosted a public meeting at the George Amos Building in Gillette, Wyoming, to present the Draft SEIS/RMPA to the public and solicit comments. Five members of the public attended the meeting. The BLM also hosted an online public meeting on June 5, 2023. Four members of the public attended the online meeting.

During the public comment period, the BLM received 25 unique written submissions containing 148 substantive comments. The Draft SEIS comments helped the BLM refine the Final SEIS and guided the development of the Proposed RMPA. All public comments are posted on the project's ePlanning website at https://eplanning.blm.gov/eplanning-ui/project/2021239/510. **Appendix H** is a record of BLM responses to substantive comments.

4.5 Protest Process

The notice of availability for the Final SEIS/Proposed RMPA published by the EPA 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.

4.6 List of Preparers

Affiliation/Preparer	Name	Role/Responsibility
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	Karsyn Lamb	Wyoming State Office Economist
	Arnie Irwin	Soil Scientist
	Brent Sobotka	Hydrologist
	Amber Haverlock	Realty Specialist
	Ardeth Hahn	Archaeologist
	Dusty Hill	Geologist
	Shari Ketcham	Biologist
	Meleah Corey	GIS Specialist
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	Shine Roshan	Socioeconomics Specialist
	Megan Stone	Environmental Justice Specialist
Ramboll	Krish Vijayaraghavan	Air Quality and Climate Change
	Ross Beardsley	Air Quality and Climate Change

4.7 SOVEREIGN TRIBAL NATION CONSULTATION

Consultation with Sovereign Tribal Nations is a requirement of NEPA, FLPMA NHPA, and BLM manual 1780. The BLM sent letters to Sovereign Tribal Nations on August 30, 2022, and October 5, 2022, to ask if the Sovereign Tribal Nations wanted to initiate formal government-to-government consultation. The BLM also followed up with emails and reached out via telephone to Sovereign Tribal Nations.

Sovereign Tribal Nation consultation will continue throughout the SEIS/RMPA process and during implementation of the final decision.

4.8 COOPERATING AGENCIES AND SOVEREIGN TRIBAL NATIONS

The BLM is engaging in ongoing collaboration with Sovereign Tribal Nations, and federal, state, and local governments as part of this SEIS/RMPA. The BLM sent letters to eligible agencies and Sovereign Tribal Nations inviting them to assist with the SEIS/RMPA.

The BLM sent invitation letters on August 25, 2022, to the following interested Sovereign Tribal Nations and eligible local, state, and federal agencies:

Counties

- Campbell County Commission
- Johnson County Commission

Conservation District

- Campbell County Conservation District

Wyoming State Agency

- Office of the Governor
- Wyoming Department of Agriculture
- Wyoming Department of Environmental Quality
- Wyoming Game and Fish Department

Federal Agencies

- EPA
- National Park Service
- US DOI – Office of Surface Mining Reclamation and Enforcement
- USFWS

Congressional

- US Representative Liz Cheney (October 2022 to December 2022)
- US Representative Harriet Hagerman (January 2023 to present date)
- US Senator John Barrasso's Office
- US Senator Cynthia Lummis's Office

Sovereign Tribal Nations

- Fort Belknap Reservation
- Crow Tribe of Indians
- Fort Peck Assiniboine and Sioux Tribes
- Northern Cheyenne Tribe
- Santee Sioux Nation of Nebraska
- Three Affiliated Tribes - Mandan, Hidatsa, and Arikara Nations
- Standing Rock Sioux Tribe
- Spirit Lake Tribe of Fort Totten
- Cheyenne River Sioux Tribe
- Crow Creek Sioux
- Lower Brule Sioux Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Sisseton Wahpeton Oyate Tribes
- Yankton Sioux Tribe
- Eastern Shoshone Tribe
- Northern Arapaho Tribe

The BLM held a cooperating agency and Sovereign Tribal Nation meeting prior to the public scoping meeting, on October 17, 2022, at the George Amos Memorial Building, 412 S. Gillette Ave., Gillette, Wyoming. Joint cooperating agency and Sovereign Tribal Nation meetings were also held in person at the George Amos Memorial Building in Gillette on December 9, 2022 (which covered alternatives development) and on January 26, 2023 (which discussed the preliminary administrative Draft SEIS/Potential RMPA). A joint cooperating agency and Sovereign Tribal Nation meeting was also held on May 31, 2023, at the George Amos Memorial Building in Gillette to discuss the public Draft SEIS/Potential RMPA.

4.9 Wyoming State Historic Preservation Office and the US Fish and Wildlife Service Consultation

The SEIS/RMPA is within the scope of both the Endangered Species Act (2015 biological opinion) and National Historic Preservation Act consultations. They determined there would be no effects on listed or proposed species, designated or proposed critical habitat, or sites eligible for the National Register of Historic Places.

Chapter 5. References

Abt, E., H. H. Suh, G. Allen, and P. Koutrakis. 2000. "Characterization of indoor particle sources: A study conducted in the metropolitan Boston area." *Environmental Health Perspectives* 108 (1):35–44. Internet website: https://doi.org/10.1289/ehp.0010835.

American Lung Association. 2001. Urban air pollution and health inequities: A workshop report. *Environmental Health Perspectives.* 2001; 109(suppl 3):357-374.

Amster, E. 2021. "Public health impact of coal-fired power plants: A critical systematic review of the epidemiological literature." *International Journal of Environmental Health Research* 31(5):558–80. Internet website: https://doi.org/10.1080/09603123.2019.1674256.

Amster, E., and C. Lew Levy. 2019. "Impact of coal-fired power plant emissions on children's health: A systematic review of the epidemiological literature." *International Journal of Environmental Research and Public Health* 16(11):2008. Internet website: https://doi.org/10.3390/ijerph16112008.

Attfield, M. D., P. L. Schleiff, J. H. Lubin, A. Blair, P. A. Stewart, R. Vermeulen, J. B. Coble, and D. T. Silverman. 2012. "The diesel exhaust in miners study: A cohort mortality study with emphasis on lung cancer." *Journal of the National Cancer Institute* 104(11):869–83. Internet website: https://doi.org/10.1093/jnci/djs035.

Austin, E., J. Xiang, T. Gould, J. Shirai, S. Yun, M.G. Yost, T. Larson, and E. Seto. 2019. Mobile Observations of Ultrafine Particles: The MOV-UP Study Report. University of Washington, Department of Environmental and Occupational Health Sciences, Seattle.

Baker, K. R., and J. T. Kelly. 2014. "Single source impacts estimated with photochemical model source sensitivity and apportionment approaches." *Atmospheric Environment* 96, 266–274. Internet website: http://dx.doi.org/10.1016/j.atmosenv.2014.07.042.

Baker, K. R., R. A. Kotchenruther, R. C. Hudman. 2016. "Estimating ozone and secondary $PM_{2.5}$ impacts from hypothetical single source emissions in the central and eastern United States." *Atmospheric Pollution Research* 7, 122-133. Internet website: http://dx.doi.org/10.1016/j.apr.2015.08.003.

Barck, C., T. Sandström, J. Lundahl, G. Hallden, M. Svartengren, V. Strand, S. Rak, and G. Bylin. 2002. "Ambient level of NO_2 augments the inflammatory response to inhaled allergen in asthmatics." *Respiratory Medicine* 96(11):907–17.

Belanger, K., J. F. Gent, E. W. Triche, M. B. Bracken, and B. P. Leaderer. 2006. "Association of indoor nitrogen dioxide exposure with respiratory symptoms in children with asthma." *American Journal of Respiratory and Critical Care Medicine* 173(3):297–303. Internet website: https://doi.org/10.1164/rccm.200408-1123OC.

Belanger, K., T. R. Holford, J. F. Gent, M. E. Hill, J. M. Kezik, and B. P. Leaderer. 2013. "Household levels of nitrogen dioxide and pediatric asthma severity." *Epidemiology* (Cambridge, Mass.) 24(2):320–30. Internet website: https://doi.org/10.1097/EDE.0b013e318280e2ac.

Bell, M. L., and F. Dominici. 2008. Effect modification by community characteristics on the short-term effects of ozone exposure and mortality in 98 US communities. *Am J Epidemiol.* 2008; 167:986-997.

Bell, M. L., R. D. Peng, F. Dominici, and J. M. Samet. 2009. "Emergency hospital admissions for cardiovascular diseases and ambient levels of carbon monoxide: Results for 126 United States urban counties, 1999–2005." *Circulation* 120(11):949–55.

Bleizeffer, D. 2024. "Arch Resources, Campbell County look to repurpose coal facilities ahead of mine closures" *WyoFile*. January 23, 2024. https://wyofile.com/arch-resources-campbell-county-look-to-repurpose-coal-facilities-ahead-of-mine-closures/.

BLM (United States Department of Interior, Bureau of Land Management). 2005. Handbook H-1601-1—BLM Land Use Planning Handbook. BLM, Washington Office, Washington, DC.

______. 2008. Handbook H-1790-1—BLM NEPA Handbook. BLM, Washington Office, 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. BLM, Buffalo Field Office, Gillette, WY. August 2009.

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

______. 2015a. Buffalo Field Office Approved Resource Management Plan. BLM/WY/PL-15/022+1610. BLM, Buffalo Field Office, Buffalo, WY. September 2015.

______. 2015b. Proposed Resource Management Plan and Final EIS for the Buffalo Field Office Planning Area. BLM/WY/PL-15/014+1610. BLM, Buffalo Field Office, Buffalo, WY. May 2015.

______. 2019. Buffalo Field Office Supplemental Environmental Impact Statement and Resource Management Plan Amendment. BLM, Buffalo Field Office, Buffalo, WY. September 2019.

______. 2022a. Buffalo Field Office Resource Management Plan Supplemental Environmental Impact Statement and Resource Management Plan Amendment Scoping Report. BLM, Buffalo Field Office, Buffalo, WY. December 2022.

______. 2022b. BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends from Coal, Oil, and Gas Exploration and Development on the Federal Mineral Estate. Internet website: https://www.blm.gov/content/ghg/2022.

_____. 2022c. Addressing Environmental Justice in NEPA Documents: Frequently Asked Questions. BLM, Socioeconomics Program, Washington, DC. Internet website: https://www.blm.gov/sites/default/files/docs/2022-09/IM2022-059_att1.pdf.

BLM GIS (United States Department of the Interior, Bureau of Land Management geographic information systems). 2022. 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, Buffalo, WY.

Bureau of Economic Analysis. 2021a. Table CAEMP25N. Total full-time and part-time employment by North American Industry Classification System (NAICS) for Campbell and Converse Counties in Wyoming. Internet website: https://apps.bea.gov/iTable/?reqid=70&step=1&acrdn=6#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMyJdLFsiQ2xhc3NpZmljYXRpb24iLCJOQUlDUyJdLFsiTWFqb3JfQXJlYSIsIjQiXSxbIlN0YXRlIixbIjU2MDAwIl1dLFsiQXJlYSIsWyI1NjAwMCIsIjU2MDA1IiwiNTYwMDkiXV0sWyJTdGF0aXN0aWMiLFsiLTEiXV0sWyJVbml0X29mX21lYXN1cmUiLCJMZXZlbHMiXSxbIllllYXIiLFsiMjAyMSIsIjIwMTUiLCIyMDEwIl1dLFsiWWVhckJlZ2luIiwiLTEiXSxbIllllYXJfRW5kIiwiLTEiXV19.

______. 2021b. Table CAIN30 Economic Profile for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties in Wyoming. Internet website: https://apps.bea.gov/iTable/?reqid=70&step=1&acrdn=6#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIxMiJdLFsiQ2xhc3NpZmljYXRpb24iLCJOb24tSW5kdXN0cnkiXSxbIk1ham9yX0FyZWEiLCI0Il0sWyJTdGF0ZSIsWyI1NjAwMCJdXSxbIkFyZWEiLFsiNTYwMDAiLCI1NjAwNSIsIjU2MDA5IiwiNTYwMTEiLCI1NjAxOSIsIjU2MDI1IiwiNTYwMzMiLCI1NjA0NSJdXSxbIlN0YXRpc3RpYyIsWyItMSJdXSxbIlVuaXRfb2ZfbWVhc3VyZSIsIkxldmVscyJdLFsiWWVhciIsWyIyMDIxIiwiMjAxNSIsIjIwMTAiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=.

Bureau of Labor Statistics. 2022. Quarterly Census for Employment and Wages. Internet website: https://data.bls.gov/cgi-bin/dsrv?en.

Burney, J. 2020. "The downstream air pollution impacts of the transition from coal to natural gas in the United States." *Nature Sustainability* 3, 152-160. Internet website: https://doi.org/10.1038/s41893-019-0453-5.

Campbell County. 2017. A Campbell County Profile- Socioeconomics. Internet website: Socioeconomic_profile__-_Campbell_County_March_2017.pdf (wyo-wcca.org).

______. 2022. Campbell County Natural Resource Land Use Plan. Internet website: https://campbellcountywy.gov/DocumentCenter/View/4929/Campbell-County-Amended-Natural-Resource--Land-Use-Plan.

______. 2023. Comment letter regarding the Notice of Availability of the Draft Resource Management Plan Amendment and Supplemental Environmental Impact Statement (SEIS) for the 2015 Buffalo Field Office Approved Resource Management Plan (RMP), Wyoming. August 3, 2023.

CEQ (Council on Environmental Quality) 1997. Environmental Justice: Guidance Under NEPA. Internet website: https://www.energy.gov/nepa/downloads/environmental-justice-guidance-under-nepa-ceq-1997.

______. 2016. Final guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews. August 1, 2016. Internet website: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf.

Chaitman, B. R., T. E. Dahms, S. Byers, L. W. Carroll, L. T. Younis, and R. D. Wiens. 1992. Carbon Monoxide Exposure of Subjects with Documented Cardiac Arrhythmias. Health Effects Institute Research Report 52. Health Effects Institute, Cambridge, MA. Internet website: https://www.healtheffects.org/publication/carbon-monoxide-exposure-subjects-documented-cardiac-arrhythmias.

Chen, L., W. Yang, B. L. Jennison, A. Goodrich, and S. T. Omaye. 2002. "Air pollution and birth weight in northern Nevada, 1991-1999." *Inhalation Toxicology* 14(2):141–57.

Cision PR Newswire. 2023. Ramaco Resources Announces Substantial Expansion of Brook Mine Rare Earth Elements Exploration Target, Board Approval for Initial Mining in Q4 2023, and new Carbon Product Technologies. August 7, 2023. Internet website: https://www.prnewswire.com/news-releases/ramaco-resources-announces-substantial-expansion-of-brook-mine-rare-earth-elements-exploration-target-board-approval-for-initial-mining-in-q4-2023-and-new-carbon-product-technologies-301894218.html.

Conant, R. T., D. Kluck, M. Anderson, A. Badger, B. M. Boustead, J. Derner, L. Farris, M. Hayes, B. Livneh, S. Mc-Neeley, D. Peck, M. Shulski, and V. Small. 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. Pp. 941–986. doi: 10.7930/NCA4.2018.CH22.

DOE (United States Department of Energy). 2009. "Energy Conservation Program: Energy Conservation Standards for Certain Consumer Products (Dishwashers, Dehumidifiers, Microwave Ovens, and Electric and Gas Kitchen Ranges and Ovens) and for Certain Commercial and Industrial Equipment (Commercial Clothes Washers)." Federal Register. April 8, 2009. Internet website: https://www.federalregister.gov/documents/2009/04/08/E9-7545/energy-conservation-program-energy-conservation-standards-for-certain-consumer-products-dishwashers.

______. 2017. Petra Nova - W.A. Parish Project. Office of Fossil Energy and Carbon Management. Internet website: https://www.energy.gov/fecm/petra-nova-wa-parish-project.

______. 2023. IRA and Carbon Management Opportunities in Wyoming. Office of Fossil Energy and Carbon Management. June 2023. Internet website: https://www.energy.gov/sites/default/files/2023-06/IRA%20and%20Carbon%20Management%20Opportunities%20in%20Wyoming_June%202023.pdf.

EIA (United States Energy Information Administration). 2009. Coal Data Browser, 2008 List of Mines for All Coal, Total, Wyoming, All Mine Statuses. Internet website: https://www.eia.gov/coal/data/browser/#/topic/38?agg=0,2,1&rank=g&geo=000000000008&mntp=g&freq=A&start=2008&end=2009&ctype=map&ltype=pin&rtype=s&maptype=0&rse=0&pin=&datecode=2001.

______. 2022a. Annual Energy Outlook 2022 (AEO2022), Washington, DC, March 2022. Internet website: https://www.eia.gov/outlooks/aeo/.

______. 2022b. Coal Data Browser. Internet website: https://www.eia.gov/coal/data/browser/.

______. 2022c. Wyoming State Energy Profile. Internet website: https://www.eia.gov/state/print.php?sid=WY.

______. 2022d. Coal Explained. Internet website: https://www.eia.gov/energyexplained/coal/use-of-coal.php.

______. 2022e. All Energy Infrastructure and Resources. Internet website: https://atlas.eia.gov/apps/all-energy-infrastructure-and-resources/explore.

______. 2022f. Natural Gas Plant Processing. Internet website: https://www.eia.gov/dnav/ng/ng_prod_pp_a_EPG0_ygp_mmcf_a.htm.

______. 2022g. International and Interstate Movements of Natural Gas by State. Internet website: https://www.eia.gov/dnav/ng/ng_move_ist_a2dcu_SMT_a.htm.

______. 2022h. Petroleum and Other Liquids – Refinery Yield Data. Internet website: https://www.eia.gov/dnav/pet/pet_pnp_pct_dc_nus_pct_a.htm.

______. 2022i. Natural Gas Explained. Internet website: https://www.eia.gov/naturalgas/data.php.

______. 2022j. Annual Energy Outlook, Table 66, Coal Mine Mouth Prices by Region and Type. Internet website: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=99-AEO2022&cases=ref2022&sourcekey=0.

______. 2022k. Annual Coal Report. Internet website: https://www.eia.gov/coal/annual/.

Electric Power Research Institute. 2018a. Hazardous Air Pollutants (HAPs) Emission Estimates and Inhalation Human Health Risk Assessment for US Coal-Fired Electric Generating Units: 2017 Base Year Post-MATS Evaluation. Electric Power Research Institute, Palo Alto, CA. 3002013577.

______. 2018b. Multi-Pathway Human Health Risk Assessment for Coal-Fired Power Plants. Electric Power Research Institute, Palo Alto, CA. Internet website: https://www.epri.com/research/products/000000003002013523.

EPA (United States Environmental Protection Agency). 1986. Guidelines for Carcinogen Risk Assessment. EPA/630/R-00/004. United States Environmental Protection Agency, Risk Assessment Forum, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/raf/car2sab/guidelines_1986.pdf.

______. 1987. Integrated Risk Information System (IRIS): Nickel Subsulfide; CASRN 12035-72-2. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0273_summary.pdf.

______. 1991a. Integrated Risk Information System (IRIS): Ethylbenzene; CASRN 100-41-4. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0051_summary.pdf.

______. 1991b. Integrated Risk Information System (IRIS): Formaldehyde; CASRN 50-00-0. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0419_summary.pdf.

______. 1994. Integrated Risk Information System (IRIS): Chlorine CASRN 7782-50-5. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0405_summary.pdf.

______. 1995a. Integrated Risk Information System (IRIS): Arsenic, Inorganic; CASRN 7440-38-2. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0278_summary.pdf.

______. 1995b. Integrated Risk Information System (IRIS): Hydrogen Chloride; CASRN 7647-01-0. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0396_summary.pdf.

______. 1995c. Integrated Risk Information System (IRIS): Mercury, Elemental; CASRN 7439-97-6. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0370_summary.pdf.

______. 1996. Proposed Guidelines for Carcinogen Risk Assessment. 68 *Federal Register* 10012. April 23, 1996. Notice of Availability and Opportunity to Comment: FRL-7457-2. United States Environmental Protection Agency, Washington, DC: 10012-10015. Internet website: https://www.govinfo.gov/content/pkg/FR-1996-04-23/pdf/96-9711.pdf.

______. 1998. Toxicological Review of Hexavalent Chromium; CAS No. 18540-29-9. In Support of Summary Information on the Integrated Risk Information System (IRIS). United States Environmental Protection Agency, Washington, DC.

______. 1999. Guidelines for Carcinogen Risk Assessment; NCEA-F-0644. United States Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

______. 2001. Integrated Risk Information System (IRIS): Methylmercury (MeHg); CASRN 22967-92-6. Reports and Assessments. United States Environmental Protection Agency, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0073_summary.pdf.

______. 2002a. Toxicological Review of Benzene (Non Cancer Effects); CAS No. 71-43-2. In Support of Summary Information on the Integrated Risk Information System (IRIS). EPA/635/R-02/001F. United States Environmental Protection Agency, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0276tr.pdf.

______. 2002b. Integrated Risk Information System (IRIS): 1,3-Butadiene; CASRN 106-99-0. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0139_summary.pdf.

______. 2003a. Toxicological Review of Acrolein (CAS No. 107-02-8) in Support of Summary Information on the Integrated Risk Information System (IRIS). EPA/635/R-03/003. United States Environmental Protection Agency, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0364tr.pdf.

______. 2003b. Integrated Risk Information System (IRIS): Xylenes; CASRN 1330-20-7. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0270_summary.pdf.

______. 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. United States Environmental Protection Agency, Risk Assessment Forum, Washington, DC. Internet website: https://www.epa.gov/sites/default/files/2013-09/documents/cancer_guidelines_final_3-25-05.pdf.

______. 2005b. Integrated Risk Information System (IRIS): N-Hexane; CASRN 110-54-3. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0486_summary.pdf.

______. 2005c. Integrated Risk Information System (IRIS): Toluene; CASRN 108-88-3. Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://iris.epa.gov/static/pdfs/0118_summary.pdf.

______. 2010. Integrated Science Assessment (ISA) for Carbon Monoxide (Final Report, January 2010). United States Environmental Protection Agency, Washington, DC. EPA/600/R-09/019F.

______. 2013. Integrated Science Assessment (ISA) for Lead (Final Report, July 2013). Reports and Assessments. United States Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC. Internet website: https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=255721.

______. 2014. Coal Ash Basics. Overviews and Factsheets. United States Environmental Protection Agency, Washington, DC. Internet website: https://www.epa.gov/coalash/coal-ash-basics.

______. 2016a. Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, Jan. 2016). EPA/600/R-15/068. United States Environmental Protection Agency, Washington, DC.

______. 2016b. Technical Guidance for Assessing Environmental Justice in Regulatory Analysis. Washington, DC.

______. 2017a. National Emissions Inventory (NEI). Internet website: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data.

______. 2017b. Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria (Final Report, Dec. 2017). EPA/600/R-17/451. United States Environmental Protection Agency, Washington, DC.

______. 2019. Integrated Science Assessment (ISA) for Particulate Matter (Final Report, Dec. 2019). EPA/600/R-19/188. United States Environmental Protection Agency, Washington, DC.

______. 2020. Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants (Final Report, Apr. 2020). EPA/600/R-20/012. United States Environmental Protection Agency, Washington, DC.

______. 2021a. Critical Load Mapper Tool. US Environmental Protection Agency, USDA Forest Service, and National Park Service, Washington, DC. CL Mapper version 2.2. Internet website: https://clmapper.epa.gov/.

______. 2021b. 2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document. Internet website: https://www.epa.gov/sites/default/files/ 2021-02/documents/nei2017_tsd_full_jan2021.pdf.

______. 2021c. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. United States Environmental Protection Agency, EPA 430-R-21-003. Internet website: https://www.epa.gov/cira/social-vulnerability-report.

______. 2022a. Design Value Reports. Internet website: https://www.epa.gov/air-trends/air-quality-design-values#map.

______. 2022b. Wyoming Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Internet website: https://www3.epa.gov/airquality/greenbook/anayo_wy.html.

______. 2022c. Supplement to the 2019 Integrated Science Assessment for Particulate Matter (Final Report, 2022). Reports and Assessments. Internet website: https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=354490.

______. 2022d. Facility Level Information on Greenhouse Gases Tool (FLIGHT). Internet website: https://ghgdata.epa.gov/ghgp/main.do.

______. 2022e. Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2020. US Environmental Protection Agency, EPA 430-R-22-003. Internet website: https://www.epa.gov/ghgemissions/draft-inventory-us-greenhouse-gas-emissionsand-sinks-1990-2020.

______. 2022f. Learn About Environmental Justice. Internet website: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice.

______. 2022g. EPA EJScreen EPA's Environmental Justice Screening and Mapping Tool (Version 2.1). Data retrieved on January 13, 2023. Internet website: https://ejscreen.epa.gov/mapper/.

______. 2023a. Reconsideration of the National Ambient Air Quality Standards for Particulate Matter. Internet website: https://www.epa.gov/system/files/documents/2023-01/PM%20NAAQS%20NPRM%20-%20prepublication%20version%20for%20web.pdf.

______. 2023b. 2020 National Emissions Inventory. Internet website: https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data.

FED (Federal Land Manager Environmental Database). 2023. Visibility Trends and Composition Following the Regional Haze Rule Metrics. Internet website: http://views.cira.colostate.edu/fed/Sites/?appkey=SBA_AqrvVisibility.

Federal Land Managers' Air Quality Related Values Work Group. 2010. Phase I Report—Revised (2010). Natural Resource Report NPS/NRPC/NRR-2010/232. Internet website: http://npshistory.com/publications/air-quality/flag-2010.pdf.

Foley, K. M., C. Hogrefe, G. Pouliot, N. Possiel, S. J. Roselle, H. Simon, and B. Timin. 2015. "Dynamic evaluation of CMAQ part I: Separating the effects of changing emissions and changing meteorology on ozone levels between 2002 and 2005 in the eastern US." *Atmospheric Environment* 103: 247–255. Internet website: https://dx.doi.org/10.1016/j.atmosenv.2014.12.038.

Fox, D. G., A. M. Bartuska, J. G. Byrne, E. Cowling, R. Fisher, G. E. Likens, S. E. Lindberg, R. A. Linthurst, J. Messer, and D. S. Nichols. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. US Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. Internet website: https://www.fs.usda.gov/treesearch/pubs/6242.

Garshick, E., F. Laden, J. E. Hart, B. Rosner, T. J. Smith, D. W. Dockery, and F. E. Speizer. 2004. "Lung cancer in railroad workers exposed to diesel exhaust." *Environmental Health Perspectives* 112(15):1539–43. Internet website: https://doi.org/10.1289/ehp.7195.

Greenberg, N., R. S. Carel, E. Derazne, H. Bibi, M. Shpriz, D. Tzur, and B. A. Portnov. 2016. "Different effects of long-term exposures to SO_2 and NO_2 air pollutants on asthma severity in young adults." *Journal of Toxicology and Environmental Health*, Part A 79(8):342–51.

Greenberg, N., R. S. Carel, E. Derazne, A. Tiktinsky, D. Tzur, and B. A. Portnov. 2017. "Modeling long-term effects attributed to nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) exposure on asthma morbidity in a nationwide cohort in Israel." *Journal of Toxicology and Environmental Health*, Part A 80(6):326–37.

Gruver, M. 2021. "Justices deny Wyoming, Montana coal suit against Washington state." *The Seattle Times*, June 28, 2021. https://www.seattletimes.com/seattle-news/northwest/supreme-court-denies-wyoming-montana-lawsuit-against-longview-coal-terminal/.

Habre, R., H. Zhou, S. P. Eckel, T. Enebish, S. Fruin, T. Bastain, E. Rappaport, and F. Gilliland. 2018. "Short-term effects of airport-associated ultrafine particle exposure on lung function and inflammation in adults with asthma." *Environment International* 118:48–59. Internet website: https://doi.org/10.1016/j.envint.2018.05.031.

Headwaters Economics. 2023. A Profile of Mining- Including Oil and Gas for Campbell and Converse Counties. Internet website: https://headwaterseconomics.org/apps/economic-profile-system/. Health Effects Institute Diesel Epidemiology Panel. 2015. Diesel Emissions and Lung Cancer: An Evaluation Health Effects Institute of Recent Epidemiological Evidence for Quantitative Risk Assessment. Health Effects Institute Special Report 19. Health Effects Institute, Boston, MA.

Health Effects Institute Energy Research Committee. 2019. Potential Human Health Effects Associated with Unconventional Oil and Gas Development: A Systematic Review of the Epidemiology Literature. Health Effects Institute – Energy, Boston, MA.

Health Effects Institute Panel on the Health Effects of Long-Term Exposure to Traffic-Related Air Pollution. 2022. Systematic Review and Meta-Analysis of Selected Health Effects of Long-Term Exposure to Traffic-Related Air Pollution. Health Effects Institute Special Report Special Report 23. Health Effects Institute, Boston, MA. Internet website: https://www.healtheffects.org/publication/systematic-review-and-meta-analysis-selected-health-effects-long-term-exposure-traffic.

Health Effects Institute Panel on the Health Effects of Traffic-Related Air Pollution. 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. Health Effects Institute Special Report 17. Health Effects Institute, Boston, MA.

Hendryx, M., K. J. Zullig, and J. Luo. 2020. "Impacts of coal use on health." *Annual Review of Public Health* 41(1):397–415. Internet website: https://doi.org/10.1146/annurev-publhealth-040119-094104.

Henneman, L. R. F, H. Shen, C. Hogrefe, A. G. Russell, and C. M. Zigler. 2021. "Four decades of united states mobile source pollutants: Spatial-temporal trends assessed by ground-based monitors, air quality models, and satellites." *Environmental Science and Technology* 55, 882-892. Internet website: https://dx.doi.org/10.1021/acs.est.0c07128.

Hudda, N., M. C. Simon, W. Zamore, and J. L. Durant. 2018. "Aviation-related impacts on ultrafine particle number concentrations outside and inside residences near an airport." *Environmental Science and Technology* 52(4):1765–72. Internet website: https://doi.org/10.1021/acs.est.7b05593.

Institute for Energy Economics and Financial Analysis. 2019. Powder River Basin Coal Industry Is in Long-Term Decline: Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming. March 2019. Internet website: http://ieefa.org/wp-content/uploads/2019/03/Powder-River-Basin-Coal-Industry-Is-in-Long-Term-Decline_March-2019.pdf.

Internal Revenue Service. 2023. Coal Excise Tax. Internet website: https://www.irs.gov/pub/irs-mssp/coal.pdf.

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, et al., editors). Cambridge University Press, Cambridge, United Kingdom and New York, New York.

______. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Pean, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekci, R. Yu, and B. Zhou (eds.)). Cambridge University Press, Cambridge, United Kingdom and New York, New York. doi:10.1017/9781009157896.

IWG (Interagency Working Group on the Social Cost of Greenhouse Gases). 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990. Internet website: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

Kaden, D. A., C. Mandin, G. D. Nielsen, and P. Wolkoff. 2010. Formaldehyde. In WHO Guidelines for Indoor Air Quality: Selected Pollutants. Bonn, Germany: World Health Organization. Internet website: https://www.who.int/europe/publications/i/item/9789289002134.

Kelly, J. T., K. R. Baker, S. L. Napelenok, and S. J. Roselle. 2015. "Examining single-source secondary impacts estimated from brute-force, decoupled direct method, and advanced plume treatment approaches." *Atmospheric Environment* 111, 10-19. Internet website: http://dx.doi.org/10.1016/j.atmosenv.2015.04.004.

Kihal-Talantikite, W., G. Perez Marchetta, and S. Deguen. 2020. "Infant mortality related to NO_2 and PM Exposure: Systematic review and meta-analysis." *International Journal of Environmental Research and Public Health* 17(8):2623. Internet website: https://doi.org/10.3390/ijerph17082623.

Klasic, M., M. Schomburg, G. Arnold, A. York, M. Baum, M. Cherin, S. Ciff, P. Kavousi, A. Tillet Miller, D. Shajari, Y. Wang, and L. Sialcita. 2022. "A review of community health impacts and boom and bust cycles in unconventional oil and gas development." *Energy Research and Social Science* 93(2022):102843.

Lammers, A., N. A. H. Janssen, A. J. F. Boere, M. Berger, C. Longo, S. J. H. Vijverberg, A. H. Neerincx, A. H. Maitland - van der Zee, and F. R. Cassee. 2020. "Effects of short-term exposures to ultrafine particles near an airport in healthy subjects." *Environment International* 141:105779. Internet website: https://doi.org/10.1016/j.envint.2020.105779.

Lee, K., J. I. Levy, Y. Yanagisawa, J. D. Spengler, and I. H. Billick. 1998. "The Boston residential nitrogen dioxide characterization study: Classification and prediction of indoor NO_2 exposure." *Journal of the Air and Waste Management Association* 48(8):736–42. Internet website: https://doi.org/10.1080/10473289.1998.10463717.

Lim, Y., L. G. Hersoug, R. Lund, H. Bruunsgaard, M. Ketzel, J. Brandt, J. Jørgensen, R. Westendorp, Z. J. Andersen, and S. Loft. 2022. "Inflammatory markers and lung function in relation to indoor and ambient air pollution." *International Journal of Hygiene and Environmental Health* 241:113944. Internet website: https://doi.org/10.1016/j.ijheh.2022.113944.

Lin, M., Y. Chen, R. T. Burnett, P. J. Villeneuve, and D. Krewski. 2003. "Effect of short-term exposure to gaseous pollution on asthma hospitalisation in children: A bi-directional case-crossover analysis." *Journal of Epidemiology and Community Health* 57(1):50–55.

Lin, W., B. Brunekreef, and U. Gehring. 2013. "Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children." *International Journal of Epidemiology* 42:1724–37.

Liu, L., S. Breitner, A. Schneider, J. Cyrys, I. Brüske, U. Franck, U. Schlink, A. M. Leitte, O. Herbarth, and A. Wiedensohler. 2013. "Size-fractioned particulate air pollution and cardiovascular emergency room visits in Beijing, China." *Environmental Research* 121:52–63.

Luo, C., X. Zhu, C. Yao, L. Hou, J. Zhang, J. Cao, and A. Wang. 2015. "Short-term exposure to particulate air pollution and risk of myocardial infarction: A systematic review and meta-analysis." *Environmental Science and Pollution Research* 22(19):14651–62. Internet website: https://doi.org/10.1007/s11356-015-5188-x.

Markandya, A., and P. Wilkinson. 2007. "Electricity generation and health." *The Lancet* 370(9591):979–90. Internet website: https://doi.org/10.1016/S0140-6736(07)61253-7.

McDuffie, E. E., R. V. Martin, J. V. Spadaro, R. Burnett, S. J. Smith, P. O'Rourke, M. S. Hammer, A. van Donkelaar, L. Bindle, and V. Shah. 2021a. "Source sector and fuel contributions to ambient $PM_{2.5}$ and attributable mortality across multiple spatial scales." *Nature Communications* 12(1):1–12.

McDuffie, E. E., R. Martin, H. Yin, and M. Brauer. 2021b. Global Burden of Disease from Major Air Pollution Sources (GBD MAPS): A Global Approach. HEI Research Report 210. Health Effects Institute, Boston, MA. Internet website: https://www.healtheffects.org/publication/global-burden-disease-major-air-pollution-sources-gbd-maps-global-approach.

MSHA (Mine Safety Health Administration). 2022. Mine Safety Health Administration Mine Data. Internet website: https://www.msha.gov/data-and-reports/mine-data-retrieval-system.

National Atmospheric Deposition Program. 2022. National Trends Network. Internet website: https://nadp.slh.wisc.edu/networks/national-trends-network/.

National Energy Technology Laboratory. 2021. The University of Kentucky Conducts Pilot-Scale Testing for REE Extraction and Recovery in NETL-Supported Initiative. February 16, 2021. US Department of Energy. Internet website: https://netl.doe.gov/node/10507.

______. 2022. Carbon Ore Processing Project Portfolio. Department of Energy. Internet website: https://netl.doe.gov/sites/default/files/2022-07/Carbon-Ore-Processing-Project-Portfolio_20220722.pdf

______. 2023. Point Source Carbon Capture Project Map, Project List. US Department of Energy. Internet website: https://netl.doe.gov/carbon-management/carbon-capture/psc-map.

National Oceanic and Atmospheric Administration. 2022. State Climate Summaries 2022. National Oceanic and Atmospheric Administration, National Centers for Environmental Information. Internet website: https://statesummaries.ncics.org.

Nature Conservancy. 2023. Coal Infrastructure Reuse Study. March 15, 2023. Internet website: https://www.nature.org/media/wyoming/coal-infrastructure-reuse-report-study-with-appendix.pdf.

NPS (National Park Service). 2022. National Park Service Air Quality Analysis Methods (Latest Version, April 2022). Internet website: https://www.nps.gov/articles/air-analysis-methods-latest.htm.

ONRR (Office of Natural Resources Revenue). 2022. County Federal Mineral Revenue Data. Internet website. https://revenuedata.doi.gov/downloads/revenue/.

Pew Research Center. 2019. US Public Views on Climate and Energy. Internet website: https://www.pewresearch.org/science/2019/11/25/u-s-public-views-on-climate-and-energy/.

Rare Element Resources. 2023. Rare Element Resources Progresses Rare Earth Processing and Separation Demonstration Project in Wyoming. News Releases. September 26, 2023. Internet website: https://www.rareelementresources.com/investor-information/news-releases/2022/09/26/rare-element-resources-progresses-rare-earth-processing-and-separation-demonstration-project-in-wyoming.

Reuters. 2023. Carbon capture project back at Texas coal plant after 3-year shutdown. September 14, 2023. Internet website: https://www.reuters.com/business/energy/carbon-capture-project-back-texas-coal-plant-after-3-year-shutdown-2023-09-14/.

Romieu, I., N. Gouveia, L. A. Cifuentes, A. Ponce de Leon, W. Junger, J. Vera, V. Strappa, M. Hurtado-Díaz, V. Miranda-Soberanis, and L. Rojas-Bracho. 2012. "Multicity study of air pollution and mortality in Latin America (the ESCALA Study)." *Res Rep Health Eff Inst* 171:5–86.

Salam, M. T., J. Millstein, Y. Li, F. W. Lurmann, H. G. Margolis, and F. D. Gilliland. 2005. "Birth outcomes and prenatal exposure to ozone, carbon monoxide, and particulate matter: Results from the children's health study." *Environmental Health Perspectives* 113(11):1638–44.

Shandro, J. A., M. M. Veiga, J. Shovller, M. Scobie, and M. Koehoorn. 2011. "Perspectives on community health issues and the mining boom and bust cycle." *Resource Policy* 36(2011)178-186.

Silverman, D. T. 2018. "Diesel exhaust and lung cancer—aftermath of becoming an IARC Group 1 carcinogen." *American Journal of Epidemiology* 187(6):1149–52. Internet website: https://doi.org/10.1093/aje/kwy036.

Silverman, D. T., C. M. Samanic, J. H. Lubin, A. E. Blair, P. A. Stewart, R. Vermeulen, J. B. Coble, et al. 2012. "The diesel exhaust in miners study: A nested case–control study of lung cancer and diesel exhaust." *Journal of the National Cancer Institute* 104(11):855–68. Internet website: https://doi.org/10.1093/jnci/djs034.

Singh, V., and J. Fehrs. 2001. The Work That Goes into Renewable Energy. Renewable Energy Policy Project. P. 26. Internet website: https://globalurban.org/The_Work_that_Goes_into_Renewable_Energy.pdf.

Spengler, J., M. Schwab, P. B. Ryan, S. Colome, A. L. Wilson, I. Billick, and E. Becker. 1994. "Personal exposure to nitrogen dioxide in the Los Angeles basin." *Air and Waste* 44(1):39–47. Internet website: https://doi.org/10.1080/1073161X.1994.10467236.

Srivastava, D., T. V. Vu, S. Tong, Z. Shi, and R. Harrison. 2022. "Formation of secondary organic aerosols from anthropogenic precursors in laboratory studies." *Nature npj Clim Atmos Sci* 5, 22. Internet website: https://doi.org/10.1038/s41612-022-00238-6.

Stacey, B. 2019. "Measurement of ultrafine particles at airports: A review." *Atmospheric Environment* 198:463–77. Internet website: https://doi.org/10.1016/j.atmosenv.2018.10.041.

Strasert, B., S. C. The, and D. S. Cohen. 2019. "Air quality and health benefits from potential coal power plant closures in Texas." *Journal of the Air and Waste Management Association* 69:3, 333-350. Internet website: https://doi.org/10.1080/10962247.2018.1537984.

Sun, L., L. A. Wallace, N. A. Dobbin, H. You, R. Kulka, T. Shin, M. St-Jean, D. Aubin, and B. C. Singer. 2018. "Effect of venting range hood flow rate on size-resolved ultrafine particle concentrations from gas stove cooking." *Aerosol Science and Technology* 52(12):1370–81. Internet website: https://doi.org/10.1080/02786826.2018.1524572.

Tessum, C. W., D. A. Paolella, S. E. Chambliss, J. S. Apte, J. D. Hill, and J. D. Marshall. 2021. $PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States. *Science Advances* Volume 7, Issue 18. April 2021.

Tishmack, J. K., and P. E. Burns. 2004. "The chemistry and mineralogy of coal and coal combustion products." *Geological Society, London, Special Publications* 236(1):223–46. Internet website: https://doi.org/10.1144/GSL.SP.2004.236.01.14.

Union of Concerned Scientists. 2013. Supporting the Nations Coal Workers in A Changing Environment. Internet website: https://cnee.colostate.edu/wp-content/uploads/2021/08/Supporting-the-Nations-Coal-Workers-report.pdf.

United Nations Environment Programme. 2022. Emissions Gap Report 2022: The Closing Window. Nairobi, Kenya. Internet website: https://www.unep.org/emissions-gap-report-2022.

United Nations Framework Convention on Climate Change. 2021. The United States of America National Determined Contribution. Reducing Greenhouse Gases in the United States: A 2030 Emissions Target. Internet website: https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf.

University of Kentucky. 2018. "Pilot-Scale Plant to Extract Rare Earth Elements in Heart of Coal Country." *University of Kentucky News*. November 7, 2018. Internet website: https://uknow.uky.edu/research/pilot-scale-plant-extract-rare-earth-elements-heart-coal-country.

University of Wyoming. 2023. Center for Carbon Capture and Conversion, Program Areas. Internet website: https://www.uwyo.edu/ser/research/centers-of-excellence/carbon-capture-conversion/program-areas.html

______. 2024. *Wyoming Integrated Test Center to Host New Large-Scale Carbon Capture Pilot Project.* Christine Reed. UW School of Energy Resources Energy Review, Highlighting the faculty, students, research, & programs at the UW School of Energy Resources, February 7, 2024.

US Census Bureau. 2021. American Community Survey (ACS) 5-Year Estimates. Table B02010: American Indian and Alaska Native Alone or in Combination with One or More Other Races. Internet website: https://data.census.gov/table?q=B02010&g=0500000US04001$1500000,26017$1500000,26147$1500000,27061$1500000,27111$1500000,53041$1500000,53067$1500000&d=ACS+5-Year+Estimates+Detailed+Tables&tid=ACSDT5Y2020.B02010&moe=false.

US Department of Health and Human Services. 2012. Toxicological Profile for Carbon Monoxide. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp201.pdf.

______. 2014. ToxFAQs for Nitrogen Oxides. Internet website: https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=396&toxid=69.

US Global Change Research Program. 2016. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.* Crimmins, A., J. Balbus, J. L. Gamble, C. B. Beard, J. E. Bell, D. Dodgen, R. J. Eisen, N. Fann, M. D. Hawkins, S. C. Herring, L. Jantarasami, D. M. Mills, S. Saha, M. C. Sarofim, J. Trtanj, and L. Ziska, Eds. US Global Change Research Program, Washington, DC, 312 pp. Internet website: http://dx.doi.org/10.7930/J0R49NQX.

______. 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D. R., C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, and B. C. Stewart (eds.)]. US Global Change Research Program, Washington, DC. 1515 pp. doi: 10.7930/NCA4.201. Internet website: https://nca2018.globalchange.gov/.

Wallingford, T. J., J. E. Anderson, R. H. Dolan, and S. L. Winkler. 2022. "Vehicle emissions and urban air quality: 60 years of progress." *Atmosphere* 13, 650. Internet website: https://doi.org/10.3390/atmos13050650.

WDEQ (Wyoming Department of Environmental Quality). 2017. 2017 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2018. 2018 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/

______. 2019. 2019 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/

______. 2020. 2020 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/

______. 2021. 2021 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/

______. 2022. 2022 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/

Willers, S. M., B. Brunekreef, M. Oldenwening, H. A. Smit, M. Kerkhof, and H. Vries. 2006. "Gas cooking, kitchen ventilation, and exposure to combustion products." *Indoor Air* 16(1):65–73. Internet website: https://doi.org/10.1111/j.1600-0668.2005.00404.x.

Woodruff, T. J., L. A. Darrow, and J. D. Parker. 2008. "Air pollution and postneonatal infant mortality in the United States, 1999–2002." *Environmental Health Perspectives* 116(1):110–15.

Wyoming Consensus Revenue Estimating Group. 2022. Wyoming State Government Revenue Forecast Fiscal Year 2022 – Fiscal Year 2026. Internet website: https://www.wyoleg.gov/budget/CREG/Reports/Jan2022CREGReport.pdf.

Wyoming Department of Revenue. 2010. 2010 Report. Internet website: https://revenue.wyo.gov/about-us/dor-annual-reports.

______. 2015. 2015 Annual Report. Internet website: https://revenue.wyo.gov/about-us/dor-annual-reports.

______. 2021. 2021 Annual Report. Internet website: https://revenue.wyo.gov/about-us/dor-annual-reports.

______. 2022. 2022 Annual Report. Internet website: https://revenue.wyo.gov/about-us/dor-annual-reports.

Wyoming Game and Fish Department GIS (geographic information system). 2018. Wyoming Game and Fish Department GIS data sets. Gillette, WY.

Wyoming Legislative Service Office. 2022. State Finances, State Data Book. Internet website: https://wyoleg.gov/StateFinances/DataBook/2023.

Wyoming Legislature. 2021. HB0047 – Local impact assistance payments. Internet website: https://www.wyoleg.gov/2021/Introduced/SF0082.pdf.

Wyoming Mining Association. 2019. 2019 Wyoming Coal Overview. August 30, 2019. Internet website: https://www.wyoleg.gov/InterimCommittee/2019/09-2019082816-02UpdatedWMACoalOverview.pdf.

______. 2021. 2020-2021 Concise Coal Guide. Internet website: https://e.issuu.com/embed.html?d=wyominningasso_conciseguidetocoal20_web&u=chickencreekcommunications.

Wyoming State Geological Survey. 2023. Coal Production & Mining. State of Wyoming. Internet website: https://www.wsgs.wyo.gov/energy/coal-production-mining.aspx.

Zeger, S. L., F. Dominici, A. McDermott, and J. Samet. 2008. "Mortality in the Medicare population and chronic exposure to fine particulate air pollution in urban centers (2000-2005)." *Environmental Health Perspectives.* 2008: 116:1614-1619.

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Chapter 6. Index

Appendix A
Coal Screening Process

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Appendix A. Coal Screening Process

A.1 Introduction

As part of the land use planning process (regulated under 43 Code of Federal Regulations [CFR] 1600), surface management agencies are charged with screening public land resources through a series of criteria. These criteria separate lands suitable for development of coal resources from those unsuitable due to potential resource conflicts with coal development (43 CFR 3420.1-4(d)).

This appendix describes the screening process for coal resources undertaken by the Wyoming Buffalo Field Office (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 Draft Supplemental Environmental Impacts Statement (EIS) and Potential Resource Management Plan Amendment (RMPA).

The Bureau of Land Management (BLM) used a coal screen developed for the 2019 Supplemental EIS, which authorizes federal coal resources in the decision area. Currently, the BLM has 42,700 acres of unmined BLM-administered federal coal under leases in the BFO decision area.

The coal screen described in this appendix corrects errors made in 2019 and provides updated information on resources in the BFO decision area since it was last screened in 2019. The BLM did not change any unsuitability criteria interpretations or decisions. Examples of errors corrected include:

- Elk crucial winter range, which was calculated in hectares in 2019 was corrected to acres.
- The 2019 screening included the Interstate 90 bypass which is not a interstate highway and thus should not have been included, this was removed in 2022.
- The travel lanes for each direction of Interstate 90 were calculated separately in 2019 resulting in double counting the acreage, this was corrected to include both directions in a single calculation in 2022.
- The quarter-mile sage-grouse lek area no surface occupancy stipulation buffer used in 2019 was changed to buffer sage-grouse leks by the 2-mile nesting habitat stipulation around sage-grouse leks. Nesting habitat—not breeding habitat—is the limiting factor for sage-grouse populations; nesting habitat is what coal mines would be required to restore following mining.

An update included for the 2022 screening was the mixed-grass prairie vegetation type, which was used to model swift fox habitat, in concurrence with the Wyoming Game and Fish Department (WGFD), instead of the prairie dog colony GIS layer, which was used as a proxy for swift fox habitat in 2019. Also, in 2022, the BLM was able to acquire the Wyoming Department of Environmental Quality's declared alluvial valley floors (AVF) layer to supplement the US Geological Survey's potential AVF GIS layer that was used in 2019. Declared AVFs are unacceptable for leasing (no exceptions), whereas potential AVFs may be leased with mitigation.

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:

1. 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.
2. 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 they are determined to be unsuitable without stipulation or exception.
3. Analyze multiple-use conflicts—According to 43 CFR 3420.1-4e(3), "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 air and water quality; wetlands, riparian areas and sole-source aquifers; the Federal lands which, if leased, would adversely impact units of the National Park System, the National Wildlife Refuge System, the National System of Trails, and the National Wild and Scenic Rivers System. Lands with coal potential may be eliminated from further consideration for leasing where multiple uses conflict.
4. 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 BFO's coal development potential area (CDPA) using stripping ratios, where appropriate and available. Where the BLM's own data were not available, the BLM used drill data from the Wyoming Oil and Gas Conservation Commission.

The adjustment of the CDPA is based on coal quality and the 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 coal in the 8,400 to 8,600 Btu range, and the mines in the southern part of the decision area produce coal 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 stripping ratio is most accurate and most predictive near the western end of active mines. This is because the western end 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 the Wyoming Oil and Gas Conservation Commission's drill data to determine the availability of coal; the BLM modified the CDPA to reflect these findings. Although there is coal on the Southern Mine Group's eastern boundary, available data suggest what is available is not economical to develop. There was no update in 2022 for the CDPA.

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 Final Supplemental EIS and Potential RMPA, 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.

The BLM corrected errors discovered in the 2019 screening and updated resource data, where available, for the unsuitability assessment. In addition to the errors and updates identified in the *Introduction* section, the 2022 data included additional nonlinear rights-of-way (ROWs), one additional bald eagle nest, and several additional golden eagle nests.

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

The alternatives analyzed in the Draft Supplemental EIS and Potential RMPA may eliminate additional coal deposits from further consideration for leasing. The BLM would eliminate these deposits 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. In particular, the no-leasing and limited leasing alternatives seek to protect public and environmental health by reducing climate change causing greenhouse gas emissions. See **Figure A-1** and **Figure A-2** for a geographical depiction of the alternatives.

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 those federal coal deposits from further consideration for leasing.

A.3.4 Screen 4—Consultation with Qualified Surface Owners

The BLM sent letters to all identifiable private surface owners with parcels overlying BLM-administered federal coal resources within the CDPA. 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**.

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 owners' preference for or against mining by other-than-underground methods (surface mining) before issuing any lease for federal coal resources beneath privately owned parcels. The BLM will not issue any leases for surface mining without qualified surface owner consent.

A.4 COAL DEVELOPMENT POTENTIAL RESULTS

The total acres of BLM-administered recoverable coal with development potential are tabulated under **Table A-1** and mapped in **Figure A-3.**

Table A-1
BLM-Administered Recoverable Coal Resources

Federal Coal Status	Acres	Billion Short Tons
CDPA	481,000	61.30
Federal coal mined out	-67,750	-8.63
Federal coal with development potential	413,250	52.66

Source: BLM GIS 2022

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 unsuitability criterion are mapped in Figures A-4 through A-8. For each criterion, resources that trigger unsuitability are identified. (Note that the resources identified 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. For example, some of the bald and golden eagle site, which drive unsuitability, are also the same area that includes habitat for species of state interest; thus, the same acre is counted in Criterion 11 and Criterion 15.

Table A-2
Application of Unsuitability Criteria

Criterion	Criterion Name and Applicable Resources in the Decision Area, Including Data Sources	Acres Unsuitable	Billion Short Tons
Criterion 1 (no exception)	Federal lands for preservation, such as national parks, national wildlife refuges, and wilderness areas, and cities (13,390 acres) Source: BLM surface ownership layer; Wyoming incorporated cities	13,390	1.71
Criterion 2 (with exception)	Federal lands within ROWs or easements, or surface leases for residential, commercial, industrial, or other public purposes: • Nonlinear ROWs—290 acres • Linear ROWs—110 acres Source: BLM ROWs and easements layer	400	0.05
Criterion 3 (with exception)	Buffer zones along road ROWs and next to communities, public schools, occupied dwellings, churches, public parks, and cemeteries: • Buildings—17,210 acres • County roads—1,980 acres • State highways—740 acres (Wyoming Highway 59 and Wyoming Highway 450) • US highway—310 acres (US Route 16) • Agency roads—10 acres	20,240	2.58
Criterion 3 (no exception)	• Cemeteries—310 acres • Interstate highways—450 acres (Interstate 90) Sources: Campbell County building and cemetery layers; BLM transportation layer	760	0.09
Criterion 4	Wilderness study areas Source: BLM wilderness study area layer	0	0
Criterion 5	Scenic areas Source: BLM visual resources inventory layer	0	0
Criterion 6	Scientific study[1] Source: BLM 2015	0	0
Criterion 7	Historic lands and sites Source: BLM cultural layer	0	0
Criterion 8	Natural areas Source: BLM surface ownership	0	0
Criterion 9	Federally designated critical habitat for threatened and endangered species Source: US Fish and Wildlife Service critical habitat layer	0	0
Criterion 10	State-listed threatened and endangered species[2]	0	0

Criterion	Criterion Name and Applicable Resources in the Decision Area, Including Data Sources	Acres Unsuitable	Billion Short Tons
Criterion 11	Bald and golden eagle sites: • Bald eagle nest buffers—2,540 acres • Golden eagle nest buffers—11,650 acres Source: BLM raptor nest layer	14,190	1.98
Criterion 12	Bald and golden eagle roost and concentration areas Source: BLM eagle roost layer	0	0
Criterion 13	Falcon nesting sites Source: BLM raptor nest layer	0	0
Criterion 14	Migratory birds of high federal interest Source: US Fish and Wildlife Service	0	0
Criterion 15	Habitat for species of state interest: • Greater sage-grouse lek buffers—34,560 acres • Sharp-tailed grouse leks—650 acres • Burrowing owl habitat—5,370 acres • Elk crucial winter range—1,610 acres • Elk calving areas—30 acres • Swift fox habitat—41,420 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	83,640	11.65
Criterion 16	100-year floodplain Source: Federal Emergency Management Agency national floodplain hazard layer	0	0
Criterion 17	Municipal watersheds Source: Campbell and Sheridan Counties	0	0
Criterion 18	Natural resource waters Source: BLM 2001	0	0
Criterion 19	Declared AVFs (no exception) Source: Wyoming Department of Environmental Quality declared AVFs layer	1,700	0.22
Criterion 20	State proposed criteria Source: BLM Washington Office	0	0

Source: BLM GIS 2022
[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 criteria 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-9**). **Table A-3** includes multiple-use conflicts that the BFO considered but 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 2019 Supplemental 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 acceptable for further leasing of coal.

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 are sufficient to accommodate limited development on BLM-administered surface. Forest Service makes their own coal leasing allocation decisions. Through the screening process, the BLM takes surface owner mining preferences into account.
Solid minerals	Salable mineral pits	Salable pits are related to the coal mines; no direct conflicts are anticipated.
	Locatable mineral plans of operations	No direct conflicts are anticipated from the two free-use permits.
	Uranium	There is no uranium potential.
	Wyoming Department of Environment Quality mining permits	Wyoming Department of Environment Quality permits are related to the coal mines; no direct conflicts are anticipated.
	Active mining claims	There are no active claims.
Fluid minerals	Active wells	Following resolution of Interior Board of Land Appeals (IBLA) 2018-203, the BLM determined that coal leases would lead to suspension of oil and gas activities, where the two conflict.

This appendix describes the coal screening process prior to alternatives development. Within Alternative A–No Leasing and Alternative C–Limited Leasing, greenhouse gas emissions were recognized as a multiple-use screen as a proxy for climate change and described in the descriptions of those alternatives, **Sections 2.2.1** and **2.2.3**.

There are insufficient data for an accurate wetland assessment. Wetlands would be inventoried as part of the leasing application process, where the BLM would make a determination of acceptability, 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 resources as unacceptable for coal leasing due to conflicts in use; therefore, the BLM eliminated them from further consideration for coal leasing under Screen 3. In sum, 940 acres were excluded from leasing under this review (880 acres excluding the acres that overlap Screen 2, no exceptions). Resources that the BLM removed from further consideration because of their significance and potential conflict with coal development are a municipal airport (700 acres) and a special recreation management area (240 acres).

A.7 Results of Consultation with Qualified Surface Owners

The BFO mailed letters to 278 private landowners who own property larger than 40 acres in the decision area. 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.

The BLM sent the letters on October 5, 2022, requesting a response by November 7, 2022. The letters requested verification of landowner qualifications and an opinion on leasing federal coal beneath their surface (in favor of, against, or undecided). The letters also inquired whether the landowners had previously provided consent for surface mining (see the example letter in **Attachment 1**). **Table A-4** lists the results; landowner response letters are included in the decision file.

Table A-4
Private Surface Owner Response within All Alternatives

Surface Owner Consultation	Status	Letter Number	Percent
Letter delivery	Sent	278	—
	Delivered	277	99
	Returned by the US Postal Service	1	1
Landowner response rate	Responses received	68	24
	Delivered without response	210	76
Landowner opinion on leasing (of responses received)	For	37	54
	Against	22	32
	Undecided	9	13
	Received, no response	0	0

Source: BFO 2022

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 unacceptable based on landowner response due to the inability to form a logical mining unit. Before potential leases are delineated, the BLM would again contact surface owners to solicit their preference for or against surface coal mining, in accordance with the BLM Coal Leasing Handbook.

The information above describes the BLM's screening process and the outcomes 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 Draft Supplemental EIS and Potential RMPA. These allocations are intended to cover the entire CDPA for the BLM-administered federal mineral estate in that document. The BLM conducted this coal screening to allow future coal leasing decisions in the CDPA. 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	Billion Short Tons
Screen 1	Coal development potential	413,250	61.3
Screen 2	No exception	-23,940	-4.54
	Exception (no exception erased)	67,280	8.64
Screen 3	Multiple use (no exception erased)	-880	-0.11
Screen 4	Consultation with landowners	0	0
Available	—	388,430	48.01

Source: BLM GIS 2022

A.8 Reference

BLM GIS (United States Department of the Interior, Bureau of Land Management geographic information systems). 2022. 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.

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Figure A-1
Alternative A: No Leasing

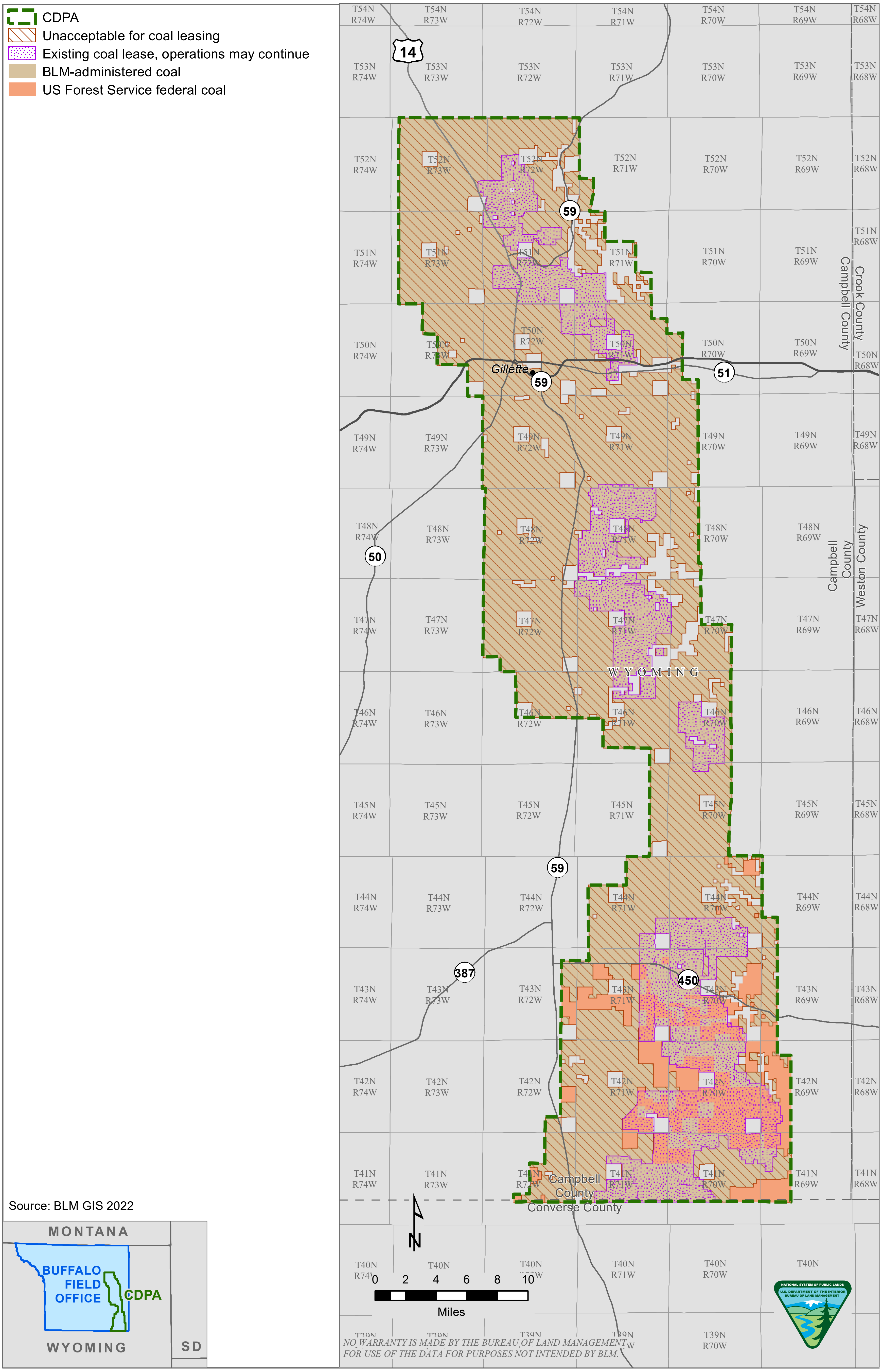


Figure A-2
Alternative B: No Action and Alternative C: Limited Leasing

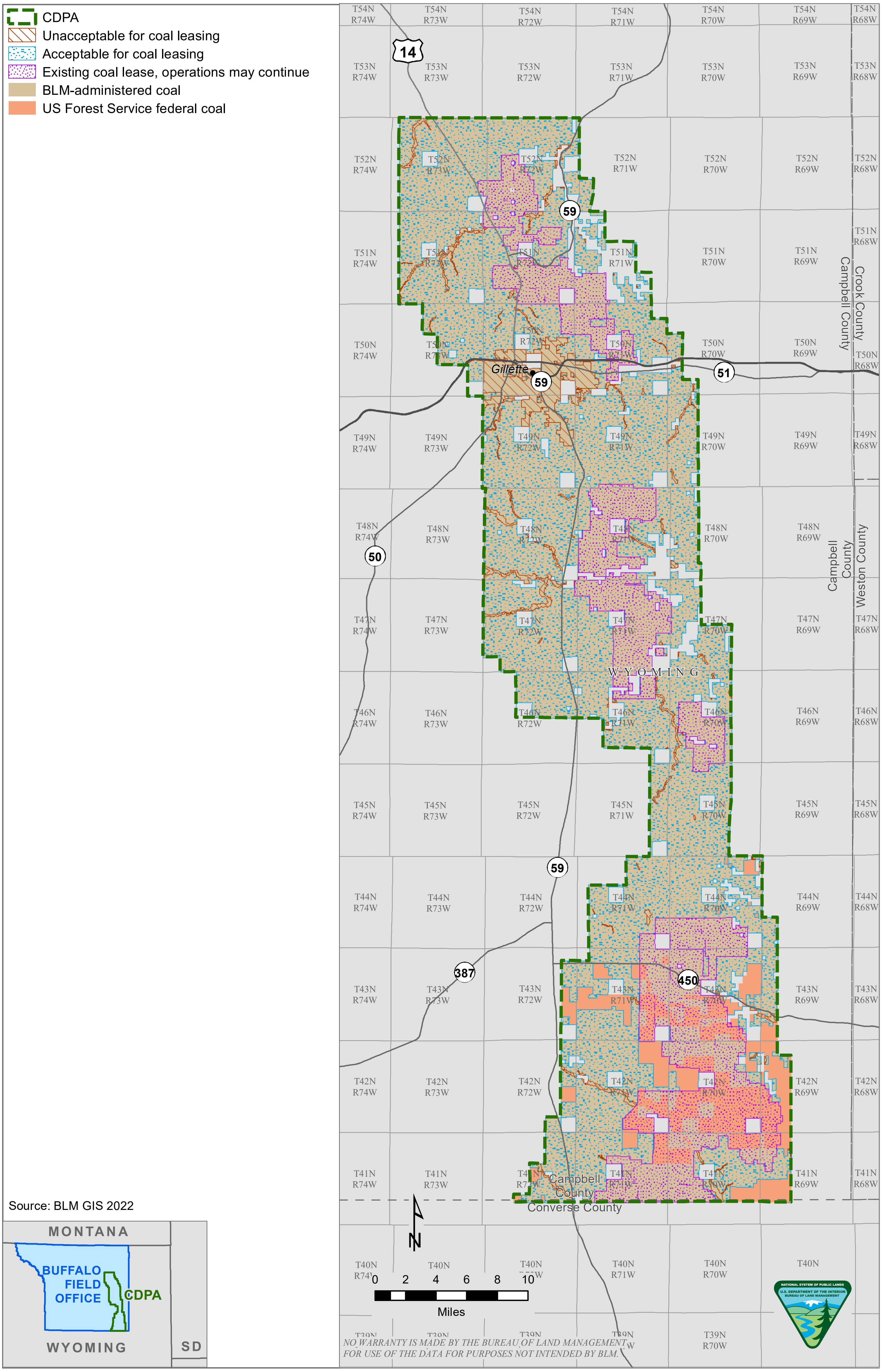
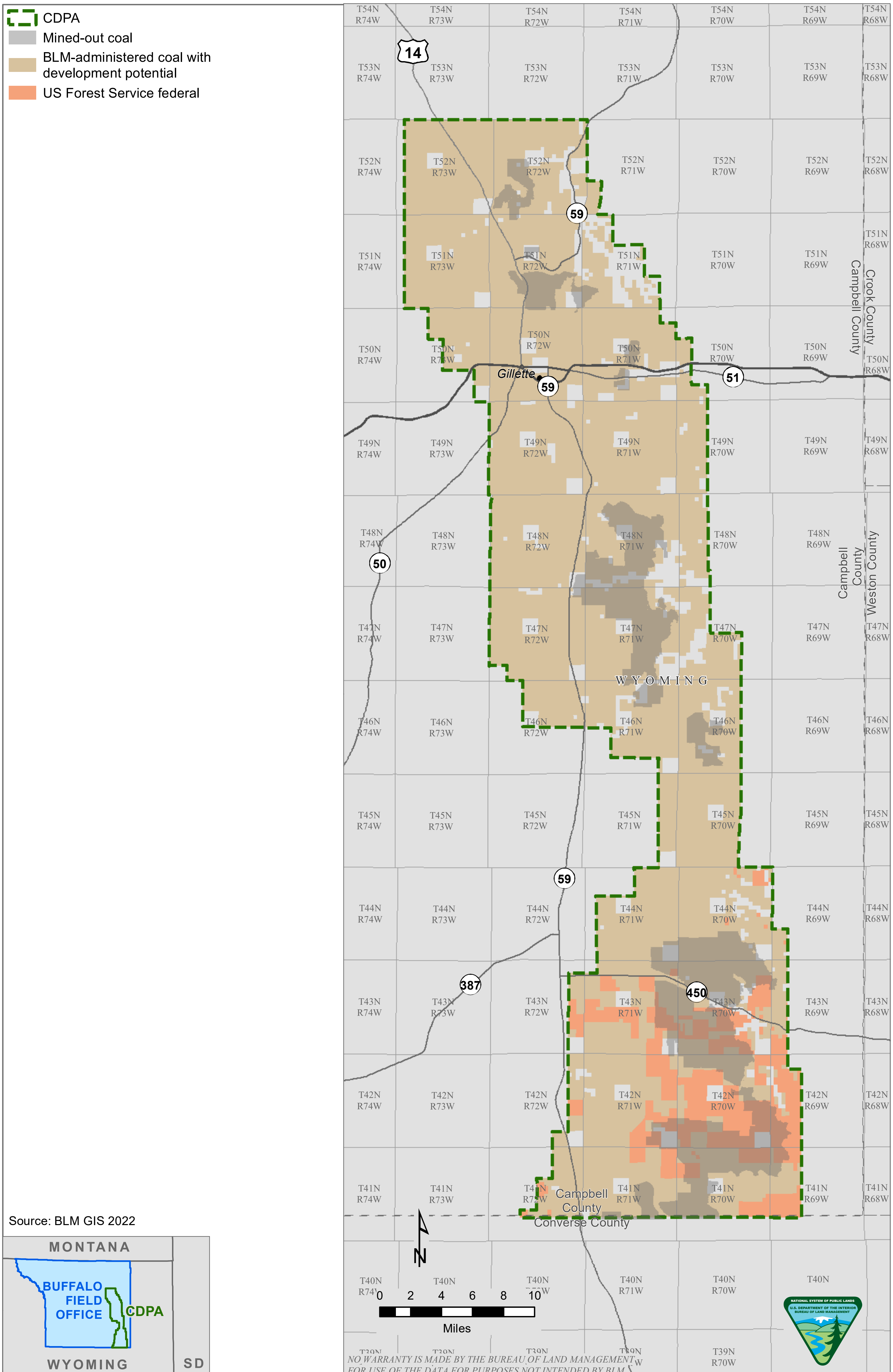


Figure A-3
Screen 1 Coal Development Potential



Source: BLM GIS 2022

Figure A-4
Screen 2 Unsuitability Assessment: Criteria 1 and 3 — Public Roads, Schools, Parks, Qualified Buildings, and Other

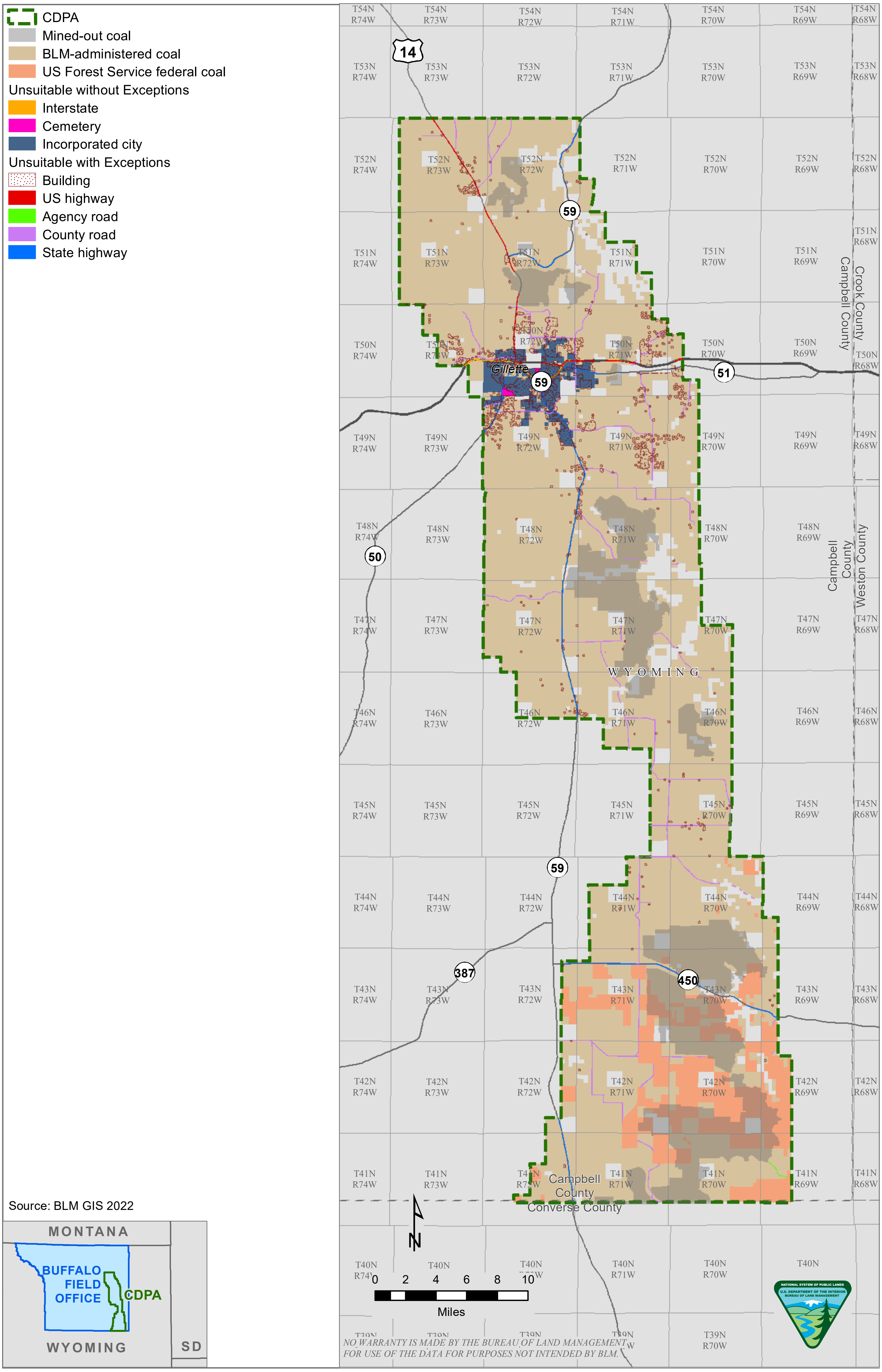


Figure A-5
Screen 2 Unsuitability Assessment: Criterion 2 — Rights-of-Ways

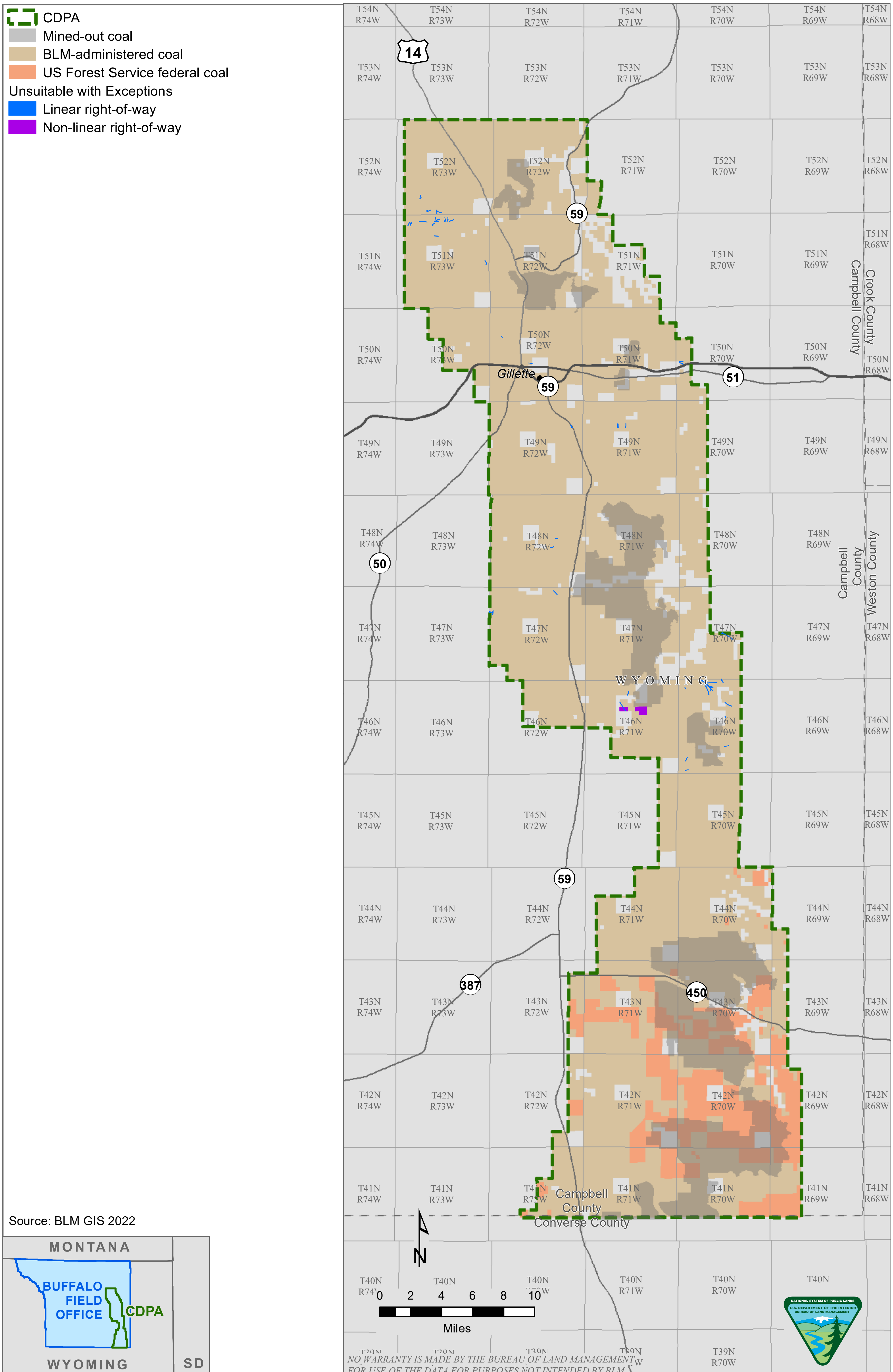


Figure A-6
Screen 2 Unsuitability Assessment: Criteria 11 — Bald and Golden Eagle Sites

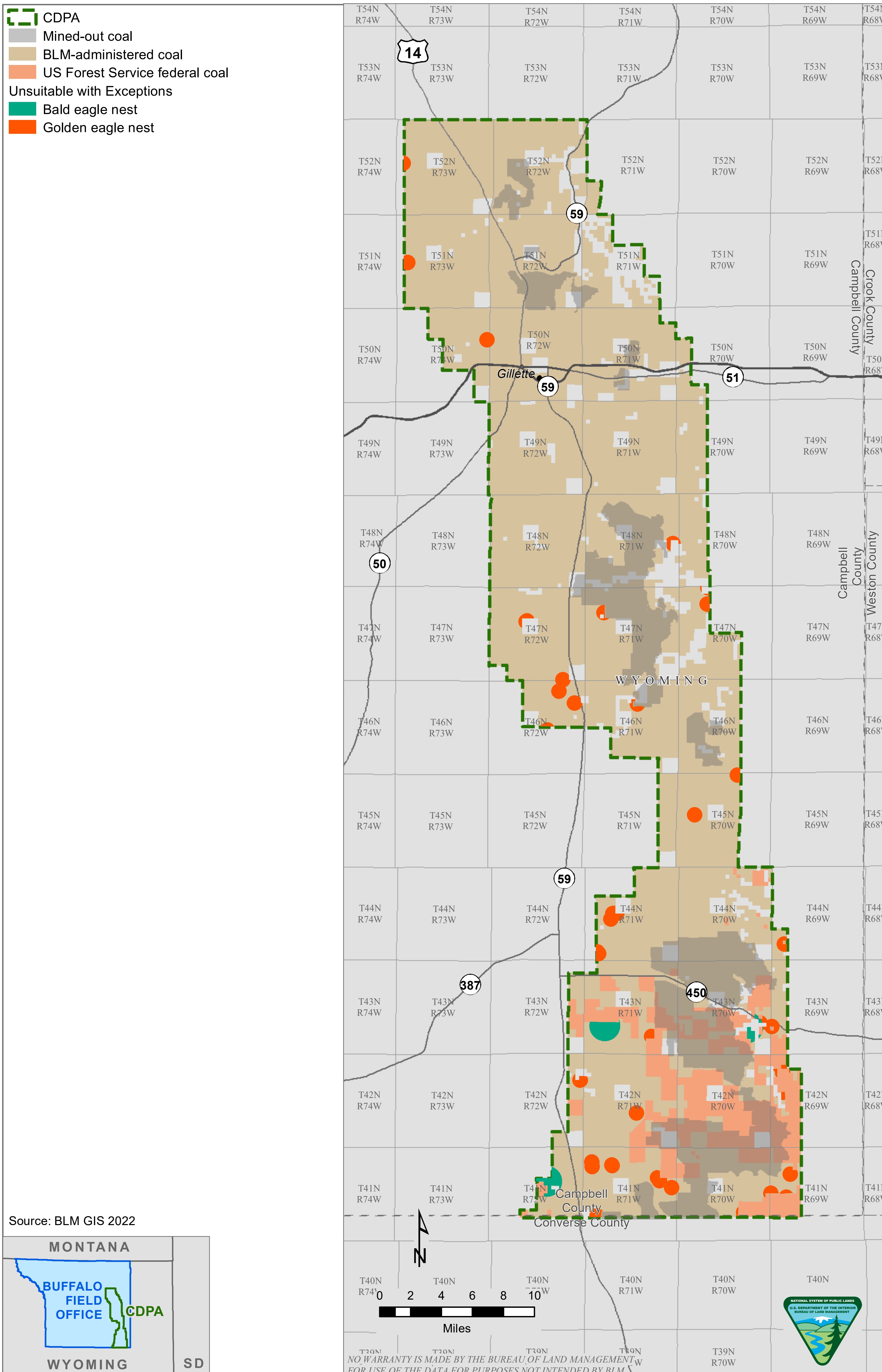


Figure A-7
Screen 2 Unsuitability Assessment: Criteria 15 — Habitat for Species of State Interest

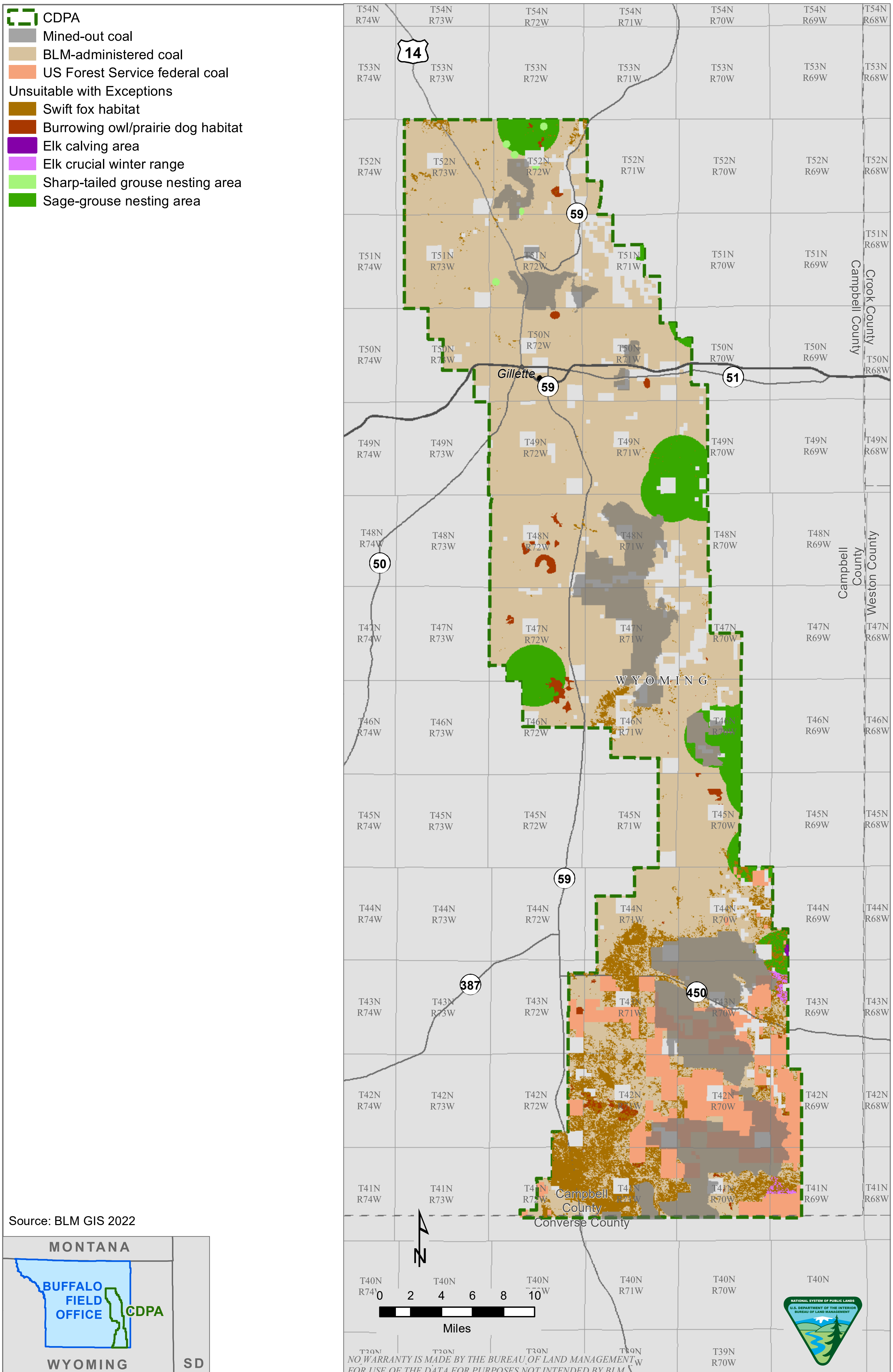
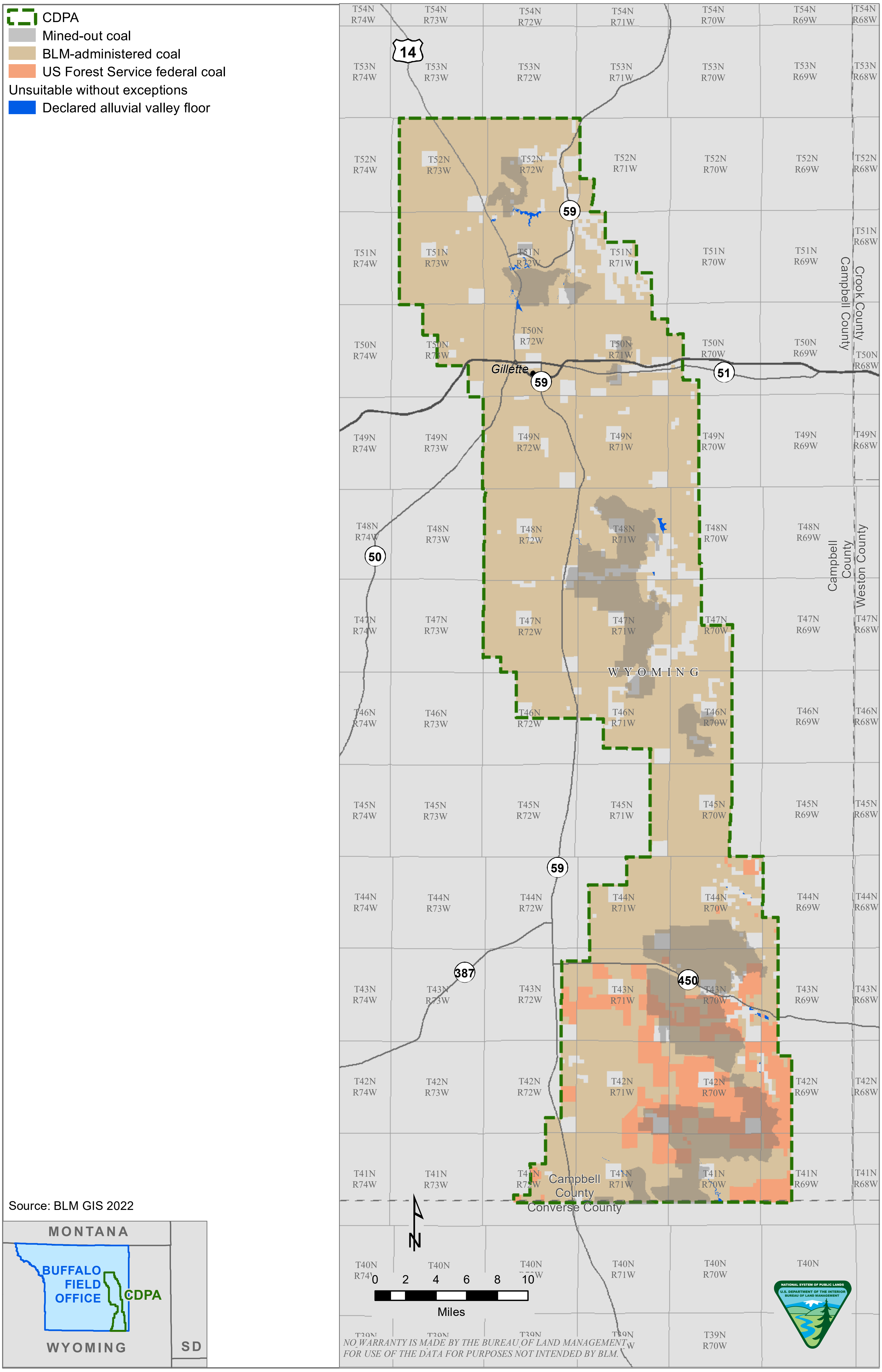
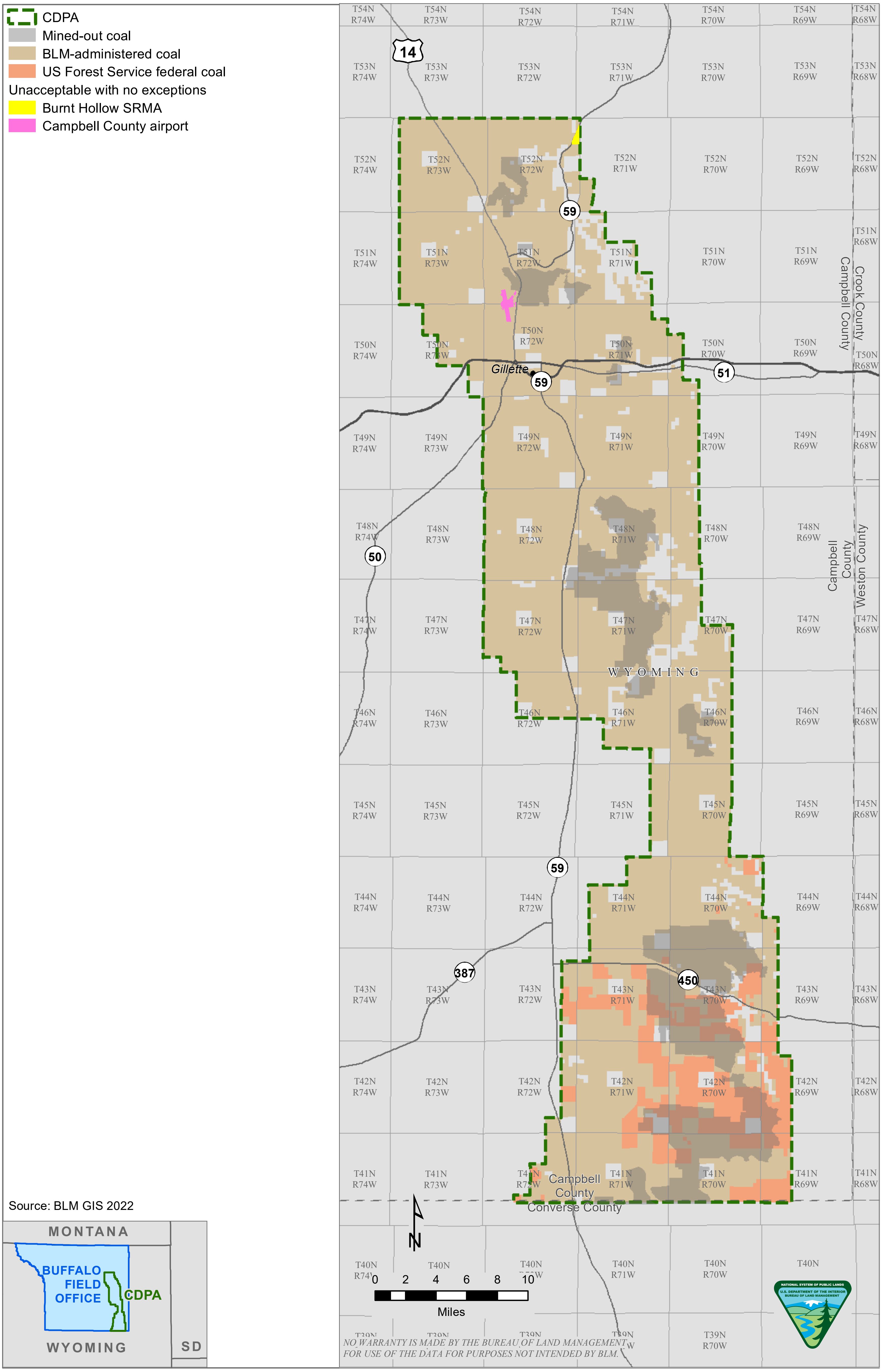


Figure A-8
Screen 2 Unsuitability Assessment: Criteria 19 — Alluvial Valley Floors



Source: BLM GIS 2022

Figure A-9
Screen 3 Multiple-Use Decisions (Unacceptable to Leasing)



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Attachment I

Sample Private Landowner Letter

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Buffalo Field Office
1425 Fort Street

Buffalo, WY 82834

In Reply Refer To:
1610

October 5, 2022

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 October 3, 2022, 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 order (Western Organization of Resource Councils, et al vs BLM; 8/03/2022).

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.

This is the second court order for coal screening in three years. You may recall receiving a similar letter in January 2019.

In accordance with 43 CFR 3420.1-4(e)(4)(i), BLM requests you notify the Buffalo Field Office in writing by **November 7, 2022** 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 **November 7, 2022**.

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.

BLM is hosting a public meeting initiating this SEIS at the Campbell County Public Library (2101 S. 4J Road, Gillette, WY) on October 17 from 5:00 pm to 7:00 pm.

After review of the surface owner consultation responses, the SEIS will be prepared. Additional information including screening results and the SEIS will be posted on the BLM e-Planning website. BLM plans to have the SEIS available for public comment in early 2023.

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,

/s/ Todd D. Yeager

Todd D. Yeager
Field Manager

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

Enclosure 1.
Please returned to the Buffalo Field Office by November 7, 2022.

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 (year) _____________.

___ 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.

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Appendix B
Reasonably Foreseeable Development

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Appendix B. Reasonably Foreseeable Development

The information contained in the Reasonably Foreseeable Development Scenario in the 2019 Supplemental Environmental Impact Statement (BLM 2019) is still considered valid, unless it is contradicted by the analysis in this document. The United States Department of the Interior, Bureau of Land Management (BLM) updated the results of that document to reflect the current alternatives, as explained and displayed below.

The United States Energy Information Administration (EIA) produced projections of the demand for coal from the Wyoming Powder River Basin in the future. The BLM used these projections of coal demand to analyze the number of years of mining remaining, given the amount of coal under existing leases—but not yet mined—and given the amount of coal available for lease under each alternative. The results in **Table B-1**, below, show that under Alternative A, under which no coal would be offered for leasing, the 4.36 billion tons of coal under existing leases would run out in 2041. Under Alternative B, under which approximately 48 billion short tons would be made available for consideration for leasing, mining would continue until approximately 2338 (EIA projections end in 2048; therefore, to analyze this alternative, the BLM assumed the demand level in 2048 of 160.75 million tons per year would continue forward for each following year until reserves are exhausted). Under Alternative C, under which 1.24 billion short tons would be made available for consideration for leasing, mining of existing leases plus the 1.24 billion short tons made available would be able to continue until 2048 before reserves are exhausted.

Table B-1
Coal Remaining by Year in the Wyoming Powder River Basin by Alternative

Year	EIA Projected Demand (million short tons)	Alternative A (million short tons)	Alternative C (million short tons)	Alternative B (million short tons)
Amount remaining in existing leases plus available for lease		4,360.00	5,560.00	52,175.32
2022	268.508	4,091.49	5,291.49	52,175.32
2023	262.757	3,828.73	5,028.73	51,906.82
2024	254.241	3,574.49	4,774.49	51,644.06
2025	181.205	3,393.29	4,593.29	51,389.82
2026	209.551	3,183.74	4,383.74	51,208.61
2027	239.974	2,943.76	4,143.76	50,999.06
2028	237.813	2,705.95	3,905.95	50,759.09
2029	237.894	2,468.06	3,668.06	50,521.28
2030	232.498	2,235.56	3,435.56	50,283.38
2031	232.370	2,003.19	3,203.19	50,050.88
2032	232.811	1,770.38	2,970.38	49,818.51
2033	233.107	1,537.27	2,737.27	49,585.70
2034	234.643	1,302.63	2,502.63	49,352.60
2035	216.807	1,085.82	2,285.82	49,117.95
2036	219.280	866.54	2,066.54	48,901.15
2037	202.116	664.42	1,864.42	48,681.87

Year	EIA Projected Demand (million short tons)	Alternative A (million short tons)	Alternative C (million short tons)	Alternative B (million short tons)
2038	199.722	464.70	1,664.70	48,479.75
2039	197.063	267.64	1,467.64	48,280.03
2040	194.675	72.96	1,272.96	48,082.96
2041	187.956	-114.99	1,085.01	47,895.01
2042	184.995	—	900.01	47,710.01
2043	184.432	—	715.58	47,525.58
2044	184.769	—	530.81	47,340.81
2045	169.869	—	360.94	47,170.94
2046	165.166	—	195.78	47,005.78
2047	162.982	—	32.80	46,842.80
2048	160.755	—	-127.96	46,682.04
2049	—	—	—	46,521.29
2050	—	—	—	46,360.53
2338	—	—	—	Continues to be extracted at an assumed rate of 160.75 million tons per year for the following 290 years.

Source: BLM 2019; EIA 2022; BLM staff analysis 2023

B.1 References

BLM (United States Department of Interior, Bureau of Land Management). 2019. Buffalo Field Office Supplemental Environmental Impact Statement and Resource Management Plan Amendment. BLM, Buffalo Field Office, Buffalo, Wyoming. September 2019.

EIA (United States Energy Information Administration). 2022. US Energy Information Administration, Annual Energy Outlook 2022 (AEO2022), Washington, DC, March 2022. Internet website: https://www.eia.gov/outlooks/aeo/.

Appendix C
Air Resources Technical Support Document

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Chapter 1. Introduction

The United States Department of Interior, Bureau of Land Management (BLM) Buffalo Field Office (BFO) prepared a Supplement Environmental Impact Statement (SEIS) and potential Resource Management Plan amendment (RMPA) under the National Environmental Policy Act for the 2015 approved Resource Management Plan (RMP), as amended. The 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* [4:20-cv-00076-GF-BMM]). The court ordered the BLM to complete a new coal screening that considers no-leasing and limited coal leasing alternatives and disclose the public health impacts, both climate and non-climate, of burning fossil fuels (coal, oil, and gas) from the BFO.

This report provides technical support documentation for the Air Resources portion of the SEIS, including greenhouse gases (GHGs) and climate change and public health effects of downstream combustion. **Section 2.0** describes the methodologies used to develop the emissions inventories for criteria and hazardous air pollutants and GHGs. **Sections 3.0** and **4.0** provide supporting information for the Affected Environment and Environmental Consequences sections of the SEIS, respectively.

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Chapter 2. Emission Inventory Methodology

2.1 Coal Mining

The BFO of the BLM has developed a coal reasonably foreseeable development (RFD) scenario that projects anticipated coal resource development in the coal development potential area (CDPA). The BLM used the US Energy Information Administration's (EIA) 2022 Annual Energy Outlook forecast for coal as the RFD scenario (see Section 2.2.4 of the SEIS). The BLM also reviewed production forecasts from the 12 individual coal mines within the Buffalo CDPA. Individual mine forecasts were lower than the EIA forecast over the planning period (2022–2038). The BLM used the 2022 EIA Annual Energy Outlook's forecast because it is the best available science for anticipated coal production. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. Collectively, the coal mines in the CDPA possess sufficient leased reserves to meet the EIA forecasted demand during the planning period of the SEIS (i.e., 2023 to 2038), and so BLM projects that reduction in coal production due to restrictions on federal leasing will not occur until after that period. Thus, BLM has developed coal projections for three alternatives through 2048 using the EIA forecast:

- Alternative A: No Leasing – New coal lease applications would not be accepted, and current applications would be denied or returned.
- Alternative B: No Action – The full CDPA would be available for future consideration of leasing (i.e., 48 billion short tons of BLM-administered recoverable coal).
- Alternative C: Limited Leasing – Available BLM-administered recoverable coal would be limited to 1.24 billion short tons which would allow for coal mining to continue at the rate projected by EIA until 2047 with reduced production in 2048.

Emissions were developed for the three alternatives as follows:

- Alternative A: No Leasing - BLM projects that leased coal reserves would be exhausted during 2041 due to no new leasing and coal production would stop and fall below the EIA forecast during that year. Therefore, emissions are entirely from existing leases and were estimated from 2023 through 2041.
- Alternative B: No Action - BLM projects that coal production would continue un-interrupted until approximately 2338 when the BLM-administered coal from the CDPA is estimated to be exhausted by projecting the 2048 EIA production forecast forward. Criteria and hazardous air pollutant emissions and GHGs were estimated for the extent of the EIA forecast (i.e., 2023 to 2048). Additionally, the total potential GHG emissions from the downstream combustion of the total 48 billion short tons of BLM-administered coal in the CDPA were estimated.
- Alternative C: Limited Leasing - The limited leasing of Alternative C would allow for coal mining to continue at the rate projected by EIA until 2047 with reduced production in 2048 due to exhaustion of leased reserves during that year. Therefore, emissions were estimated from 2023 to 2048. Future leases would provide the portion of the EIA demand not met by existing leases in 2041 and all of the production from 2042 to 2047.

The production, and therefore emissions, under all alternatives would be the same through 2040, including the remainder of the planning period (i.e., 2023 to 2038). Then, emissions under Alternative A (No

Leasing) would be lower than the other alternatives in 2041 and zero from 2042 to 2048. Production, and therefore emissions, under Alternative B (No Action) and Alternative C (Limited Leasing) would be the same through 2047. In 2048, production and emissions would be lower under Alternative C compared to Alternative B (No Action) as BLM forecasts that future leases under Alternative C would be mined out in that year. The only alternative with potential coal production beyond 2048 would be Alternative B (No Action).

Annual coal mining emissions of criteria and hazardous air pollutants and greenhouse gases (GHGs) were estimated separately for existing and future leases for 2022 through 2048 using the annual production forecast from the EIA. A federal fraction of 97.65 percent was estimated based on the federal and total leased acreage in the CDPA in the BLM GIS database and applied to allocate the total production between federal and nonfederal.

2.1.1 Criteria Air Pollutants

Historical emissions and production data for mines in the BFO were obtained from the IMPACT/Open Air System[1] of the Wyoming Department of Environmental Quality (WY DEQ 2020a) and used to develop emissions intensities (tons of emitted pollutant per ton of produced coal) for each criteria air pollutant (CAP) and precursor. Emissions intensities were developed separately for each pod of mines in the BFO (i.e., North, Middle, and South). Coal mining emissions intensities of criteria air pollutants and precursors (PM_{10}, $PM_{2.5}$, NOx, CO, volatile organic compounds [VOC], and SO_2) were estimated for processes including stationary sources, non-road equipment, blasting, and fugitive dust emissions from earth moving, coal processing and vehicle travel on unpaved roads. Emissions intensities from each mine were grouped into pod averages weighted by the mine's average production from 2017–2021 according to Wyoming mine level data from the EIA's Coal Data Browser.[2] For those mines for which data were not available from the Wyoming Coal Mines Emissions Inventory, the highest emissions intensity from mines in the same pod were used as a surrogate.

The WY DEQ emissions inventories do not include mobile sources, and so available mobile source emissions data from permit applications and other sources for one or two mines in each pod was used to develop emissions intensities that were applied to the entire pod:

- North Pod: Emissions data from Dry Fork Mine were used.[3]
- Middle Pod: Mobile source emissions data from both Cordero Rojo Mine[4] and Caballo Mine[5] were used. Only NOx emissions were available for Caballo Mine and they were applied as the NOx emissions intensity was higher than Cordero Rojo Mine. Data for Cordero Rojo Mine were used for all other criteria air pollutants and precursors.

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[1] https://deq.wyoming.gov/aqd/impact-and-open-air/

[2] https://www.eia.gov/coal/data/browser/

[3] Mobile source emissions from Permit Application Analysis A0004720 (https://openair.wyo.gov/filestore/Facilities/F000282/Applications/4706/145495.zip). Emissions data from 2025 conservatively used as that year has the highest NOx emissions intensity.

[4] Cordero Rojo Mine Permit Modification, November 2016 (https://openair.wyo.gov/filestore/Facilities/F004164/Applications/3646/118235.zip). Emissions data from 2025 conservatively used as that year has the highest NOx emissions intensity.

[5] Estimated 2017 mobile emissions data from WY DEQ in response to comments on the Western Regional Air Partnership 2028 Modeling Platform Emissions Inventory.

- South Pod: The only mobile source emissions data for the south pod that could be identified was NOx emissions from North Antelope Rochelle Mine.[6] Thus, the maximum emissions intensities from the other pods (i.e., Dry Fork Mine in the north pod) were applied for all other criteria air pollutants.

Hazardous air pollutant (HAP) emissions were estimated by applying a 0.1 factor to the total VOC emissions. Diesel particulate matter (DPM) emissions were estimated by assuming all $PM_{2.5}$ from mobile source were DPM.

The total CAP and HAP emissions intensities used to develop the emissions projections for coal produced in the CDPA are shown in **Table 2-1**. The mines, pod assignments, and recent average annual production is included as **Table 2-2**.

Table 2-1
Criteria and hazardous air pollutant weighted average emissions intensities used for coal mining in the BFO CDPA (tons pollutant per ton of coal)

Pod	PM_{10}	$PM_{2.5}$	NOx	CO	VOC	SO_2	HAPs	DPM
North	4.03E-05	7.66E-06	9.58E-05	2.86E-05	4.40E-06	1.70E-05	4.40E-07	2.91E-06
Middle	5.43E-05	8.39E-06	3.51E-05	5.16E-05	3.62E-06	1.72E-05	3.62E-07	2.59E-06
South	4.18E-05	7.21E-06	3.82E-05	7.72E-05	4.46E-06	1.68E-05	4.46E-07	2.91E-06

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter.

Table 2-2
Average annual coal production by mine (2017–2021)

Mine	Pod	2017–2021 Average Annual Production (short tons)
Antelope Coal Mine	South	23,290,165
Belle Ayr Mine	Middle	14,027,503
Black Thunder	South	64,634,669
Buckskin Mine	North	13,199,721
Caballo Mine	Middle	12,108,364
Coal Creek Mine	Middle	4,727,285
Cordero Rojo Mine	Middle	12,710,230
Dry Fork Mine	North	5,220,869
Eagle Butte Mine	North	14,363,104
North Antelope Rochelle Mine	South	82,832,535
Rawhide Mine	North	10,207,432
Wyodak Mine	North	3,844,826

2.1.2 Greenhouse Gases

Emissions of greenhouse gases (GHGs) were estimated following the approaches applied by the BLM to estimate emissions from coal mining in the Powder River Basin of Wyoming and Montana in national *BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2022a, hereafter referred to

[6] Ibid.

as the BLM Specialist Report).[7] The BLM used average life cycle GHG emission factors in carbon dioxide equivalents (CO_2e) from the 2016 National Energy Technology Laboratory (NETL) report titled *Life Cycle Analysis of Coal Exports from the Powder River Basin* (NETL 2016). These emissions factors are shown in **Table 2-3** and cover emissions from processes including mine reclamation, coal extraction, overburden removal, and construction and account for fugitive methane emissions at the mine (NETL 2016). In addition to the CO_2e factors used in the BLM Specialist Report, this assessment also applies the NETL emission factors for carbon dioxide (CO_2), methane (CH_4), and nitrous dioxide (N_2O) following the same approaches. The emission factors from the NETL report are provided in units of kg CO_2e/MWh; they were converted to units of kg CO_2e/short ton of coal using a factor of 0.455 short tons of Powder River Basin coal per MWh derived by BLM using data from NETL (BLM 2022a).

Emissions in carbon dioxide equivalents (CO_2e) were calculated using 20-year and 100-year time horizon global warming potentials (GWPs) from the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC 2021) (see **Section 2.6** for more information).

Table 2-3
Greenhouse gas emissions factors used for coal mining (kg GHG per short ton of coal)

CO_2	CH_4	N_2O	20-year CO_2e	100-year CO_2e
7.867	0.147	0.006	21.5	13.8

Source: BLM 2022a, NETL 2016
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

2.2 Oil and Gas Production and Midstream Sources

2.2.1 Emission Sources

The oil and gas production and midstream source emission inventory includes emissions from the following phases, similar to the 2015 RMP/EIS (BLM 2015) and 2019 SEIS (BLM 2019):

- **Construction phase** (e.g., well-pad and road construction, vehicle travel on unpaved roads, surface disturbance)
- **Pre-production** (e.g., drilling, fracturing, completion)
- **Operational** phase (e.g., well workover, dehydrators, tanks, commuting vehicles for workers, liquids transfer operations, wellhead fugitives, well venting and flaring, compressors, road reclamation, evaporative ponds)

2.2.2 Years

Emissions were estimated for base year 2022 and forecast years from 2023 to 2038 using the same calculation methodology and oil and gas activity as the 2015 RMP/Final EIS and 2019 Final SEIS.

2.2.3 Geographical

The oil and gas emission inventory includes the entire BFO.

[7] https://www.blm.gov/content/ghg/2021/

2.2.4 Pollutants

Emissions were estimated for the following pollutants/gases:

- Criteria air pollutants
  - Nitrogen oxides (NOx)
  - Volatile organic compounds (VOC)
  - Particulate matter with a diameter less than or equal to 10 microns (PM_{10})
  - Particulate matter with a diameter less than or equal to 2.5 microns ($PM_{2.5}$)
  - Sulfur dioxide (SO_2)
- Hazardous air pollutants (HAPs)
  - Benzene
  - Ethylbenzene
  - Formaldehyde
  - N-hexane
  - Toluene
  - Xylenes
- Greenhouse gases
  - CO_2
  - CH_4
  - N_2O
  - CO_2e

Emissions of CO_2e were calculated for the 100-year and 20-year time horizons using GWPs from IPCC AR6 (IPCC 2022). See **Section 2.6** for more information.

2.2.5 Mineral Designation

Emissions were estimated for BLM-administered oil and gas activities (federal) and oil and gas sources not administered by the BLM (nonfederal) within the BFO.

2.2.6 Oil and Gas Activity

The emission inventory includes three well types: oil, coalbed natural gas (CBNG), and conventional natural gas. Annual oil and gas active well counts and production were estimated by well type are based on estimates from the 2019 SEIS (BLM 2019b).

2.2.7 Emission Inventory Development Methodology

Criteria pollutant and HAP emissions were developed by leveraging the emissions calculation methodology applied in the 2019 SEIS. Annual emission rates for 2015 and 2024 were obtained from the 2015 RMP/EIS. All other years were estimated using a methodology similar to the estimation of emissions in the 2019 SEIS. Criteria and HAP emissions for years 2022 and 2023 were estimated by interpolating between 2015 and 2024 emission rates on an emissions per production basis for each well type. Emissions for years 2025-2038 were estimated based on the 2024 emission rates multiplied by their annual production rate.

GHG emissions were based on the 2019 Final SEIS (BLM 2019b) and CO_2e equivalents were updated using more recent GWPs from the IPCC AR6.

2.3 Other BLM-authorized Activities

The emissions analysis of BLM-authorized activities other than oil and gas development and coal mining from the 2015 RMP are incorporated by reference for the selected alternative of the 2015 RMP (Alternative D) and summarized in **Section 4.5**. The other BLM-authorized activities assessed in the 2015 RMP were:

- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Minerals
- Fire and Fuels Management
- Forestry and woodland Management
- Land Resources – Rights-of-Way and Renewable Energy Projects
- Land Resources – Comprehensive Trails and Travel Management
- Livestock Grazing Management

BLM estimated emissions for these activities for the years 2015 and 2024. The emissions estimates for 2024 are incorporated here. Note that BLM expects that the 2024 annual activity rates and corresponding emissions for these activities from the 2015 RMP remain representative of expected activity levels and emissions for this SEIS.

2.4 Coal Transportation and Downstream Combustion

2.4.1 Transportation

The Environmental Protection Agency (EPA) Guidance (2022c) approach was used to estimate emissions using activity for rail freight movements. This guidance indicates that using gross ton-miles (GTM) is the preferred option for freight rail activity. Rail gross tonnage combines the weight of the locomotives, the tare weight of rail cars, and revenue freight tonnage. The EPA recommends calculating fuel consumption from the average fuel consumption factor (FCF) and GTM and emissions from the fuel consumption using equations 1 and 2.

$$\text{FC} = \text{GTM} \times \text{FCF} \tag{1}$$

Where FC = fuel consumption (gal)
GTM = gross ton-miles (ton-mi)
FCF = fleet average fuel consumption factor (gal/ton-mi)

$$\text{Emissions} = \text{EF (g/gallon)} \times \text{FC} \tag{2}$$

The FCF was derived from the annual reporting by railroads ("R-1 Report"), in this case, BNSF[8] railroad, and the calendar year 2021 BNSF report was the latest available report at the time of writing. The report

[8] https://www.bnsf.com/about-bnsf/financial-information/pdf/21R1.pdf, accessed in December 2022. Table 750 provides fuel consumption, and Table 755 provides gross and revenue ton-miles.

provides annual gross and revenue ton-miles and fuel consumption for line-haul, switching, and work trains (used to maintain the system).

It was not feasible to identify specific train configurations (number of locomotives and rail cars) relative to the freight movements to estimate the Gross to Revenue weight fraction. As a result, revenue (actual paying freight) ton-miles (RTM) was substituted for GTM to compare with the overall fuel consumption to calculate the FCF. The use of fuel consumption by RTM is consistent with the EPA guidance because it uses the average annual revenue to gross weight fraction for the fuel consumption calculation.

BLM provided estimated one-way rail miles from mines within the Wyoming Powder River Basin to their end-users and 2021 annual coal shipments data from each mine to each end-user. A coal shipment weighted average distance was calculated for 2021 for each pod (North, Middle, and South). The miles were rounded up to the nearest hundred. End-users that were closed in 2022 were not included in the calculation. The same distances were applied to all years (2022-2048) because coal shipment data are not available by year. **Table 2-4** shows the calculated weighted average rail transport distances for each pod.

Table 2-4
Coal shipment weighted average rail distances for each pod for 2021

Mine Pod	Distance (miles)
Middle	1,000
North	1,100
South	1,100

BNSF activity in the calendar year 2021 resulted in an average of 507 RTM/gallon (1/FCF). Of the total fuel consumption, 4.4 percent was from switching and work trains with the remainder of fuel consumption used in the line-haul activity. RTM/gallon average activity derived from the R-1 Report total freight moves and fuel consumption incorporates the fuel consumption from empty train return moves.

EPA (2009) provides locomotive engine emission factors for hydrocarbons, CO, NOx, and PM directly in gram per gallon units accounting for the expected fleet age distribution and other factors. For calendar years after 2040, the same emission factors as for year 2040 were assumed in calculating emissions because EPA did not forecast it further. Thus, it is a conservatively high estimate of emissions for those years. A fuel consumption weighted combination of "Large Railroads 'Line-haul' and 'Switch'" was used to calculate the emission factors of hydrocarbons, CO, NOx, and PM. EPA (2022c) provides VOC and $PM_{2.5}$ conversions from hydrocarbons and PM respectively and emission rates for methane (CH_4) and nitrous oxide (N_2O). EPA (2022c and 2009) estimated the average diesel fuel density of 3200 grams per gallon to convert emission factors in gram per gram of fuel to gram per gallon units. Appendix J in the EPA (2022c) emission inventory guidance provides HAPs as a fraction of either $PM_{2.5}$ or VOC emissions. Multiplying the freight tonnage by the distance moved (one-way) provides RTM and dividing by the freight transport efficiency estimates the fuel consumed by mode. Then the fuel consumption multiplied by the emission factors in gallons units provides the expected emissions from freight transport.

2.4.2 Downstream Combustion

To estimate GHG emissions from the downstream combustion of the coal produced in the CDPA, we applied EPA (2022c) emissions factors for stationary combustion of sub-bituminous coal following the approach of the BLM (2022a) Specialist Report. The emissions factors are presented in **Table 2-5**. Downstream combustion emissions were estimated annually for 2022 to 2048, and for the full CDPA that would be available for future consideration of leasing (i.e., 48 billion short tons of BLM-administered recoverable coal).

Table 2-5
Greenhouse gas emission factors for downstream coal combustion (kg per short ton)

CO_2	CH_4	N_2O	20-year CO_2e	100-year CO_2e
1,676.1825	0.18975	0.0276	1,699.4	1,689.4

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

The names and locations of the coal-fired power plants that burn coal produced in the CDPA in year 2021 are reported in **Section 4.6**. Emissions of criteria and hazardous air pollutants from these power plants were also reported in that section. The exact coal-fired power plant destinations and the amount of coal that would be supplied to those plants from the CDPA in the future are uncertain. In addition, there is uncertainty over the federal versus nonfederal fraction of coal that will be burned at these power plants as well as the amount of coal they may burn from outside the CDPA. Since coal production from the CDPA shows a declining trend, future emissions of criteria and hazardous air pollutants from the downstream combustion of coal from the CDPA would be comparable to or lower than the emissions reported in that section.

2.5 Oil and Gas Processing, Transportation, and Downstream Combustion

Emissions of CO_2, CH_4, and N_2O from oil and gas processing, transportation and downstream combustion were calculated for 2022 through 2038 using the estimated oil and gas production rates from the BFO discussed in **Section 2.2.6**.

Emissions factors developed by NETL were used to calculate GHG emissions of CO_2, CH_4, and N_2O from the refining and transportation of produced oil (NETL 2008) consistent with the BLM Specialist Report. The emissions factors are provided in terms of kilograms per barrel of oil developed (kg/bbl) and GHG emissions are calculated using the emissions factors and the estimated oil production from wells developed. Emissions from refining are weighted based on fuel (product) type as reported in the BLM's "Oil and Gas Leasing Greenhouse Gas Emission Inventory Tool" version 2022c (BLM 2022b). The emissions factors for the refining and transportation of oil are shown in **Table 2-6** and **Table 2-10**, respectively.

Table 2-6
Greenhouse gas emissions factors for the refining of oil

Refined Product	US Consumption	CO_2 (kg/bbl)	CH_4 (kg/bbl)	N_2O (kg/bbl)
Gasoline	44.3%	4.60E+01	5.62E-02	7.45E-04
Diesel	20.8%	5.08E+01	6.27E-02	7.85E-04

Refined Product	US Consumption	CO_2 (kg/bbl)	CH_4 (kg/bbl)	N_2O (kg/bbl)
Kerosene (Jet)	6.1%	3.05E+01	3.76E-02	4.72E-04
Residual Fuel Oil	1.2%	3.57E+01	4.38E-02	5.64E-04
Coke	1.4%	4.24E+01	5.10E-02	7.28E-04
Light Ends	22.8%	2.89E+01	3.50E-02	4.84E-04
Heavy Ends	3.3%	6.70E+01	8.09E-02	1.13E-03
Total	**100%**	**1.54E+09**	**1.88E+06**	**2.51E+04**

Source: NETL 2008, BLM 2022b
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; kg = kilograms; bbl = barrel.

Table 2-7
Greenhouse gas emissions factors for the transportation of oil

Process	CO_2 (kg/bbl)	CH_4 (kg/bbl)	N_2O (kg/bbl)
Transport of Crude	7.92E+00	4.27E-03	1.59E-04
Transport of Product	4.54E+00	2.81E-03	8.93E-05
Total	**1.25E+01**	**7.08E-03**	**2.48E-04**

Source: NETL 2008, BLM 2022b
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; kg = kilograms; bbl = barrel.

Emissions factors developed by NETL were also used to calculate GHG emissions of CO_2, CH_4, and N_2O from the processing, gathering and boosting, transmission, storage, and distribution of natural gas (NETL 2019). These emissions factors are provided in terms of kilograms per mega joule (kg/MJ) of natural gas and GHG emissions are calculated using the emissions factors and the estimated natural gas production from wells developed. The emission factors for gathering and boosting, transmission, storage, and distribution of natural gas are combined to create a single emissions factor for transportation of natural gas. The emissions factors used to calculate GHG emissions from the processing and transportation of natural gas are shown in **Table 2-8**. These emission factors are used for both conventional natural gas and coalbed methane natural gas.

Table 2-8
Greenhouse gas emissions factors for the processing and transportation of natural gas

	CO_2 (kg/MJ)	CH_4 (kg/MJ)	N_2O (kg/MJ)
Processing	**1.33E-03**	**1.38E-05**	**4.73E-09**
Transportation:			
Gathering/Boosting	3.20E-03	5.10E-05	0.00E+00
Transmission Station	4.61E-03	3.62E-05	1.21E-07
Transmission Pipeline	1.40E-07	6.71E-06	0.00E+00
Storage	4.41E-07	1.56E-06	3.06E-13
Distribution	1.02E-05	2.86E-05	0.00E+00
Total Transportation	**7.82E-03**	**1.24E-04**	**1.21E-07**

Source: NETL 2019
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; kg = kilograms; MJ = mega joule.

Table 2-9 provides the emissions factors that were used to calculate GHG emissions of CO_2, CH_4, and N_2O from the downstream combustion of oil and natural gas (conventional and coalbed). These emission factors were obtained from 40 CFR 98 Table C-1 and Table C-2, consistent with the BLM Specialist Report.

Table 2-9
Greenhouse gas emissions factors for the downstream combustion of oil and natural gas

	CO_2	CH_4	N_2O	
Oil	1.029E+01	4.140E-04	8.280E-05	kg/gal
Gas	5.444E-02	1.026E-06	1.026E-07	kg/cf

Source: 40 CFR 98, Table C-1 and Table C-2
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; kg = kilograms; gal = gallon; cf = cubic feet.

2.6 Global Warming Potentials

Different GHGs have different atmospheric lifetimes; some, such as methane, react in the atmosphere relatively quickly, on the order of 12 years (see EPA 2022b), 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 (BLM 2019).

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.

This SEIS reports CO_2e emissions using the 20-year and 100-year time horizon GWPs from IPCC AR6. The 20-year CO_2e is presented to estimate the relative impacts of shorter-lived GHGs more clearly (i.e., CH_4) over the 20-year life of the SEIS. The IPCC AR6 provides different warming potentials for methane gas based on whether the greenhouse gas is fossil or non-fossil originated. The GWPs for fossil originated methane gas are applied for all emission types except for emissions related to livestock grazing, which uses the non-fossil origin GWP for CH_4. **Table 2-10** below shows the GWPs used in this SEIS adapted from AR6. Note that the choice of adapting 100-year and 20-year GWPs from AR6 will result in differences in calculated CO_2e values compared to ones calculated based on other GWPs (i.e., 100-year time horizon GWPs from the IPCC Fourth Assessment Report).

Table 2-10
Global warming potentials adapted from sixth assessment report of the IPCC (2021)

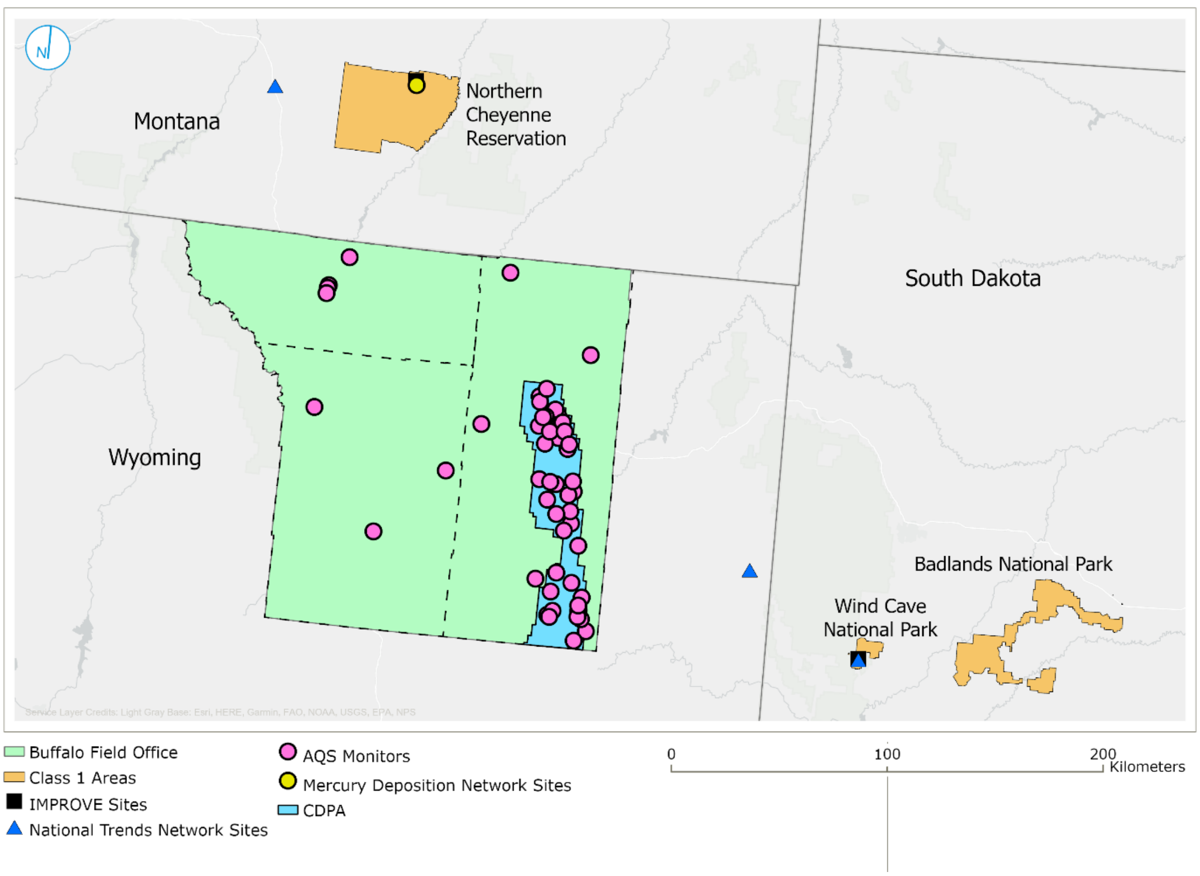
Time Horizon	CO_2	CH_4 - Fossil Origin	CH_4 - Non-Fossil Origin	N_2O
100 Year	1	29.8	27.2	273
20 Year	1	82.5	80.8	273

Source: IPCC 2021
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide.

Chapter 3. Supporting Information for Affected Environment

3.1 Analysis Areas

Figure 3-1
BFO, select federal and Sovereign Tribal Nations Class I areas, and monitoring sites for air quality and air quality related values



3.2 National and State Ambient Air Quality Standards

Table 3-1 and **Table 3-2** present the national and state ambient air quality standards, respectively. Primary standards provide public health protection, while secondary standards provide public welfare protection, such as protection against decreased visibility and damage to vegetation and buildings. The State of Wyoming regulates air quality using the National Ambient Air Quality Standards (NAAQS) and has established an additional standard for PM_{10}.

Table 3-1
National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Period	NAAQS	Form
CO	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Pb	Primary and Secondary	Rolling 3-month average	0.15 μg/m^3	Not to be exceeded
NO_2	Primary and Secondary	Annual	53 ppb	Annual mean
	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
O_3	Primary and secondary	8 hours	0.070 ppm (70 ppb)	Annual 4th highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	Primary	Annual	9.0 μg/m^3	Annual mean averaged over 3 years
	Secondary	Annual	15.0 μg/m^3	Annual mean averaged over 3 years
	Primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once a year, on average over 3 years
SO_2	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: EPA 2022b
Notes: ppm – parts per million; ppb – parts per billion; μg/m^3 – micrograms per cubic meter. In February 2024, the EPA revised the primary annual PM2.5 standard from 12.0 μg/m3 to 9.0 μg/m3.

Table 3-2
Wyoming Ambient Air Quality Standards

Pollutant	Averaging Period	Wyoming Ambient Air Quality Standard (WAAQS)	Form
PM_{10}	Annual	50 μg/m^3	Annual mean averaged over 3 years

Source: WY DEQ 2022

The states that contain power plants receiving coal from mines in the CDPA can change from year to year. In 2021, the states with power plants receiving coal from the CDPA were Alabama, Arkansas, Arizona, Colorado, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Mississippi, Nebraska, Nevada, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Washington, Wisconsin, and Wyoming (EIA 2022b). The EPA allows states to set air quality standards that are stricter than the NAAQS; information on such standards, when established, are available from the individual state's environmental division or department. Information on receiving power plants is provided in **Section 4.6.1**.

3.3 Monitoring Stations for Air Quality

Table 3-3
Criteria Air Pollutant Monitoring Sites within the BFO

Air Quality System (AQS) Number	Site Name	County	Parameters Measured
560050012	Fortification Creek (WARMS site)	Campbell	$PM_{2.5}$
560050013	NARM NA-9	Campbell	PM_{10}
560050014	Black Thunder Site 6	Campbell	PM_{10}
560050015	Black Thunder Site 15	Campbell	PM_{10}
560050017	Buckskin West	Campbell	PM_{10}
560050084	School Creek SC-1	Campbell	PM_{10}
560050086	School Creek SC-3	Campbell	PM_{10}
560050087	School Creek SC-2	Campbell	PM_{10}
560050099	Wright	Campbell	PM_{10}
560050123	Thunder Basin	Campbell	NO_2, PM_{10}, $PM_{2.5}$, SO_2
560050303	Coal Creek Site 3	Campbell	PM_{10}
560050456	Campbell County	Campbell	NO_2, O_3, PM_{10}
560050802	1 Site (Met Station and Hi-Vols BA1 and BA1-B)	Campbell	PM_{10}
560050808	Eagle Butte EB-3	Campbell	PM_{10}
560050826	Rawhide Hilltop Site	Campbell	PM_{10}
560050841	Coal Creek Site 7	Campbell	PM_{10}
560050857	Black Hills Power Site 4	Campbell	PM_{10}, SO_2
560050869	NARM RO-1	Campbell	PM_{10}
560050875	Black Thunder Mine Site 3	Campbell	PM_{10}
560050879	Dry Fork Site DF-1 Meteorological Station	Campbell	TSP
560050884	Buckskin West	Campbell	PM_{10}
560050885	Cordero Rojo Site E-10	Campbell	PM_{10}
560050886	Caballo Mine CB-8	Campbell	PM_{10}
560050891	Black Thunder BTM 36-2	Campbell	PM_{10}
560050892	Belle Ayr BA-4	Campbell	NO_2, PM_{10}
560050893	Belle Ayr BA-3	Campbell	PM_{10}
560050895	Rawhide North Site	Campbell	PM_{10}
560050897	Dry Fork Site DF-4	Campbell	PM_{10}
560050898	Belle Ayr Ranch House Monitor	Campbell	PM_{10}
560050900	AMAX Eagle Butte Site EB-5 Southeast of Mining Activity	Campbell	PM_{10}
560050907	Black Thunder Site 12	Campbell	PM_{10}
560050908	Caballo Mine Site CB-9	Campbell	PM_{10}
560051002	Gillette SLAMS site	Campbell	PM_{10}
560051003	Cordero Rojo Site W-11	Campbell	PM_{10}
560051009	Cordero Rojo Site S-11	Campbell	PM_{10}
560051877	Black Thunder Sites 25-3, 25-4, and 25-5	Campbell	PM_{10}
560051879	Dry Fork Site DF-2	Campbell	PM_{10}
560051899	Buckskin Mine North Site & PRB-$PM_{2.5}$ Network	Campbell	PM_{10}, $PM_{2.5}$
560051900	NARM NA-7	Campbell	PM_{10}
560051915	New PM_{10} Site Known as BTM 31-1 Active 10-00	Campbell	PM_{10}
560051917	Black Thunder Mine JR5	Campbell	PM_{10}
560052900	Eagle Butte EB-5	Campbell	PM_{10}
560052901	Eagle Butte-Rawhide School Monitor	Campbell	PM_{10}

Air Quality System (AQS) Number	Site Name	County	Parameters Measured
560055555	Wyodak Site 5	Campbell	PM_{10}
560056666	Wyodak Site 6	Campbell	PM_{10}
560190002	Buffalo	Campbell	PM_{10}, SO_2
560190004	Johnson County	Johnson	NO_2, O_3, PM_{10}, $PM_{2.5}$
560330002	Sheridan - Police Station SLAMS Site	Johnson	PM_{10}, $PM_{2.5}$
560330006	Sheridan Mobile	Sheridan	NO_2, O_3, PM_{10}, $PM_{2.5}$
560331003	Sheridan - Meadowlark SLAMS site	Sheridan	PM_{10}, $PM_{2.5}$

Source: EPA 2022

3.4 Monitoring Data for Air Quality

3.4.1 Carbon Monoxide (CO)

Motor vehicles and other internal combustion engines are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. CO is also created during refuse, agricultural, and wood-stove burning and through mining, oil and gas development, and other industrial processes.

CO 1-hour and 8-hour design values are presented in **Table 3-4** and **Table 3-5**.

Table 3-4
CO 1-hour design values (ppm), 2017–2021

Site Name	2017	2018	2019	2020	2021	Met NAAQS (35 ppm)
Converse County	0.12*	0.38	0.19	0.46	0.55	Yes
Cheyenne NCore	0.88	0.49	0.16	0.185	0.45	Yes

Source: WY DEQ 2017, 2018, 2019, 2020b, 2021, 2022
Notes: The design values are the 1-hour average concentration. (*) signifies that the value did not meet data completeness requirements per 40 CFR 50.

Table 3-5
CO 8-hour design values (ppm), 2017–2021

Site Name	2017	2018	2019	2020	2021	Met NAAQS (9 ppm)
Converse County	0.1*	0.3	0.2	0.4	0.4	Yes
Cheyenne NCore	0.8	0.4	0.4	1.4	0.3	Yes

Source: WY DEQ 2017, 2018, 2019, 2020b, 2021, 2022
Notes: The design values are the maximum 8-hour average concentration. (*) signifies that the value did not meet data completeness requirements per 40 CFR 50.

3.4.2 Lead (Pb)

The primary historical source of lead emissions has been certain types of industrial sources and lead in gasoline and diesel fuel. However, because lead in fuels has decreased substantially, the processing of metals containing trace amounts of lead is now the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturing plants. There are no active lead monitors in Wyoming, due to low background concentrations of lead (WDEQ 2022).

3.4.3 Nitrogen Oxides (NOx)

Nitrogen oxides (NO_x), including nitric oxide (NO) and nitrogen dioxide (NO_2), are formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuel (for example, in mining activities, oil and gas development, automobiles, power plants, other industrial processes, and home and office heating). Within the atmosphere, NO_2 contributes to visibility impacts and may be visible as reddish-brown haze. NO_2 (and other NO_x compounds) also forms nitric acid, a component of atmospheric deposition (for example, acid rain).

NO_2 1-hour and annual design values are presented in **Table 3-6** and **Table 3-7**.

Table 3-6
County-level NO_2 1-hour design values (ppb), 2017–2021

County Name	AQS Site ID	2017	2018	2019	2020	2021	Met NAAQS (100 ppb)
Campbell	560050892	30	29	30	—	—	Yes

Source: EPA 2022g
Notes: The level of the 2010 1-hour NAAQS for NO_2 is 100 ppb. The design values are the 98th percentile of the daily maximum 1-hour average concentration averaged over 3 consecutive years. The values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure.

Table 3-7
County-level NO_2 annual design values (annual average of hourly concentrations in ppb), 2017–2021

County Name	AQS Site ID	2017	2018	2019	2020	2021	Met NAAQS (53 ppb)
Campbell	560050123	—	5	4	1	1	Yes
Johnson	560190004	—	—	1	1	1	Yes

Source: EPA 2022g
Notes: The level of the 1970 annual NAAQS for NO_2 is 53 ppb. The design values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure.

3.4.4 Ozone (O_3)

Tropospheric O_3 is not emitted directly into the atmosphere. Instead, it is formed by photochemical reactions of precursor air pollutants, including VOCs and NOx. These precursors are emitted by mobile sources, stationary combustion equipment, and other industrial sources. Ozone formation is enhanced by increased sunlight and higher air temperatures. Elevated O_3 concentrations may also occur during winter in snow-covered rural areas.

O_3 8-hour design values are presented in **Table 3-8**.

Table 3-8
County-level O_3 design values (ppm), 2017–2021

County Name	AQS Site ID	2017	2018	2019	2020	2021	Met NAAQS (0.070 ppm)
Campbell	560050123	0.063	0.061	0.061	0.060	0.064	Yes
Johnson	560190004	0.060	0.061	0.061	0.060	0.064	Yes

Source: EPA 2022g
Notes: The level of the 2015 8-hour O_3 NAAQS is 0.070 ppm. The design values are the 3-year average of the annual 4th highest daily maximum 8-hour concentration. The values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure.

3.4.5 Particulate Matter (PM)

Emissions of PM are generated by a variety of sources, including agricultural activities, industrial emissions, and road dust resuspended by vehicle traffic. Within the BFO, primary sources of PM include smoke from wildland fire, residential wood burning, mining, oil and gas development, street sand, physically disturbed soils, and dust from unpaved roads. Impacts of PM include health effects, deposition on plants and surfaces (including soiling of snow, which can contribute to climate change), localized reductions in visibility, and potential corrosion. $PM_{2.5}$ also contributes to reduced visibility in nationally important areas such as national parks. $PM_{2.5}$ emissions are primarily generated by internal combustion diesel engines, soils with high silt and clay content, and secondary aerosols formed by chemical reactions in the atmosphere.

County-level PM_{10} 24-hour design values are presented in **Table 3-9**. Annual average PM_{10} concentrations at Wyoming Department of Environmental Quality monitoring sites within the BFO are presented in **Table 3-10**. County-level $PM_{2.5}$ 24-hour and annual design values are presented in **Table 3-11** and **Table 3-12**, respectively.

Table 3-9
County-level PM_{10} estimated number of NAAQS exceedances (averaged over 3 consecutive years), 2017–2021

County Name	AQS Site ID	2017	2018	2019	2020	2021	Met NAAQS (150 µg/m³)
Campbell	560050895	1.4	1.4	1	0.4	0.4	No (2017–2018); Yes (2019–2021)
Johnson	560190004	—	—	—	—	0	Yes
Sheridan	560330002	0	0	0	0	—	Yes

Source: EPA 2022g
Notes: The level of the 1987 24-hour PM_{10} NAAQS is 150 µg/m³, not to be exceeded more than once per year on average over 3 years. The design values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure.

Table 3-10
Annual average PM_{10} (µg/m³), 2017–2021

Site Name	2017	2018	2019	2020	2021	Met WAAQS (50 µg/m³)
Gillette	13	13	13*	12*	N/A	Yes
Sheridan-Meadowlark	10	11	10	10	N/A	Yes
Sheridan-Police Station	17	17	16	15	14	Yes
Johnson County	N/A	N/A	N/A	9*	8	Yes
Wright Jr-Sr High School	13*	11*	11*	11*	N/A	Yes

Source: WY DEQ 2017, 2018, 2019, 2020b, 2021, 2022
Notes: (*) signifies that the value did not meet data completeness requirements per 40 CFR 50; N/A signifies that the site was not in operation for the years of study.

Table 3-11
County-level $PM_{2.5}$ 24-hour design values (µg/m³), 2017–2021

County Name	AQS Site ID	2017	2018	2019	2020	2021	Met NAAQS (35 µg/m³)
Campbell	560050895	19	19	15	—	—	Yes
Sheridan	560330002	24	23	21	24	27	Yes

Source: EPA 2022g
Notes: The level of the 2006 24-hour $PM_{2.5}$ NAAQS is 35 µg/m³. The design values are the 98th percentile of the 24-hour average concentrations, averaged over 3 consecutive year. The values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure.

Table 3-12
County-level $PM_{2.5}$ annual design values (µg/m³), 2017–2021

County Name	AQS Site ID	2015–2017	2016–2018	2017–2019	2018–2020	2019–2021	Met NAAQS (9.0 µg/m³)
Campbell	560050895	4.8	4.5	3.3	—	—	Yes
Sheridan	560330002	7.3	7.2	7	6.5	6.3	Yes

Source: EPA 2022g
Notes: The level of the 2012 annual $PM_{2.5}$ NAAQS is 9.0 µg/m³. The design values are the annual mean concentrations, averaged over 3 consecutive year. The values shown here are computed using Federal Reference Method or equivalent data reported by Sovereign Tribal Nations, state, and local monitoring agencies to the EPA's AQS as of May 4, 2022. Concentrations flagged by Sovereign Tribal Nations, state, or local monitoring agencies as having been affected by an exception event (for example, wildfire or volcanic eruption) and concurred by the associated EPA Regional Office are not included in these calculations. Only valid design values are shown; — represents insufficient data or site closure. In February 2024, the EPA announced its revised primary annual $PM_{2.5}$ standard from 12.0 µg/m³ to of 9.0 µg/m³.

3.4.6 Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless gas with a pungent odor. It is emitted primarily from stationary sources that burn fossil fuels (that is, coal, oil, and gas) containing trace amounts of elemental sulfur. Some other human sources of SO_2 include metal smelters and petroleum refineries. SO_2 is also emitted from natural sources such as volcanoes. In the atmosphere, SO_2 converts to sulfuric acid, a component of atmospheric deposition (acid rain), and forms secondary aerosols, subsequently contributing to visibility impacts at Class I areas.

SO_2 1-hour design values at Wyoming Department of Environmental Quality monitors are presented in **Table 3-13**.

Table 3-13
County-level SO_2 1-hour design values (ppb), 2017–2021

Site Name	2017	2018	2019	2020	2021	Met NAAQS (75 ppb)
Moxa Arch	21	20	12	9	8	Yes
Cheyenne NCore	9	4	5	4	5*	Yes

Source: WY DEQ 2017, 2018, 2019, 2020b, 2021, 2022
Notes: The design values are the 99th percentile of 1-hour daily maximum concentration, averaged over 3 years. (*) signifies that the value did not meet data completeness requirements per 40 CFR 50.

3.5 ATTAINMENT STATUS

There are no nonattainment areas for any criteria pollutant within the BFO. Sheridan, Wyoming, which is within the BFO, was redesignated as a PM_{10} maintenance area in 2018 based on monitored air quality data for the PM_{10} NAAQS during the years 2014–2016. The EPA fully approved the Limited Maintenance Plan, submitted by the State of Wyoming to the EPA on June 2, 2017. This air quality maintenance plan provided guidelines for reducing fugitive dust (which was the primary source of the PM_{10} issue) and voluntary curtailment of solid fuel combustion.

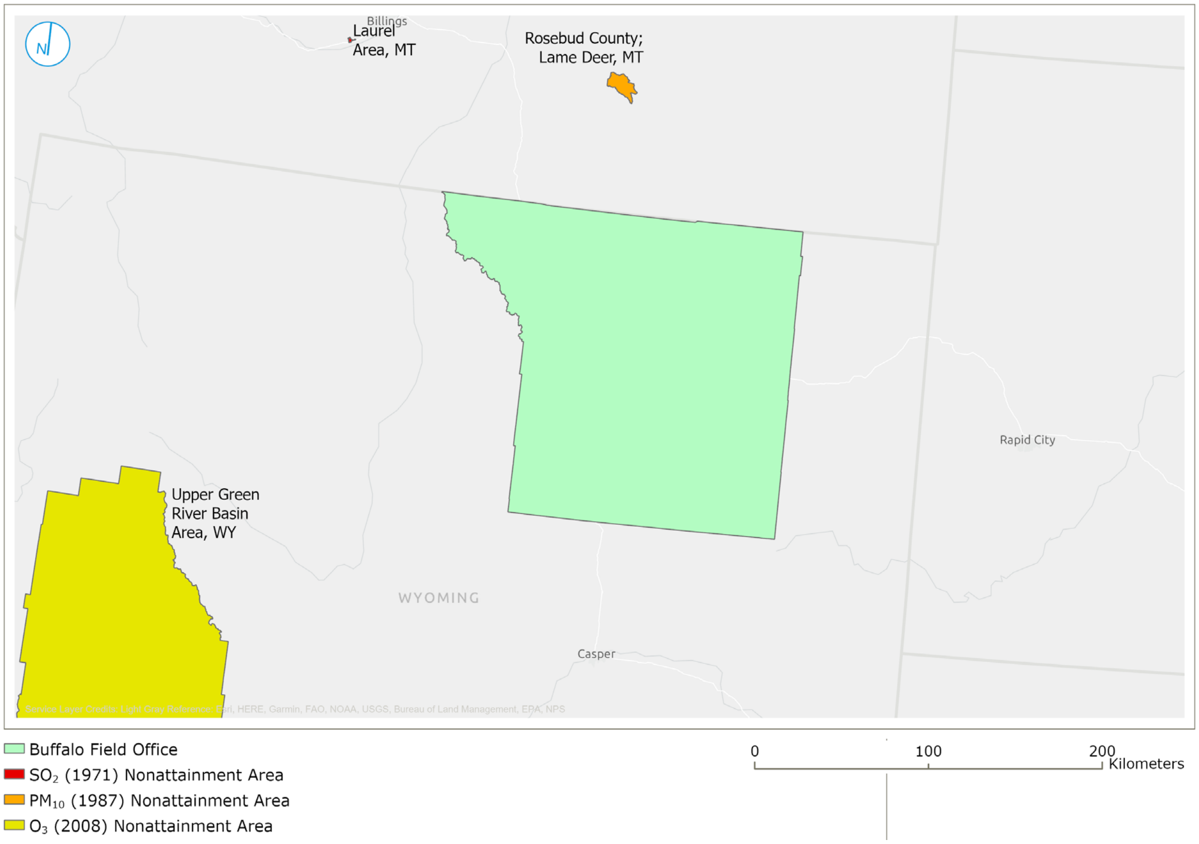
The Upper Green River Basin Area, located in Sublette and Sweetwater Counties, Wyoming, is the only nonattainment area in Wyoming. It was designated as a marginal nonattainment area for 8-hour ozone (2008 Standard) in 2012. This nonattainment area is approximately 100 miles southwest of the BFO. There are two additional areas designated as nonattainment in Montana that are near but not within the BFO. The Lame Deer, Montana, area, approximately 50 miles north of the BFO, was designated as a moderate PM_{10} nonattainment area in 1990. Laurel, Montana, was designated nonattainment in 1978 for the 1971 24-hour SO_2 NAAQS; however, the Montana Department of Environmental Quality is in the process of a redesignation request and maintenance plan for the Laurel area. Laurel is approximately 65 miles northwest of the BFO. These areas are shown in **Figure 3-2**.

Table 3-14
Nonattainment/maintenance areas near the BFO

Location	County	State	NAAQS	Nonattainment Designation
Laurel Area	Yellowstone County	Montana	Sulfur Dioxide (1971 Standard)	11/15/1990
Lame Deer	Rosebud County	Montana	PM-10 (1987 Standard)	11/15/1990
Upper Green River Basin Area	Sublette County, Sweetwater County	Wyoming	8-Hour Ozone (2008 Standard)	7/20/2012

Source: EPA 2022h

Figure 3-2
Nonattainment areas near the BFO



The nonattainment status of regions with coal-fired power plants where downstream combustion of BFO coal could occur is shown in **Section 3.9.3**. In summary, some key regions that have power plants receiving BFO coal, as well as nonattainment areas for one or more criteria pollutants (particularly O_3), include Alabama, Colorado, Georgia, Louisiana, Missouri, Texas, and the states around Lake Michigan. Some distinct O_3 nonattainment areas with power plants within or nearby that burn BFO coal include Houston-Galveston-Brazoria in Texas, the San Antonio area in Texas, the St. Louis area in Missouri-Illinois, the Denver-Boulder-Greeley-Ft. Collins area in Colorado, the Chicago area in Illinois, and the Detroit area in Michigan. In the case of SO_2 and $PM_{2.5}$, states where receiving power plants are in or near nonattainment areas include Alabama, Arizona, Georgia, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Texas, and Wisconsin. The design values corresponding to the ambient air concentrations in these and other areas are available from the EPA (https://www.epa.gov/air-trends/air-quality-design-values#report).

The power plants typically receive both federal and nonfederal coal and may also combust coal from sources outside the CDPA. The nonattainment areas present in urban regions commonly have a multitude of other emission sources also contributing to nonattainment. In general, the power plants and other sources in the regions are subject to local, state, and federal regulations aimed at improving local and regional air quality and making progress toward attainment.

More discussion on the receiving power plants and impacts of burning coal is presented in the *Coal Downstream Combustion* heading and in the *Downstream Combustion Impacts on Air Quality and Public Health* heading in **Section 3.5.1.2** Air Quality, of the SEIS, and **Section 4.6**, below. Potential impacts on communities affected by the downstream combustion of coal from the CDPA are discussed in the Environmental Justice section of the SEIS.

3.6 MONITORING STATIONS FOR AIR QUALITY RELATED VALUES

Table 3-15
IMPROVE Monitors at Select Federal and Tribal Class I areas

Site ID	Area Name	State
NOCH1	Northern Cheyenne	Montana
WICA1	Wind Cave	South Dakota

Source: IMPROVE 2022

Table 3-16
National Trends Network Monitors Near and Downwind of the BFO

Site ID	Area Name	State
SD04	Wind Cave National Park-Elk Mountain	South Dakota
WY99	Newcastle	Wyoming
MT00	Little Bighorn Battlefield National Monument	Montana

Source: NADP 2022b

Table 3-17
Mercury Deposition Network Monitors within the Analysis Area

Site	Name	County	State
MT95	Badger Peak	Rosebud	Montana

Source: NADP 2022a

3.7 CRITICAL LOADS FOR NITROGEN DEPOSITION

While there are no federal standards for atmospheric deposition, critical loads are used as indicators of impacts from atmospheric deposition. Critical loads of deposition are an estimate of the deposition of a pollutant below which significant harmful effects are not expected to occur, based on current knowledge (Federal Land Managers' Air Quality Related Values Work Group 2010). Relevant critical loads for nitrogen deposition in nearby Class I areas, determined from the EPA critical load mapper tool (EPA 2021a), are listed in **Table 3-18**. Because multiple critical loads are available for nitrogen deposition, conservatively, the lowest nitrogen critical load representing the resource most sensitive to deposition at each Class I area is used in this analysis. A critical load of 5 kilograms sulfur per hectare per year (kg S/ha-year) is used for total sulfur deposition (Fox 1989).

Table 3-18
Minimum Critical Load Values for Nitrogen Deposition at Federal and Tribal Class I areas

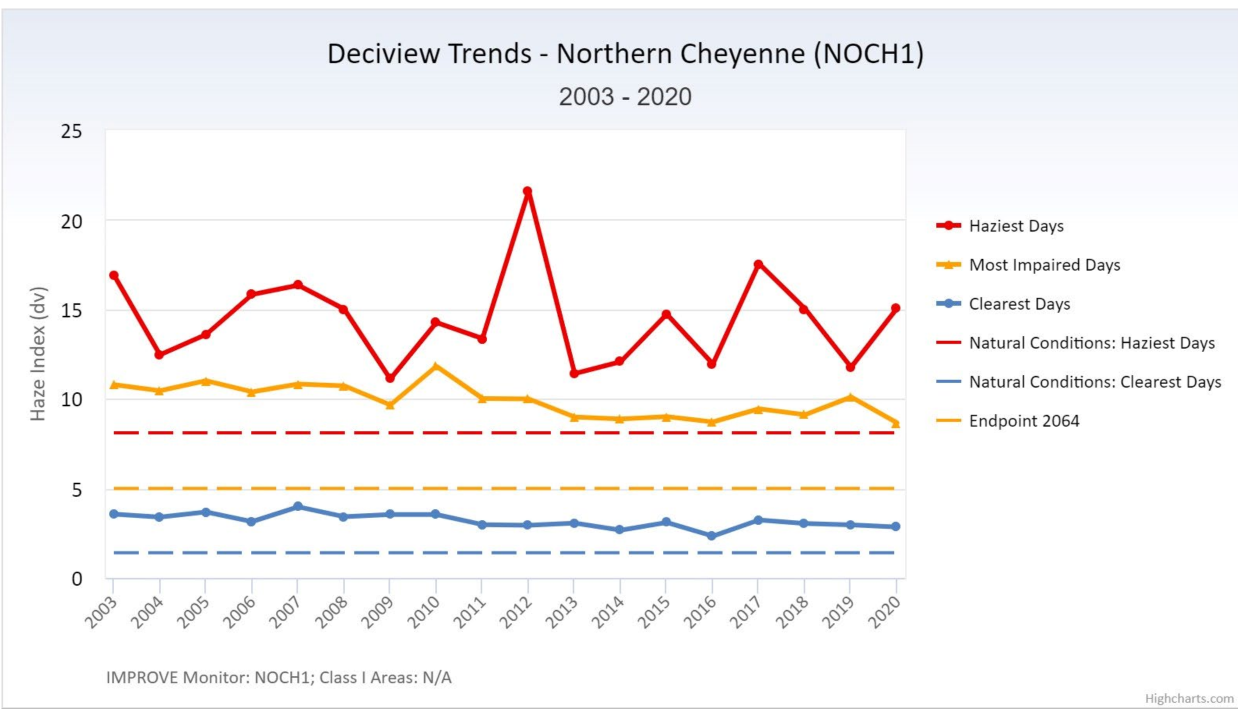
Class I Area	Ecological Receptor	Critical Load (kg N/ha-year)
Northern Cheyenne Indian Reservation	Empirical herb/shrub	5
	Empirical mycorrhizae	12
	Herb Species Richness – open canopy	8.26
Badlands National Park	Empirical herb/shrub	5
	Empirical mycorrhizae	12
	Herb Species Richness – open canopy	8.25
Wind Cave National Park	Empirical Forest	4
	Empirical herb/shrub	4
	Empirical mycorrhizae	5
	Herb Species Richness – open canopy	8.08

Source: EPA 2021a
Notes: Where multiple critical loads were available, the minimum value was used.
kg N/ha-year = kilograms of nitrogen per hectare per year

3.8 Monitoring Data for Air Quality Related Values

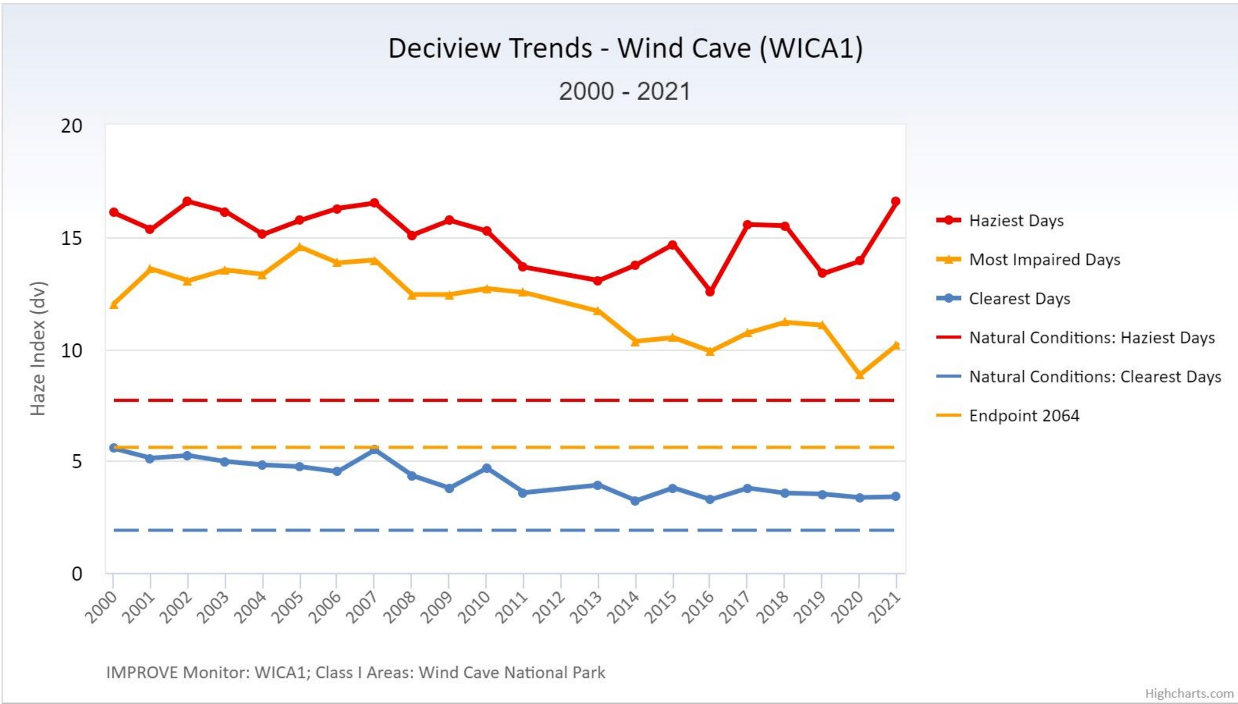
3.8.1 Visibility

Figure 3-3
Haze index at the Northern Cheyenne station



Source: FED 2023

Figure 3-4
Haze index at the Wind Cave station



Source: FED 2023

3.8.2 Deposition

Table 3-19
Annual average and maximum total deposition of nitrogen at Sovereign Tribal Nations and federal Class I areas, 2017 to 2021

Class I Area	Critical Load (kg N/ha-year)	Average Total Nitrogen Deposition (kg N/ha-year)					Maximum Total Nitrogen Deposition (kg N/ha-year)				
		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Badlands National Park	5	4.54	4.01	6.29	3.39	5.36	4.92	4.28	6.58	3.51	6.54
Northern Cheyenne Reservation	5	2.94	3.60	4.00	2.81	3.27	3.77	4.57	6.45	5.08	5.66
Wind Cave National Park	4	5.51	6.15	7.05	5.98	6.91	6.09	6.75	7.87	6.64	7.83

Figure 3-5
Wet nitrogen deposition in the US, 2021

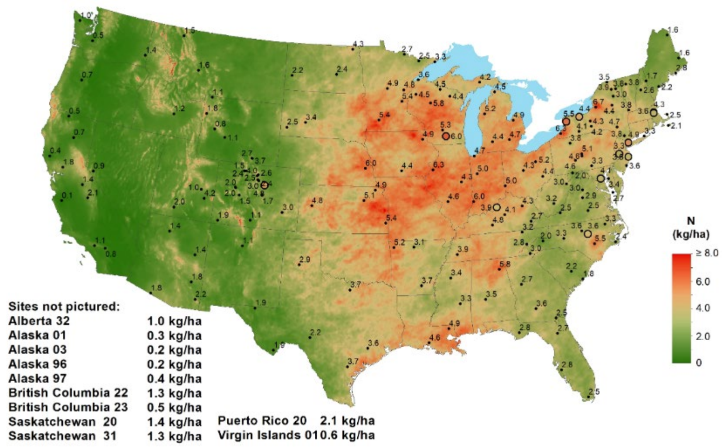


Figure 3-6
Nitrogen wet deposition, 2011–2021, at Little Bighorn Battlefield National Monument (MT00), Wind Cave National Park (SD04), and Newcastle (WY99)

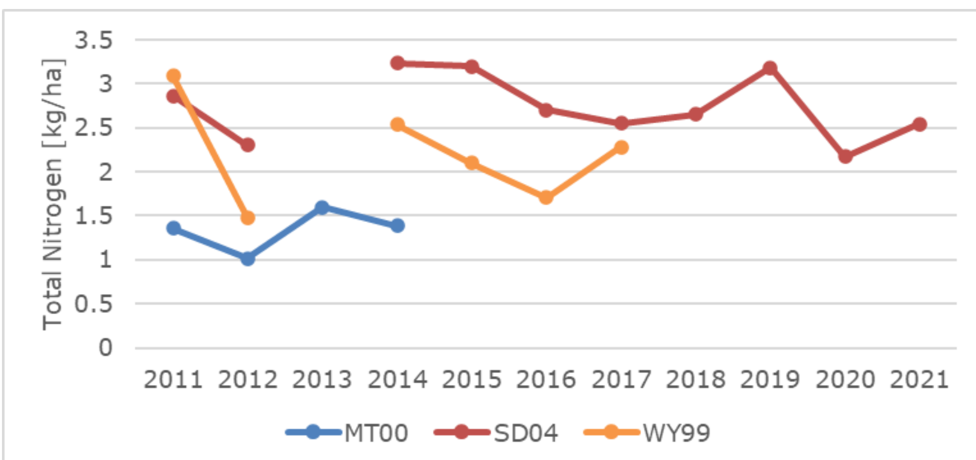


Table 3-20
Annual average and maximum total deposition of sulfur at Sovereign Tribal Nations and federal Class I areas, 2017 to 2021

Class I Area	Critical Load (kg S/ha-year)	Average Total Sulfur Deposition (kg S/ha-year)					Maximum Total Sulfur Deposition (kg S/ha-year)				
		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Badlands National Park	5	0.80	0.73	1.14	0.58	0.95	0.90	0.77	1.23	0.59	0.99
Northern Cheyenne Reservation	5	0.73	0.74	0.80	0.49	0.54	0.80	0.81	0.86	0.54	0.63
Wind Cave National Park	5	0.84	0.83	0.88	0.69	0.81	0.89	0.87	0.93	0.70	0.87

Figure 3-7
Wet sulfate deposition in the US, 2021

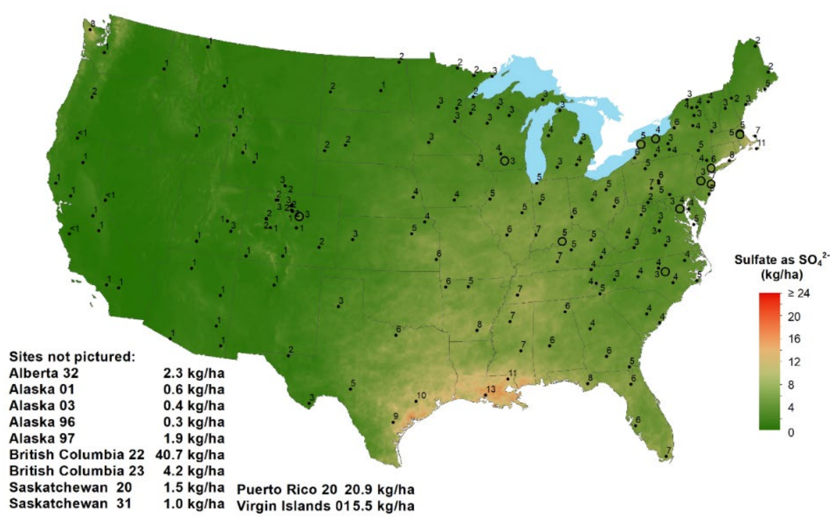


Figure 3-8
Sulfate wet deposition, 2011–2021, at Little Bighorn Battlefield National Monument (MT00), Wind Cave National Park (SD04), and Newcastle (WY99)

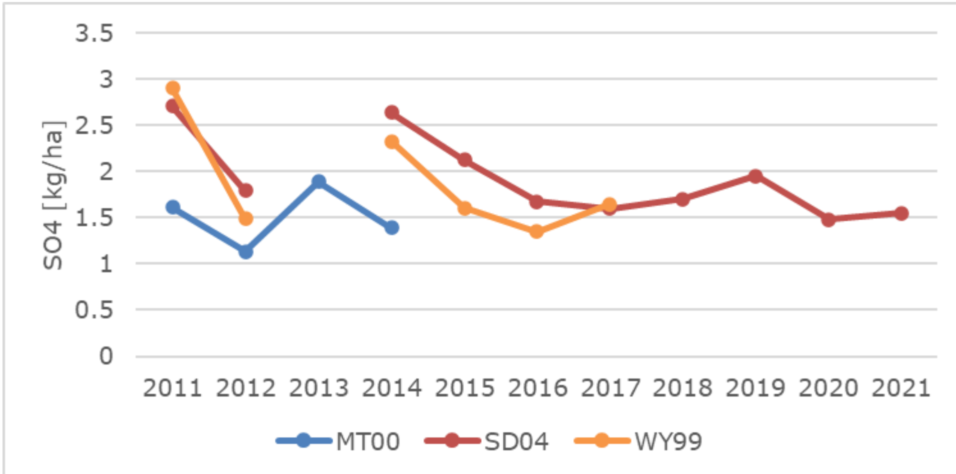


Figure 3-9
Wet mercury deposition in the US, 2019

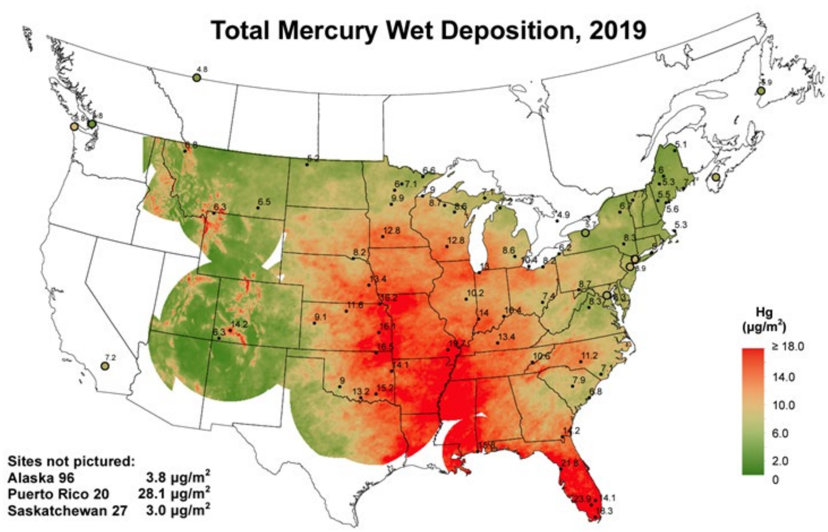
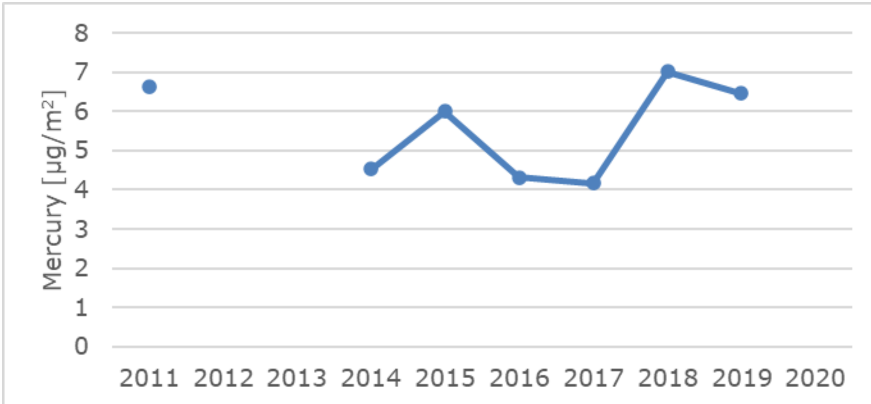


Figure 3-10
Mercury wet deposition, 2011–2020, at Badger Peak



3.9 Coal Emissions

3.9.1 Mining

Existing production and emissions estimates for 2022 from mining of federal, nonfederal, and total coal in the CDPA are shown in **Table 3-21** for GHGs and **Table 3-22** for CAPs.

Table 3-21
Existing (2022) federal and nonfederal greenhouse gas emissions from coal mining in the CDPA

Mineral Designation	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year CO_2e (metric tons)	100-year CO_2e (metric tons)
Federal	262.20	2,062,813	38,418	1,527	5,649,178	3,624,571
Nonfederal	6.31	49,643	925	37	135,951	87,227
Total	**268.51**	**2,112,456**	**39,342**	**1,564**	**5,785,129**	**3,711,798**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-22
Existing (2022) federal and nonfederal CAP and precursor emissions from coal mining in the CDPA

Mineral Designation	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
Federal	262.20	11,509	1,975	12,933	16,344	1,124	4,541	112.4	746.8
Nonfederal	6.31	277	48	311	393	27	109	2.7	18.0
Total	**268.51**	**11,786**	**2,022**	**13,244**	**16,738**	**1,151**	**4,650**	**115.1**	**764.7**

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter.

3.9.2 Transportation

Table 3-23
Existing (2022) federal, nonfederal, and total CAP emissions and total HAP emissions from the rail transportation of coal produced in the CDPA (tons per year)

Mineral Designation	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
Federal	57,233.9	1,284.1	1,245.5	2,264.3	57.9	16,444.6	999.2
Nonfederal	1,377.4	30.9	30.0	54.5	1.4	395.7	24.0
Total	**58,611.3**	**1,315.0**	**1,275.5**	**2,318.8**	**59.3**	**16,840.4**	**1,023.3**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Table 3-24
Existing (2022) federal and nonfederal HAP emissions from the rail transportation of coal produced in the CDPA (pounds)

Hazardous Air Pollutant	Federal	Nonfederal	Total
1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.3E-03	1.5E-04	**6.5E-03**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1.2E-02	2.9E-04	**1.2E-02**
1,2,3,4,7,8-Hexachlorodibenzofuran	2.3E-03	5.6E-05	**2.4E-03**
1,2,3,6,7,8-Hexachlorodibenzofuran	1.2E-03	3.0E-05	**1.3E-03**
1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	3.0E-04	7.3E-06	**3.1E-04**
1,2,3,7,8,9-Hexachlorodibenzofuran	8.9E-04	2.1E-05	**9.1E-04**
1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1.4E-03	3.4E-05	**1.4E-03**
1,2,3,7,8-Pentachlorodibenzofuran	4.0E-03	9.7E-05	**4.1E-03**
1,3-Butadiene	8.4E+03	2.0E+02	**8.6E+03**
2,2,4-Trimethylpentane	3.2E+04	7.8E+02	**3.3E+04**
2,3,4,7,8-Pentachlorodibenzofuran	6.5E-03	1.6E-04	**6.6E-03**
2,3,7,8-Tetrachlorodibenzofuran	1.9E-02	4.6E-04	**1.9E-02**
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	6.5E-04	1.6E-05	**6.6E-04**
Acenaphthene	1.7E+03	4.1E+01	**1.8E+03**
Acenaphthylene	2.2E+03	5.4E+01	**2.3E+03**
Acetaldehyde	3.5E+05	8.5E+03	**3.6E+05**

Hazardous Air Pollutant	Federal	Nonfederal	Total
Acrolein	7.2E+04	1.7E+03	**7.4E+04**
Anthracene	2.4E+02	5.9E+00	**2.5E+02**
Arsenic	2.6E+03	6.2E+01	**2.6E+03**
Benz[a]Anthracene	2.2E+01	5.2E-01	**2.2E+01**
Benzene	1.0E+05	2.5E+03	**1.0E+05**
Benzo[a]Pyrene	5.3E+00	1.3E-01	**5.4E+00**
Benzo[b]Fluoranthene	6.5E+00	1.6E-01	**6.6E+00**
Benzo[g,h,i,]Perylene	9.2E+00	2.2E-01	**9.4E+00**
Benzo[k]Fluoranthene	5.1E+00	1.2E-01	**5.2E+00**
Chromium (VI)	1.3E+01	3.0E-01	**1.3E+01**
Chrysene	3.2E+01	7.7E-01	**3.3E+01**
Dibenzo[a,h]Anthracene	2.4E+00	5.8E-02	**2.5E+00**
Ethyl Benzene	1.7E+04	4.2E+02	**1.8E+04**
Fluoranthene	2.7E+02	6.4E+00	**2.7E+02**
Fluorene	2.3E+03	5.4E+01	**2.3E+03**
Formaldehyde	1.0E+06	2.4E+04	**1.0E+06**
Hexane	1.3E+04	3.0E+02	**1.3E+04**
Indeno[1,2,3-c,d]Pyrene	3.8E+00	9.2E-02	**3.9E+00**
Manganese	5.6E+03	1.3E+02	**5.7E+03**
Mercury	4.9E+00	1.2E-01	**5.0E+00**
Naphthalene	1.2E+04	3.0E+02	**1.3E+04**
Nickel	9.7E+03	2.3E+02	**1.0E+04**
Octachlorodibenzofuran	5.4E-03	1.3E-04	**5.5E-03**
Octachlorodibenzo-p-Dioxin	4.7E-02	1.1E-03	**4.8E-02**
Phenanthrene	4.9E+03	1.2E+02	**5.0E+03**
Propionaldehyde	1.7E+05	4.2E+03	**1.8E+05**
Pyrene	3.6E+02	8.7E+00	**3.7E+02**
Toluene	9.7E+04	2.3E+03	**1.0E+05**
Xylenes (Mixed Isomers)	7.4E+04	1.8E+03	**7.6E+04**

Table 3-25
Coal rail transportation emissions of criteria and hazardous air pollutants in the peak year (2023) of federal coal production from existing leases in the CDPA

Mineral Designation	Annual Production (tons/year)	PM_{10} (tons/ year)	$PM_{2.5}$ (tons/ year)	NOx (tons/ year)	CO (tons/ year)	VOC (tons/ year)	SO_2 (tons/ year)	HAP (tons/ year)
Federal	256,582,534	1,192.7	1,156.9	52,949.9	16,079.7	2,084.4	56.6	919.9
Nonfederal	6,174,797	28.7	27.8	1,274.3	387.0	50.2	1.4	22.1
Total	262,757,331	1,221.4	1,184.7	54,224.2	16,466.7	2,134.6	58.0	942.0

Notes: The peak federal coal production from existing leases from 2023 onward occurs in 2023. All tonnages in the table are in short tons. PM_{10} = particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = diesel particulate matter.

Table 3-26
Existing (2022) federal and nonfederal greenhouse gas emissions from the transportation of coal produced in the CDPA (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	5,714,745.9	447.9	143.3	5,790,820.1	5,767,217.7
Nonfederal	137,528.4	10.8	3.4	139,359.2	138,791.2
Total	**5,852,274.4**	**458.6**	**146.8**	**5,930,179.3**	**5,906,008.9**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

3.9.3 Downstream Combustion and Nonattainment Areas

The nonattainment areas for all criteria pollutants in the country (EPA 2023c) are shown, along with the locations of coal-fired power plants that received coal from the CDPA in 2021 (EIA 2023), in **Figure 3-11** through **Figure 3-17**. Carbon monoxide nonattainment areas (**Figure 3-11**) are present in urban areas, which are influenced by numerous other emission sources, in particular, transportation. There is negligible overlap between Pb (**Figure 3-12**), NO_2 (**Figure 3-13**), or PM_{10} (**Figure 3-14**) nonattainment areas and BFO downstream combustion power plants. There are several O_3 nonattainment areas with power plants burning BFO coal within the area or nearby. Key areas include Houston-Galveston-Brazoria in Texas, the San Antonio area in Texas, the St. Louis area in Missouri-Illinois, the Denver-Boulder-Greeley-Ft. Collins area in Colorado, the Chicago area in Illinois, and the Detroit area in Michigan.

In the case of $PM_{2.5}$ (**Figure 3-17**) and/or SO_2 (**Figure 3-15**), states where receiving power plants are in or near nonattainment areas include Alabama, Arizona, Georgia, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Texas, and Wisconsin. The strengthening of the $PM_{2.5}$ or O_3 standards by the EPA may increase the number of nonattainment areas that contain receiving power plants. The power plants usually receive both federal and nonfederal coal and may also combust coal from sources outside the BFO CDPA. Nonattainment is caused by a combination of source sectors and applicable federal, state, and local regulations target attainment.

Figure 3-11
US power plants receiving coal from the BFO CDPA and carbon monoxide nonattainment areas

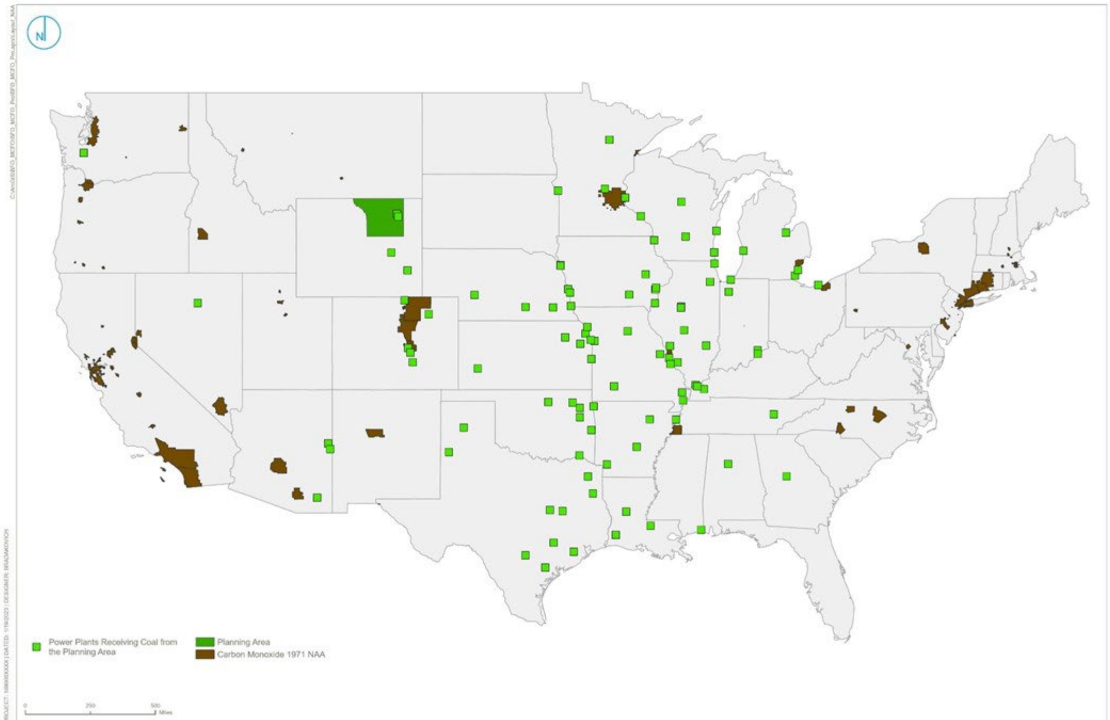


Figure 3-12
US power plants receiving coal from the BFO CDPA and lead nonattainment areas

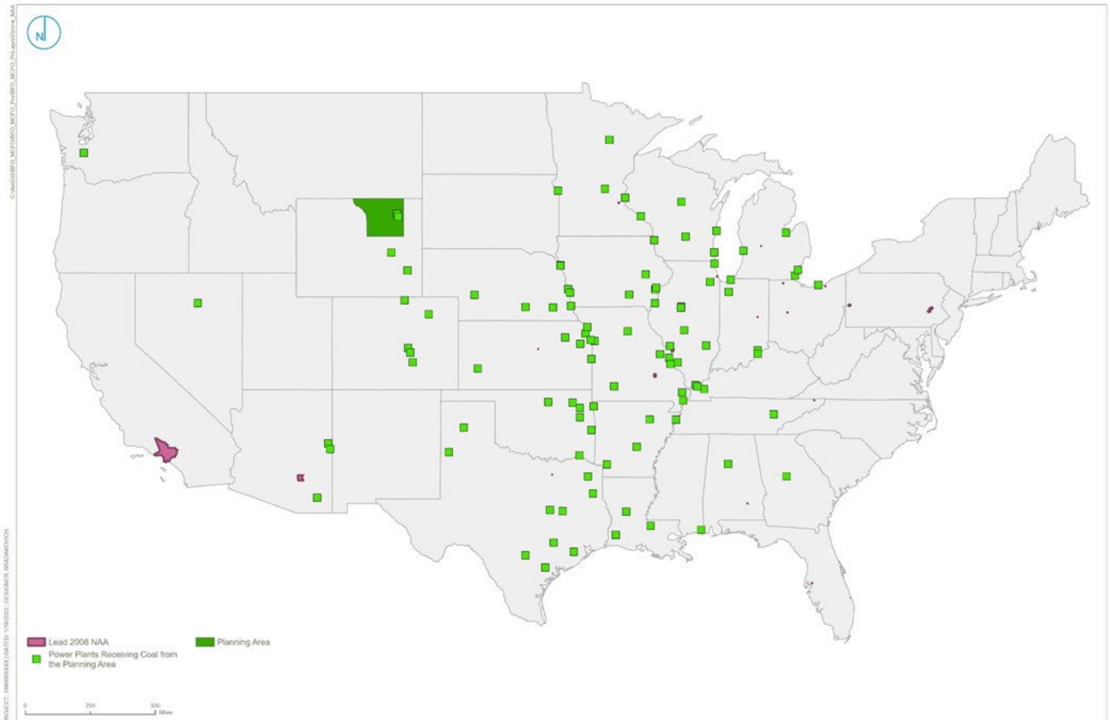


Figure 3-13
US power plants receiving coal from the BFO CDPA and nitrogen dioxide nonattainment areas

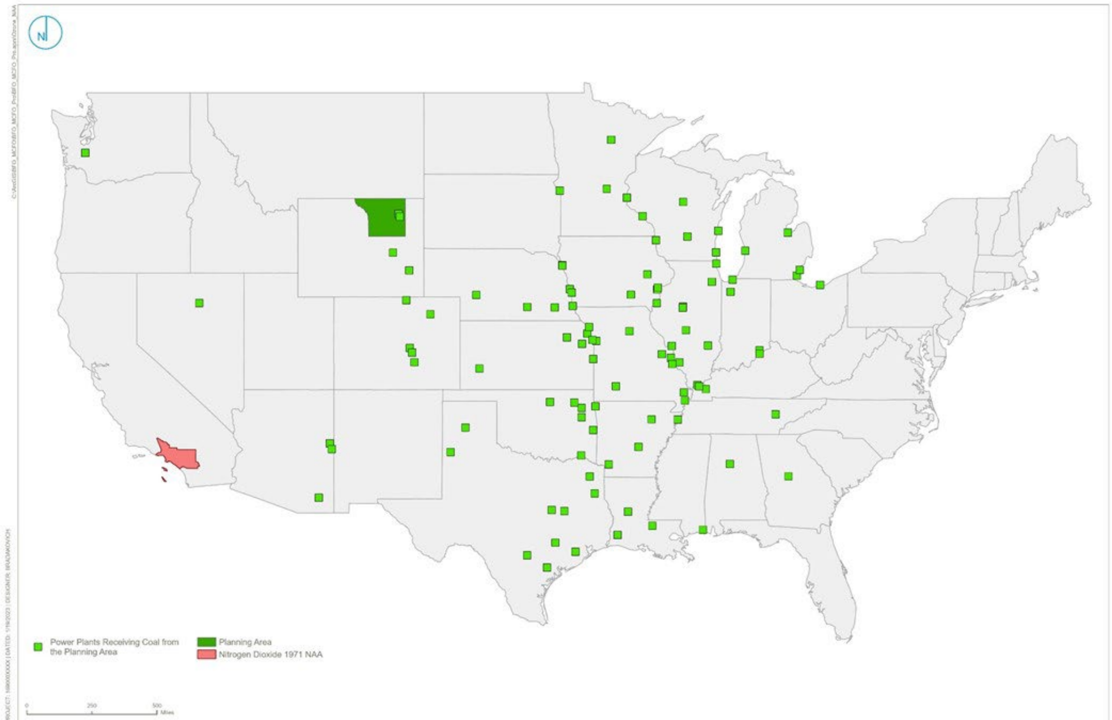


Figure 3-14
US power plants receiving coal from the BFO CDPA and ozone nonattainment areas

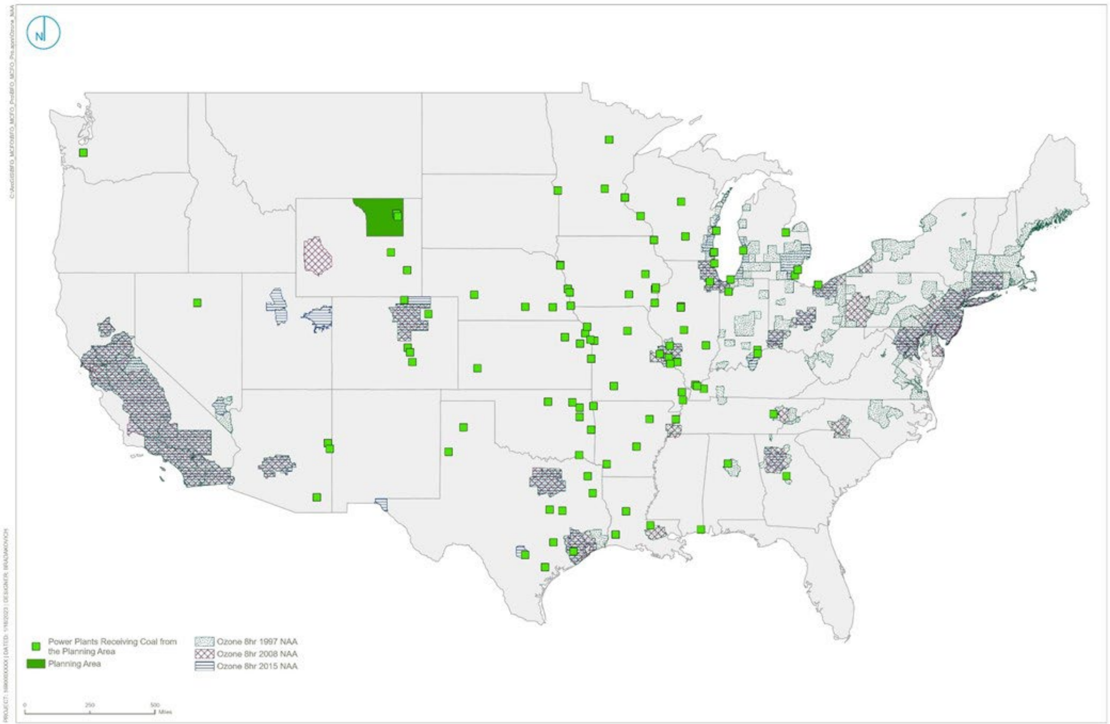


Figure 3-15
US power plants receiving coal from the BFO CDPA and sulfur dioxide nonattainment areas

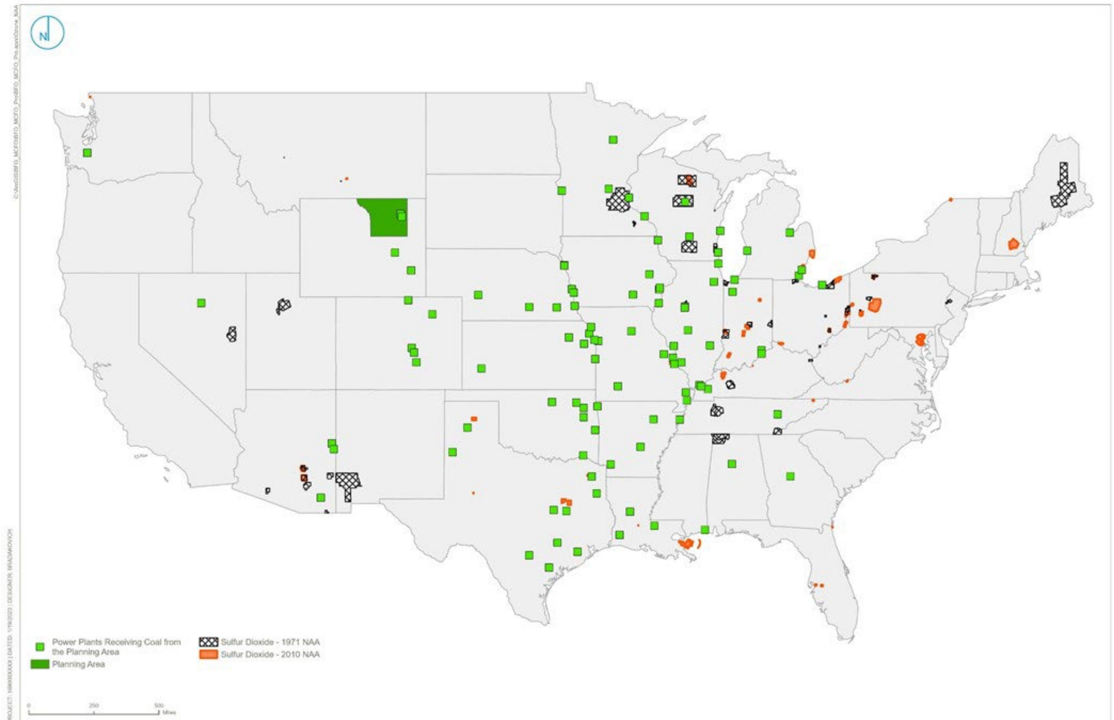


Figure 3-16
US power plants receiving coal from the BFO CDPA and PM_{10} nonattainment areas

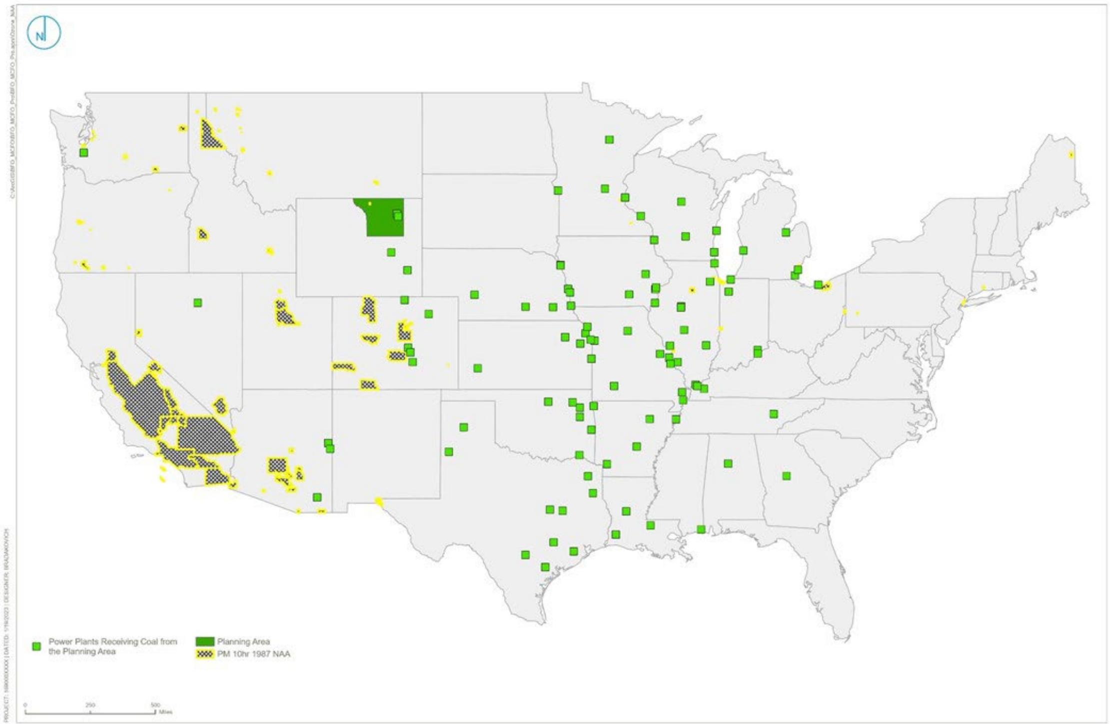
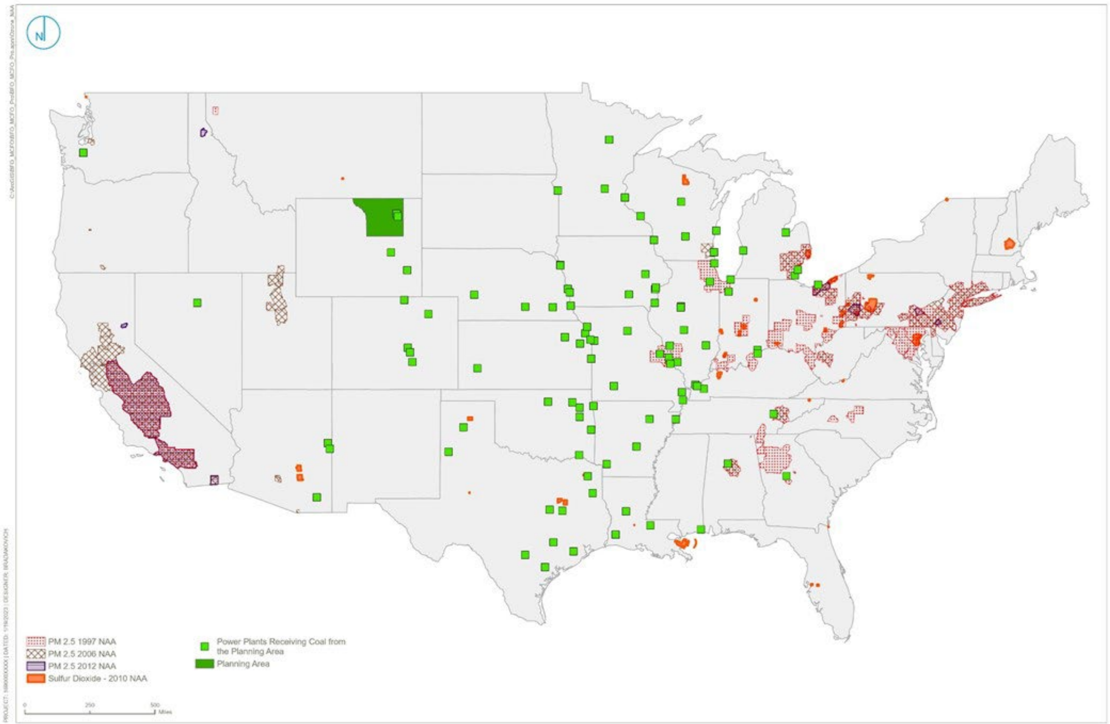


Figure 3-17
US power plants receiving coal from the BFO CDPA and $PM_{2.5}$ nonattainment areas



3.9.4 Downstream Combustion and Greenhouse Gas Emissions

Existing production and GHG emissions estimates for 2022 from downstream combustion of federal, nonfederal and total coal production in the CDPA are shown in **Table 3-27**.

Table 3-27
Existing (2022) federal and nonfederal greenhouse gas emissions from coal downstream combustion

Mineral Designation	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year CO_2e (metric tons)	100-year CO_2e (metric tons)
Federal	262.20	439,491,459	49,752	7,237	445,571,611	442,949,678
Nonfederal	6.31	10,576,599	1,197	174	10,722,922	10,659,823
Total	**268.51**	**450,068,058**	**50,949**	**7,411**	**456,294,533**	**453,609,502**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

3.9.5 Downstream Combustion and Criteria and Hazardous Air Pollutant Emissions

Table 3-28
US annual coal combustion emissions of CAPs and precursors by percentage from source sector groups

Emission Source Sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	NH_3	Total VOC
Commercial/ institutional	0.4%	0.3%	1.5%	0.7%	0.9%	1.2%	<0.1%	1.1%
Electric generation	94.5%	92.9%	79.3%	90.9%	86.6%	71.6%	86.8%	95.1%
Industrial	5.1%	6.8%	19.2%	8.4%	12.5%	27.1%	13.2%	3.7%
Total coal combustion emissions (short tons/year)	**2.8E+05**	**6.2E+05**	**7.8E+04**	**5.3E+04**	**8.9E+05**	**21.1**	**2.6E+03**	**1.1E+04**

Source: EPA 2023b
Notes: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories. PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; NH_3 = ammonia.

Table 3-29
US annual coal combustion emissions of HAPs by percentage from source sector groups

Pollutant	Emission Source Sector			Total Coal Combustion Emissions (short tons/year)
	Commercial/ Institutional (%)	Electric Generation (%)	Industrial (%)	
Acrolein	<0.1	93.6	6.4	29.5
Arsenic	<0.1	71.4	27.2	17.7
Benzo(a)pyrene	<0.1	82.3	17.7	0.2
Cadmium	<0.1	78.0	21.2	2.2
Chlorine gas	<0.1	79.3	20.1	47.5
Hexavalent chromium	<0.1	74.8	24.8	5.2
Hydrochloric acid	<0.1	65.7	32.1	4,696.2
Manganese	<0.1	82.4	16.7	74.8
Mercury	<0.1	92.4	5.6	3.9
Nickel	<0.1	73.0	26.5	27.7
Dioxins/furans*	—	—	—	1.3E-12 to 1.2E-7*

Source: EPA 2023b; *EPRI 2018a
Notes: Total emissions (in short tons/year), except for dioxins/furans, are for 2020 and are calculated as a sum of other categories reported in the EPA National Emissions Inventory (NEI). Dioxins/furans emissions are from Electric Power Research Institute 2018a and reported as the range across all power plants assessed for 2017. Dioxins/furans emissions are expressed in Electric Power Research Institute 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021b).

3.10 Oil and Gas Emissions

3.10.1 Production and Midstream Sources

Base year 2022 production and emissions estimates are shown in **Table 3-30**, **Table 3-31**, and **Table 3-32** for oil, conventional natural gas, and coalbed natural gas wells in the BFO, respectively. Emissions were estimated for base year 2022 using the estimated oil and gas production rates from the 2015 BFO RMP, these estimates may not match actual production.

Table 3-30
2022 oil production and emissions in the BFO by mineral designation in tons per year

Mineral Designation	Oil Production Rate (MMBO)	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
Federal	4.7	979	228	41	271	62	115	4	40,403	749	1.2	102,531	63,056
Nonfederal	5.0	1,035	241	43	270	64	122	4	42,073	734	1.3	102,961	64,291

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM10 = particulate matter with a diameter less than or equal to 10 microns; PM2.5 =particulate matter with a diameter less than or equal to 2.5 microns; SO2 = sulfur dioxide; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO2e = carbon dioxide equivalent
MMBO = millions of barrels of oil
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6

Table 3-31
2022 conventional natural gas production and emissions in the BFO by mineral designation in tons per year

Mineral Designation	Gas Production Rate (BCF) Total; Conventional	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
Federal	62.9; 4.0	186	84	327	56	12	1	49	56,507	2,125	0.5	231,950	119,968
Nonfederal	106.9; 3.3	184	84	326	56	12	1	48	55,520	2,071	0.5	226,511	117,371

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM10 =particulate matter with a diameter less than or equal to 10 microns; PM2.5 =particulate matter with a diameter less than or equal to 2.5 microns; SO2 = sulfur dioxide; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO2e = carbon dioxide equivalent
BCF = billions cubic feet
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 3-32
2022 coalbed natural gas production and emissions in the BFO by mineral designation in tons per year

Mineral Designation	Gas Production Rate (BCF) Total; Coalbed	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
Federal	62.9; 58.9	64	31	4,701	235	28	1	475	12,939	9,214	0.1	773,131	287,546
Nonfederal	106.9; 103.6	116	56	8,527	427	52	2	862	23,504	19,193	0.2	1,606,966	595,498

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; SO2 = sulfur dioxide; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent
BCF = billions cubic feet
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

3.10.2 Transportation, Processing, and Downstream Combustion

GHG emissions of CO_2, CH_4, and N_2O from oil and gas processing, transportation and downstream combustion were calculated for the base year 2022 using the estimated oil and gas production rates from the BFO. Emissions were calculated for both federal and nonfederal oil and gas wells.

The CO_2, CH_4, and N_2O emissions for year 2022, along with CO_2e emissions using both the 20-year and 100-year time horizon AR6 GWPs, from oil processing, conventional natural gas processing, and coalbed natural gas processing emissions, are shown in **Table 3-33** through **Table 3-35**, respectively. The GHG emissions from transportation are provided in **Table 3-36** through **Table 3-38**, and the emissions from downstream combustion activities are provided in **Table 3-39** through **Table 3-41**. Note that these emissions are the same for all alternatives.

Table 3-33
2022 federal and nonfederal greenhouse gas emissions from the processing of oil produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	200,568	245.2	3.2	221,682	208,758
Nonfederal	213,370	260.9	3.4	235,832	222,083
Total	**413,939**	**506.1**	**6.7**	**457,515**	**430,842**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-34
2022 federal and nonfederal greenhouse gas emissions from the processing of conventional natural gas produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	5,800	60.2	0.02	10,770	7,599
Nonfederal	4,754	49.3	0.02	8,828	6,228
Total	**10,554**	**109.5**	**0.04**	**19,598**	**13,827**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-35
2022 federal and nonfederal greenhouse gas emissions from the processing of coalbed methane produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	85,729	889.5	0.3	159,198	112,320
Nonfederal	150,802	1,564.7	0.5	280,037	197,577
Total	**236,531**	**2,454.2**	**0.8**	**439,235**	**309,897**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-36
2022 federal and nonfederal greenhouse gas emissions from the transport of oil produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	58,562	33.3	1.2	61,626	59,872
Nonfederal	62,300	35.4	1.2	65,559	63,694
Total	**120,862**	**68.7**	**2.4**	**127,185**	**123,566**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-37
2022 federal and nonfederal greenhouse gas emissions from the transport of conventional natural gas produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	34,105	541.0	0.5	78,886	50,373
Nonfederal	27,954	443.5	0.4	64,658	41,288
Total	**62,059**	**984.5**	**1.0**	**143,544**	**91,660**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-38
2022 federal and nonfederal greenhouse gas emissions from the transport of coalbed methane produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	504,112	7,997.3	7.8	1,166,020	744,561
Nonfederal	886,759	14,067.7	13.7	2,051,087	1,309,721
Total	**1,390,871**	**22,065.0**	**21.5**	**3,217,107**	**2,054,282**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-39
2022 federal and nonfederal greenhouse gas emissions from the downstream combustion of oil produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	2,030,559	81.7	16.3	2,041,763	2,037,457
Nonfederal	2,160,169	86.9	17.4	2,172,089	2,167,507
Total	**4,190,728**	**168.7**	**33.7**	**4,213,852**	**4,204,963**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-40
2022 federal and nonfederal greenhouse gas emissions from the downstream combustion of conventional natural gas produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	216,984	4.1	0.4	217,433	217,218
Nonfederal	177,850	3.4	0.3	178,218	178,041
Total	**394,834**	**7.4**	**0.7**	**395,651**	**395,259**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-41
2022 federal and nonfederal greenhouse gas emissions from the downstream combustion of coalbed methane produced in the BFO (metric tons)

Mineral Designation	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
Federal	3,207,264	60.4	6.0	3,213,901	3,210,716
Nonfederal	5,641,739	106.3	10.6	5,653,414	5,647,811
Total	**8,849,003**	**166.8**	**16.7**	**8,867,315**	**8,858,526**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 3-42
US annual petroleum product combustion emissions of CAPs and precursors by percentage from source sector groups

Petroleum product and source sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	NH_3	Total VOC
Gasoline: On-road light duty	50.3%	20.3%	34.9%	16.1%	10%	—	82.9%	41.0%
Gasoline: On-road heavy duty	2.1%	0.7%	1.1%	0.5%	0.1%	—	2.3%	1.3%
Gasoline: Off-road mobile	41.6%	4.5%	12.5%	18.2%	0.3%	<0.1%	0.6%	45.9%
Fuel oil: On-road light duty	0.7%	3.4%	2.9%	3.3%	0.1%	—	1.2%	1.2%
Fuel oil: On-road heavy duty	2.2%	31.7%	21.2%	20.2%	1.7%	—	9.5%	3.4%
Fuel oil: Off-road mobile	1.2%	15.7%	14.3%	22.2%	0.4%	<0.1%	0.9%	2.8%
Fuel oil: Railroad	0.4%	11.1%	3.7%	5.8%	0.2%	<0.1%	0.1%	1.0%
Fuel oil: Commercial marine vessels	0.1%	5.8%	1.8%	2.7%	6.1%	0.1%	0.1%	0.5%
Fuel oil: Commercial/ institutional	0.1%	1.0%	1.0%	3.6%	3.7%	0.1%	0.2%	0.2%
Fuel oil: Electric generation	<0.1%%	1.3%	1.3%	1.7%	49.0%	0.3%	0.6%	0.1%
Fuel oil: Industrial	0.1%	1.8%	1.7%	2.4%	16.0%	3.3%	0.1%	0.3%
Fuel oil: Residential	<0.1%%	0.7%	1.1%	1.6%	0.7%	0.4%	1.5%	<0.1%%
Jet and aircraft fuel	1.3%	2.0%	2.6%	3.7%	11.7%	95.8%	—	2.5%
Total petroleum product combustion emissions (short tons/year)	**2.6E+07**	**4.2E+06**	**3.2E+05**	**2.0E+05**	**7.7E+04**	**4.5E+02**	**9.3E+04**	**2.0E+06**

Source: EPA 2023b
Notes: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories. $PM_{2.5}$ emissions include DPM and ultrafine particle emissions. PM_{10} = particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide NH_3 = ammonia.

Table 3-43
US annual petroleum product combustion emissions of CAPs and precursors by percentage from source sector groups

Petroleum product and source sector	1,3-butadiene	Benzene	Formal-dehyde	Hexane	Ethyl benzene	Toluene	Xylenes	Acrolein
Gasoline: On-road light duty	30.9%	38.6%	10.8%	60.3%	41.9%	49.6%	44.9%	9.3%
Gasoline: On-road heavy duty	0.8%	1.3%	0.7%	2.0%	1.3%	1.6%	1.4%	0.33%
Gasoline: Off-road mobile	55.7%	51.7%	18.1%	36.5%	53.8%	47.0%	50.6%	11.3%
Fuel oil: On-road light duty	0.8%	0.4%	4.4%	0.1%	0.3%	0.1%	0.2%	4.2%
Fuel oil: On-road heavy duty	1.8%	1.0%	12.1%	0.3%	1.1%	0.4%	1.6%	11.3%
Fuel oil: Off-road mobile	1.4%	4.3%	31.9%	0.2%	1.0%	0.8%	0.7%	29.1%
Fuel oil: Railroad	0.5%	0.9%	10.2%	0.2%	0.2%	0.2%	0.3%	9.1%
Fuel oil: Commercial marine vessels	0.1%	0.1%	0.9%	0.1%	<0.1%	<0.1%	<0.1%	0.5%
Fuel oil: Commercial/ institutional	<0.1%	<0.1%	0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Fuel oil: Electric generation	<0.1%	0.1%	0.5%	0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Fuel oil: Industrial	<0.1%	0.1%	0.2%	<0.1%	<0.1%	<0.1%	<0.1%	0.1%
Fuel oil: Residential	—	<0.1%	0.1%	<0.1%	—	—	—	—
Jet and aircraft fuel	7.9%	1.4%	10.1%	<0.1%	0.3%	0.3%	0.2%	24.8%
Total petroleum product combustion emissions (short tons/year)	**7.8E+03**	**4.8E+04**	**4.4E+04**	**3.7E+04**	**3.1E+04**	**1.8E+05**	**1.1E+54**	**3.5E+03**

Source: EPA 2023b
Notes: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories.

Table 3-44
US annual natural gas combustion emissions of CAPs and precursors by percentage from source sector groups

Emission Source Sector	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	Lead	NH_3	Total VOC
Commercial/institutional	18.1%	12.6%	7.2%	7.1%	5.2%	30.2%	1.7%	9.5%
Residential	14.7%	19.4%	4.4%	4.3%	5.8%	<0.1%	64.8%	13.1%
Electric generation	13.1%	16.0%	50.3%	51.1%	26.5%	21.3%	21.5%	12.9%
Industrial	54.2%	52.0%	38.1%	37.5%	62.4%	48.4%	12.0%	64.5%
Total natural gas combustion emissions (short tons/year)	**6.4E+05**	**1.1E+06**	**6.1E+04**	**5.8E+04**	**2.2E+04**	**7.0**	**6.9E+04**	**9.6E+04**

Source: EPA 2023b
Notes: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories. PM_{10} = particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; NH_3 = ammonia.

Table 3-45
US Annual Natural Gas Combustion Emissions of HAPs by Percentage from Source Sector Groups

Emission Source Sector	1,3-buta diene	Benzene	Formal-dehyde	Hexane	Ethyl benzene	Toluene	Xylenes	Acrolein
Commercial/ institutional	0.5%	2.9%	2.8%	16.7%	3.7%	3.3%	3.4%	1.4%
Residential	—	1.0%	1.2%	<0.1%	—	<0.1%	—	—
Electric generation	2.2%	10.7%	13.4%	30.3%	65.5%	54.7%	56.1%	2.4%
Industrial	97.3%	85.3%	82.6%	53.0%	30.8%	42.0%	40.5%	96.2%
Total natural gas combustion emissions (short tons/year)	**2.8E+02**	**4.9E+02**	**1.4E+04**	**2.8E+03**	**2.0E+02**	**9.5E+02**	**4.6E+02**	**2.0E+03**

Source: EPA 2023b
Notes: Total emissions (in short tons/year) are for 2020 and are calculated as a sum of emissions in the categories.

Chapter 4. Supporting Information for Environmental Consequences and Cumulative Impacts

4.1 Regional Modeling Overview

The BFO SEIS tiers off the western US regional photochemical modeling for circa 2028 conducted separately by BLM (2023). The BLM modeling incorporated data from the Western Regional Air Partnership/Western Air Quality Study Regional Haze modeling study (WRAP/WAQS)[9, 10]. The WRAP/WAQS photochemical modeling data was previously developed and vetted by the consortium of state and federal agencies under the WRAP. For the circa 2028 BLM regional modeling, the platform was supplemented with additional oil and gas forecasted production and coal mining data from the BLM. The regional photochemical modeling was performed using the Comprehensive Air Quality Model with Extensions (CAMx) version 7.10 (www.camx.com). The following sections provide a summary of the modeling domains, configuration, emissions, and other inputs used in the BLM modeling platform.

4.1.1 Modeling Domains

The modeling domains have horizontal resolutions of 36 km and 12 km and are the same as those used in the WRAP/WAQS modeling. The 36 km resolution domain covers the continental United States (CONUS), while the 12 km resolution domain covers the western US and those areas with oil and gas development and coal mining that are relevant to the BLM. Map projection and definition parameters for these domains are shown in **Table 4-1** and **Table 4-2**. **Figure 4-1** shows the extent of both modeling domains.

Table 4-1
Projection parameters for the modeling domains

Parameter	Value
Projection	Lambert-Conformal Conic
1st True Latitude	33 degrees N
2nd True Latitude	45 degrees N
Central Longitude	97 degrees W
Central Latitude	40 degrees N

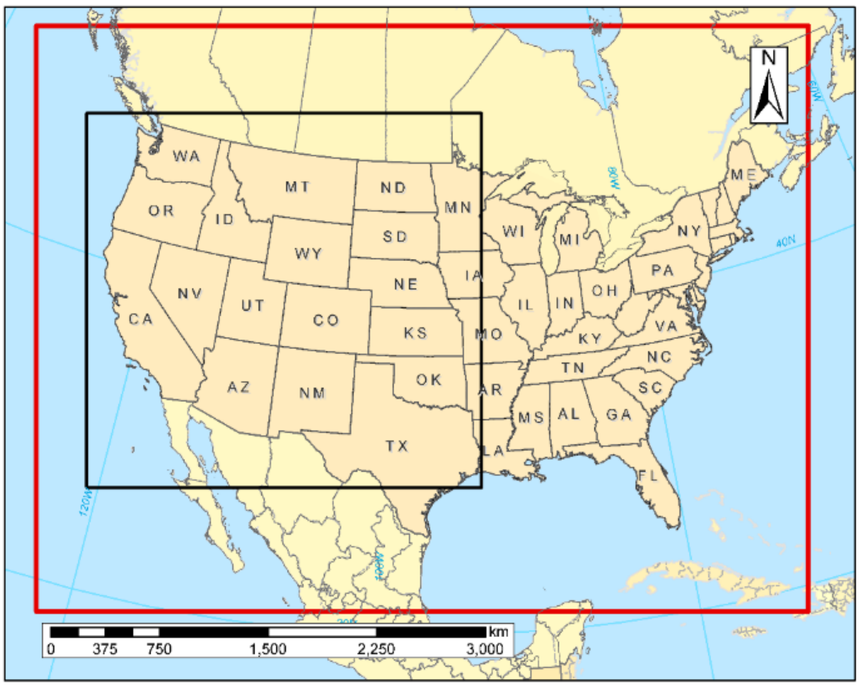
9 https://www.wrapair2.org/
10 https://views.cira.colostate.edu/wiki/#WAQS-2014-Modeling-Platform

Table 4-2
Grid definitions for 36 km and 12 km resolution modeling domains

Grid	Origin (Southwest) (km)*	Extent (NE) (km)	Number of grid cells in X direction (NX)	Number of grid cells in Y direction (NY)
36 km CONUS	(-2736, -2088)	(2592, 1944)	148	112
12 km Western US	(-2388, -1236)	(336, 1344)	227	215

*Coordinates shown are relative to the central longitude and latitude in **Table 2-1**.

Figure 4-1
Continental (36 km) US modeling domain in red and western US (12 km) modeling domain in black



The vertical layer structure is identical to that used in the WRAP/WAQS modeling study. The vertical domain is derived from the Weather Research and Forecasting meteorological model that initially had 36 vertical layers, but for the 2028 BLM modeling were collapsed, resulting in 25 layers in the CAMx domain for optimal computational efficiency.

4.1.2 Model Inputs

The circa 2028 BLM regional photochemical modeling used meteorological data developed with the Weather Research and Forecasting model (Skamarock et al., 2008). This dataset, developed by the University of North Carolina for the year 2014 as part of the WRAP/WAQS modeling study, was obtained from the Intermountain West Data Warehouse (IWDW) and used without modification. The dataset has been previously reviewed and evaluated by WRAP states and federal agencies (UNC 2016).

The boundary and initial conditions for the 36 km domain in the 2028 BLM modeling were derived from a GEOS-Chem global chemistry model simulation conducted for the WRAP/WAQS modeling study. To remove the effects of the initial concentrations, CAMx was run for a ten-day spin-up period. Additional inputs, such as gridded daily ozone column data, were obtained from the Ozone Monitoring Instrument (OMI) database and processed for use in CAMx. The OMI dataset was also used to calculate photolysis rates for CAMx with the Tropospheric Ultraviolet and Visible (TUV) radiation model preprocessor.

4.1.3 CAMx Model Configuration

The CAMx model configuration and science options, including the Carbon Bond 6 mechanism (CB6r4) for gas-phase chemistry (Yarwood et al., 2010), the Piecewise Parabolic Method (Colella and Woodward, 1984) for horizontal transport, the CAMx implicit scheme with vertical velocity update for vertical advection (Emery et al., 2011), and the Zhang et al. (2003) approach for dry deposition, were identical to those used in the WRAP/WAQS modeling study. This CAMx modeling system has been previously evaluated in a 2014 base case simulation (2014v2) as part of the WRAP/WAQS modeling study and underwent a rigorous technical review by the interagency stakeholder group[11].

4.1.4 Source Apportionment Groups

The CAMx Anthropogenic Precursor Culpability Assessment (APCA) version of the Ozone Source Apportionment Technology (OSAT) tool and the Particulate Source Apportionment Technology (PSAT) tool were used in the circa 2028 BLM modeling to assess the contributions of ozone, particulate sulfate, and nitrate among other pollutants from the specific source groups shown in **Table 4-3**. These groups were defined to better understand the impacts of federal and nonfederal coal and oil and gas development sources in the intermountain west states.

Table 4-3
CAMx source apportionment groups

Group	ID	Description
1	Natural STATE[a]	Natural emissions in individual state (fires, biogenic, lightning, sea salt, windblown dust)
2	OilGas_ExistFed STATE	Existing federal oil and gas development in individual state ("existing" defined here as wells drilled prior to 2020)
3	OilGas_NewFed STATE	New federal oil and gas development in individual state ("new" defined here as wells drilled from 2020 onwards)
4	Coal_Fed STATE	Federal coal mining in in individual state
5	OilGas_ExisTribal	Existing tribal oil and gas development ("existing" defined here as wells drilled prior to 2020)
6	OilGas_NewTribal	New tribal oil and gas development ("new" defined here as wells drilled from 2020 onwards)
7	Coal_EGU WRAP states	Coal electric generating units in WRAP states (including individual state and others)
8	Coal_comb WRAP states	Other (non-EGU) coal combustion sources in WRAP states (including individual state and others)
9	OilGas_NonFed	Nonfederal oil and gas development
10	Coal_NonFed	Nonfederal coal mining

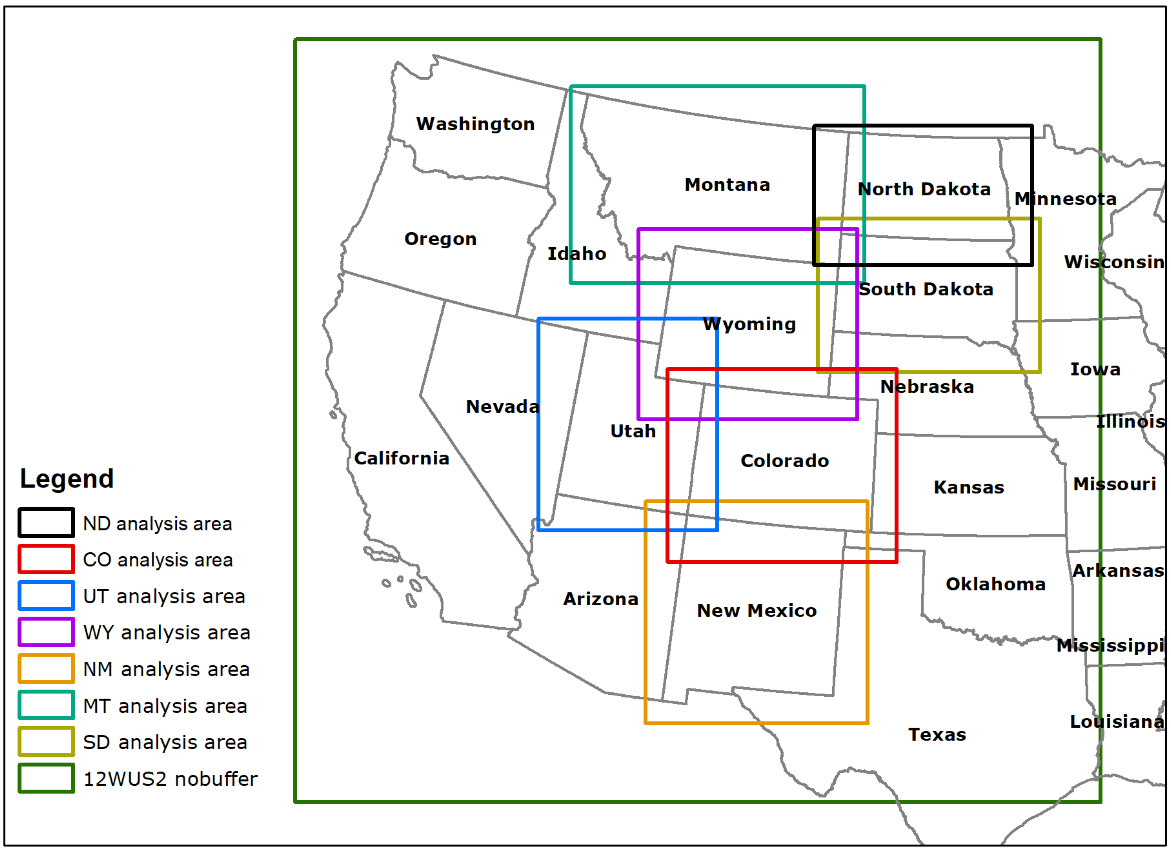
[11] https://views.cira.colostate.edu/iwdw/docs/WRAP_WAQS_2014v2_MPE.aspx

Group	ID	Description
11	Anthro_Rest[b]	Other anthropogenic sources inside and outside individual state
12	Natural outside STATE	Natural emissions outside individual state

[a] STATE. Results are reported for the source group within each individual state
[b] The anthropogenic emissions outside the individual "target" state include the contributions from oil and gas and coal emissions from states outside the "target" state

Air quality and air quality related value (AQRV) modeling results are assessed for separate sub-domains, i.e., analysis areas (**Figure 4-2**), each including the state of interest and the additional regions within approximately 60 kilometers (km) of the state.

Figure 4-2
Overview of analysis areas (sub-domains) in 2028 BLM modeling study



4.2 Regional Modeling Results

Impacts are discussed in the following sections for the following source apportionment groups:

- Federal coal in Wyoming
- Federal oil and gas in Wyoming (new and existing)
- Coal EGU in WRAP states
- Other coal combustion in WRAP states
- Cumulative

4.2.1.1 Regional Modeling Results for Coal Mining and Combustion

In the BLM circa 2028 regional photochemical modeling study, the air quality impacts of 176.8 million tons/year of federal coal in Wyoming were modeled. Of this amount, the modeled federal coal production in the BFO CDPA was 173.7 million tons. The nonfederal coal production modeled was 24.4 million tons for all of Wyoming and 19.3 million tons for the CDPA.

The air quality impacts from federal coal are shown in **Table 4-4**. For each form of the NAAQS pollutant, three metrics are shown in Wyoming in general and at individual areas:

- Cumulative – this is the total impact from all sources anywhere inside and outside Wyoming, both anthropogenic and natural
- Federal coal percent contribution – this is the impact from total Wyoming federal coal at the same time and place as the cumulative, expressed as a percent of the cumulative
- Peak source contribution – this is the maximum impact from total Wyoming federal coal anywhere in the region of interest and at any time, i.e., it is not co-located with the cumulative value.

Table 4-4
Modeled air concentrations and air quality related values due to emissions from federal coal mining in Wyoming

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
8-hour Ozone (standard = 70 ppb)	Cumulative (ppb)	62.9	54.5	59.9	56.1
	Federal Coal Percent Contribution	0.2%	0.3%	0.0%	0.7%
	Peak source contribution (ppb)	5.3	0.2	0.7	0.8
1-hour NO_2 (standard = 100 ppb)	Cumulative (ppb)	36.9	3.0	9.7	2.5
	Federal Coal Percent Contribution	0.0%	0.0%	0.0%	0.2%
	Peak source contribution (ppb)	31.0	0.0	0.7	0.0
24-hour $PM_{2.5}$ (standard = 35 $\mu g/m^3$)	Cumulative ($\mu g/m^3$)	102.5	10.1	72.1	26.5
	Federal Coal Percent Contribution	0.0%	0.0%	0.0%	0.1%
	Peak source contribution (mg/m^3)	3.3	0.1	0.1	0.1
Annual $PM_{2.5}$ (standard = 9 $\mu g/m^3$)	Cumulative ($\mu g/m^3$)	12.9	3.1	7.0	3.8
	Federal Coal Percent Contribution	0.1%	0.3%	0.1%	0.4%
	Peak source contribution (mg/m^3)	1.4	0.0	0.0	0.0
24-hour PM_{10} (standard = 150 $\mu g/m^3$)	Cumulative ($\mu g/m^3$)	1,073.6	20.2	420.1	64.6
	Federal Coal Percent Contribution	0.0%	0.6%	0.0%	0.0%
	Peak source contribution ($\mu g/m^3$)	13.8	0.2	0.2	0.1

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
1-hour SO_2 (standard = 75 ppb)	Cumulative (ppb)	20.9	1.4	9.9	2.6
	Federal Coal Percent Contribution	87.7%	0.2%	0.0%	0.0%
	Peak source contribution (ppb)	18.3	0.0	0.0	0.0
3-hour SO_2 (standard = 0.5 ppm or 500 ppb)	Cumulative (ppb)	42.7	1.1	25.2	3.5
	Federal Coal Percent Contribution	0.0%	0.2%	0.0%	0.0%
	Peak source contribution (ppb)	18.2	0.0	0.0	0.0
AQRV: Nitrogen deposition (critical load = 5 to 12 kg N/ha)	Cumulative (kg N/ha-year)	17.9	4.2	4.8	4.6
	Federal Coal Percent Contribution	0.0%	0.2%	0.4%	0.3%
	Peak source contribution (kg N/ha-year)	0.0	0.0	0.0	0.0
AQRV: Sulfur deposition (critical load = 5 kg S/ha)	Cumulative (kg S/ha-year)	2.0	0.5	0.6	0.5
	Federal Coal Percent Contribution	70.8%	0.6%	1.9%	2.2%
	Peak source contribution (kg S/ha-year)	1.4	0.0	0.0	0.0
AQRV: Visibility change	Peak source group contribution in delta deciviews and days > 1.0 in parentheses	—	0.0 (0)	2.4 (1)	0.9 (0)

ppb = parts per billion; μg/m³ = micrograms per cubic meter; ppm = parts per million; kg N/ha = kilograms of nitrogen per hectare; kg S/ha = kilograms of sulfur per hectare

The modeling study included the impacts of coal-fired electric generating units (EGUs) and other coal combustion sources in the Western Regional Air Partnership (WRAP) states of Arizona, California, Colorado, Idaho, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Wyoming, and Washington. These impacts are reported in **Table 4-5** and **Table 4-6**, respectively.

Table 4-5
Modeled air concentrations and air quality related values due to emissions from coal EGUs in Western Regional Air Partnership states

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
8-hour Ozone (standard = 70 ppb)	Cumulative (ppb)	62.9	54.5	59.9	56.1
	Coal EGU Percent Contribution	2.8%	1.5%	0.2%	0.7%
	Peak source contribution (ppb)	8.1	0.8	6.1	1.3

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
1-hour NO_2 (standard = 100 ppb)	Cumulative (ppb)	36.9	3.0	9.7	2.5
	Coal EGU Percent Contribution	0.0%	0.4%	0.2%	0.6%
	Peak source contribution (ppb)	4.9	0.0	0.5	0.0
24-hour $PM_{2.5}$ (standard = 35 μg/m^3)	Cumulative (μg/m^3)	102.5	10.1	72.1	26.5
	Coal EGU Percent Contribution	0.1%	0.6%	0.1%	0.2%
	Peak source contribution (mg/m^3)	1.0	0.9	0.2	0.2
Annual $PM_{2.5}$ (standard = 9 μg/m^3)	Cumulative (μg/m^3)	12.9	3.1	7.0	3.8
	Coal EGU Percent Contribution	0.5%	2.1%	0.9%	1.5%
	Peak source contribution (mg/m^3)	0.1	0.1	0.1	0.1
24-hour PM_{10} (standard = 150 μg/m^3)	Cumulative (μg/m^3)	1,073.6	20.2	420.1	64.6
	Coal EGU Percent Contribution	0.0%	2.2%	0.0%	0.1%
	Peak source contribution (μg/m^3)	0.7	0.6	0.2	0.1
1-hour SO_2 (standard = 75 ppb)	Cumulative (ppb)	20.9	1.4	9.9	2.6
	Coal EGU Percent Contribution	1.0%	75.0%	0.4%	0.2%
	Peak source contribution (ppb)	7.8	1.1	0.1	0.1
3-hour SO_2 (standard = 0.5 ppm or 500 ppb)	Cumulative (ppb)	42.7	1.1	25.2	3.5
	Coal EGU Percent Contribution	0.1%	74.0%	0.0%	1.8%
	Peak source contribution (ppb)	5.6	0.8	0.1	0.1
AQRV: Nitrogen deposition (critical load = 5 to 12 kg N/ha)	Cumulative (kg N/ha-year)	17.9	4.2	4.8	4.6
	Coal EGU Percent Contribution	0.1%	1.2%	1.6%	0.9%
	Peak source contribution (kg N/ha-year)	0.0	0.0	0.1	0.0
AQRV: Sulfur deposition (critical load = 5 kg S/ha)	Cumulative (kg S/ha-year)	2.0	0.5	0.6	0.5
	Coal EGU Percent Contribution	4.5%	11.3%	18.8%	13.7%
	Peak source contribution (kg S/ha-year)	0.1	0.1	0.1	0.1
AQRV: Visibility change	Peak source group contribution in delta deciviews and days > 1.0 in parentheses	—	4.4 (22)	6.2 (26)	2.2 (12)

ppb = parts per billion; μg/m^3 = micrograms per cubic meter; ppm = parts per million; kg N/ha = kilograms of nitrogen per hectare; kg S/ha = kilograms of sulfur per hectare

Table 4-6
Modeled air concentrations and air quality related values due to emissions from other coal combustion sources in Western Regional Air Partnership states

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
8-hour Ozone (standard = 70 ppb)	Cumulative (ppb)	62.9	54.5	59.9	56.1
	Coal Combustion Percent Contribution	7.7%	0.1%	0.1%	0.0%
	Peak source contribution (ppb)	5.6	0.0	0.1	0.0
1-hour NO_2 (standard = 100 ppb)	Cumulative (ppb)	36.9	3.0	9.7	2.5
	Coal Combustion Percent Contribution	0.1%	0.0%	0.1%	0.0%
	Peak source contribution (ppb)	6.0	0.0	0.0	0.0
24-hour $PM_{2.5}$ (standard = 35 μg/m^3)	Cumulative (μg/m^3)	102.5	10.1	72.1	26.5
	Coal Combustion Percent Contribution	0.0%	0.1%	0.0%	0.0%
	Peak source contribution (mg/m^3)	2.5	0.1	0.0	0.0
Annual $PM_{2.5}$ (standard = 9 μg/m^3)	Cumulative (μg/m^3)	12.9	3.1	7.0	3.8
	Coal Combustion Percent Contribution	0.0%	0.3%	0.1%	0.2%
	Peak source contribution (mg/m^3)	0.3	0.0	0.0	0.0
24-hour PM_{10} (standard = 150 μg/m^3)	Cumulative (μg/m^3)	1,073.6	20.2	420.1	64.6
	Coal Combustion Percent Contribution	0.0%	0.2%	0.0%	0.0%
	Peak source contribution (μg/m^3)	5.5	0.1	0.0	0.0
1-hour SO_2 (standard = 75 ppb)	Cumulative (ppb)	20.9	1.4	9.9	2.6
	Coal Combustion Percent Contribution	0.2%	10.4%	0.1%	0.0%
	Peak source contribution (ppb)	14.4	0.1	0.0	0.0
3-hour SO_2 (standard = 0.5 ppm or 500 ppb)	Cumulative (ppb)	42.7	1.1	25.2	3.5
	Coal Combustion Percent Contribution	0.0%	10.3%	0.0%	0.1%
	Peak source contribution (ppb)	13.5	0.1	0.0	0.0
AQRV: Nitrogen deposition (critical load = 5 to 12 kg N/ha)	Cumulative (kg N/ha-year)	17.9	4.2	4.8	4.6
	Coal Combustion Percent Contribution	0.0%	0.1%	0.1%	0.1%
	Peak source contribution (kg N/ha-year)	0.005	0.004	0.003	0.004

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
AQRV: Sulfur deposition (critical load = 5 kg S/ha)	Cumulative (kg S/ha-year)	2.0	0.5	0.6	0.5
	Coal Combustion Percent Contribution	0.5%	1.6%	1.2%	1.8%
	Peak source contribution (kg S/ha-year)	0.01	0.01	0.01	0.01
AQRV: Visibility change	Peak source group contribution in delta deciviews and days > 1.0 in parentheses	—	0.8 (0)	0.6 (0)	0.3 (0)

ppb = parts per billion; µg/m^3 = micrograms per cubic meter; ppm = parts per million; kg N/ha = kilograms of nitrogen per hectare; kg S/ha = kilograms of sulfur per hectare

Figure 4-3 to **Figure 4-18** show the spatial extent of the data listed in **Table 4-4** to **Table 4-6** displaying impacts from federal coal and coal EGU on air quality (AQ) and AQRV metrics. The maps in the following figures center on the BFO area in eastern Wyoming, with state boundaries shown with darker lines and county boundaries shown with lighter lines. Diamond symbols on the maps represent the location of the maximum value for that figure and circle symbols indicate the location of the minimum value for that figure.

Figure 4-3
Modeled cumulative 4th highest daily maximum 8-hour ozone contribution from federal coal in Wyoming

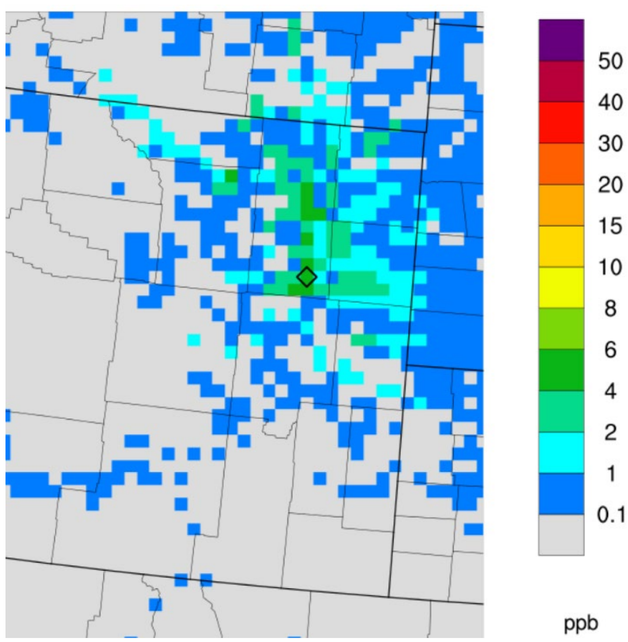


Figure 4-4
Modeled cumulative 4th highest daily maximum 8-hour ozone contribution from coal EGUs

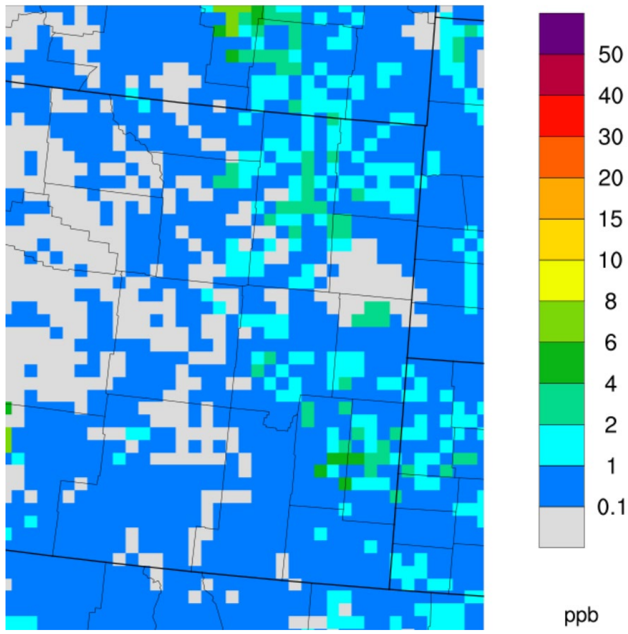


Figure 4-5
Modeled cumulative 8th highest daily maximum NO_2 contribution from federal coal in Wyoming

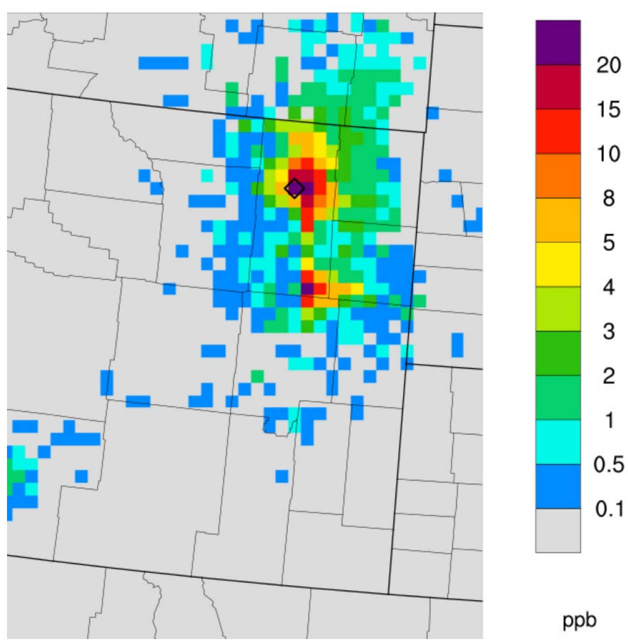


Figure 4-6
Modeled cumulative 8th highest daily maximum NO_2 contribution from coal EGUs

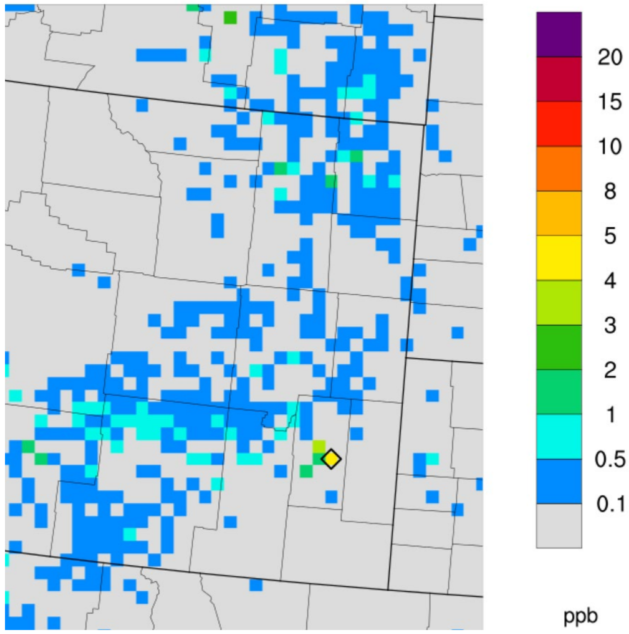


Figure 4-7
Modeled cumulative 8th highest daily $PM_{2.5}$ contribution from federal coal in Wyoming

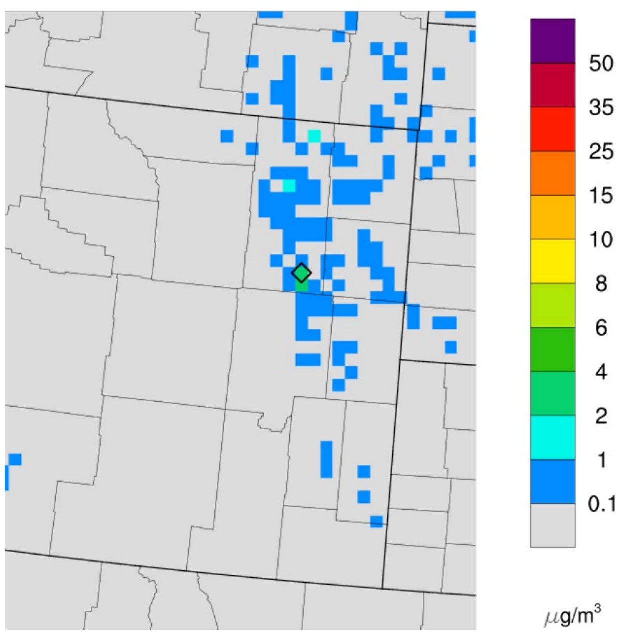


Figure 4-8
Modeled cumulative 8th highest daily $PM_{2.5}$ contribution from coal EGUs

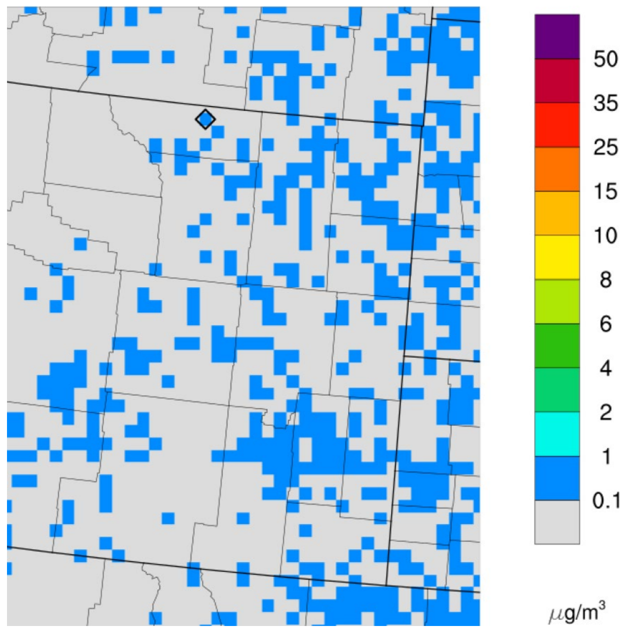


Figure 4-9
Modeled cumulative annual $PM_{2.5}$ contribution from federal coal in Wyoming

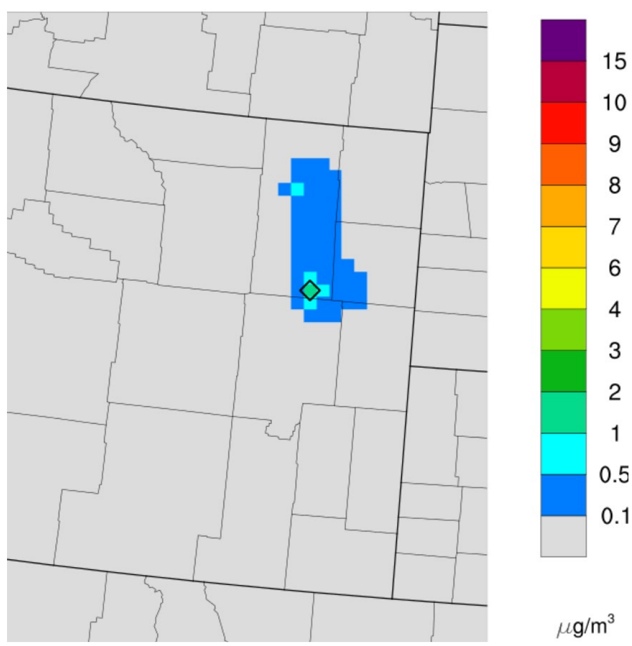


Figure 4-10
Modeled cumulative annual $PM_{2.5}$ contribution from coal EGUs

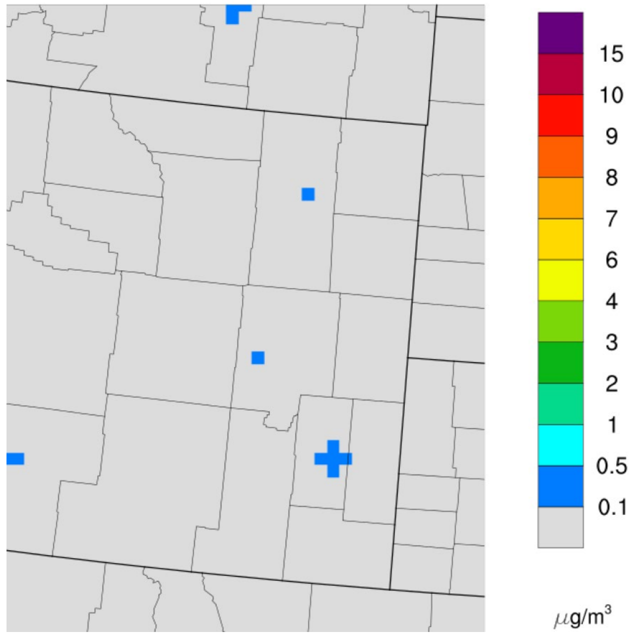


Figure 4-11
Modeled cumulative 2nd highest daily average PM_{10} contribution from federal coal in Wyoming

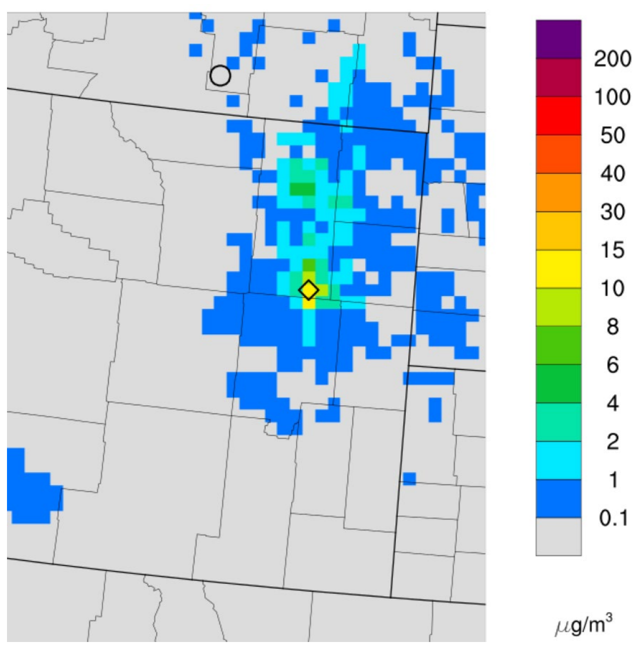


Figure 4-12
Modeled cumulative 2nd highest daily average PM_{10} contribution from coal EGUs

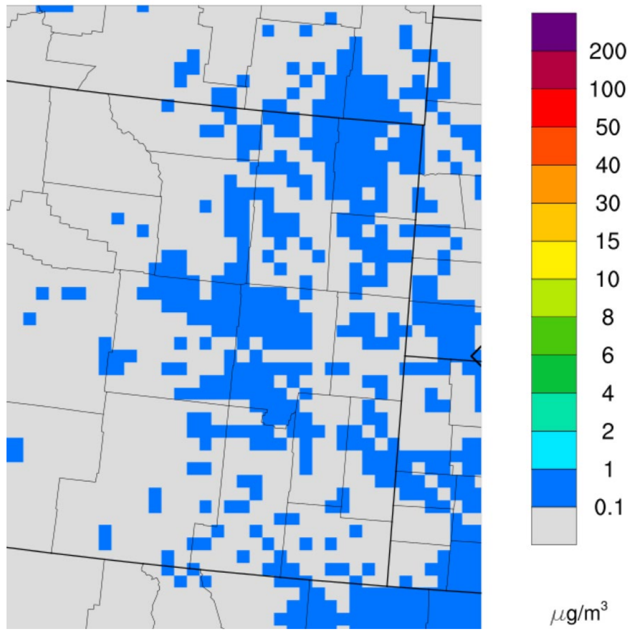


Figure 4-13
Modeled cumulative 4th highest 1-hour daily maximum SO_2 contribution from federal coal in Wyoming

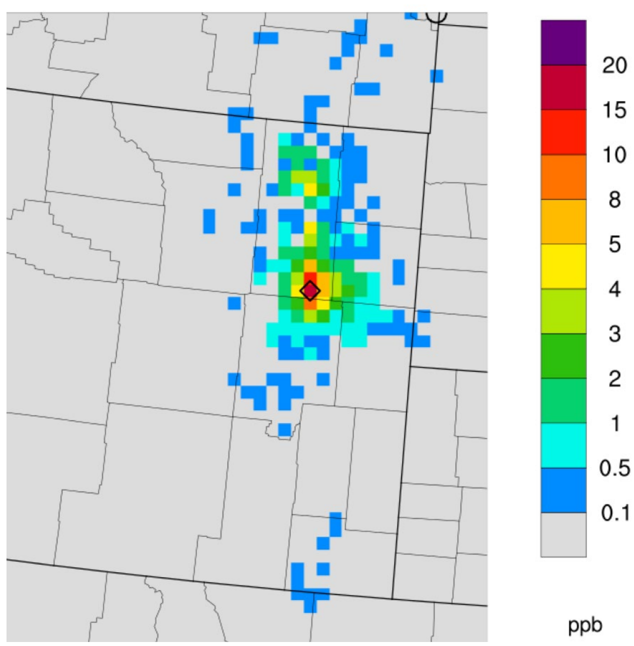


Figure 4-14
Modeled cumulative 4th highest 1-hour daily maximum SO_2 contribution from coal EGUs

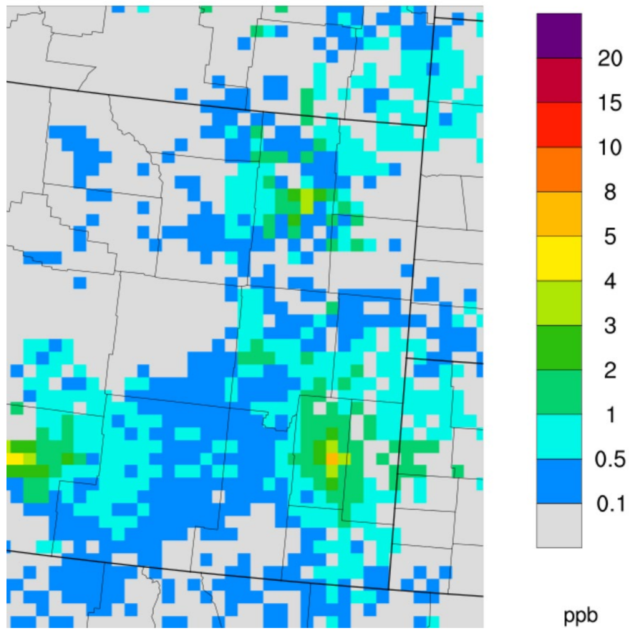


Figure 4-15
Modeled cumulative annual nitrogen deposition (kg N/ha-yr) contribution from federal coal in Wyoming

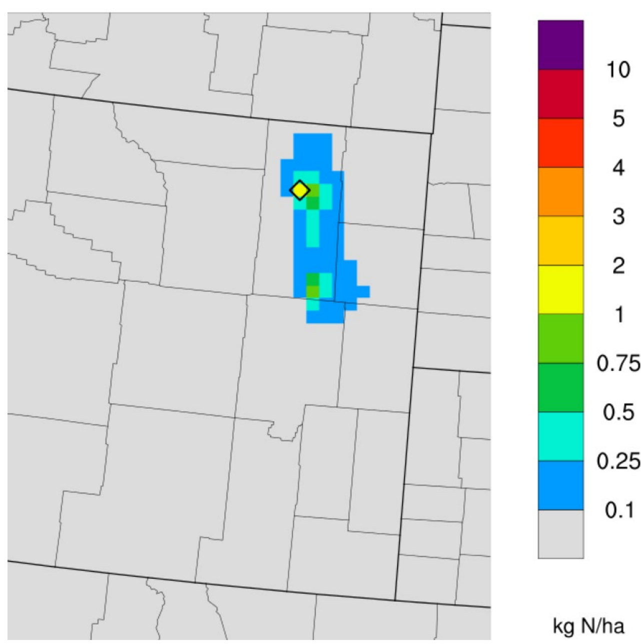


Figure 4-16
Modeled cumulative annual nitrogen deposition (kg N/ha-yr) contribution from coal EGUs

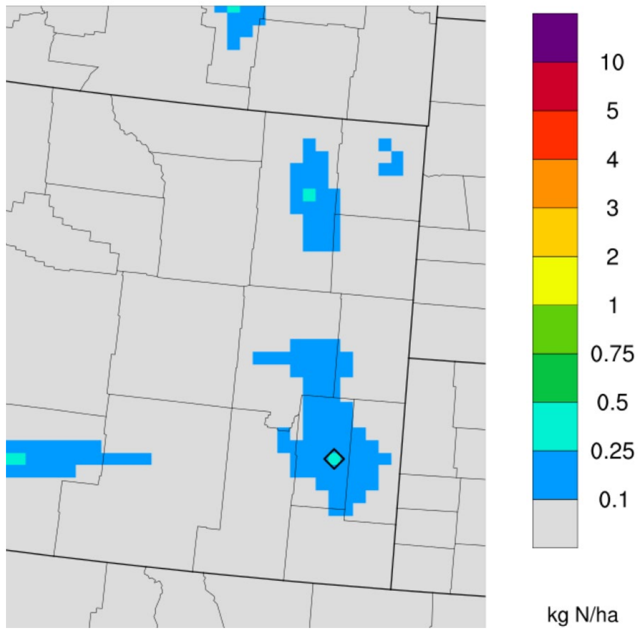


Figure 4-17
Modeled cumulative annual sulfur deposition (kg S/ha-yr) contribution from federal coal in Wyoming

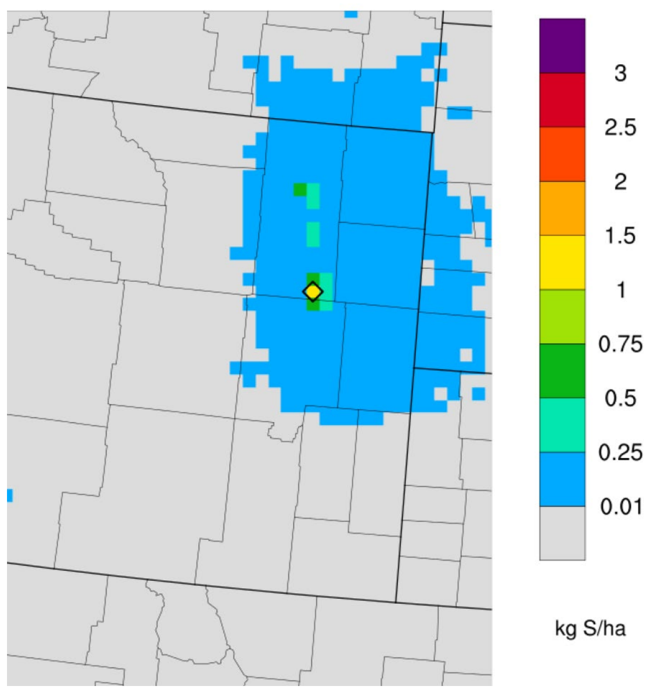
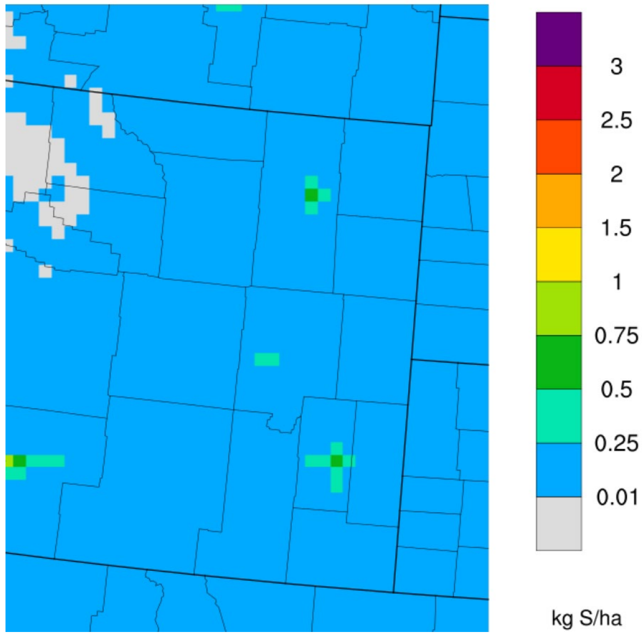


Figure 4-18
Modeled cumulative annual sulfur deposition (kg S/ha-yr) contribution from coal EGUs



4.2.1.2 Regional Modeling Results for Oil and Gas

The modeling study included impacts of federal oil and gas development in Wyoming of approximately 110 million barrels of crude oil per year and 1,400 billion cubic feet of gas per year. The modeled federal production in the BFO was 63 million barrels of crude oil and 132 billion cubic feet of gas. The modeled total (federal + nonfederal) production in the BFO was 79 million barrels of crude oil and 166 billion cubic feet of gas.

The modeled federal impacts are shown in **Table 4-7**. All metrics are below the NAAQS except for $PM_{2.5}$ and PM_{10}. The exceedances of $PM_{2.5}$ and PM_{10} NAAQS and the PM_{10} WAAQS concentrations (not shown here) are due to wildfires in western Montana. **Figure 4-19** to **Figure 4-34** show the spatial extent of the data listed in **Table 4-4** to **Table 4-6**, displaying impacts from federal oil and gas to AQ and AQRV metrics. The figure maps center on the BFO area in eastern Wyoming. State boundaries are shown with darker lines and county boundaries are shown with lighter lines.

Table 4-7
Modeled air concentrations and air quality related values due to emissions from federal oil and gas (new plus existing) development in Wyoming

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
8-hour Ozone (standard = 70 ppb)	Cumulative (ppb)	62.9	54.5	59.9	56.1
	Federal Oil and Gas Percent Contribution	1.6%	0.7%	0.0%	0.1%
	Peak source contribution (ppb)	2.5	0.2	0.4	0.3
1-hour NO_2 (standard = 100 ppb)	Cumulative (ppb)	36.9	3.0	9.7	2.5
	Federal Oil and Gas Percent Contribution	0.0%	0.1%	0.8%	0.2%
	Peak source contribution (ppb)	17.3	0.0	0.4	0.0
24-hour $PM_{2.5}$ (standard = 35 μg/m^3)	Cumulative (μg/m^3)	102.5	10.1	72.1	26.5
	Federal Oil and Gas Percent Contribution	0.0%	0.1%	0.0%	0.0%
	Peak source contribution (mg/m^3)	0.6	0.1	0.0	0.0
Annual $PM_{2.5}$ (standard = 9 μg/m^3)	Cumulative (μg/m^3)	12.9	3.1	7.0	3.8
	Federal Oil and Gas Percent Contribution	0.1%	0.4%	0.1%	0.3%
	Peak source contribution (mg/m^3)	0.3	0.0	0.0	0.0
24-hour PM_{10} (standard = 150 μg/m^3)	Cumulative (μg/m^3)	1,073.6	20.2	420.1	64.6
	Federal Oil and Gas Percent Contribution	0.0%	0.6%	0.0%	0.0%
	Peak source contribution (μg/m^3)	0.6	0.1	0.1	0.0
1-hour SO_2 (standard = 75 ppb)	Cumulative (ppb)	20.9	1.4	9.9	2.6
	Federal Oil and Gas Percent Contribution	1%	0%	0%	0%
	Peak source contribution (ppb)	5.2	0.0	0.0	0.0
3-hour SO_2 (standard = 0.5 ppm or 500 ppb)	Cumulative (ppb)	42.7	1.1	25.2	3.5
	Federal Oil and Gas Percent Contribution	0.0%	0.2%	0.0%	0.0%
	Peak source contribution (ppb)	4.4	0.0	0.0	0.0
AQRV: Nitrogen deposition (critical load = 5 to 12 kg N/ha)	Cumulative (kg N/ha-year)	17.9	4.2	4.8	4.6
	Federal Oil and Gas Percent Contribution	0.0%	0.4%	0.6%	0.5%
	Peak source contribution (kg N/ha-year)	0.00	0.02	0.03	0.02

		Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
AQRV: Sulfur deposition (critical load = 5 kg S/ha)	Cumulative (kg S/ha-year)	2.0	0.5	0.6	0.5
	Federal Oil and Gas Percent Contribution	2.5%	0.7%	1.6%	2.3%
	Peak source contribution (kg S/ha-year)	0.1	0.0	0.0	0.0
AQRV: Visibility change	Peak source group contribution in delta deciviews and days > 1.0 in parentheses	—	0.0 (0)	0.9 (0)	1.0 (1)

ppb = parts per billion; µg/m^3 = micrograms per cubic meter; ppm = parts per million; kg N/ha = kilograms of nitrogen per hectare; kg S/ha = kilograms of sulfur per hectare

Figure 4-19
Modeled cumulative 4th highest daily maximum 8-hour ozone contribution from existing federal oil and gas in Wyoming

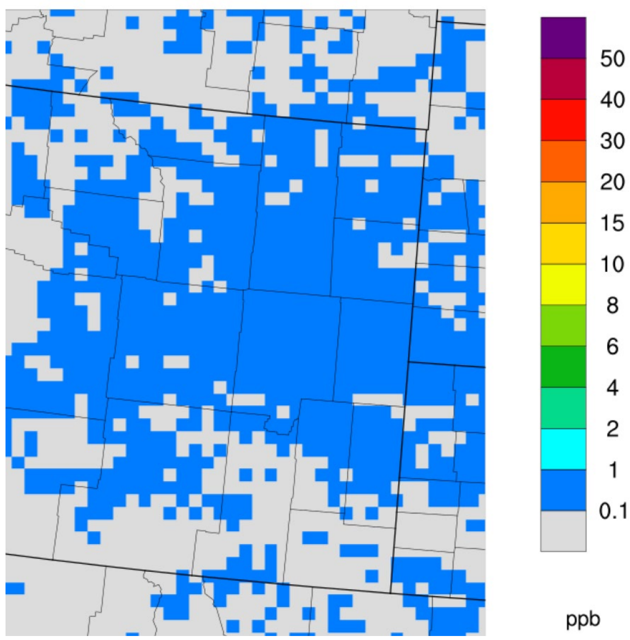


Figure 4-20
Modeled cumulative 4th highest daily maximum 8-hour ozone contribution from new federal oil and gas in Wyoming

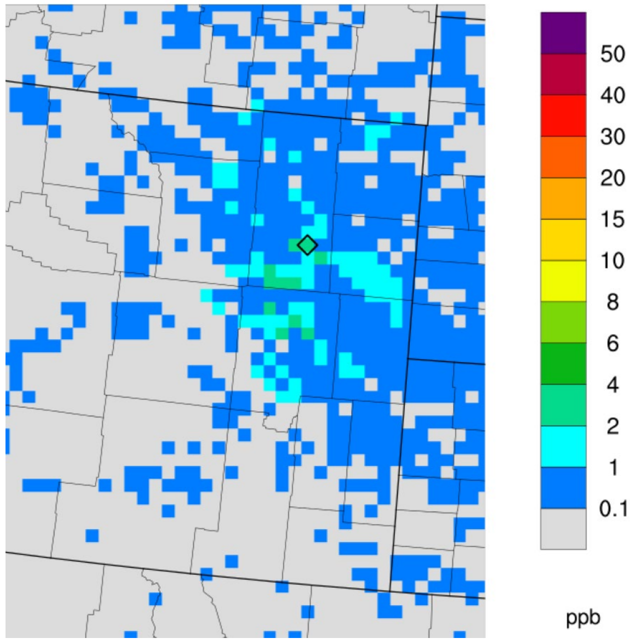


Figure 4-21
Modeled cumulative 8th highest daily maximum NO_2 contribution from existing federal oil and gas in Wyoming

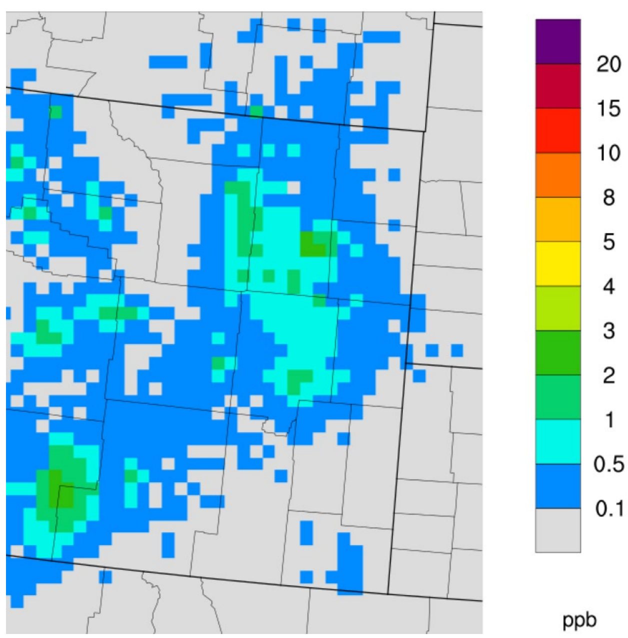


Figure 4-22
Modeled cumulative 8th highest daily maximum NO_2 contribution from new federal oil and gas in Wyoming

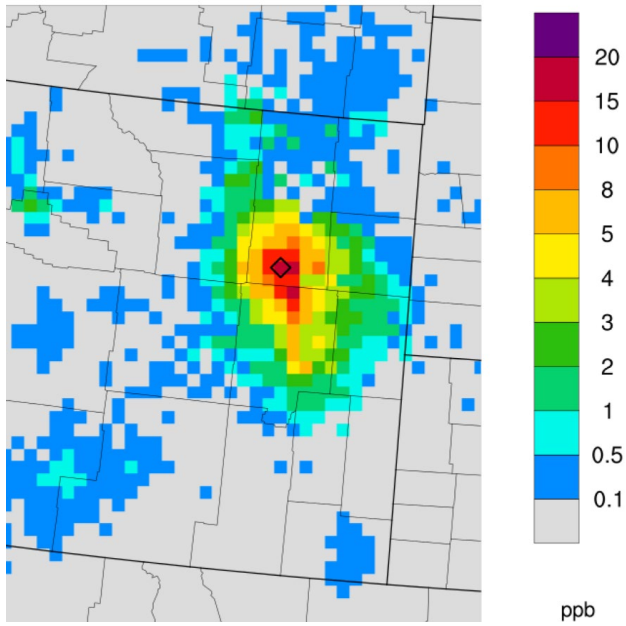


Figure 4-23
Modeled cumulative 8th highest daily $PM_{2.5}$ contribution from existing federal oil and gas in Wyoming

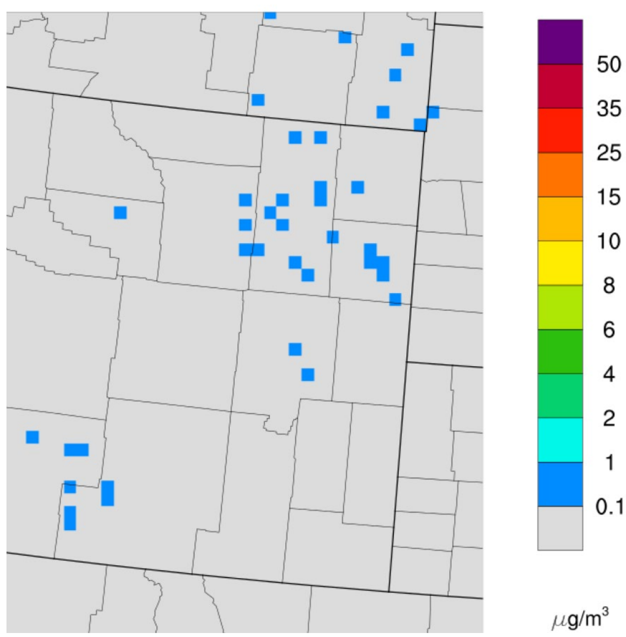


Figure 4-24
Modeled cumulative 8th highest daily $PM_{2.5}$ contribution from new federal oil and gas in Wyoming

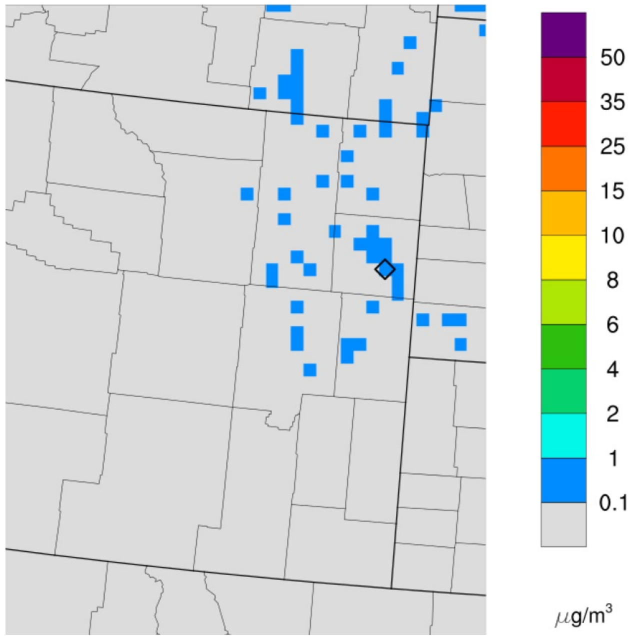


Figure 4-25
Modeled cumulative annual $PM_{2.5}$ contribution from existing federal oil and gas in Wyoming

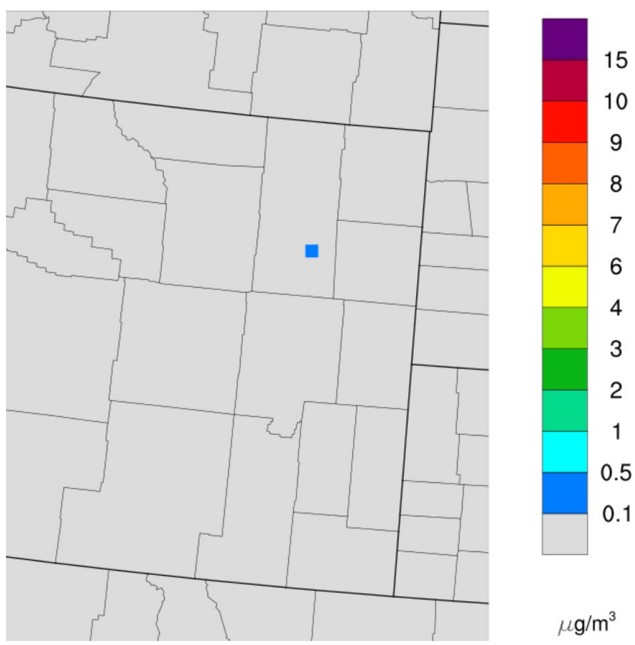


Figure 4-26
Modeled cumulative annual $PM_{2.5}$ contribution from new federal oil and gas in Wyoming

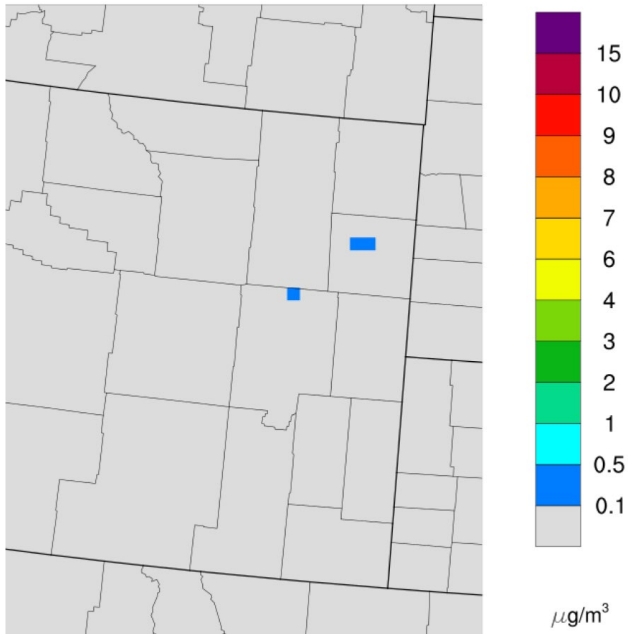


Figure 4-27
Modeled cumulative 2nd highest daily average PM_{10} contribution from existing federal oil and gas in Wyoming

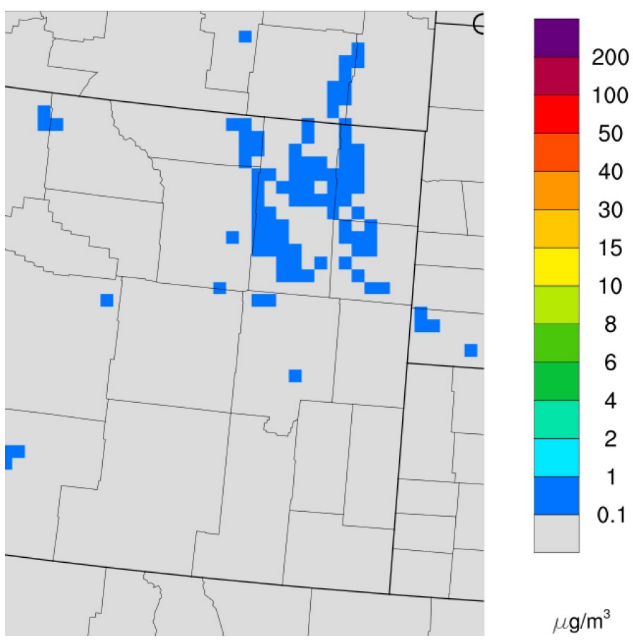


Figure 4-28
Modeled cumulative 2nd highest daily average PM_{10} contribution from new federal oil and gas in Wyoming

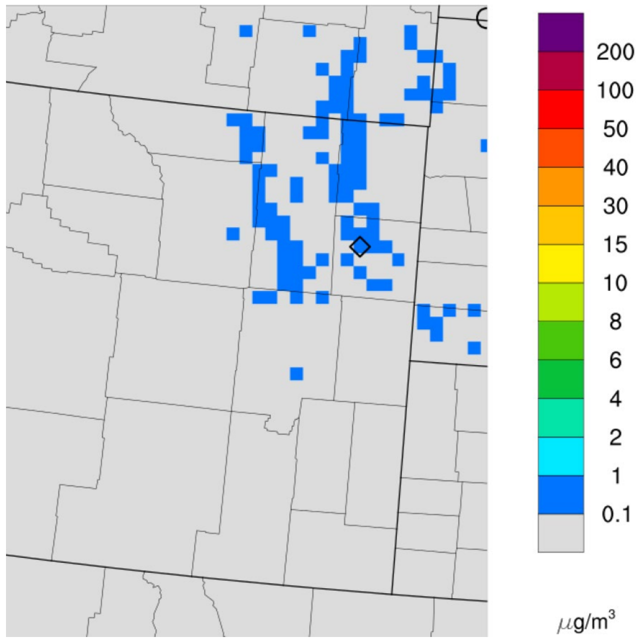


Figure 4-29
Modeled cumulative 4th highest 1-hour daily maximum SO_2 contribution from existing federal oil and gas in Wyoming

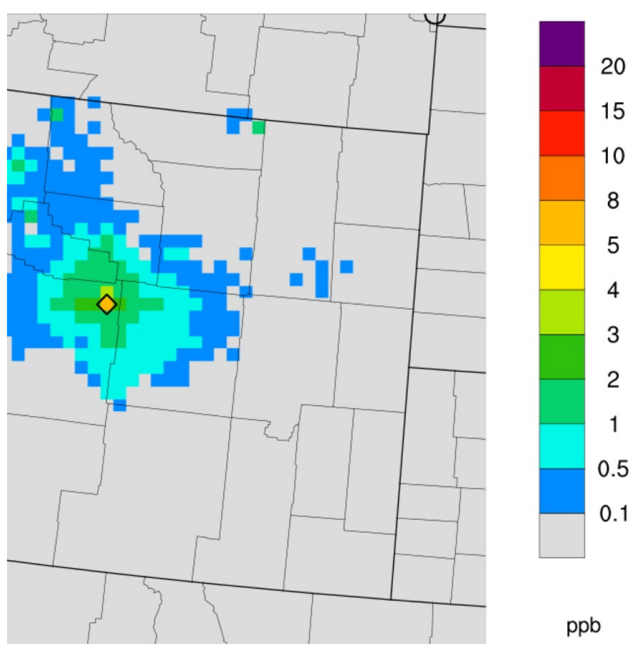


Figure 4-30
Modeled cumulative 4th highest 1-hour daily maximum SO_2 contribution from new federal oil and gas in Wyoming

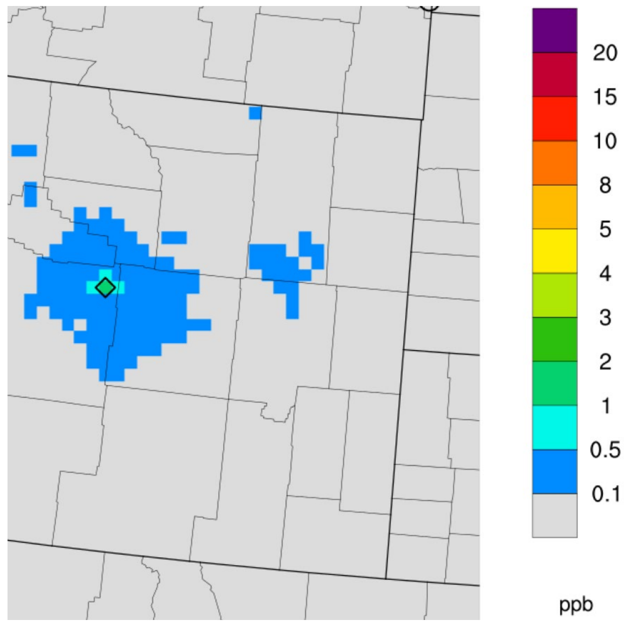


Figure 4-31
Modeled cumulative annual nitrogen deposition (kg N/ha-yr) contribution from existing federal oil and gas in Wyoming

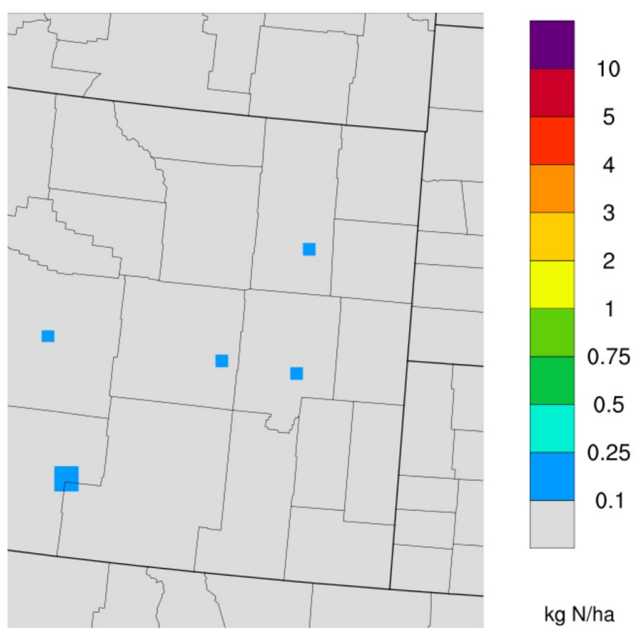


Figure 4-32
Modeled cumulative annual nitrogen deposition (kg N/ha-yr) contribution from new federal oil and gas in Wyoming

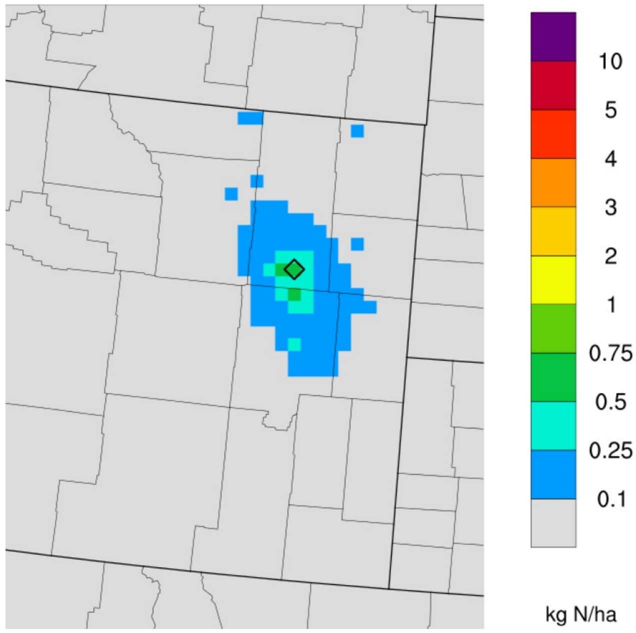


Figure 4-33
Modeled cumulative annual sulfur deposition (kg S/ha-yr) contribution from existing federal oil and gas in Wyoming

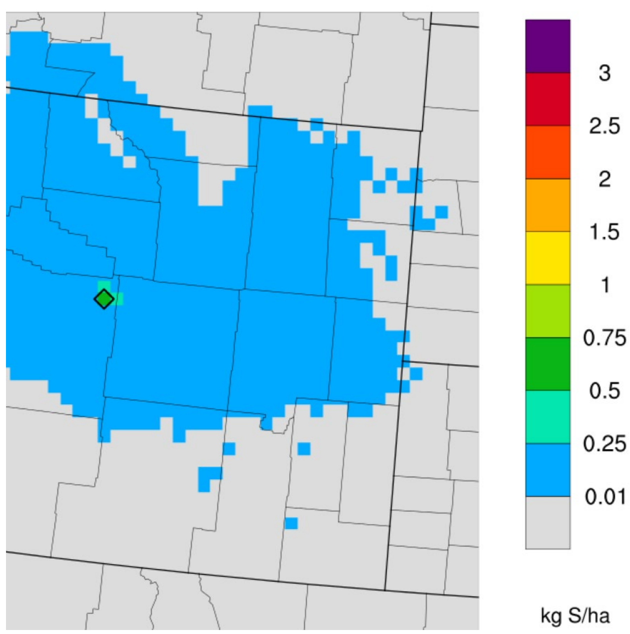
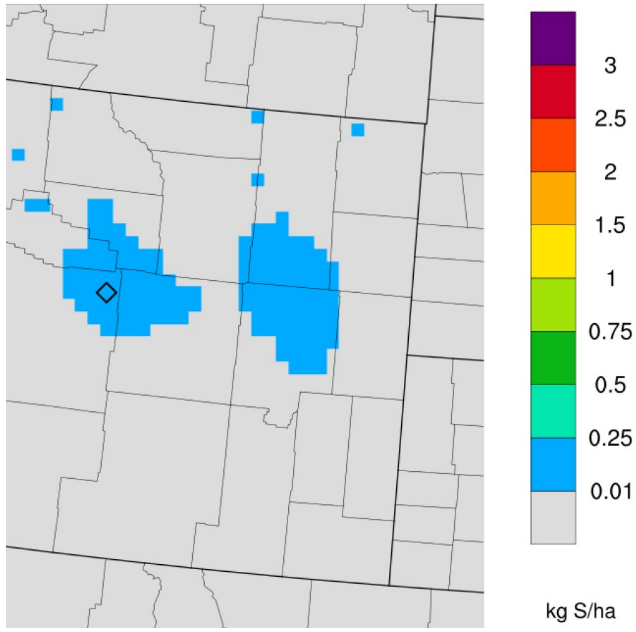


Figure 4-34
Modeled cumulative annual sulfur deposition (kg S/ha-yr) contribution from new federal oil and gas in Wyoming



4.2.1.3 Regional Modeling Results for Cumulative Sources

The subdomain for Wyoming shown in **Figure 4-2** above was used in the assessment of cumulative effects for air quality and AQRVs. Cumulative air quality impacts were modeled using the CAMx photochemical model, as discussed above. This model accounts for emissions from federal coal mining, federal oil and gas development, coal combustion, and other cumulative sources. **Table 4-8** summarizes the impacts to both AQ and AQRV due to all cumulative sources including anthropogenic and natural sources.

Table 4-8
Modeled air concentrations and air quality related values due to emissions from cumulative sources

	Wyoming	Badlands	Northern Cheyenne Reservation	Wind Cave National Park
8-hour Ozone (ppb)	62.9	54.5	59.9	56.1
1-hour NO_2 (ppb)	36.9	3.0	9.7	2.5
24-hour $PM_{2.5}$ (µg/m^3)	102.5	10.1	72.1	26.5
Annual $PM_{2.5}$ (µg/m^3)	12.9	3.1	7.0	3.8
24-hour PM_{10} (µg/m^3)	1,073.6	20.2	420.1	64.6
1-hour SO_2 (ppb)	20.9	1.4	9.9	2.6
3-hour SO_2 (ppb)	42.7	1.1	25.2	3.5
AQRV: Nitrogen deposition (kg N/ha)	17.9	4.2	4.8	4.6
AQRV: Sulfur deposition (kg S/ha)	2.0	0.5	0.6	0.5

Figure 4-35 to **Figure 4-42** show the spatial extent of the data listed in **Table 4-4** to **Table 4-6**, and show the cumulative impacts for AQ and AQRV metrics due to contributions from all the sources included in the BLM circa 2028 modeling. The figure maps center on the BFO area in eastern Wyoming. State boundaries are shown with darker lines and county boundaries are shown with lighter lines. Diamond symbols on the maps represent the location of the maximum value for that figure and circle symbols indicate the location of the minimum value for that figure.

Cumulative impacts in the Wyoming subdomain are predicted to be below the NAAQS for ozone, NO_2, and SO_2. Cumulative impacts for $PM_{2.5}$, and PM_{10} exceed the NAAQS at isolated areas throughout the state, mostly due to the modeled natural source group that includes fires, biogenic emissions, windblown dust, and lightning NOx. The contributions from federal oil and gas and federal coal development are generally less than 3 percent at the location of these exceedances.

Modeled cumulative nitrogen deposition is below the lowest critical load (5 kg N/ha-year for herb/shrubs [EPA 2021c]) at all Class I areas in the analysis. Contributions are minimal at these locations from the Federal coal and oil and gas, and never exceed more than 2 percent of the total deposition. Sulfur deposition is below the critical load of 5 kg S/ha-year over Wyoming. The coal EGU sector impacts visibility at all three class I areas in the analysis. Other sectors generally do not lead to impacts over 1 delta deciview. Note that a 1 delta deciview threshold is applicable to individual projects not regional resource management plans.

Figure 4-35
Modeled cumulative 4th highest daily maximum 8-hour ozone

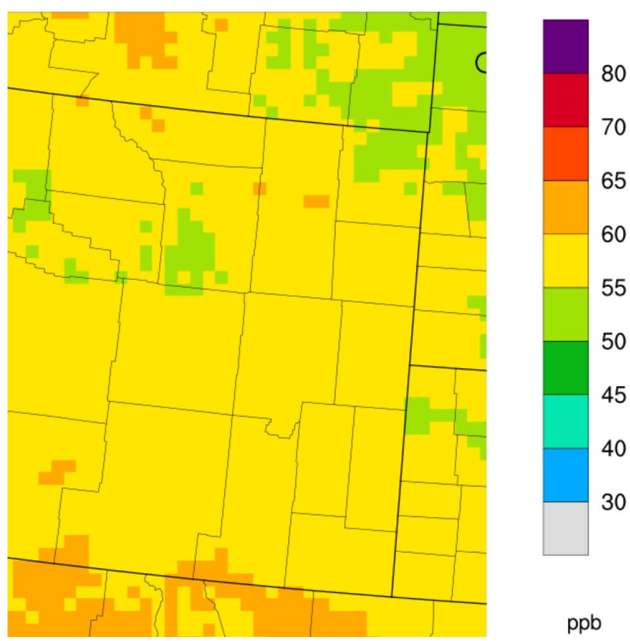


Figure 4-36
Modeled cumulative 8th highest daily maximum NO_2

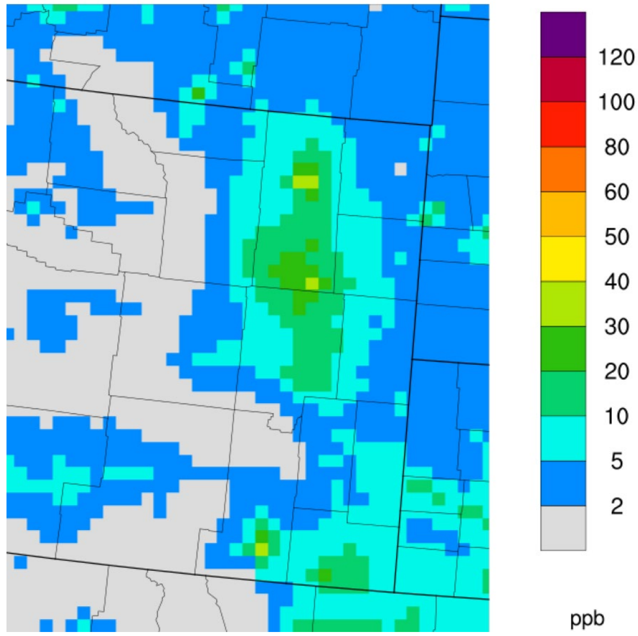


Figure 4-37
Modeled cumulative 8th highest daily $PM_{2.5}$

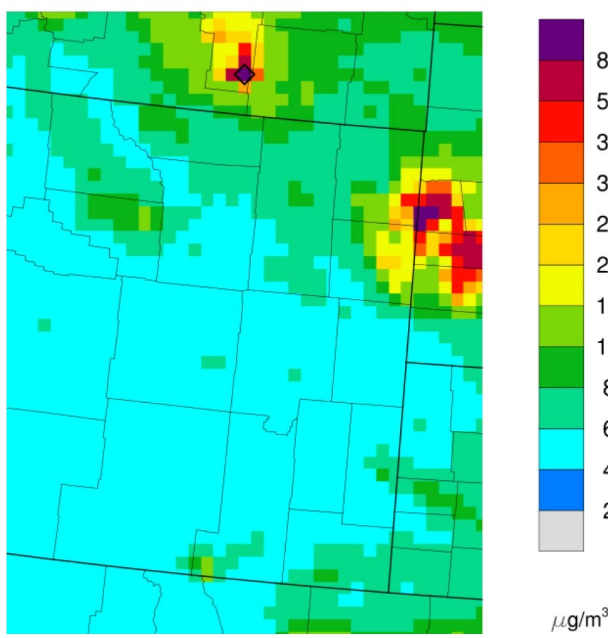


Figure 4-38
Modeled cumulative annual $PM_{2.5}$

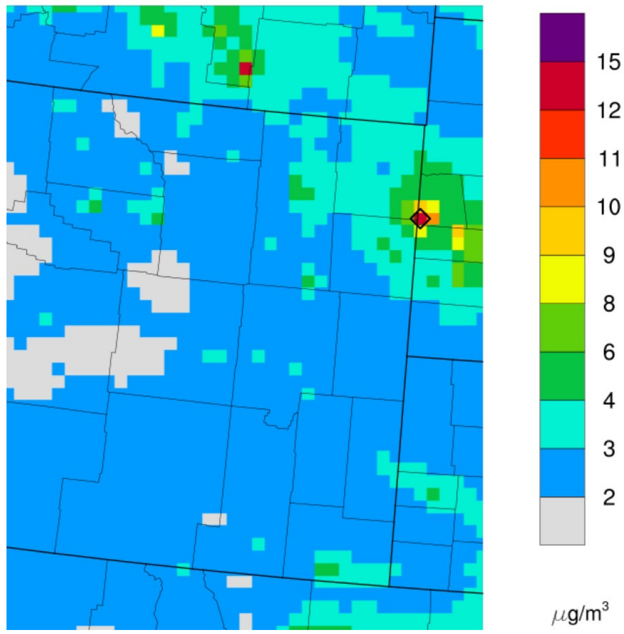


Figure 4-39
Modeled cumulative 2nd highest daily average PM_{10}

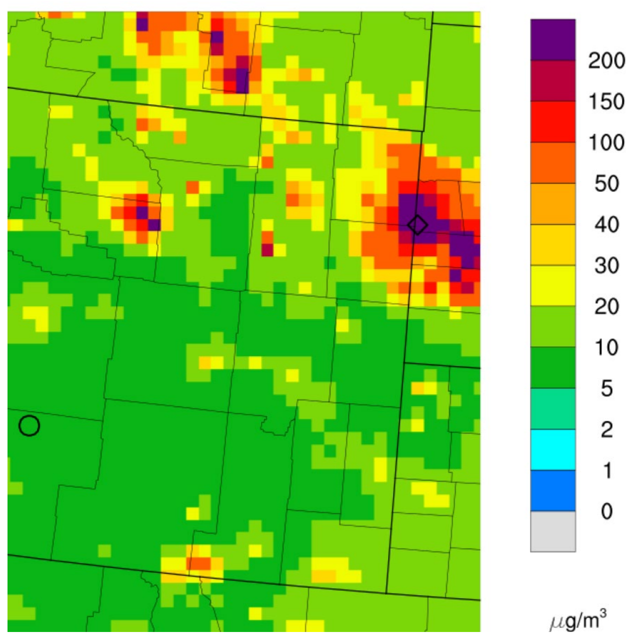


Figure 4-40
Modeled cumulative 4th highest 1-hour daily maximum SO_2

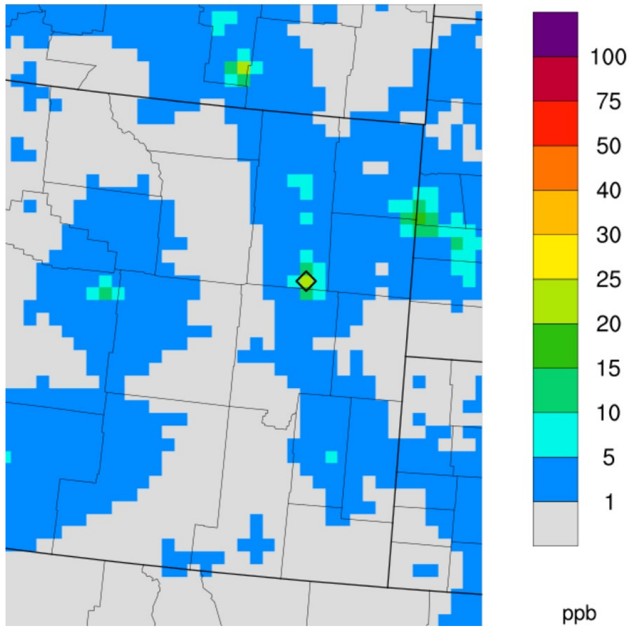


Figure 4-41
Modeled cumulative annual nitrogen deposition

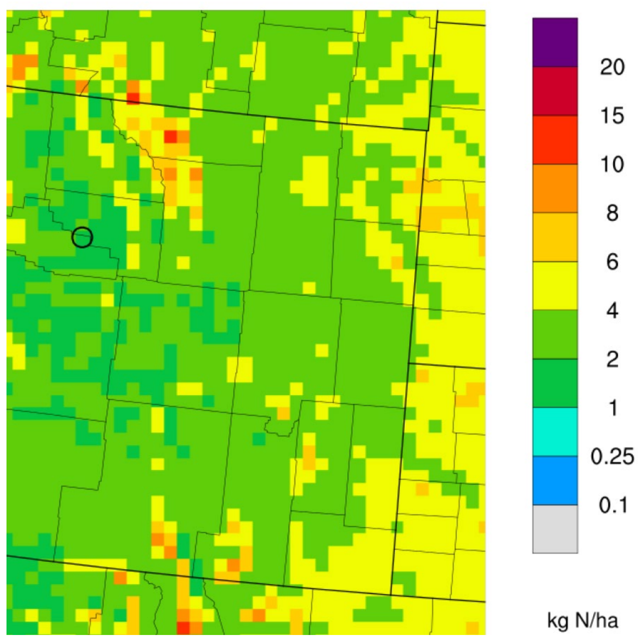
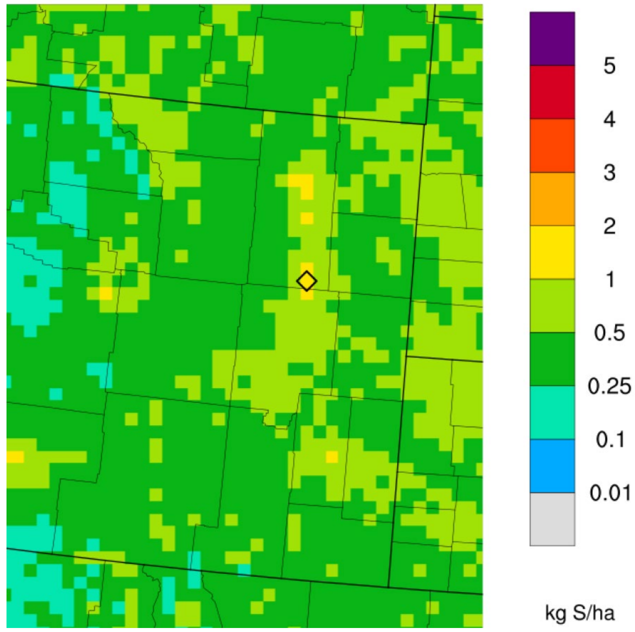


Figure 4-42
Modeled cumulative annual sulfur deposition



4.3 Coal Emissions

4.3.1 Mining

Alternative A. No Leasing

Projected federal, nonfederal, and total emissions of criteria and hazardous air pollutants from coal mining in the CDPA under Alternative A (No Leasing) are shown in **Table 4-9**, **Table 4-10**, and **Table 4-11**, respectively. Under this Alternative, the mining of federal coal in the CDPA would cease in 2041.

Table 4-9
Federal criteria and hazardous air pollutant and precursor emissions from mining of coal from existing leases in the CDPA under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	262.20	11,509	1,975	12,933	16,344	1,124	4,541	112	747
2023	256.58	11,295	1,933	12,445	16,110	1,098	4,445	110	730
2024	248.27	10,926	1,872	12,168	15,481	1,062	4,300	106	706
2025	176.95	7,807	1,335	8,617	11,039	756	3,065	76	503
2026	204.63	9,028	1,544	9,968	12,765	874	3,544	87	582
2027	234.33	10,380	1,774	11,527	14,422	998	4,056	100	665
2028	232.22	10,312	1,760	11,454	14,208	987	4,019	99	658
2029	232.30	10,313	1,761	11,449	14,225	988	4,021	99	659
2030	227.03	10,075	1,720	11,132	13,965	966	3,930	97	644
2031	226.91	10,068	1,719	11,138	13,949	965	3,928	97	644
2032	227.34	9,873	1,704	11,402	14,242	981	3,938	98	650
2033	227.63	9,907	1,705	11,096	14,499	982	3,946	98	651
2034	229.13	9,973	1,716	11,169	14,594	988	3,972	99	655
2035	211.71	9,205	1,584	10,264	13,556	914	3,670	91	605
2036	214.13	9,310	1,602	10,378	13,713	924	3,712	92	612
2037	197.37	8,588	1,478	9,602	12,594	851	3,421	85	564
2038	195.03	8,506	1,463	9,607	12,292	840	3,379	84	557
2039	192.43	8,393	1,444	9,480	12,128	828	3,334	83	549
2040	190.10	8,353	1,436	9,733	11,511	813	3,289	81	541
2041	71.25	3,178	539	3,246	4,568	303	1,235	30	202

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2042	-	-	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-	-	-
2045	-	-	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-	-	-

Notes: PM_{10} = particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter.

Table 4-10
Nonfederal criteria and hazardous air pollutant and precursor emissions from coal mining in the CDPA under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	6.31	277.0	47.5	311.2	393.3	27.0	109.3	2.7	18.0
2023	6.17	271.8	46.5	299.5	387.7	26.4	107.0	2.6	17.6
2024	5.97	262.9	45.0	292.8	372.6	25.6	103.5	2.6	17.0
2025	4.26	187.9	32.1	207.4	265.7	18.2	73.8	1.8	12.1
2026	4.92	217.3	37.2	239.9	307.2	21.0	85.3	2.1	14.0
2027	5.64	249.8	42.7	277.4	347.1	24.0	97.6	2.4	16.0
2028	5.59	248.2	42.4	275.7	341.9	23.8	96.7	2.4	15.8
2029	5.59	248.2	42.4	275.5	342.3	23.8	96.8	2.4	15.9
2030	5.46	242.5	41.4	267.9	336.1	23.2	94.6	2.3	15.5
2031	5.46	242.3	41.4	268.0	335.7	23.2	94.5	2.3	15.5
2032	5.47	237.6	41.0	274.4	342.7	23.6	94.8	2.4	15.6
2033	5.48	238.4	41.0	267.0	348.9	23.6	95.0	2.4	15.7
2034	5.51	240.0	41.3	268.8	351.2	23.8	95.6	2.4	15.8
2035	5.09	221.5	38.1	247.0	326.2	22.0	88.3	2.2	14.6

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2036	5.15	224.1	38.6	249.8	330.0	22.2	89.3	2.2	14.7
2037	4.75	206.7	35.6	231.1	303.1	20.5	82.3	2.0	13.6
2038	4.69	204.7	35.2	231.2	295.8	20.2	81.3	2.0	13.4
2039	4.63	202.0	34.7	228.1	291.9	19.9	80.2	2.0	13.2
2040	4.57	201.0	34.6	234.2	277.0	19.6	79.2	2.0	13.0
2041	1.71	76.5	13.0	78.1	109.9	7.3	29.7	0.7	4.9
2042	-	-	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-	-	-
2045	-	-	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-	-	-

Notes: PM_{10} = particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter.

Table 4-11
Total criteria and hazardous air pollutant and precursor emissions from mining of coal from existing federal leases and nonfederal leases in the CDPA under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	268.51	11,786	2,022	13,244	16,738	1,151	4,650	115.1	764.7
2023	262.76	11,567	1,980	12,744	16,498	1,124	4,552	112.4	747.7
2024	254.24	11,189	1,917	12,461	15,853	1,088	4,403	108.8	723.4
2025	181.20	7,995	1,367	8,824	11,305	774	3,138	77.4	515.1
2026	209.55	9,245	1,581	10,208	13,072	895	3,629	89.5	595.7
2027	239.97	10,630	1,816	11,805	14,769	1,022	4,154	102.2	681.0
2028	237.81	10,560	1,803	11,730	14,550	1,011	4,116	101.1	674.2
2029	237.89	10,562	1,803	11,725	14,568	1,011	4,117	101.1	674.5

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2030	232.50	10,317	1,761	11,400	14,301	989	4,025	98.9	659.4
2031	232.37	10,311	1,760	11,406	14,284	988	4,022	98.8	659.0
2032	232.81	10,111	1,745	11,676	14,585	1,005	4,033	100.5	665.7
2033	233.11	10,146	1,746	11,363	14,848	1,005	4,041	100.5	666.2
2034	234.64	10,213	1,757	11,438	14,945	1,012	4,067	101.2	670.6
2035	216.81	9,427	1,622	10,511	13,882	936	3,759	93.6	619.9
2036	219.28	9,534	1,641	10,628	14,043	946	3,802	94.6	627.0
2037	202.12	8,794	1,513	9,833	12,897	872	3,504	87.2	577.7
2038	199.72	8,711	1,499	9,839	12,588	860	3,461	86.0	570.3
2039	197.06	8,595	1,479	9,708	12,420	848	3,414	84.8	562.7
2040	194.68	8,554	1,471	9,967	11,788	833	3,368	83.3	554.0
2041	72.96	3,254	552	3,324	4,678	310	1,265	31.0	206.7
2042	-	-	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-	-	-
2045	-	-	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-	-	-

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Alternative B. No Action

Projected federal, nonfederal, and total emissions of criteria and hazardous air pollutants from coal mining in the CDPA under Alternative B (No Action) are shown in **Table 4-12**, **Table 4-13**, and **Table 4-14**, respectively.

Table 4-12
Federal criteria and hazardous air pollutant and precursor emissions from mining of coal from existing and new future federal leases in the CDPA under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	262.20	11,509	1,975	12,933	16,344	1,124	4,541	115	763
2023	256.58	11,295	1,933	12,445	16,110	1,098	4,445	113	747
2024	248.27	10,926	1,872	12,168	15,481	1,062	4,300	109	722
2025	176.95	7,807	1,335	8,617	11,039	756	3,065	78	515
2026	204.63	9,028	1,544	9,968	12,765	874	3,544	90	595
2027	234.33	10,380	1,774	11,527	14,422	998	4,056	103	682
2028	232.22	10,312	1,760	11,454	14,208	987	4,019	102	676
2029	232.30	10,313	1,761	11,449	14,225	988	4,021	102	676
2030	227.03	10,075	1,720	11,132	13,965	966	3,930	100	661
2031	226.91	10,068	1,719	11,138	13,949	965	3,928	100	660
2032	227.34	9,873	1,704	11,402	14,242	981	3,938	100	661
2033	227.63	9,907	1,705	11,096	14,499	982	3,946	100	662
2034	229.13	9,973	1,716	11,169	14,594	988	3,972	101	667
2035	211.71	9,205	1,584	10,264	13,556	914	3,670	93	616
2036	214.13	9,310	1,602	10,378	13,713	924	3,712	94	623
2037	197.37	8,588	1,478	9,602	12,594	851	3,421	87	574
2038	195.03	8,506	1,463	9,607	12,292	840	3,379	86	567
2039	192.43	8,393	1,444	9,480	12,128	828	3,334	85	560
2040	190.10	8,353	1,436	9,733	11,511	813	3,289	84	553
2041	183.54	8,187	1,388	8,360	11,768	780	3,182	78	520
2042	180.65	8,149	1,377	8,466	11,163	760	3,127	76	509
2043	180.10	8,080	1,369	8,496	11,178	761	3,118	76	509
2044	180.43	7,904	1,356	8,757	11,411	775	3,127	77	514
2045	165.88	7,306	1,252	8,252	10,220	709	2,872	71	472
2046	161.28	7,131	1,217	7,689	10,177	688	2,795	69	458
2047	159.15	7,518	1,266	9,446	7,286	641	2,729	64	439
2048	156.98	7,654	1,259	8,053	7,780	620	2,697	62	427

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Table 4-13
Nonfederal criteria and hazardous air pollutant and precursor emissions from coal mining in the CDPA under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	6.31	277.0	47.5	311.2	393.3	27.0	109.3	2.7	18.0
2023	6.17	271.8	46.5	299.5	387.7	26.4	107.0	2.6	17.6
2024	5.97	262.9	45.0	292.8	372.6	25.6	103.5	2.6	17.0
2025	4.26	187.9	32.1	207.4	265.7	18.2	73.8	1.8	12.1
2026	4.92	217.3	37.2	239.9	307.2	21.0	85.3	2.1	14.0
2027	5.64	249.8	42.7	277.4	347.1	24.0	97.6	2.4	16.0
2028	5.59	248.2	42.4	275.7	341.9	23.8	96.7	2.4	15.8
2029	5.59	248.2	42.4	275.5	342.3	23.8	96.8	2.4	15.9
2030	5.46	242.5	41.4	267.9	336.1	23.2	94.6	2.3	15.5
2031	5.46	242.3	41.4	268.0	335.7	23.2	94.5	2.3	15.5
2032	5.47	237.6	41.0	274.4	342.7	23.6	94.8	2.4	15.6
2033	5.48	238.4	41.0	267.0	348.9	23.6	95.0	2.4	15.7
2034	5.51	240.0	41.3	268.8	351.2	23.8	95.6	2.4	15.8
2035	5.09	221.5	38.1	247.0	326.2	22.0	88.3	2.2	14.6
2036	5.15	224.1	38.6	249.8	330.0	22.2	89.3	2.2	14.7
2037	4.75	206.7	35.6	231.1	303.1	20.5	82.3	2.0	13.6
2038	4.69	204.7	35.2	231.2	295.8	20.2	81.3	2.0	13.4
2039	4.63	202.0	34.7	228.1	291.9	19.9	80.2	2.0	13.2
2040	4.57	201.0	34.6	234.2	277.0	19.6	79.2	2.0	13.0
2041	4.42	197.0	33.4	201.2	283.2	18.8	76.6	1.9	12.5
2042	4.35	196.1	33.1	203.7	268.6	18.3	75.3	1.8	12.3
2043	4.33	194.5	33.0	204.5	269.0	18.3	75.0	1.8	12.2
2044	4.34	190.2	32.6	210.7	274.6	18.6	75.2	1.9	12.4
2045	3.99	175.8	30.1	198.6	246.0	17.1	69.1	1.7	11.4
2046	3.88	171.6	29.3	185.0	244.9	16.6	67.3	1.7	11.0
2047	3.83	180.9	30.5	227.3	175.3	15.4	65.7	1.5	10.6
2048	3.78	184.2	30.3	193.8	187.2	14.9	64.9	1.5	10.3

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Table 4-14
Total criteria and hazardous air pollutant and precursor emissions from mining of coal from existing and new future federal leases and nonfederal leases in the CDPA under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	268.51	11,786	2,022	13,244	16,738	1,151	4,650	115	765
2023	262.76	11,567	1,980	12,744	16,498	1,124	4,552	112	748
2024	254.24	11,189	1,917	12,461	15,853	1,088	4,403	109	723
2025	181.20	7,995	1,367	8,824	11,305	774	3,138	77	515
2026	209.55	9,245	1,581	10,208	13,072	895	3,629	90	596
2027	239.97	10,630	1,816	11,805	14,769	1,022	4,154	102	681
2028	237.81	10,560	1,803	11,730	14,550	1,011	4,116	101	674
2029	237.89	10,562	1,803	11,725	14,568	1,011	4,117	101	675
2030	232.50	10,317	1,761	11,400	14,301	989	4,025	99	659
2031	232.37	10,311	1,760	11,406	14,284	988	4,022	99	659
2032	232.81	10,111	1,745	11,676	14,585	1,005	4,033	100	666
2033	233.11	10,146	1,746	11,363	14,848	1,005	4,041	101	666
2034	234.64	10,213	1,757	11,438	14,945	1,012	4,067	101	671
2035	216.81	9,427	1,622	10,511	13,882	936	3,759	94	620
2036	219.28	9,534	1,641	10,628	14,043	946	3,802	95	627
2037	202.12	8,794	1,513	9,833	12,897	872	3,504	87	578
2038	199.72	8,711	1,499	9,839	12,588	860	3,461	86	570
2039	197.06	8,595	1,479	9,708	12,420	848	3,414	85	563
2040	194.68	8,554	1,471	9,967	11,788	833	3,368	83	554
2041	187.96	8,384	1,421	8,562	12,051	798	3,258	80	532
2042	185.00	8,345	1,410	8,670	11,432	779	3,203	78	521
2043	184.43	8,275	1,402	8,701	11,447	779	3,193	78	521
2044	184.77	8,094	1,388	8,968	11,686	793	3,202	79	527
2045	169.87	7,482	1,282	8,451	10,466	726	2,941	73	483
2046	165.17	7,303	1,246	7,874	10,422	705	2,862	70	469
2047	162.98	7,699	1,297	9,674	7,461	657	2,794	66	449
2048	160.75	7,838	1,289	8,247	7,967	635	2,762	63	438

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter.

Alternative C. Limited Leasing

Projected federal, nonfederal, and total emissions of criteria and hazardous air pollutants from coal mining in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-15**, **Table 4-16**, and **Table 4-17**, respectively. Under this Alternative, the mining of federal coal in the CDPA would cease in 2048.

Table 4-15
Federal criteria and hazardous air pollutant and precursor emissions from mining of coal from existing and new future federal leases in the CDPA under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	262.20	11,509	1,975	12,933	16,344	1,124	4,541	112	747
2023	256.58	11,295	1,933	12,445	16,110	1,098	4,445	110	730
2024	248.27	10,926	1,872	12,168	15,481	1,062	4,300	106	706
2025	176.95	7,807	1,335	8,617	11,039	756	3,065	76	503
2026	204.63	9,028	1,544	9,968	12,765	874	3,544	87	582
2027	234.33	10,380	1,774	11,527	14,422	998	4,056	100	665
2028	232.22	10,312	1,760	11,454	14,208	987	4,019	99	658
2029	232.30	10,313	1,761	11,449	14,225	988	4,021	99	659
2030	227.03	10,075	1,720	11,132	13,965	966	3,930	97	644
2031	226.91	10,068	1,719	11,138	13,949	965	3,928	97	644
2032	227.34	9,873	1,704	11,402	14,242	981	3,938	98	650
2033	227.63	9,907	1,705	11,096	14,499	982	3,946	98	651
2034	229.13	9,973	1,716	11,169	14,594	988	3,972	99	655
2035	211.71	9,205	1,584	10,264	13,556	914	3,670	91	605
2036	214.13	9,310	1,602	10,378	13,713	924	3,712	92	612
2037	197.37	8,588	1,478	9,602	12,594	851	3,421	85	564
2038	195.03	8,506	1,463	9,607	12,292	840	3,379	84	557
2039	192.43	8,393	1,444	9,480	12,128	828	3,334	83	549
2040	190.10	8,353	1,436	9,733	11,511	813	3,289	81	541
2041	183.54	8,187	1,388	8,360	11,768	780	3,182	78	520
2042	180.65	8,149	1,377	8,466	11,163	760	3,127	76	509
2043	180.10	8,080	1,369	8,496	11,178	761	3,118	76	509
2044	180.43	7,904	1,356	8,757	11,411	775	3,127	77	514

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2045	165.88	7,306	1,252	8,252	10,220	709	2,872	71	472
2046	161.28	7,131	1,217	7,689	10,177	688	2,795	69	458
2047	159.15	7,518	1,266	9,446	7,286	641	2,729	64	439
2048	32.02	1,561	257	1,643	1,587	126	550	13	87

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Table 4-16
Nonfederal criteria and hazardous air pollutant and precursor emissions from coal mining in the CDPA under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	6.31	277.0	47.5	311.2	393.3	27.0	109.3	2.7	18.0
2023	6.17	271.8	46.5	299.5	387.7	26.4	107.0	2.6	17.6
2024	5.97	262.9	45.0	292.8	372.6	25.6	103.5	2.6	17.0
2025	4.26	187.9	32.1	207.4	265.7	18.2	73.8	1.8	12.1
2026	4.92	217.3	37.2	239.9	307.2	21.0	85.3	2.1	14.0
2027	5.64	249.8	42.7	277.4	347.1	24.0	97.6	2.4	16.0
2028	5.59	248.2	42.4	275.7	341.9	23.8	96.7	2.4	15.8
2029	5.59	248.2	42.4	275.5	342.3	23.8	96.8	2.4	15.9
2030	5.46	242.5	41.4	267.9	336.1	23.2	94.6	2.3	15.5
2031	5.46	242.3	41.4	268.0	335.7	23.2	94.5	2.3	15.5
2032	5.47	237.6	41.0	274.4	342.7	23.6	94.8	2.4	15.6
2033	5.48	238.4	41.0	267.0	348.9	23.6	95.0	2.4	15.7
2034	5.51	240.0	41.3	268.8	351.2	23.8	95.6	2.4	15.8
2035	5.09	221.5	38.1	247.0	326.2	22.0	88.3	2.2	14.6
2036	5.15	224.1	38.6	249.8	330.0	22.2	89.3	2.2	14.7
2037	4.75	206.7	35.6	231.1	303.1	20.5	82.3	2.0	13.6
2038	4.69	204.7	35.2	231.2	295.8	20.2	81.3	2.0	13.4

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2039	4.63	202.0	34.7	228.1	291.9	19.9	80.2	2.0	13.2
2040	4.57	201.0	34.6	234.2	277.0	19.6	79.2	2.0	13.0
2041	4.42	197.0	33.4	201.2	283.2	18.8	76.6	1.9	12.5
2042	4.35	196.1	33.1	203.7	268.6	18.3	75.3	1.8	12.3
2043	4.33	194.5	33.0	204.5	269.0	18.3	75.0	1.8	12.2
2044	4.34	190.2	32.6	210.7	274.6	18.6	75.2	1.9	12.4
2045	3.99	175.8	30.1	198.6	246.0	17.1	69.1	1.7	11.4
2046	3.88	171.6	29.3	185.0	244.9	16.6	67.3	1.7	11.0
2047	3.83	180.9	30.5	227.3	175.3	15.4	65.7	1.5	10.6
2048	0.77	37.6	6.2	39.5	38.2	3.0	13.2	0.3	2.1

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Table 4-17
Total criteria and hazardous air pollutant and precursor emissions from mining of coal from existing and new future federal leases and nonfederal leases in the CDPA under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2022	268.51	11,786	2,022	13,244	16,738	1,151	4,650	115	765
2023	262.76	11,567	1,980	12,744	16,498	1,124	4,552	112	748
2024	254.24	11,189	1,917	12,461	15,853	1,088	4,403	109	723
2025	181.20	7,995	1,367	8,824	11,305	774	3,138	77	515
2026	209.55	9,245	1,581	10,208	13,072	895	3,629	90	596
2027	239.97	10,630	1,816	11,805	14,769	1,022	4,154	102	681
2028	237.81	10,560	1,803	11,730	14,550	1,011	4,116	101	674
2029	237.89	10,562	1,803	11,725	14,568	1,011	4,117	101	675
2030	232.50	10,317	1,761	11,400	14,301	989	4,025	99	659
2031	232.37	10,311	1,760	11,406	14,284	988	4,022	99	659
2032	232.81	10,111	1,745	11,676	14,585	1,005	4,033	100	666

Year	Coal Production (million short tons per year)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	NOx (short tons)	CO (short tons)	VOC (short tons)	SO_2 (short tons)	HAPs (short tons)	DPM (short tons)
2033	233.11	10,146	1,746	11,363	14,848	1,005	4,041	101	666
2034	234.64	10,213	1,757	11,438	14,945	1,012	4,067	101	671
2035	216.81	9,427	1,622	10,511	13,882	936	3,759	94	620
2036	219.28	9,534	1,641	10,628	14,043	946	3,802	95	627
2037	202.12	8,794	1,513	9,833	12,897	872	3,504	87	578
2038	199.72	8,711	1,499	9,839	12,588	860	3,461	86	570
2039	197.06	8,595	1,479	9,708	12,420	848	3,414	85	563
2040	194.68	8,554	1,471	9,967	11,788	833	3,368	83	554
2041	187.96	8,384	1,421	8,562	12,051	798	3,258	80	532
2042	185.00	8,345	1,410	8,670	11,432	779	3,203	78	521
2043	184.43	8,275	1,402	8,701	11,447	779	3,193	78	521
2044	184.77	8,094	1,388	8,968	11,686	793	3,202	79	527
2045	169.87	7,482	1,282	8,451	10,466	726	2,941	73	483
2046	165.17	7,303	1,246	7,874	10,422	705	2,862	70	469
2047	162.98	7,699	1,297	9,674	7,461	657	2,794	66	449
2048	32.80	1,599	263	1,682	1,625	129	563	13	89

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; SO_2 = sulfur dioxide; HAPs = hazardous air pollutants; DPM = Diesel particulate matter

Alternative A. No Leasing

Projected federal, nonfederal, and total emissions of greenhouse gases from coal mining in the CDPA under Alternative A (No Leasing) are shown in **Table 4-18**, **Table 4-19**, and **Table 4-20**, respectively.

Table 4-18
Federal greenhouse gas emissions from mining of coal from existing federal leases under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	2,062,813	38,418	1,527	5,649,178	3,624,571
2023	256.58	2,018,636	37,595	1,494	5,528,194	3,546,946
2024	248.27	1,953,212	36,376	1,446	5,349,025	3,431,989

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2025	176.95	1,392,105	25,926	1,031	3,812,391	2,446,069
2026	204.63	1,609,877	29,982	1,192	4,408,777	2,828,717
2027	234.33	1,843,601	34,335	1,365	5,048,847	3,239,392
2028	232.22	1,827,000	34,026	1,353	5,003,384	3,210,222
2029	232.30	1,827,624	34,037	1,353	5,005,094	3,211,320
2030	227.03	1,786,171	33,265	1,322	4,891,571	3,138,482
2031	226.91	1,785,184	33,247	1,322	4,888,867	3,136,747
2032	227.34	1,788,575	33,310	1,324	4,898,154	3,142,706
2033	227.63	1,790,846	33,353	1,326	4,904,373	3,146,696
2034	229.13	1,802,647	33,572	1,335	4,936,693	3,167,433
2035	211.71	1,665,622	31,020	1,233	4,561,438	2,926,665
2036	214.13	1,684,619	31,374	1,247	4,613,463	2,960,045
2037	197.37	1,552,760	28,918	1,150	4,252,357	2,728,356
2038	195.03	1,534,367	28,576	1,136	4,201,986	2,696,037
2039	192.43	1,513,935	28,195	1,121	4,146,031	2,660,136
2040	190.10	1,495,594	27,854	1,107	4,095,803	2,627,909
2041	71.25	560,550	10,440	415	1,535,111	984,943
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-19
Nonfederal greenhouse gas emissions from mining activities under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	49,643	925	37	135,951	87,227
2023	6.17	48,580	905	36	133,039	85,359
2024	5.97	47,005	875	35	128,727	82,593
2025	4.26	33,502	624	25	91,747	58,866
2026	4.92	38,743	722	29	106,100	68,075
2027	5.64	44,367	826	33	121,503	77,958
2028	5.59	43,968	819	33	120,409	77,256
2029	5.59	43,983	819	33	120,450	77,282
2030	5.46	42,985	801	32	117,718	75,529
2031	5.46	42,961	800	32	117,653	75,488
2032	5.47	43,043	802	32	117,877	75,631
2033	5.48	43,098	803	32	118,026	75,727
2034	5.51	43,382	808	32	118,804	76,226
2035	5.09	40,084	747	30	109,773	70,432
2036	5.15	40,541	755	30	111,025	71,235
2037	4.75	37,368	696	28	102,335	65,659
2038	4.69	36,925	688	27	101,123	64,882
2039	4.63	36,434	679	27	99,776	64,018
2040	4.57	35,992	670	27	98,568	63,242
2041	1.71	13,490	251	10	36,943	23,703
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-20
Total greenhouse gas emissions from mining of coal from existing federal leases and nonfederal leases under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	2,112,456	39,342	1,564	5,785,129	3,711,798
2023	262.76	2,067,215	38,500	1,530	5,661,233	3,632,305
2024	254.24	2,000,217	37,252	1,481	5,477,752	3,514,582
2025	181.20	1,425,607	26,550	1,055	3,904,138	2,504,935
2026	209.55	1,648,620	30,704	1,221	4,514,877	2,896,791
2027	239.97	1,887,968	35,161	1,398	5,170,350	3,317,350
2028	237.81	1,870,968	34,845	1,385	5,123,793	3,287,478
2029	237.89	1,871,607	34,857	1,386	5,125,544	3,288,602
2030	232.50	1,829,156	34,066	1,354	5,009,290	3,214,011
2031	232.37	1,828,145	34,047	1,353	5,006,520	3,212,235
2032	232.81	1,831,618	34,112	1,356	5,016,031	3,218,337
2033	233.11	1,833,943	34,155	1,358	5,022,399	3,222,423
2034	234.64	1,846,029	34,380	1,367	5,055,497	3,243,659
2035	216.81	1,705,706	31,767	1,263	4,671,212	2,997,097
2036	219.28	1,725,160	32,129	1,277	4,724,488	3,031,280
2037	202.12	1,590,128	29,614	1,177	4,354,692	2,794,015
2038	199.72	1,571,292	29,264	1,163	4,303,109	2,760,919
2039	197.06	1,550,368	28,874	1,148	4,245,807	2,724,153
2040	194.68	1,531,586	28,524	1,134	4,194,371	2,691,151
2041	72.96	574,040	10,691	425	1,572,055	1,008,646
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Alternative B. No Action

Projected federal, nonfederal, and total emissions of greenhouse gases from coal mining in the CDPA under Alternative B (No Action) are shown in **Table 4-21**, **Table 4-22**, and **Table 4-23**, respectively.

Table 4-21
Federal greenhouse gas emissions from mining of coal from existing and future federal leases under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	2,062,813	38,418	1,527	5,649,178	3,624,571
2023	256.58	2,018,636	37,595	1,494	5,528,194	3,546,946
2024	248.27	1,953,212	36,376	1,446	5,349,025	3,431,989
2025	176.95	1,392,105	25,926	1,031	3,812,391	2,446,069
2026	204.63	1,609,877	29,982	1,192	4,408,777	2,828,717
2027	234.33	1,843,601	34,335	1,365	5,048,847	3,239,392
2028	232.22	1,827,000	34,026	1,353	5,003,384	3,210,222
2029	232.30	1,827,624	34,037	1,353	5,005,094	3,211,320
2030	227.03	1,786,171	33,265	1,322	4,891,571	3,138,482
2031	226.91	1,785,184	33,247	1,322	4,888,867	3,136,747
2032	227.34	1,788,575	33,310	1,324	4,898,154	3,142,706
2033	227.63	1,790,846	33,353	1,326	4,904,373	3,146,696
2034	229.13	1,802,647	33,572	1,335	4,936,693	3,167,433
2035	211.71	1,665,622	31,020	1,233	4,561,438	2,926,665
2036	214.13	1,684,619	31,374	1,247	4,613,463	2,960,045
2037	197.37	1,552,760	28,918	1,150	4,252,357	2,728,356
2038	195.03	1,534,367	28,576	1,136	4,201,986	2,696,037
2039	192.43	1,513,935	28,195	1,121	4,146,031	2,660,136
2040	190.10	1,495,594	27,854	1,107	4,095,803	2,627,909
2041	183.54	1,443,970	26,892	1,069	3,954,427	2,537,201
2042	180.65	1,421,229	26,469	1,052	3,892,148	2,497,242
2043	180.10	1,416,898	26,388	1,049	3,880,288	2,489,633
2044	180.43	1,419,492	26,436	1,051	3,887,392	2,494,191
2045	165.88	1,305,019	24,305	966	3,573,899	2,293,050
2046	161.28	1,268,889	23,632	939	3,474,953	2,229,565
2047	159.15	1,252,114	23,319	927	3,429,015	2,200,091

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2048	156.98	1,234,998	23,000	914	3,382,141	2,170,016

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-22
Nonfederal greenhouse gas emissions from mining activities under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	49,643	925	37	135,951	87,227
2023	6.17	48,580	905	36	133,039	85,359
2024	5.97	47,005	875	35	128,727	82,593
2025	4.26	33,502	624	25	91,747	58,866
2026	4.92	38,743	722	29	106,100	68,075
2027	5.64	44,367	826	33	121,503	77,958
2028	5.59	43,968	819	33	120,409	77,256
2029	5.59	43,983	819	33	120,450	77,282
2030	5.46	42,985	801	32	117,718	75,529
2031	5.46	42,961	800	32	117,653	75,488
2032	5.47	43,043	802	32	117,877	75,631
2033	5.48	43,098	803	32	118,026	75,727
2034	5.51	43,382	808	32	118,804	76,226
2035	5.09	40,084	747	30	109,773	70,432
2036	5.15	40,541	755	30	111,025	71,235
2037	4.75	37,368	696	28	102,335	65,659
2038	4.69	36,925	688	27	101,123	64,882
2039	4.63	36,434	679	27	99,776	64,018
2040	4.57	35,992	670	27	98,568	63,242
2041	4.42	34,750	647	26	95,165	61,059
2042	4.35	34,203	637	25	93,667	60,097
2043	4.33	34,098	635	25	93,381	59,914
2044	4.34	34,161	636	25	93,552	60,024
2045	3.99	31,406	585	23	86,008	55,183

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2046	3.88	30,536	569	23	83,627	53,656
2047	3.83	30,133	561	22	82,521	52,946
2048	3.78	29,721	554	22	81,393	52,223

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-23
Total greenhouse gas emissions from mining of coal from existing and future federal leases and nonfederal leases under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	2,112,456	39,342	1,564	5,785,129	3,711,798
2023	262.76	2,067,215	38,500	1,530	5,661,233	3,632,305
2024	254.24	2,000,217	37,252	1,481	5,477,752	3,514,582
2025	181.20	1,425,607	26,550	1,055	3,904,138	2,504,935
2026	209.55	1,648,620	30,704	1,221	4,514,877	2,896,791
2027	239.97	1,887,968	35,161	1,398	5,170,350	3,317,350
2028	237.81	1,870,968	34,845	1,385	5,123,793	3,287,478
2029	237.89	1,871,607	34,857	1,386	5,125,544	3,288,602
2030	232.50	1,829,156	34,066	1,354	5,009,290	3,214,011
2031	232.37	1,828,145	34,047	1,353	5,006,520	3,212,235
2032	232.81	1,831,618	34,112	1,356	5,016,031	3,218,337
2033	233.11	1,833,943	34,155	1,358	5,022,399	3,222,423
2034	234.64	1,846,029	34,380	1,367	5,055,497	3,243,659
2035	216.81	1,705,706	31,767	1,263	4,671,212	2,997,097
2036	219.28	1,725,160	32,129	1,277	4,724,488	3,031,280
2037	202.12	1,590,128	29,614	1,177	4,354,692	2,794,015
2038	199.72	1,571,292	29,264	1,163	4,303,109	2,760,919
2039	197.06	1,550,368	28,874	1,148	4,245,807	2,724,153
2040	194.68	1,531,586	28,524	1,134	4,194,371	2,691,151
2041	187.96	1,478,720	27,540	1,095	4,049,592	2,598,260
2042	185.00	1,455,432	27,106	1,077	3,985,815	2,557,340

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2043	184.43	1,450,997	27,023	1,074	3,973,669	2,549,547
2044	184.77	1,453,653	27,073	1,076	3,980,945	2,554,215
2045	169.87	1,336,425	24,889	989	3,659,906	2,348,233
2046	165.17	1,299,425	24,200	962	3,558,579	2,283,221
2047	162.98	1,282,247	23,880	949	3,511,536	2,253,037
2048	160.75	1,264,719	23,554	936	3,463,534	2,222,239

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Alternative C. Limited Leasing

Projected federal, nonfederal, and total emissions of greenhouse gases from coal mining in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-24**, **Table 4-25**, and **Table 4-26**, respectively.

Table 4-24
Federal greenhouse gas emissions from mining of coal from existing and future federal leases under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	2,062,813	38,418	1,527	5,649,178	3,624,571
2023	256.58	2,018,636	37,595	1,494	5,528,194	3,546,946
2024	248.27	1,953,212	36,376	1,446	5,349,025	3,431,989
2025	176.95	1,392,105	25,926	1,031	3,812,391	2,446,069
2026	204.63	1,609,877	29,982	1,192	4,408,777	2,828,717
2027	234.33	1,843,601	34,335	1,365	5,048,847	3,239,392
2028	232.22	1,827,000	34,026	1,353	5,003,384	3,210,222
2029	232.30	1,827,624	34,037	1,353	5,005,094	3,211,320
2030	227.03	1,786,171	33,265	1,322	4,891,571	3,138,482
2031	226.91	1,785,184	33,247	1,322	4,888,867	3,136,747
2032	227.34	1,788,575	33,310	1,324	4,898,154	3,142,706
2033	227.63	1,790,846	33,353	1,326	4,904,373	3,146,696
2034	229.13	1,802,647	33,572	1,335	4,936,693	3,167,433

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2035	211.71	1,665,622	31,020	1,233	4,561,438	2,926,665
2036	214.13	1,684,619	31,374	1,247	4,613,463	2,960,045
2037	197.37	1,552,760	28,918	1,150	4,252,357	2,728,356
2038	195.03	1,534,367	28,576	1,136	4,201,986	2,696,037
2039	192.43	1,513,935	28,195	1,121	4,146,031	2,660,136
2040	190.10	1,495,594	27,854	1,107	4,095,803	2,627,909
2041	183.54	1,443,970	26,892	1,069	3,954,427	2,537,201
2042	180.65	1,421,229	26,469	1,052	3,892,148	2,497,242
2043	180.10	1,416,898	26,388	1,049	3,880,288	2,489,633
2044	180.43	1,419,492	26,436	1,051	3,887,392	2,494,191
2045	165.88	1,305,019	24,305	966	3,573,899	2,293,050
2046	161.28	1,268,889	23,632	939	3,474,953	2,229,565
2047	159.15	1,252,114	23,319	927	3,429,015	2,200,091
2048	32.02	251,949	4,692	187	689,982	442,700

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-25
Nonfederal greenhouse gas emissions from mining activities under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	49,643	925	37	135,951	87,227
2023	6.17	48,580	905	36	133,039	85,359
2024	5.97	47,005	875	35	128,727	82,593
2025	4.26	33,502	624	25	91,747	58,866
2026	4.92	38,743	722	29	106,100	68,075
2027	5.64	44,367	826	33	121,503	77,958
2028	5.59	43,968	819	33	120,409	77,256
2029	5.59	43,983	819	33	120,450	77,282
2030	5.46	42,985	801	32	117,718	75,529
2031	5.46	42,961	800	32	117,653	75,488
2032	5.47	43,043	802	32	117,877	75,631

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2033	5.48	43,098	803	32	118,026	75,727
2034	5.51	43,382	808	32	118,804	76,226
2035	5.09	40,084	747	30	109,773	70,432
2036	5.15	40,541	755	30	111,025	71,235
2037	4.75	37,368	696	28	102,335	65,659
2038	4.69	36,925	688	27	101,123	64,882
2039	4.63	36,434	679	27	99,776	64,018
2040	4.57	35,992	670	27	98,568	63,242
2041	4.42	34,750	647	26	95,165	61,059
2042	4.35	34,203	637	25	93,667	60,097
2043	4.33	34,098	635	25	93,381	59,914
2044	4.34	34,161	636	25	93,552	60,024
2045	3.99	31,406	585	23	86,008	55,183
2046	3.88	30,536	569	23	83,627	53,656
2047	3.83	30,133	561	22	82,521	52,946
2048	0.77	6,063	113	4	16,605	10,654

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-26
Total greenhouse gas emissions from mining of coal from existing and future federal leases and nonfederal leases under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	2,112,456	39,342	1,564	5,785,129	3,711,798
2023	262.76	2,067,215	38,500	1,530	5,661,233	3,632,305
2024	254.24	2,000,217	37,252	1,481	5,477,752	3,514,582
2025	181.20	1,425,607	26,550	1,055	3,904,138	2,504,935
2026	209.55	1,648,620	30,704	1,221	4,514,877	2,896,791
2027	239.97	1,887,968	35,161	1,398	5,170,350	3,317,350
2028	237.81	1,870,968	34,845	1,385	5,123,793	3,287,478
2029	237.89	1,871,607	34,857	1,386	5,125,544	3,288,602

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2030	232.50	1,829,156	34,066	1,354	5,009,290	3,214,011
2031	232.37	1,828,145	34,047	1,353	5,006,520	3,212,235
2032	232.81	1,831,618	34,112	1,356	5,016,031	3,218,337
2033	233.11	1,833,943	34,155	1,358	5,022,399	3,222,423
2034	234.64	1,846,029	34,380	1,367	5,055,497	3,243,659
2035	216.81	1,705,706	31,767	1,263	4,671,212	2,997,097
2036	219.28	1,725,160	32,129	1,277	4,724,488	3,031,280
2037	202.12	1,590,128	29,614	1,177	4,354,692	2,794,015
2038	199.72	1,571,292	29,264	1,163	4,303,109	2,760,919
2039	197.06	1,550,368	28,874	1,148	4,245,807	2,724,153
2040	194.68	1,531,586	28,524	1,134	4,194,371	2,691,151
2041	187.96	1,478,720	27,540	1,095	4,049,592	2,598,260
2042	185.00	1,455,432	27,106	1,077	3,985,815	2,557,340
2043	184.43	1,450,997	27,023	1,074	3,973,669	2,549,547
2044	184.77	1,453,653	27,073	1,076	3,980,945	2,554,215
2045	169.87	1,336,425	24,889	989	3,659,906	2,348,233
2046	165.17	1,299,425	24,200	962	3,558,579	2,283,221
2047	162.98	1,282,247	23,880	949	3,511,536	2,253,037
2048	32.80	258,012	4,805	191	706,587	453,354

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

4.3.2 Transportation

Alternative A. No Leasing

Projected federal and nonfederal CAP and total HAP emissions from transportation of coal produced in the CDPA under Alternative A (No Leasing) are shown in **Table 4-27** and **Table 4-28**, respectively.

Table 4-27
2023-2048 federal CAP and total HAP emissions from the transportation of coal produced from existing federal leases in the CDPA for Alternative A (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	52,949.9	1,192.7	1,156.9	2,084.4	56.6	16,079.7	919.9
2024	48,189.9	1,037.4	1,006.2	1,883.2	54.8	15,558.5	830.7
2025	32,116.2	693.6	672.8	1,240.4	39.0	11,080.5	547.3
2026	34,718.2	754.1	731.5	1,377.2	45.1	12,814.1	607.5
2027	37,456.7	807.4	783.2	1,456.7	51.6	14,653.5	642.6
2028	34,865.3	742.7	720.4	1,322.8	51.1	14,509.5	583.7
2029	32,655.8	636.6	617.5	1,258.6	51.1	14,515.5	554.6
2030	29,724.2	566.8	549.7	1,169.4	50.0	14,189.1	515.0
2031	27,512.3	564.1	547.2	1,051.9	49.9	14,181.6	463.9
2032	26,050.4	513.1	497.7	999.7	50.4	14,305.6	440.6
2033	24,367.8	459.8	446.0	936.6	50.4	14,317.3	412.6
2034	22,813.3	406.5	394.3	878.4	50.8	14,411.7	386.7
2035	19,501.7	371.4	360.2	754.8	46.9	13,321.2	332.5
2036	18,603.6	325.1	315.3	703.2	47.4	13,473.1	309.6
2037	16,130.9	297.5	288.6	641.6	43.7	12,415.2	282.5
2038	14,966.8	247.8	240.4	585.1	43.2	12,257.5	257.3
2039	13,821.1	242.5	235.3	573.1	42.6	12,094.3	252.1
2040	13,130.3	194.3	188.4	515.5	42.0	11,914.8	226.5
2041	4,902.0	72.5	70.4	192.5	15.7	4,448.2	84.6
2042	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-
2045	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-
Total	**504,476.4**	**10,125.9**	**9,822.1**	**19,625.0**	**882.3**	**250,540.8**	**8649.9**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Table 4-28
2023-2048 nonfederal CAP and total HAP emissions from the transportation of coal produced in the CDPA for Alternative A (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	1,274.3	28.7	27.8	50.2	1.4	387.0	22.1
2024	1,159.7	25.0	24.2	45.3	1.3	374.4	20.0
2025	772.9	16.7	16.2	29.8	0.9	266.7	13.2
2026	835.5	18.1	17.6	33.1	1.1	308.4	14.6

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2027	901.4	19.4	18.8	35.1	1.2	352.6	15.5
2028	839.1	17.9	17.3	31.8	1.2	349.2	14.0
2029	785.9	15.3	14.9	30.3	1.2	349.3	13.3
2030	715.3	13.6	13.2	28.1	1.2	341.5	12.4
2031	662.1	13.6	13.2	25.3	1.2	341.3	11.2
2032	626.9	12.3	12.0	24.1	1.2	344.3	10.6
2033	586.4	11.1	10.7	22.5	1.2	344.6	9.9
2034	549.0	9.8	9.5	21.1	1.2	346.8	9.3
2035	469.3	8.9	8.7	18.2	1.1	320.6	8.0
2036	447.7	7.8	7.6	16.9	1.1	324.2	7.4
2037	388.2	7.2	6.9	15.4	1.1	298.8	6.8
2038	360.2	6.0	5.8	14.1	1.0	295.0	6.2
2039	332.6	5.8	5.7	13.8	1.0	291.1	6.1
2040	316.0	4.7	4.5	12.4	1.0	286.7	5.5
2041	118.0	1.7	1.7	4.6	0.4	107.0	2.0
2042	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-
2045	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-
Total	**12,140.5**	**243.7**	**236.4**	**472.3**	**21.2**	**6,029.4**	**208.2**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Projected federal HAP emissions from transportation of coal produced in the CDPA under Alternative A (No Leasing) are shown in **Table 4-29**, **Table 4-30** and **Table 4-31**.

Table 4-29
2023-2048 federal HAP emissions from the transportation of coal produced from existing federal leases in the CDPA for Alternative A (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	5.9E-03	1.1E-02	2.2E-03	1.2E-03	2.8E-04	8.2E-04	1.3E-03	3.8E-03	7.8E+03	3.0E+04	6.0E-03	1.8E-02	6.0E-04	1.6E+03	2.1E+03
2024	5.1E-03	9.8E-03	1.9E-03	1.0E-03	2.4E-04	7.1E-04	1.1E-03	3.3E-03	7.0E+03	2.7E+04	5.2E-03	1.5E-02	5.2E-04	1.4E+03	1.9E+03
2025	3.4E-03	6.6E-03	1.3E-03	6.7E-04	1.6E-04	4.8E-04	7.5E-04	2.2E-03	4.6E+03	1.8E+04	3.5E-03	1.0E-02	3.5E-04	9.4E+02	1.2E+03
2026	3.7E-03	7.1E-03	1.4E-03	7.3E-04	1.8E-04	5.2E-04	8.2E-04	2.4E-03	5.1E+03	2.0E+04	3.8E-03	1.1E-02	3.8E-04	1.0E+03	1.4E+03
2027	4.0E-03	7.6E-03	1.5E-03	7.8E-04	1.9E-04	5.5E-04	8.7E-04	2.5E-03	5.4E+03	2.1E+04	4.1E-03	1.2E-02	4.1E-04	1.1E+03	1.4E+03
2028	3.6E-03	7.0E-03	1.4E-03	7.1E-04	1.7E-04	5.1E-04	8.0E-04	2.3E-03	4.9E+03	1.9E+04	3.7E-03	1.1E-02	3.7E-04	1.0E+03	1.3E+03
2029	3.1E-03	6.0E-03	1.2E-03	6.1E-04	1.5E-04	4.4E-04	6.9E-04	2.0E-03	4.7E+03	1.8E+04	3.2E-03	9.3E-03	3.2E-04	9.5E+02	1.2E+03
2030	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	4.4E+03	1.7E+04	2.8E-03	8.3E-03	2.8E-04	8.9E+02	1.2E+03
2031	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	3.9E+03	1.5E+04	2.8E-03	8.3E-03	2.8E-04	8.0E+02	1.0E+03
2032	2.5E-03	4.8E-03	9.3E-04	4.9E-04	1.2E-04	3.5E-04	5.5E-04	1.6E-03	3.7E+03	1.4E+04	2.6E-03	7.5E-03	2.6E-04	7.6E+02	9.9E+02
2033	2.2E-03	4.3E-03	8.3E-04	4.4E-04	1.1E-04	3.1E-04	4.9E-04	1.4E-03	3.5E+03	1.3E+04	2.3E-03	6.7E-03	2.3E-04	7.1E+02	9.3E+02
2034	2.0E-03	3.8E-03	7.3E-04	3.9E-04	9.4E-05	2.8E-04	4.4E-04	1.3E-03	3.3E+03	1.3E+04	2.0E-03	5.9E-03	2.0E-04	6.7E+02	8.7E+02

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	1.8E-03	3.5E-03	6.7E-04	3.6E-04	8.7E-05	2.5E-04	4.0E-04	1.2E-03	2.8E+03	1.1E+04	1.9E-03	5.4E-03	1.9E-04	5.7E+02	7.5E+02
2036	1.6E-03	3.0E-03	5.9E-04	3.1E-04	7.6E-05	2.2E-04	3.5E-04	1.0E-03	2.6E+03	1.0E+04	1.6E-03	4.7E-03	1.6E-04	5.3E+02	7.0E+02
2037	1.4E-03	2.8E-03	5.4E-04	2.8E-04	6.9E-05	2.0E-04	3.2E-04	9.3E-04	2.4E+03	9.1E+03	1.5E-03	4.4E-03	1.5E-04	4.9E+02	6.4E+02
2038	1.2E-03	2.3E-03	4.5E-04	2.4E-04	5.7E-05	1.7E-04	2.7E-04	7.7E-04	2.2E+03	8.3E+03	1.2E-03	3.6E-03	1.2E-04	4.4E+02	5.8E+02
2039	1.2E-03	2.3E-03	4.4E-04	2.3E-04	5.6E-05	1.7E-04	2.6E-04	7.6E-04	2.1E+03	8.2E+03	1.2E-03	3.5E-03	1.2E-04	4.3E+02	5.7E+02
2040	9.4E-04	1.8E-03	3.5E-04	1.8E-04	4.5E-05	1.3E-04	2.1E-04	6.0E-04	1.9E+03	7.3E+03	9.6E-04	2.8E-03	9.6E-05	3.9E+02	5.1E+02
2041	3.5E-04	6.8E-04	1.3E-04	6.9E-05	1.7E-05	4.9E-05	7.7E-05	2.2E-04	7.2E+02	2.7E+03	3.6E-04	1.1E-03	3.6E-05	1.5E+02	1.9E+02
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**4.9E-02**	**9.6E-02**	**1.8E-02**	**9.7E-03**	**2.4E-03**	**6.9E-03**	**1.1E-02**	**3.2E-02**	**7.3E+04**	**2.8E+05**	**5.1E-02**	**1.5E-01**	**5.1E-03**	**1.5E+04**	**1.9E+04**

Table 4-30
2023-2048 federal HAP emissions from the transportation of coal produced from existing federal leases in the CDPA for Alternative A (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,I,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	3.3E+05	6.7E+04	2.3E+02	2.4E+03	2.0E+01	9.4E+04	4.9E+00	6.0E+00	8.6E+00	4.7E+00	1.2E+01	3.0E+01	2.2E+00	1.6E+04	2.5E+02
2024	2.9E+05	6.0E+04	2.0E+02	2.1E+03	1.8E+01	8.5E+04	4.3E+00	5.2E+00	7.4E+00	4.1E+00	1.0E+01	2.6E+01	1.9E+00	1.4E+04	2.2E+02
2025	1.9E+05	4.0E+04	1.3E+02	1.4E+03	1.2E+01	5.6E+04	2.9E+00	3.5E+00	5.0E+00	2.7E+00	6.7E+00	1.7E+01	1.3E+00	9.5E+03	1.4E+02
2026	2.2E+05	4.4E+04	1.4E+02	1.5E+03	1.3E+01	6.2E+04	3.1E+00	3.8E+00	5.4E+00	3.0E+00	7.3E+00	1.9E+01	1.4E+00	1.1E+04	1.6E+02
2027	2.3E+05	4.7E+04	1.5E+02	1.6E+03	1.4E+01	6.6E+04	3.3E+00	4.1E+00	5.8E+00	3.2E+00	7.8E+00	2.0E+01	1.5E+00	1.1E+04	1.7E+02
2028	2.1E+05	4.2E+04	1.4E+02	1.5E+03	1.3E+01	6.0E+04	3.1E+00	3.7E+00	5.3E+00	2.9E+00	7.2E+00	1.9E+01	1.4E+00	1.0E+04	1.5E+02
2029	2.0E+05	4.0E+04	1.2E+02	1.3E+03	1.1E+01	5.7E+04	2.6E+00	3.2E+00	4.6E+00	2.5E+00	6.1E+00	1.6E+01	1.2E+00	9.7E+03	1.3E+02
2030	1.8E+05	3.7E+04	1.1E+02	1.1E+03	9.7E+00	5.3E+04	2.3E+00	2.9E+00	4.1E+00	2.2E+00	5.5E+00	1.4E+01	1.1E+00	9.0E+03	1.2E+02
2031	1.6E+05	3.4E+04	1.1E+02	1.1E+03	9.6E+00	4.7E+04	2.3E+00	2.8E+00	4.1E+00	2.2E+00	5.4E+00	1.4E+01	1.1E+00	8.1E+03	1.2E+02
2032	1.6E+05	3.2E+04	9.9E+01	1.0E+03	8.7E+00	4.5E+04	2.1E+00	2.6E+00	3.7E+00	2.0E+00	5.0E+00	1.3E+01	9.6E-01	7.7E+03	1.1E+02
2033	1.5E+05	3.0E+04	8.9E+01	9.2E+02	7.8E+00	4.2E+04	1.9E+00	2.3E+00	3.3E+00	1.8E+00	4.4E+00	1.2E+01	8.6E-01	7.2E+03	9.6E+01
2034	1.4E+05	2.8E+04	7.9E+01	8.1E+02	6.9E+00	4.0E+04	1.7E+00	2.1E+00	2.9E+00	1.6E+00	3.9E+00	1.0E+01	7.6E-01	6.7E+03	8.5E+01
2035	1.2E+05	2.4E+04	7.1E+01	7.4E+02	6.3E+00	3.4E+04	1.5E+00	1.9E+00	2.7E+00	1.5E+00	3.6E+00	9.3E+00	6.9E-01	5.8E+03	7.7E+01
2036	1.1E+05	2.3E+04	6.3E+01	6.5E+02	5.6E+00	3.2E+04	1.3E+00	1.6E+00	2.4E+00	1.3E+00	3.1E+00	8.1E+00	6.1E-01	5.4E+03	6.8E+01
2037	1.0E+05	2.1E+04	5.7E+01	5.9E+02	5.1E+00	2.9E+04	1.2E+00	1.5E+00	2.1E+00	1.2E+00	2.9E+00	7.4E+00	5.6E-01	4.9E+03	6.2E+01
2038	9.2E+04	1.9E+04	4.8E+01	4.9E+02	4.2E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.8E-01	2.4E+00	6.2E+00	4.6E-01	4.5E+03	5.2E+01
2039	9.0E+04	1.8E+04	4.7E+01	4.8E+02	4.1E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.6E-01	2.3E+00	6.1E+00	4.5E-01	4.4E+03	5.1E+01
2040	8.1E+04	1.6E+04	3.8E+01	3.8E+02	3.3E+00	2.3E+04	8.0E-01	9.8E-01	1.4E+00	7.7E-01	1.9E+00	4.9E+00	3.6E-01	4.0E+03	4.1E+01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,I,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	3.0E+04	6.2E+03	1.4E+01	1.4E+02	1.2E+00	8.7E+03	3.0E-01	3.7E-01	5.3E-01	2.9E-01	6.9E-01	1.8E+00	1.4E-01	1.5E+03	1.5E+01
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**3.1E+06**	**6.3E+05**	**1.9E+03**	**2.0E+04**	**1.7E+02**	**8.8E+05**	**4.2E+01**	**5.1E+01**	**7.3E+01**	**4.0E+01**	**9.8E+01**	**2.5E+02**	**1.9E+01**	**1.5E+05**	**2.1E+03**

Table 4-31
2023-2048 federal HAP emissions from the transportation of coal produced from existing federal leases in the CDPA for Alternative A (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	2.1E+03	9.3E+05	1.2E+04	3.5E+00	5.2E+03	4.5E+00	1.1E+04	9.0E+03	5.0E-03	4.4E-02	4.5E+03	1.6E+05	3.4E+02	9.0E+04	6.9E+04
2024	1.8E+03	8.4E+05	1.1E+04	3.1E+00	4.5E+03	4.0E+00	1.0E+04	7.8E+03	4.4E-03	3.8E-02	3.9E+03	1.5E+05	2.9E+02	8.1E+04	6.2E+04
2025	1.2E+03	5.5E+05	6.9E+03	2.1E+00	3.0E+03	2.6E+00	6.8E+03	5.2E+03	2.9E-03	2.5E-02	2.6E+03	9.6E+04	2.0E+02	5.3E+04	4.1E+04
2026	1.3E+03	6.1E+05	7.7E+03	2.2E+00	3.3E+03	2.9E+00	7.5E+03	5.7E+03	3.2E-03	2.8E-02	2.9E+03	1.1E+05	2.1E+02	5.9E+04	4.5E+04
2027	1.4E+03	6.5E+05	8.1E+03	2.4E+00	3.5E+03	3.1E+00	8.0E+03	6.1E+03	3.4E-03	3.0E-02	3.1E+03	1.1E+05	2.3E+02	6.3E+04	4.8E+04
2028	1.3E+03	5.9E+05	7.4E+03	2.2E+00	3.2E+03	2.9E+00	7.2E+03	5.6E+03	3.1E-03	2.7E-02	2.8E+03	1.0E+05	2.1E+02	5.7E+04	4.3E+04
2029	1.1E+03	5.6E+05	7.0E+03	1.9E+00	2.7E+03	2.6E+00	6.9E+03	4.8E+03	2.7E-03	2.3E-02	2.4E+03	9.7E+04	1.8E+02	5.4E+04	4.1E+04
2030	1.0E+03	5.2E+05	6.5E+03	1.7E+00	2.4E+03	2.3E+00	6.4E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	9.0E+04	1.6E+02	5.0E+04	3.8E+04
2031	1.0E+03	4.7E+05	5.9E+03	1.7E+00	2.4E+03	2.3E+00	5.7E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	8.1E+04	1.6E+02	4.5E+04	3.5E+04
2032	9.1E+02	4.5E+05	5.6E+03	1.5E+00	2.2E+03	2.1E+00	5.5E+03	3.9E+03	2.1E-03	1.9E-02	2.0E+03	7.7E+04	1.5E+02	4.3E+04	3.3E+04
2033	8.2E+02	4.2E+05	5.2E+03	1.4E+00	2.0E+03	1.9E+00	5.1E+03	3.4E+03	1.9E-03	1.7E-02	1.8E+03	7.2E+04	1.3E+02	4.0E+04	3.1E+04
2034	7.3E+02	3.9E+05	4.9E+03	1.2E+00	1.7E+03	1.7E+00	4.8E+03	3.0E+03	1.7E-03	1.5E-02	1.6E+03	6.8E+04	1.2E+02	3.8E+04	2.9E+04
2035	6.6E+02	3.4E+05	4.2E+03	1.1E+00	1.6E+03	1.5E+00	4.1E+03	2.8E+03	1.6E-03	1.4E-02	1.4E+03	5.8E+04	1.1E+02	3.2E+04	2.5E+04
2036	5.8E+02	3.1E+05	3.9E+03	9.6E-01	1.4E+03	1.3E+00	3.8E+03	2.4E+03	1.4E-03	1.2E-02	1.3E+03	5.4E+04	9.3E+01	3.0E+04	2.3E+04
2037	5.3E+02	2.9E+05	3.6E+03	8.8E-01	1.3E+03	1.2E+00	3.5E+03	2.2E+03	1.2E-03	1.1E-02	1.1E+03	5.0E+04	8.5E+01	2.8E+04	2.1E+04
2038	4.4E+02	2.6E+05	3.3E+03	7.4E-01	1.1E+03	1.0E+00	3.2E+03	1.8E+03	1.0E-03	9.0E-03	9.6E+02	4.5E+04	7.1E+01	2.5E+04	1.9E+04
2039	4.3E+02	2.6E+05	3.2E+03	7.2E-01	1.0E+03	9.9E-01	3.1E+03	1.8E+03	1.0E-03	8.8E-03	9.3E+02	4.4E+04	6.9E+01	2.5E+04	1.9E+04

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	3.5E+02	2.3E+05	2.9E+03	5.8E-01	8.3E+02	8.3E-01	2.8E+03	1.4E+03	8.0E-04	7.0E-03	7.5E+02	4.0E+04	5.6E+01	2.2E+04	1.7E+04
2041	1.3E+02	8.6E+04	1.1E+03	2.2E-01	3.1E+02	3.1E-01	1.1E+03	5.4E+02	3.0E-04	2.6E-03	2.8E+02	1.5E+04	2.1E+01	8.3E+03	6.3E+03
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**1.8E+04**	**8.8E+06**	**1.1E+05**	**3.0E+01**	**4.4E+04**	**4.0E+01**	**1.1E+05**	**7.6E+04**	**4.2E-02**	**3.7E-01**	**3.9E+04**	**1.5E+06**	**2.9E+03**	**8.4E+05**	**6.5E+05**

Nonfederal HAP emissions from transportation of coal produced in the CDPA under Alternative A (No Leasing) are shown in **Table 4-32**, **Table 4-33** and **Table 4-34**.

Table 4-32
2023-2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative A (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	1.4E-04	2.7E-04	5.2E-05	2.8E-05	6.8E-06	2.0E-05	3.1E-05	9.1E-05	1.9E+02	7.1E+02	1.4E-04	4.2E-04	1.5E-05	3.8E+01	5.0E+01
2024	1.2E-04	2.4E-04	4.6E-05	2.4E-05	5.9E-06	1.7E-05	2.7E-05	7.9E-05	1.7E+02	6.5E+02	1.3E-04	3.7E-04	1.3E-05	3.4E+01	4.5E+01
2025	8.2E-05	1.6E-04	3.0E-05	1.6E-05	3.9E-06	1.2E-05	1.8E-05	5.3E-05	1.1E+02	4.3E+02	8.4E-05	2.5E-04	8.4E-06	2.3E+01	3.0E+01
2026	8.9E-05	1.7E-04	3.3E-05	1.7E-05	4.3E-06	1.2E-05	2.0E-05	5.7E-05	1.2E+02	4.7E+02	9.1E-05	2.7E-04	9.2E-06	2.5E+01	3.3E+01
2027	9.5E-05	1.8E-04	3.5E-05	1.9E-05	4.6E-06	1.3E-05	2.1E-05	6.1E-05	1.3E+02	5.0E+02	9.8E-05	2.9E-04	9.8E-06	2.7E+01	3.5E+01
2028	8.8E-05	1.7E-04	3.3E-05	1.7E-05	4.2E-06	1.2E-05	1.9E-05	5.6E-05	1.2E+02	4.5E+02	9.0E-05	2.6E-04	9.0E-06	2.4E+01	3.2E+01
2029	7.5E-05	1.4E-04	2.8E-05	1.5E-05	3.6E-06	1.0E-05	1.6E-05	4.8E-05	1.1E+02	4.3E+02	7.7E-05	2.2E-04	7.7E-06	2.3E+01	3.0E+01
2030	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.3E-05	1.0E+02	4.0E+02	6.8E-05	2.0E-04	6.8E-06	2.1E+01	2.8E+01
2031	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.2E-05	9.4E+01	3.6E+02	6.8E-05	2.0E-04	6.8E-06	1.9E+01	2.5E+01
2032	6.0E-05	1.2E-04	2.2E-05	1.2E-05	2.9E-06	8.4E-06	1.3E-05	3.9E-05	8.9E+01	3.4E+02	6.2E-05	1.8E-04	6.2E-06	1.8E+01	2.4E+01
2033	5.4E-05	1.0E-04	2.0E-05	1.1E-05	2.6E-06	7.5E-06	1.2E-05	3.4E-05	8.4E+01	3.2E+02	5.5E-05	1.6E-04	5.5E-06	1.7E+01	2.2E+01
2034	4.7E-05	9.2E-05	1.8E-05	9.3E-06	2.3E-06	6.7E-06	1.0E-05	3.0E-05	7.9E+01	3.0E+02	4.9E-05	1.4E-04	4.9E-06	1.6E+01	2.1E+01

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	4.4E-05	8.4E-05	1.6E-05	8.5E-06	2.1E-06	6.1E-06	9.6E-06	2.8E-05	6.8E+01	2.6E+02	4.5E-05	1.3E-04	4.5E-06	1.4E+01	1.8E+01
2036	3.8E-05	7.3E-05	1.4E-05	7.5E-06	1.8E-06	5.3E-06	8.4E-06	2.4E-05	6.3E+01	2.4E+02	3.9E-05	1.1E-04	3.9E-06	1.3E+01	1.7E+01
2037	3.5E-05	6.7E-05	1.3E-05	6.8E-06	1.7E-06	4.9E-06	7.7E-06	2.2E-05	5.7E+01	2.2E+02	3.6E-05	1.0E-04	3.6E-06	1.2E+01	1.5E+01
2038	2.9E-05	5.6E-05	1.1E-05	5.7E-06	1.4E-06	4.1E-06	6.4E-06	1.9E-05	5.2E+01	2.0E+02	3.0E-05	8.7E-05	3.0E-06	1.1E+01	1.4E+01
2039	2.8E-05	5.5E-05	1.1E-05	5.6E-06	1.4E-06	4.0E-06	6.3E-06	1.8E-05	5.1E+01	2.0E+02	2.9E-05	8.5E-05	2.9E-06	1.0E+01	1.4E+01
2040	2.3E-05	4.4E-05	8.4E-06	4.4E-06	1.1E-06	3.2E-06	5.0E-06	1.4E-05	4.6E+01	1.8E+02	2.3E-05	6.8E-05	2.3E-06	9.4E+00	1.2E+01
2041	8.4E-06	1.6E-05	3.1E-06	1.7E-06	4.0E-07	1.2E-06	1.9E-06	5.4E-06	1.7E+01	6.6E+01	8.6E-06	2.5E-05	8.7E-07	3.5E+00	4.6E+00
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**1.2E-03**	**2.3E-03**	**4.4E-04**	**2.3E-04**	**5.7E-05**	**1.7E-04**	**2.6E-04**	**7.6E-04**	**1.8E+03**	**6.7E+03**	**1.2E-03**	**3.6E-03**	**1.2E-04**	**3.6E+02**	**4.7E+02**

Table 4-33
2023-2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative A (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	7.9E+03	1.6E+03	5.5E+00	5.8E+01	4.9E-01	2.3E+03	1.2E-01	1.4E-01	2.1E-01	1.1E-01	2.8E-01	7.1E-01	5.4E-02	3.9E+02	5.9E+00
2024	7.1E+03	1.5E+03	4.8E+00	5.0E+01	4.2E-01	2.0E+03	1.0E-01	1.3E-01	1.8E-01	9.8E-02	2.4E-01	6.2E-01	4.7E-02	3.5E+02	5.2E+00
2025	4.7E+03	9.6E+02	3.2E+00	3.4E+01	2.8E-01	1.3E+03	6.9E-02	8.4E-02	1.2E-01	6.6E-02	1.6E-01	4.2E-01	3.1E-02	2.3E+02	3.5E+00
2026	5.2E+03	1.1E+03	3.5E+00	3.6E+01	3.1E-01	1.5E+03	7.5E-02	9.2E-02	1.3E-01	7.1E-02	1.8E-01	4.5E-01	3.4E-02	2.5E+02	3.8E+00
2027	5.5E+03	1.1E+03	3.7E+00	3.9E+01	3.3E-01	1.6E+03	8.0E-02	9.8E-02	1.4E-01	7.7E-02	1.9E-01	4.8E-01	3.6E-02	2.7E+02	4.0E+00
2028	5.0E+03	1.0E+03	3.4E+00	3.6E+01	3.0E-01	1.4E+03	7.4E-02	9.0E-02	1.3E-01	7.0E-02	1.7E-01	4.5E-01	3.3E-02	2.4E+02	3.7E+00
2029	4.7E+03	9.7E+02	2.9E+00	3.1E+01	2.6E-01	1.4E+03	6.3E-02	7.7E-02	1.1E-01	6.0E-02	1.5E-01	3.8E-01	2.9E-02	2.3E+02	3.2E+00
2030	4.4E+03	9.0E+02	2.6E+00	2.7E+01	2.3E-01	1.3E+03	5.6E-02	6.9E-02	9.8E-02	5.4E-02	1.3E-01	3.4E-01	2.6E-02	2.2E+02	2.8E+00
2031	4.0E+03	8.1E+02	2.6E+00	2.7E+01	2.3E-01	1.1E+03	5.6E-02	6.8E-02	9.8E-02	5.3E-02	1.3E-01	3.4E-01	2.5E-02	1.9E+02	2.8E+00
2032	3.8E+03	7.7E+02	2.4E+00	2.5E+01	2.1E-01	1.1E+03	5.1E-02	6.2E-02	8.9E-02	4.9E-02	1.2E-01	3.1E-01	2.3E-02	1.8E+02	2.6E+00
2033	3.5E+03	7.2E+02	2.1E+00	2.2E+01	1.9E-01	1.0E+03	4.6E-02	5.6E-02	8.0E-02	4.4E-02	1.1E-01	2.8E-01	2.1E-02	1.7E+02	2.3E+00
2034	3.3E+03	6.8E+02	1.9E+00	1.9E+01	1.7E-01	9.5E+02	4.0E-02	4.9E-02	7.1E-02	3.9E-02	9.4E-02	2.5E-01	1.8E-02	1.6E+02	2.1E+00
2035	2.8E+03	5.8E+02	1.7E+00	1.8E+01	1.5E-01	8.2E+02	3.7E-02	4.5E-02	6.4E-02	3.5E-02	8.6E-02	2.2E-01	1.7E-02	1.4E+02	1.9E+00
2036	2.7E+03	5.4E+02	1.5E+00	1.6E+01	1.3E-01	7.6E+02	3.2E-02	3.9E-02	5.7E-02	3.1E-02	7.5E-02	2.0E-01	1.5E-02	1.3E+02	1.6E+00
2037	2.4E+03	4.9E+02	1.4E+00	1.4E+01	1.2E-01	6.9E+02	3.0E-02	3.6E-02	5.2E-02	2.8E-02	6.9E-02	1.8E-01	1.3E-02	1.2E+02	1.5E+00
2038	2.2E+03	4.5E+02	1.2E+00	1.2E+01	1.0E-01	6.3E+02	2.5E-02	3.0E-02	4.3E-02	2.3E-02	5.7E-02	1.5E-01	1.1E-02	1.1E+02	1.3E+00
2039	2.2E+03	4.4E+02	1.1E+00	1.2E+01	1.0E-01	6.2E+02	2.4E-02	2.9E-02	4.2E-02	2.3E-02	5.6E-02	1.5E-01	1.1E-02	1.1E+02	1.2E+00
2040	1.9E+03	4.0E+02	9.1E-01	9.2E+00	8.0E-02	5.6E+02	1.9E-02	2.4E-02	3.4E-02	1.8E-02	4.5E-02	1.2E-01	8.7E-03	9.5E+01	9.8E-01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	7.3E+02	1.5E+02	3.4E-01	3.5E+00	3.0E-02	2.1E+02	7.2E-03	8.8E-03	1.3E-02	6.9E-03	1.7E-02	4.4E-02	3.3E-03	3.6E+01	3.7E-01
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**7.4E+04**	**1.5E+04**	**4.7E+01**	**4.9E+02**	**4.1E+00**	**2.1E+04**	**1.0E+00**	**1.2E+00**	**1.8E+00**	**9.6E-01**	**2.4E+00**	**6.1E+00**	**4.6E-01**	**3.6E+03**	**5.1E+01**

Table 4-34
2023–2048 Nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative A (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	5.1E+01	2.2E+04	2.8E+02	8.5E-02	1.2E+02	1.1E-01	2.7E+02	2.2E+02	1.2E-04	1.1E-03	1.1E+02	3.9E+03	8.1E+00	2.2E+03	1.6E+03
2024	4.4E+01	2.0E+04	2.5E+02	7.4E-02	1.1E+02	9.6E-02	2.5E+02	1.9E+02	1.1E-04	9.1E-04	9.5E+01	3.5E+03	7.0E+00	1.9E+03	1.5E+03
2025	2.9E+01	1.3E+04	1.7E+02	5.0E-02	7.2E+01	6.4E-02	1.6E+02	1.3E+02	7.0E-05	6.1E-04	6.3E+01	2.3E+03	4.7E+00	1.3E+03	9.8E+02
2026	3.2E+01	1.5E+04	1.8E+02	5.4E-02	7.8E+01	7.0E-02	1.8E+02	1.4E+02	7.6E-05	6.6E-04	6.9E+01	2.6E+03	5.1E+00	1.4E+03	1.1E+03
2027	3.4E+01	1.6E+04	2.0E+02	5.8E-02	8.4E+01	7.5E-02	1.9E+02	1.5E+02	8.2E-05	7.1E-04	7.4E+01	2.7E+03	5.5E+00	1.5E+03	1.2E+03
2028	3.2E+01	1.4E+04	1.8E+02	5.3E-02	7.7E+01	6.9E-02	1.7E+02	1.3E+02	7.5E-05	6.5E-04	6.8E+01	2.5E+03	5.1E+00	1.4E+03	1.0E+03
2029	2.7E+01	1.4E+04	1.7E+02	4.5E-02	6.6E+01	6.2E-02	1.7E+02	1.1E+02	6.4E-05	5.6E-04	5.9E+01	2.3E+03	4.4E+00	1.3E+03	1.0E+03
2030	2.4E+01	1.3E+04	1.6E+02	4.0E-02	5.8E+01	5.5E-02	1.5E+02	1.0E+02	5.7E-05	5.0E-04	5.2E+01	2.2E+03	3.9E+00	1.2E+03	9.3E+02
2031	2.4E+01	1.1E+04	1.4E+02	4.0E-02	5.8E+01	5.4E-02	1.4E+02	1.0E+02	5.7E-05	4.9E-04	5.2E+01	2.0E+03	3.9E+00	1.1E+03	8.3E+02
2032	2.2E+01	1.1E+04	1.3E+02	3.7E-02	5.3E+01	5.0E-02	1.3E+02	9.3E+01	5.2E-05	4.5E-04	4.7E+01	1.9E+03	3.5E+00	1.0E+03	7.9E+02
2033	2.0E+01	1.0E+04	1.3E+02	3.3E-02	4.7E+01	4.5E-02	1.2E+02	8.3E+01	4.6E-05	4.0E-04	4.3E+01	1.7E+03	3.2E+00	9.7E+02	7.4E+02
2034	1.7E+01	9.4E+03	1.2E+02	2.9E-02	4.2E+01	4.0E-02	1.2E+02	7.3E+01	4.1E-05	3.5E-04	3.8E+01	1.6E+03	2.8E+00	9.1E+02	7.0E+02
2035	1.6E+01	8.1E+03	1.0E+02	2.7E-02	3.8E+01	3.6E-02	9.9E+01	6.7E+01	3.7E-05	3.2E-04	3.4E+01	1.4E+03	2.5E+00	7.8E+02	6.0E+02
2036	1.4E+01	7.5E+03	9.4E+01	2.3E-02	3.3E+01	3.2E-02	9.2E+01	5.8E+01	3.3E-05	2.8E-04	3.0E+01	1.3E+03	2.2E+00	7.3E+02	5.6E+02
2037	1.3E+01	6.9E+03	8.6E+01	2.1E-02	3.1E+01	2.9E-02	8.4E+01	5.4E+01	3.0E-05	2.6E-04	2.7E+01	1.2E+03	2.0E+00	6.6E+02	5.1E+02
2038	1.1E+01	6.3E+03	7.9E+01	1.8E-02	2.5E+01	2.5E-02	7.7E+01	4.4E+01	2.5E-05	2.2E-04	2.3E+01	1.1E+03	1.7E+00	6.1E+02	4.6E+02
2039	1.0E+01	6.2E+03	7.7E+01	1.7E-02	2.5E+01	2.4E-02	7.5E+01	4.4E+01	2.4E-05	2.1E-04	2.2E+01	1.1E+03	1.7E+00	5.9E+02	4.5E+02

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	8.4E+00	5.5E+03	6.9E+01	1.4E-02	2.0E+01	2.0E-02	6.8E+01	3.5E+01	1.9E-05	1.7E-04	1.8E+01	9.6E+02	1.3E+00	5.3E+02	4.1E+02
2041	3.1E+00	2.1E+03	2.6E+01	5.2E-03	7.4E+00	7.4E-03	2.5E+01	1.3E+01	7.2E-06	6.3E-05	6.8E+00	3.6E+02	5.0E-01	2.0E+02	1.5E+02
2042	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2043	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2044	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2045	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2046	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2047	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2048	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total	**4.3E+02**	**2.1E+05**	**2.6E+03**	**7.2E-01**	**1.0E+03**	**9.6E-01**	**2.6E+03**	**1.8E+03**	**1.0E-03**	**8.9E-03**	**9.3E+02**	**3.6E+04**	**6.9E+01**	**2.0E+04**	**1.6E+04**

Projected federal, and nonfederal greenhouse gas emissions from transportation of coal produced in the CDPA under Alternative A (No Leasing) are shown in **Table 4-35** and **Table 4-36**, respectively.

Table 4-35
2023–2048 federal greenhouse gas emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative A (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	5,587,925.8	437.9	140.1	5,662,311.8	5,639,233.1
2024	5,406,785.3	423.7	135.6	5,478,759.9	5,456,429.4
2025	3,850,621.3	301.8	96.6	3,901,880.4	3,885,977.0
2026	4,453,067.1	349.0	111.7	4,512,346.0	4,493,954.4
2027	5,092,299.2	399.1	127.7	5,160,087.4	5,139,055.8
2028	5,042,245.8	395.2	126.5	5,109,367.8	5,088,542.8
2029	5,044,348.2	395.3	126.5	5,111,498.1	5,090,664.4
2030	4,930,919.1	386.4	123.7	4,996,559.1	4,976,193.9
2031	4,928,313.1	386.2	123.6	4,993,918.4	4,973,564.0
2032	4,971,402.6	389.6	124.7	5,037,581.5	5,017,049.1
2033	4,975,477.9	389.9	124.8	5,041,711.0	5,021,161.9
2034	5,008,266.5	392.5	125.6	5,074,936.1	5,054,251.5
2035	4,629,304.6	362.8	116.1	4,690,929.5	4,671,810.0
2036	4,682,079.8	366.9	117.4	4,744,407.3	4,725,069.8
2037	4,314,472.6	338.1	108.2	4,371,906.5	4,354,087.3
2038	4,259,656.7	333.8	106.8	4,316,360.9	4,298,768.1
2039	4,202,933.2	329.4	105.4	4,258,882.3	4,241,523.8
2040	4,140,546.5	324.5	103.8	4,195,665.1	4,178,564.3
2041	1,545,815.8	121.1	38.8	1,566,393.6	1,560,009.2
2042	-	-	-	-	-
2043	-	-	-	-	-
2044	-	-	-	-	-
2045	-	-	-	-	-
2046	-	-	-	-	-
2047	-	-	-	-	-
2048	-	-	-	-	-
Total	**87,066,481.0**	**6,823.4**	**2,183.5**	**88,225,502.4**	**87,865,909.6**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-36
2023–2048 nonfederal greenhouse gas emissions from the transportation of coal produced in the CDPA for Alternative A (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	134,476.5	10.5	3.4	136,266.6	135,711.2
2024	130,117.2	10.2	3.3	131,849.3	131,311.9
2025	92,667.3	7.3	2.3	93,900.9	93,518.1
2026	107,165.5	8.4	2.7	108,592.0	108,149.4
2027	122,548.9	9.6	3.1	124,180.3	123,674.2
2028	121,344.4	9.5	3.0	122,959.7	122,458.5

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2029	121,395.0	9.5	3.0	123,011.0	122,509.6
2030	118,665.2	9.3	3.0	120,244.9	119,754.8
2031	118,602.5	9.3	3.0	120,181.3	119,691.5
2032	119,639.5	9.4	3.0	121,232.1	120,738.0
2033	119,737.6	9.4	3.0	121,331.5	120,837.0
2034	120,526.6	9.4	3.0	122,131.1	121,633.3
2035	111,406.7	8.7	2.8	112,889.8	112,429.6
2036	112,676.8	8.8	2.8	114,176.7	113,711.4
2037	103,830.1	8.1	2.6	105,212.3	104,783.5
2038	102,510.9	8.0	2.6	103,875.6	103,452.2
2039	101,145.9	7.9	2.5	102,492.3	102,074.6
2040	99,644.5	7.8	2.5	100,970.9	100,559.4
2041	37,200.9	2.9	0.9	37,696.1	37,542.5
2042	-	-	-	-	-
2043	-	-	-	-	-
2044	-	-	-	-	-
2045	-	-	-	-	-
2046	-	-	-	-	-
2047	-	-	-	-	-
2048	-	-	-	-	-
Total	**2,095,301.9**	**164.2**	**52.5**	**2,123,194.4**	**2,114,540.6**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Alternative B. No Action

Projected federal and nonfederal CAP and total HAP emissions from transportation of coal produced in the CDPA under Alternative B (No Action) are shown in **Table 4-37** and **Table 4-38**, respectively.

Table 4-37
2023–2048 federal CAP and total HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative B (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	52,949.9	1,192.7	1,156.9	2,084.4	56.6	16,079.7	919.9
2024	48,189.9	1,037.4	1,006.2	1,883.2	54.8	15,558.5	830.7
2025	32,116.2	693.6	672.8	1,240.4	39.0	11,080.5	547.3
2026	34,718.2	754.1	731.5	1,377.2	45.1	12,814.1	607.5
2027	37,456.7	807.4	783.2	1,456.7	51.6	14,653.5	642.6
2028	34,865.3	742.7	720.4	1,322.8	51.1	14,509.5	583.7
2029	32,655.8	636.6	617.5	1,258.6	51.1	14,515.5	554.6
2030	29,724.2	566.8	549.7	1,169.4	50.0	14,189.1	515.0
2031	27,512.3	564.1	547.2	1,051.9	49.9	14,181.6	463.9
2032	26,050.4	513.1	497.7	999.7	50.4	14,305.6	440.6
2033	24,367.8	459.8	446.0	936.6	50.4	14,317.3	412.6
2034	22,813.3	406.5	394.3	878.4	50.8	14,411.7	386.7
2035	19,501.7	371.4	360.2	754.8	46.9	13,321.2	332.5
2036	18,603.6	325.1	315.3	703.2	47.4	13,473.1	309.6

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2037	16,130.9	297.5	288.6	641.6	43.7	12,415.2	282.5
2038	14,966.8	247.8	240.4	585.1	43.2	12,257.5	257.3
2039	13,821.1	242.5	235.3	573.1	42.6	12,094.3	252.1
2040	13,130.3	194.3	188.4	515.5	42.0	11,914.8	226.5
2041	12,627.5	186.8	181.2	495.8	40.4	11,458.5	217.8
2042	12,378.7	183.1	177.7	486.0	39.6	11,232.8	213.5
2043	12,362.9	182.9	177.4	485.4	39.5	11,218.4	213.2
2044	12,480.6	184.7	179.1	490.0	39.9	11,325.2	215.3
2045	11,451.1	169.4	164.3	449.6	36.6	10,391.0	197.5
2046	11,124.5	164.6	159.6	436.8	35.5	10,094.6	191.9
2047	10,707.1	158.4	153.7	420.4	34.2	9,715.9	184.7
2048	10,454.0	154.7	150.0	410.4	33.4	9,486.2	180.3
Total	**593,160.9**	**11,438.0**	**11,094.8**	**23,106.8**	**1,165.7**	**331,015.2**	**10179.7**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Table 4-38

2023–2048 nonfederal CAP and total HAP emissions from the transportation of coal produced in the CDPA for Alternative B (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	1,274.3	28.7	27.8	50.2	1.4	387.0	22.1
2024	1,159.7	25.0	24.2	45.3	1.3	374.4	20.0
2025	772.9	16.7	16.2	29.8	0.9	266.7	13.2
2026	835.5	18.1	17.6	33.1	1.1	308.4	14.6
2027	901.4	19.4	18.8	35.1	1.2	352.6	15.5
2028	839.1	17.9	17.3	31.8	1.2	349.2	14.0
2029	785.9	15.3	14.9	30.3	1.2	349.3	13.3
2030	715.3	13.6	13.2	28.1	1.2	341.5	12.4
2031	662.1	13.6	13.2	25.3	1.2	341.3	11.2
2032	626.9	12.3	12.0	24.1	1.2	344.3	10.6
2033	586.4	11.1	10.7	22.5	1.2	344.6	9.9
2034	549.0	9.8	9.5	21.1	1.2	346.8	9.3
2035	469.3	8.9	8.7	18.2	1.1	320.6	8.0
2036	447.7	7.8	7.6	16.9	1.1	324.2	7.4
2037	388.2	7.2	6.9	15.4	1.1	298.8	6.8
2038	360.2	6.0	5.8	14.1	1.0	295.0	6.2
2039	332.6	5.8	5.7	13.8	1.0	291.1	6.1
2040	316.0	4.7	4.5	12.4	1.0	286.7	5.5
2041	303.9	4.5	4.4	11.9	1.0	275.8	5.2
2042	297.9	4.4	4.3	11.7	1.0	270.3	5.1
2043	297.5	4.4	4.3	11.7	1.0	270.0	5.1
2044	300.4	4.4	4.3	11.8	1.0	272.5	5.2
2045	275.6	4.1	4.0	10.8	0.9	250.1	4.8
2046	267.7	4.0	3.8	10.5	0.9	242.9	4.6
2047	257.7	3.8	3.7	10.1	0.8	233.8	4.4
2048	251.6	3.7	3.6	9.9	0.8	228.3	4.3
Total	**14,274.7**	**275.3**	**267.0**	**556.1**	**28.1**	**7,966.1**	**245.0**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Projected federal HAP emissions from transportation of coal produced in the CDPA under Alternative B (No Action) are shown in **Table 4-39**, **Table 4-40** and **Table 4-41**.

Table 4-39
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative B (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	5.9E-03	1.1E-02	2.2E-03	1.2E-03	2.8E-04	8.2E-04	1.3E-03	3.8E-03	7.8E+03	3.0E+04	6.0E-03	1.8E-02	6.0E-04	1.6E+03	2.1E+03
2024	5.1E-03	9.8E-03	1.9E-03	1.0E-03	2.4E-04	7.1E-04	1.1E-03	3.3E-03	7.0E+03	2.7E+04	5.2E-03	1.5E-02	5.2E-04	1.4E+03	1.9E+03
2025	3.4E-03	6.6E-03	1.3E-03	6.7E-04	1.6E-04	4.8E-04	7.5E-04	2.2E-03	4.6E+03	1.8E+04	3.5E-03	1.0E-02	3.5E-04	9.4E+02	1.2E+03
2026	3.7E-03	7.1E-03	1.4E-03	7.3E-04	1.8E-04	5.2E-04	8.2E-04	2.4E-03	5.1E+03	2.0E+04	3.8E-03	1.1E-02	3.8E-04	1.0E+03	1.4E+03
2027	4.0E-03	7.6E-03	1.5E-03	7.8E-04	1.9E-04	5.5E-04	8.7E-04	2.5E-03	5.4E+03	2.1E+04	4.1E-03	1.2E-02	4.1E-04	1.1E+03	1.4E+03
2028	3.6E-03	7.0E-03	1.4E-03	7.1E-04	1.7E-04	5.1E-04	8.0E-04	2.3E-03	4.9E+03	1.9E+04	3.7E-03	1.1E-02	3.7E-04	1.0E+03	1.3E+03
2029	3.1E-03	6.0E-03	1.2E-03	6.1E-04	1.5E-04	4.4E-04	6.9E-04	2.0E-03	4.7E+03	1.8E+04	3.2E-03	9.3E-03	3.2E-04	9.5E+02	1.2E+03
2030	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	4.4E+03	1.7E+04	2.8E-03	8.3E-03	2.8E-04	8.9E+02	1.2E+03
2031	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	3.9E+03	1.5E+04	2.8E-03	8.3E-03	2.8E-04	8.0E+02	1.0E+03
2032	2.5E-03	4.8E-03	9.3E-04	4.9E-04	1.2E-04	3.5E-04	5.5E-04	1.6E-03	3.7E+03	1.4E+04	2.6E-03	7.5E-03	2.6E-04	7.6E+02	9.9E+02
2033	2.2E-03	4.3E-03	8.3E-04	4.4E-04	1.1E-04	3.1E-04	4.9E-04	1.4E-03	3.5E+03	1.3E+04	2.3E-03	6.7E-03	2.3E-04	7.1E+02	9.3E+02
2034	2.0E-03	3.8E-03	7.3E-04	3.9E-04	9.4E-05	2.8E-04	4.4E-04	1.3E-03	3.3E+03	1.3E+04	2.0E-03	5.9E-03	2.0E-04	6.7E+02	8.7E+02

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	1.8E-03	3.5E-03	6.7E-04	3.6E-04	8.7E-05	2.5E-04	4.0E-04	1.2E-03	2.8E+03	1.1E+04	1.9E-03	5.4E-03	1.9E-04	5.7E+02	7.5E+02
2036	1.6E-03	3.0E-03	5.9E-04	3.1E-04	7.6E-05	2.2E-04	3.5E-04	1.0E-03	2.6E+03	1.0E+04	1.6E-03	4.7E-03	1.6E-04	5.3E+02	7.0E+02
2037	1.4E-03	2.8E-03	5.4E-04	2.8E-04	6.9E-05	2.0E-04	3.2E-04	9.3E-04	2.4E+03	9.1E+03	1.5E-03	4.4E-03	1.5E-04	4.9E+02	6.4E+02
2038	1.2E-03	2.3E-03	4.5E-04	2.4E-04	5.7E-05	1.7E-04	2.7E-04	7.7E-04	2.2E+03	8.3E+03	1.2E-03	3.6E-03	1.2E-04	4.4E+02	5.8E+02
2039	1.2E-03	2.3E-03	4.4E-04	2.3E-04	5.6E-05	1.7E-04	2.6E-04	7.6E-04	2.1E+03	8.2E+03	1.2E-03	3.5E-03	1.2E-04	4.3E+02	5.7E+02
2040	9.4E-04	1.8E-03	3.5E-04	1.8E-04	4.5E-05	1.3E-04	2.1E-04	6.0E-04	1.9E+03	7.3E+03	9.6E-04	2.8E-03	9.6E-05	3.9E+02	5.1E+02
2041	9.0E-04	1.7E-03	3.4E-04	1.8E-04	4.3E-05	1.3E-04	2.0E-04	5.8E-04	1.8E+03	7.1E+03	9.2E-04	2.7E-03	9.3E-05	3.8E+02	4.9E+02
2042	8.8E-04	1.7E-03	3.3E-04	1.7E-04	4.2E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	6.9E+03	9.1E-04	2.7E-03	9.1E-05	3.7E+02	4.8E+02
2043	8.8E-04	1.7E-03	3.3E-04	1.7E-04	4.2E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	6.9E+03	9.1E-04	2.7E-03	9.1E-05	3.7E+02	4.8E+02
2044	8.9E-04	1.7E-03	3.3E-04	1.7E-04	4.3E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	7.0E+03	9.1E-04	2.7E-03	9.2E-05	3.7E+02	4.9E+02
2045	8.2E-04	1.6E-03	3.0E-04	1.6E-04	3.9E-05	1.1E-04	1.8E-04	5.2E-04	1.7E+03	6.4E+03	8.4E-04	2.5E-03	8.4E-05	3.4E+02	4.5E+02
2046	7.9E-04	1.5E-03	3.0E-04	1.6E-04	3.8E-05	1.1E-04	1.8E-04	5.1E-04	1.6E+03	6.2E+03	8.1E-04	2.4E-03	8.2E-05	3.3E+02	4.3E+02
2047	7.6E-04	1.5E-03	2.8E-04	1.5E-04	3.7E-05	1.1E-04	1.7E-04	4.9E-04	1.6E+03	6.0E+03	7.8E-04	2.3E-03	7.9E-05	3.2E+02	4.2E+02
2048	7.5E-04	1.4E-03	2.8E-04	1.5E-04	3.6E-05	1.0E-04	1.6E-04	4.8E-04	1.5E+03	5.8E+03	7.7E-04	2.2E-03	7.7E-05	3.1E+02	4.1E+02
Total	**5.6E-02**	**1.1E-01**	**2.1E-02**	**1.1E-02**	**2.7E-03**	**7.8E-03**	**1.2E-02**	**3.6E-02**	**8.6E+04**	**3.3E+05**	**5.7E-02**	**1.7E-01**	**5.7E-03**	**1.8E+04**	**2.3E+04**

Table 4-40
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative B (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	3.3E+05	6.7E+04	2.3E+02	2.4E+03	2.0E+01	9.4E+04	4.9E+00	6.0E+00	8.6E+00	4.7E+00	1.2E+01	3.0E+01	2.2E+00	1.6E+04	2.5E+02
2024	2.9E+05	6.0E+04	2.0E+02	2.1E+03	1.8E+01	8.5E+04	4.3E+00	5.2E+00	7.4E+00	4.1E+00	1.0E+01	2.6E+01	1.9E+00	1.4E+04	2.2E+02
2025	1.9E+05	4.0E+04	1.3E+02	1.4E+03	1.2E+01	5.6E+04	2.9E+00	3.5E+00	5.0E+00	2.7E+00	6.7E+00	1.7E+01	1.3E+00	9.5E+03	1.4E+02
2026	2.2E+05	4.4E+04	1.4E+02	1.5E+03	1.3E+01	6.2E+04	3.1E+00	3.8E+00	5.4E+00	3.0E+00	7.3E+00	1.9E+01	1.4E+00	1.1E+04	1.6E+02
2027	2.3E+05	4.7E+04	1.5E+02	1.6E+03	1.4E+01	6.6E+04	3.3E+00	4.1E+00	5.8E+00	3.2E+00	7.8E+00	2.0E+01	1.5E+00	1.1E+04	1.7E+02
2028	2.1E+05	4.2E+04	1.4E+02	1.5E+03	1.3E+01	6.0E+04	3.1E+00	3.7E+00	5.3E+00	2.9E+00	7.2E+00	1.9E+01	1.4E+00	1.0E+04	1.5E+02
2029	2.0E+05	4.0E+04	1.2E+02	1.3E+03	1.1E+01	5.7E+04	2.6E+00	3.2E+00	4.6E+00	2.5E+00	6.1E+00	1.6E+01	1.2E+00	9.7E+03	1.3E+02
2030	1.8E+05	3.7E+04	1.1E+02	1.1E+03	9.7E+00	5.3E+04	2.3E+00	2.9E+00	4.1E+00	2.2E+00	5.5E+00	1.4E+01	1.1E+00	9.0E+03	1.2E+02
2031	1.6E+05	3.4E+04	1.1E+02	1.1E+03	9.6E+00	4.7E+04	2.3E+00	2.8E+00	4.1E+00	2.2E+00	5.4E+00	1.4E+01	1.1E+00	8.1E+03	1.2E+02
2032	1.6E+05	3.2E+04	9.9E+01	1.0E+03	8.7E+00	4.5E+04	2.1E+00	2.6E+00	3.7E+00	2.0E+00	5.0E+00	1.3E+01	9.6E-01	7.7E+03	1.1E+02
2033	1.5E+05	3.0E+04	8.9E+01	9.2E+02	7.8E+00	4.2E+04	1.9E+00	2.3E+00	3.3E+00	1.8E+00	4.4E+00	1.2E+01	8.6E-01	7.2E+03	9.6E+01
2034	1.4E+05	2.8E+04	7.9E+01	8.1E+02	6.9E+00	4.0E+04	1.7E+00	2.1E+00	2.9E+00	1.6E+00	3.9E+00	1.0E+01	7.6E-01	6.7E+03	8.5E+01
2035	1.2E+05	2.4E+04	7.1E+01	7.4E+02	6.3E+00	3.4E+04	1.5E+00	1.9E+00	2.7E+00	1.5E+00	3.6E+00	9.3E+00	6.9E-01	5.8E+03	7.7E+01
2036	1.1E+05	2.3E+04	6.3E+01	6.5E+02	5.6E+00	3.2E+04	1.3E+00	1.6E+00	2.4E+00	1.3E+00	3.1E+00	8.1E+00	6.1E-01	5.4E+03	6.8E+01
2037	1.0E+05	2.1E+04	5.7E+01	5.9E+02	5.1E+00	2.9E+04	1.2E+00	1.5E+00	2.1E+00	1.2E+00	2.9E+00	7.4E+00	5.6E-01	4.9E+03	6.2E+01
2038	9.2E+04	1.9E+04	4.8E+01	4.9E+02	4.2E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.8E-01	2.4E+00	6.2E+00	4.6E-01	4.5E+03	5.2E+01
2039	9.0E+04	1.8E+04	4.7E+01	4.8E+02	4.1E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.6E-01	2.3E+00	6.1E+00	4.5E-01	4.4E+03	5.1E+01
2040	8.1E+04	1.6E+04	3.8E+01	3.8E+02	3.3E+00	2.3E+04	8.0E-01	9.8E-01	1.4E+00	7.7E-01	1.9E+00	4.9E+00	3.6E-01	4.0E+03	4.1E+01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	7.8E+04	1.6E+04	3.6E+01	3.7E+02	3.2E+00	2.2E+04	7.7E-01	9.4E-01	1.4E+00	7.4E-01	1.8E+00	4.7E+00	3.5E-01	3.8E+03	3.9E+01
2042	7.6E+04	1.6E+04	3.6E+01	3.6E+02	3.1E+00	2.2E+04	7.6E-01	9.2E-01	1.3E+00	7.2E-01	1.8E+00	4.6E+00	3.4E-01	3.7E+03	3.9E+01
2043	7.6E+04	1.6E+04	3.5E+01	3.6E+02	3.1E+00	2.2E+04	7.6E-01	9.2E-01	1.3E+00	7.2E-01	1.7E+00	4.6E+00	3.4E-01	3.7E+03	3.9E+01
2044	7.7E+04	1.6E+04	3.6E+01	3.7E+02	3.2E+00	2.2E+04	7.6E-01	9.3E-01	1.3E+00	7.3E-01	1.8E+00	4.6E+00	3.5E-01	3.8E+03	3.9E+01
2045	7.0E+04	1.4E+04	3.3E+01	3.4E+02	2.9E+00	2.0E+04	7.0E-01	8.5E-01	1.2E+00	6.7E-01	1.6E+00	4.3E+00	3.2E-01	3.5E+03	3.6E+01
2046	6.8E+04	1.4E+04	3.2E+01	3.3E+02	2.8E+00	2.0E+04	6.8E-01	8.3E-01	1.2E+00	6.5E-01	1.6E+00	4.1E+00	3.1E-01	3.4E+03	3.5E+01
2047	6.6E+04	1.3E+04	3.1E+01	3.1E+02	2.7E+00	1.9E+04	6.5E-01	8.0E-01	1.1E+00	6.2E-01	1.5E+00	4.0E+00	3.0E-01	3.2E+03	3.3E+01
2048	6.4E+04	1.3E+04	3.0E+01	3.1E+02	2.7E+00	1.8E+04	6.4E-01	7.8E-01	1.1E+00	6.1E-01	1.5E+00	3.9E+00	2.9E-01	3.2E+03	3.3E+01
Total	**3.6E+06**	**7.4E+05**	**2.2E+03**	**2.3E+04**	**1.9E+02**	**1.0E+06**	**4.7E+01**	**5.8E+01**	**8.2E+01**	**4.5E+01**	**1.1E+02**	**2.9E+02**	**2.1E+01**	**1.8E+05**	**2.4E+03**

Table 4-41
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative B (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	2.1E+03	9.3E+05	1.2E+04	3.5E+00	5.2E+03	4.5E+00	1.1E+04	9.0E+03	5.0E-03	4.4E-02	4.5E+03	1.6E+05	3.4E+02	9.0E+04	6.9E+04
2024	1.8E+03	8.4E+05	1.1E+04	3.1E+00	4.5E+03	4.0E+00	1.0E+04	7.8E+03	4.4E-03	3.8E-02	3.9E+03	1.5E+05	2.9E+02	8.1E+04	6.2E+04
2025	1.2E+03	5.5E+05	6.9E+03	2.1E+00	3.0E+03	2.6E+00	6.8E+03	5.2E+03	2.9E-03	2.5E-02	2.6E+03	9.6E+04	2.0E+02	5.3E+04	4.1E+04
2026	1.3E+03	6.1E+05	7.7E+03	2.2E+00	3.3E+03	2.9E+00	7.5E+03	5.7E+03	3.2E-03	2.8E-02	2.9E+03	1.1E+05	2.1E+02	5.9E+04	4.5E+04
2027	1.4E+03	6.5E+05	8.1E+03	2.4E+00	3.5E+03	3.1E+00	8.0E+03	6.1E+03	3.4E-03	3.0E-02	3.1E+03	1.1E+05	2.3E+02	6.3E+04	4.8E+04
2028	1.3E+03	5.9E+05	7.4E+03	2.2E+00	3.2E+03	2.9E+00	7.2E+03	5.6E+03	3.1E-03	2.7E-02	2.8E+03	1.0E+05	2.1E+02	5.7E+04	4.3E+04
2029	1.1E+03	5.6E+05	7.0E+03	1.9E+00	2.7E+03	2.6E+00	6.9E+03	4.8E+03	2.7E-03	2.3E-02	2.4E+03	9.7E+04	1.8E+02	5.4E+04	4.1E+04
2030	1.0E+03	5.2E+05	6.5E+03	1.7E+00	2.4E+03	2.3E+00	6.4E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	9.0E+04	1.6E+02	5.0E+04	3.8E+04
2031	1.0E+03	4.7E+05	5.9E+03	1.7E+00	2.4E+03	2.3E+00	5.7E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	8.1E+04	1.6E+02	4.5E+04	3.5E+04
2032	9.1E+02	4.5E+05	5.6E+03	1.5E+00	2.2E+03	2.1E+00	5.5E+03	3.9E+03	2.1E-03	1.9E-02	2.0E+03	7.7E+04	1.5E+02	4.3E+04	3.3E+04
2033	8.2E+02	4.2E+05	5.2E+03	1.4E+00	2.0E+03	1.9E+00	5.1E+03	3.4E+03	1.9E-03	1.7E-02	1.8E+03	7.2E+04	1.3E+02	4.0E+04	3.1E+04
2034	7.3E+02	3.9E+05	4.9E+03	1.2E+00	1.7E+03	1.7E+00	4.8E+03	3.0E+03	1.7E-03	1.5E-02	1.6E+03	6.8E+04	1.2E+02	3.8E+04	2.9E+04
2035	6.6E+02	3.4E+05	4.2E+03	1.1E+00	1.6E+03	1.5E+00	4.1E+03	2.8E+03	1.6E-03	1.4E-02	1.4E+03	5.8E+04	1.1E+02	3.2E+04	2.5E+04
2036	5.8E+02	3.1E+05	3.9E+03	9.6E-01	1.4E+03	1.3E+00	3.8E+03	2.4E+03	1.4E-03	1.2E-02	1.3E+03	5.4E+04	9.3E+01	3.0E+04	2.3E+04
2037	5.3E+02	2.9E+05	3.6E+03	8.8E-01	1.3E+03	1.2E+00	3.5E+03	2.2E+03	1.2E-03	1.1E-02	1.1E+03	5.0E+04	8.5E+01	2.8E+04	2.1E+04
2038	4.4E+02	2.6E+05	3.3E+03	7.4E-01	1.1E+03	1.0E+00	3.2E+03	1.8E+03	1.0E-03	9.0E-03	9.6E+02	4.5E+04	7.1E+01	2.5E+04	1.9E+04
2039	4.3E+02	2.6E+05	3.2E+03	7.2E-01	1.0E+03	9.9E-01	3.1E+03	1.8E+03	1.0E-03	8.8E-03	9.3E+02	4.4E+04	6.9E+01	2.5E+04	1.9E+04

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	3.5E+02	2.3E+05	2.9E+03	5.8E-01	8.3E+02	8.3E-01	2.8E+03	1.4E+03	8.0E-04	7.0E-03	7.5E+02	4.0E+04	5.6E+01	2.2E+04	1.7E+04
2041	3.4E+02	2.2E+05	2.8E+03	5.5E-01	7.9E+02	8.0E-01	2.7E+03	1.4E+03	7.7E-04	6.7E-03	7.2E+02	3.8E+04	5.4E+01	2.1E+04	1.6E+04
2042	3.3E+02	2.2E+05	2.7E+03	5.4E-01	7.8E+02	7.8E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.8E+04	5.2E+01	2.1E+04	1.6E+04
2043	3.3E+02	2.2E+05	2.7E+03	5.4E-01	7.8E+02	7.8E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.7E+04	5.2E+01	2.1E+04	1.6E+04
2044	3.3E+02	2.2E+05	2.7E+03	5.5E-01	7.8E+02	7.9E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.8E+04	5.3E+01	2.1E+04	1.6E+04
2045	3.0E+02	2.0E+05	2.5E+03	5.0E-01	7.2E+02	7.2E-01	2.5E+03	1.3E+03	7.0E-04	6.1E-03	6.6E+02	3.5E+04	4.9E+01	1.9E+04	1.5E+04
2046	3.0E+02	1.9E+05	2.4E+03	4.9E-01	7.0E+02	7.0E-01	2.4E+03	1.2E+03	6.8E-04	5.9E-03	6.4E+02	3.4E+04	4.7E+01	1.9E+04	1.4E+04
2047	2.8E+02	1.9E+05	2.3E+03	4.7E-01	6.7E+02	6.8E-01	2.3E+03	1.2E+03	6.6E-04	5.7E-03	6.1E+02	3.2E+04	4.5E+01	1.8E+04	1.4E+04
2048	2.8E+02	1.8E+05	2.3E+03	4.6E-01	6.6E+02	6.6E-01	2.2E+03	1.1E+03	6.4E-04	5.6E-03	6.0E+02	3.2E+04	4.4E+01	1.8E+04	1.3E+04
Total	**2.0E+04**	**1.0E+07**	**1.3E+05**	**3.4E+01**	**4.9E+04**	**4.6E+01**	**1.3E+05**	**8.6E+04**	**4.8E-02**	**4.2E-01**	**4.4E+04**	**1.8E+06**	**3.2E+03**	**9.9E+05**	**7.6E+05**

Nonfederal HAP emissions from transportation of coal produced in the CDPA under Alternative B (No Action) are shown in **Table 4-42**, **Table 4-43** and **Table 4-44**.

Table 4-42
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative B (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	1.4E-04	2.7E-04	5.2E-05	2.8E-05	6.8E-06	2.0E-05	3.1E-05	9.1E-05	1.9E+02	7.1E+02	1.4E-04	4.2E-04	1.5E-05	3.8E+01	5.0E+01
2024	1.2E-04	2.4E-04	4.6E-05	2.4E-05	5.9E-06	1.7E-05	2.7E-05	7.9E-05	1.7E+02	6.5E+02	1.3E-04	3.7E-04	1.3E-05	3.4E+01	4.5E+01
2025	8.2E-05	1.6E-04	3.0E-05	1.6E-05	3.9E-06	1.2E-05	1.8E-05	5.3E-05	1.1E+02	4.3E+02	8.4E-05	2.5E-04	8.4E-06	2.3E+01	3.0E+01
2026	8.9E-05	1.7E-04	3.3E-05	1.7E-05	4.3E-06	1.2E-05	2.0E-05	5.7E-05	1.2E+02	4.7E+02	9.1E-05	2.7E-04	9.2E-06	2.5E+01	3.3E+01
2027	9.5E-05	1.8E-04	3.5E-05	1.9E-05	4.6E-06	1.3E-05	2.1E-05	6.1E-05	1.3E+02	5.0E+02	9.8E-05	2.9E-04	9.8E-06	2.7E+01	3.5E+01
2028	8.8E-05	1.7E-04	3.3E-05	1.7E-05	4.2E-06	1.2E-05	1.9E-05	5.6E-05	1.2E+02	4.5E+02	9.0E-05	2.6E-04	9.0E-06	2.4E+01	3.2E+01
2029	7.5E-05	1.4E-04	2.8E-05	1.5E-05	3.6E-06	1.0E-05	1.6E-05	4.8E-05	1.1E+02	4.3E+02	7.7E-05	2.2E-04	7.7E-06	2.3E+01	3.0E+01
2030	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.3E-05	1.0E+02	4.0E+02	6.8E-05	2.0E-04	6.8E-06	2.1E+01	2.8E+01
2031	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.2E-05	9.4E+01	3.6E+02	6.8E-05	2.0E-04	6.8E-06	1.9E+01	2.5E+01
2032	6.0E-05	1.2E-04	2.2E-05	1.2E-05	2.9E-06	8.4E-06	1.3E-05	3.9E-05	8.9E+01	3.4E+02	6.2E-05	1.8E-04	6.2E-06	1.8E+01	2.4E+01
2033	5.4E-05	1.0E-04	2.0E-05	1.1E-05	2.6E-06	7.5E-06	1.2E-05	3.4E-05	8.4E+01	3.2E+02	5.5E-05	1.6E-04	5.5E-06	1.7E+01	2.2E+01
2034	4.7E-05	9.2E-05	1.8E-05	9.3E-06	2.3E-06	6.7E-06	1.0E-05	3.0E-05	7.9E+01	3.0E+02	4.9E-05	1.4E-04	4.9E-06	1.6E+01	2.1E+01

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	4.4E-05	8.4E-05	1.6E-05	8.5E-06	2.1E-06	6.1E-06	9.6E-06	2.8E-05	6.8E+01	2.6E+02	4.5E-05	1.3E-04	4.5E-06	1.4E+01	1.8E+01
2036	3.8E-05	7.3E-05	1.4E-05	7.5E-06	1.8E-06	5.3E-06	8.4E-06	2.4E-05	6.3E+01	2.4E+02	3.9E-05	1.1E-04	3.9E-06	1.3E+01	1.7E+01
2037	3.5E-05	6.7E-05	1.3E-05	6.8E-06	1.7E-06	4.9E-06	7.7E-06	2.2E-05	5.7E+01	2.2E+02	3.6E-05	1.0E-04	3.6E-06	1.2E+01	1.5E+01
2038	2.9E-05	5.6E-05	1.1E-05	5.7E-06	1.4E-06	4.1E-06	6.4E-06	1.9E-05	5.2E+01	2.0E+02	3.0E-05	8.7E-05	3.0E-06	1.1E+01	1.4E+01
2039	2.8E-05	5.5E-05	1.1E-05	5.6E-06	1.4E-06	4.0E-06	6.3E-06	1.8E-05	5.1E+01	2.0E+02	2.9E-05	8.5E-05	2.9E-06	1.0E+01	1.4E+01
2040	2.3E-05	4.4E-05	8.4E-06	4.4E-06	1.1E-06	3.2E-06	5.0E-06	1.4E-05	4.6E+01	1.8E+02	2.3E-05	6.8E-05	2.3E-06	9.4E+00	1.2E+01
2041	2.2E-05	4.2E-05	8.1E-06	4.3E-06	1.0E-06	3.0E-06	4.8E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.5E-05	2.2E-06	9.0E+00	1.2E+01
2042	2.1E-05	4.1E-05	7.9E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2043	2.1E-05	4.1E-05	7.9E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.3E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2044	2.1E-05	4.1E-05	8.0E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2045	2.0E-05	3.8E-05	7.3E-06	3.9E-06	9.4E-07	2.8E-06	4.3E-06	1.3E-05	4.0E+01	1.5E+02	2.0E-05	5.9E-05	2.0E-06	8.2E+00	1.1E+01
2046	1.9E-05	3.7E-05	7.1E-06	3.8E-06	9.1E-07	2.7E-06	4.2E-06	1.2E-05	3.9E+01	1.5E+02	2.0E-05	5.7E-05	2.0E-06	8.0E+00	1.0E+01
2047	1.8E-05	3.6E-05	6.8E-06	3.6E-06	8.8E-07	2.6E-06	4.1E-06	1.2E-05	3.8E+01	1.4E+02	1.9E-05	5.5E-05	1.9E-06	7.7E+00	1.0E+01
2048	1.8E-05	3.5E-05	6.7E-06	3.5E-06	8.6E-07	2.5E-06	4.0E-06	1.2E-05	3.7E+01	1.4E+02	1.8E-05	5.4E-05	1.8E-06	7.5E+00	9.8E+00
Total	**1.3E-03**	**2.6E-03**	**5.0E-04**	**2.6E-04**	**6.4E-05**	**1.9E-04**	**3.0E-04**	**8.6E-04**	**2.1E+03**	**7.9E+03**	**1.4E-03**	**4.0E-03**	**1.4E-04**	**4.2E+02**	**5.5E+02**

Table 4-43
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative B (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	7.9E+03	1.6E+03	5.5E+00	5.8E+01	4.9E-01	2.3E+03	1.2E-01	1.4E-01	2.1E-01	1.1E-01	2.8E-01	7.1E-01	5.4E-02	3.9E+02	5.9E+00
2024	7.1E+03	1.5E+03	4.8E+00	5.0E+01	4.2E-01	2.0E+03	1.0E-01	1.3E-01	1.8E-01	9.8E-02	2.4E-01	6.2E-01	4.7E-02	3.5E+02	5.2E+00
2025	4.7E+03	9.6E+02	3.2E+00	3.4E+01	2.8E-01	1.3E+03	6.9E-02	8.4E-02	1.2E-01	6.6E-02	1.6E-01	4.2E-01	3.1E-02	2.3E+02	3.5E+00
2026	5.2E+03	1.1E+03	3.5E+00	3.6E+01	3.1E-01	1.5E+03	7.5E-02	9.2E-02	1.3E-01	7.1E-02	1.8E-01	4.5E-01	3.4E-02	2.5E+02	3.8E+00
2027	5.5E+03	1.1E+03	3.7E+00	3.9E+01	3.3E-01	1.6E+03	8.0E-02	9.8E-02	1.4E-01	7.7E-02	1.9E-01	4.8E-01	3.6E-02	2.7E+02	4.0E+00
2028	5.0E+03	1.0E+03	3.4E+00	3.6E+01	3.0E-01	1.4E+03	7.4E-02	9.0E-02	1.3E-01	7.0E-02	1.7E-01	4.5E-01	3.3E-02	2.4E+02	3.7E+00
2029	4.7E+03	9.7E+02	2.9E+00	3.1E+01	2.6E-01	1.4E+03	6.3E-02	7.7E-02	1.1E-01	6.0E-02	1.5E-01	3.8E-01	2.9E-02	2.3E+02	3.2E+00
2030	4.4E+03	9.0E+02	2.6E+00	2.7E+01	2.3E-01	1.3E+03	5.6E-02	6.9E-02	9.8E-02	5.4E-02	1.3E-01	3.4E-01	2.6E-02	2.2E+02	2.8E+00
2031	4.0E+03	8.1E+02	2.6E+00	2.7E+01	2.3E-01	1.1E+03	5.6E-02	6.8E-02	9.8E-02	5.3E-02	1.3E-01	3.4E-01	2.5E-02	1.9E+02	2.8E+00
2032	3.8E+03	7.7E+02	2.4E+00	2.5E+01	2.1E-01	1.1E+03	5.1E-02	6.2E-02	8.9E-02	4.9E-02	1.2E-01	3.1E-01	2.3E-02	1.8E+02	2.6E+00
2033	3.5E+03	7.2E+02	2.1E+00	2.2E+01	1.9E-01	1.0E+03	4.6E-02	5.6E-02	8.0E-02	4.4E-02	1.1E-01	2.8E-01	2.1E-02	1.7E+02	2.3E+00
2034	3.3E+03	6.8E+02	1.9E+00	1.9E+01	1.7E-01	9.5E+02	4.0E-02	4.9E-02	7.1E-02	3.9E-02	9.4E-02	2.5E-01	1.8E-02	1.6E+02	2.1E+00
2035	2.8E+03	5.8E+02	1.7E+00	1.8E+01	1.5E-01	8.2E+02	3.7E-02	4.5E-02	6.4E-02	3.5E-02	8.6E-02	2.2E-01	1.7E-02	1.4E+02	1.9E+00
2036	2.7E+03	5.4E+02	1.5E+00	1.6E+01	1.3E-01	7.6E+02	3.2E-02	3.9E-02	5.7E-02	3.1E-02	7.5E-02	2.0E-01	1.5E-02	1.3E+02	1.6E+00
2037	2.4E+03	4.9E+02	1.4E+00	1.4E+01	1.2E-01	6.9E+02	3.0E-02	3.6E-02	5.2E-02	2.8E-02	6.9E-02	1.8E-01	1.3E-02	1.2E+02	1.5E+00
2038	2.2E+03	4.5E+02	1.2E+00	1.2E+01	1.0E-01	6.3E+02	2.5E-02	3.0E-02	4.3E-02	2.3E-02	5.7E-02	1.5E-01	1.1E-02	1.1E+02	1.3E+00
2039	2.2E+03	4.4E+02	1.1E+00	1.2E+01	1.0E-01	6.2E+02	2.4E-02	2.9E-02	4.2E-02	2.3E-02	5.6E-02	1.5E-01	1.1E-02	1.1E+02	1.2E+00
2040	1.9E+03	4.0E+02	9.1E-01	9.2E+00	8.0E-02	5.6E+02	1.9E-02	2.4E-02	3.4E-02	1.8E-02	4.5E-02	1.2E-01	8.7E-03	9.5E+01	9.8E-01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	1.9E+03	3.8E+02	8.7E-01	8.9E+00	7.7E-02	5.4E+02	1.9E-02	2.3E-02	3.3E-02	1.8E-02	4.3E-02	1.1E-01	8.4E-03	9.2E+01	9.5E-01
2042	1.8E+03	3.7E+02	8.6E-01	8.7E+00	7.6E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.7E-02	4.2E-02	1.1E-01	8.2E-03	9.0E+01	9.3E-01
2043	1.8E+03	3.7E+02	8.5E-01	8.7E+00	7.5E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.7E-02	4.2E-02	1.1E-01	8.2E-03	9.0E+01	9.3E-01
2044	1.8E+03	3.8E+02	8.6E-01	8.8E+00	7.6E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.8E-02	4.2E-02	1.1E-01	8.3E-03	9.1E+01	9.4E-01
2045	1.7E+03	3.5E+02	7.9E-01	8.1E+00	7.0E-02	4.9E+02	1.7E-02	2.1E-02	3.0E-02	1.6E-02	3.9E-02	1.0E-01	7.6E-03	8.3E+01	8.6E-01
2046	1.6E+03	3.4E+02	7.7E-01	7.8E+00	6.8E-02	4.7E+02	1.6E-02	2.0E-02	2.9E-02	1.6E-02	3.8E-02	1.0E-01	7.4E-03	8.1E+01	8.3E-01
2047	1.6E+03	3.2E+02	7.4E-01	7.5E+00	6.5E-02	4.6E+02	1.6E-02	1.9E-02	2.8E-02	1.5E-02	3.6E-02	9.6E-02	7.1E-03	7.8E+01	8.0E-01
2048	1.5E+03	3.2E+02	7.2E-01	7.4E+00	6.4E-02	4.4E+02	1.5E-02	1.9E-02	2.7E-02	1.5E-02	3.6E-02	9.4E-02	7.0E-03	7.6E+01	7.8E-01
Total	**8.7E+04**	**1.8E+04**	**5.3E+01**	**5.5E+02**	**4.7E+00**	**2.5E+04**	**1.1E+00**	**1.4E+00**	**2.0E+00**	**1.1E+00**	**2.7E+00**	**6.9E+00**	**5.1E-01**	**4.3E+03**	**5.7E+01**

Table 4-44
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative B (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	5.1E+01	2.2E+04	2.8E+02	8.5E-02	1.2E+02	1.1E-01	2.7E+02	2.2E+02	1.2E-04	1.1E-03	1.1E+02	3.9E+03	8.1E+00	2.2E+03	1.6E+03
2024	4.4E+01	2.0E+04	2.5E+02	7.4E-02	1.1E+02	9.6E-02	2.5E+02	1.9E+02	1.1E-04	9.1E-04	9.5E+01	3.5E+03	7.0E+00	1.9E+03	1.5E+03
2025	2.9E+01	1.3E+04	1.7E+02	5.0E-02	7.2E+01	6.4E-02	1.6E+02	1.3E+02	7.0E-05	6.1E-04	6.3E+01	2.3E+03	4.7E+00	1.3E+03	9.8E+02
2026	3.2E+01	1.5E+04	1.8E+02	5.4E-02	7.8E+01	7.0E-02	1.8E+02	1.4E+02	7.6E-05	6.6E-04	6.9E+01	2.6E+03	5.1E+00	1.4E+03	1.1E+03
2027	3.4E+01	1.6E+04	2.0E+02	5.8E-02	8.4E+01	7.5E-02	1.9E+02	1.5E+02	8.2E-05	7.1E-04	7.4E+01	2.7E+03	5.5E+00	1.5E+03	1.2E+03
2028	3.2E+01	1.4E+04	1.8E+02	5.3E-02	7.7E+01	6.9E-02	1.7E+02	1.3E+02	7.5E-05	6.5E-04	6.8E+01	2.5E+03	5.1E+00	1.4E+03	1.0E+03
2029	2.7E+01	1.4E+04	1.7E+02	4.5E-02	6.6E+01	6.2E-02	1.7E+02	1.1E+02	6.4E-05	5.6E-04	5.9E+01	2.3E+03	4.4E+00	1.3E+03	1.0E+03
2030	2.4E+01	1.3E+04	1.6E+02	4.0E-02	5.8E+01	5.5E-02	1.5E+02	1.0E+02	5.7E-05	5.0E-04	5.2E+01	2.2E+03	3.9E+00	1.2E+03	9.3E+02
2031	2.4E+01	1.1E+04	1.4E+02	4.0E-02	5.8E+01	5.4E-02	1.4E+02	1.0E+02	5.7E-05	4.9E-04	5.2E+01	2.0E+03	3.9E+00	1.1E+03	8.3E+02
2032	2.2E+01	1.1E+04	1.3E+02	3.7E-02	5.3E+01	5.0E-02	1.3E+02	9.3E+01	5.2E-05	4.5E-04	4.7E+01	1.9E+03	3.5E+00	1.0E+03	7.9E+02
2033	2.0E+01	1.0E+04	1.3E+02	3.3E-02	4.7E+01	4.5E-02	1.2E+02	8.3E+01	4.6E-05	4.0E-04	4.3E+01	1.7E+03	3.2E+00	9.7E+02	7.4E+02
2034	1.7E+01	9.4E+03	1.2E+02	2.9E-02	4.2E+01	4.0E-02	1.2E+02	7.3E+01	4.1E-05	3.5E-04	3.8E+01	1.6E+03	2.8E+00	9.1E+02	7.0E+02
2035	1.6E+01	8.1E+03	1.0E+02	2.7E-02	3.8E+01	3.6E-02	9.9E+01	6.7E+01	3.7E-05	3.2E-04	3.4E+01	1.4E+03	2.5E+00	7.8E+02	6.0E+02
2036	1.4E+01	7.5E+03	9.4E+01	2.3E-02	3.3E+01	3.2E-02	9.2E+01	5.8E+01	3.3E-05	2.8E-04	3.0E+01	1.3E+03	2.2E+00	7.3E+02	5.6E+02
2037	1.3E+01	6.9E+03	8.6E+01	2.1E-02	3.1E+01	2.9E-02	8.4E+01	5.4E+01	3.0E-05	2.6E-04	2.7E+01	1.2E+03	2.0E+00	6.6E+02	5.1E+02
2038	1.1E+01	6.3E+03	7.9E+01	1.8E-02	2.5E+01	2.5E-02	7.7E+01	4.4E+01	2.5E-05	2.2E-04	2.3E+01	1.1E+03	1.7E+00	6.1E+02	4.6E+02
2039	1.0E+01	6.2E+03	7.7E+01	1.7E-02	2.5E+01	2.4E-02	7.5E+01	4.4E+01	2.4E-05	2.1E-04	2.2E+01	1.1E+03	1.7E+00	5.9E+02	4.5E+02

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	8.4E+00	5.5E+03	6.9E+01	1.4E-02	2.0E+01	2.0E-02	6.8E+01	3.5E+01	1.9E-05	1.7E-04	1.8E+01	9.6E+02	1.3E+00	5.3E+02	4.1E+02
2041	8.1E+00	5.3E+03	6.7E+01	1.3E-02	1.9E+01	1.9E-02	6.5E+01	3.3E+01	1.9E-05	1.6E-04	1.7E+01	9.2E+02	1.3E+00	5.1E+02	3.9E+02
2042	7.9E+00	5.2E+03	6.5E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.0E+02	1.3E+00	5.0E+02	3.8E+02
2043	7.9E+00	5.2E+03	6.5E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.0E+02	1.3E+00	5.0E+02	3.8E+02
2044	8.0E+00	5.3E+03	6.6E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.1E+02	1.3E+00	5.1E+02	3.9E+02
2045	7.3E+00	4.8E+03	6.0E+01	1.2E-02	1.7E+01	1.7E-02	5.9E+01	3.0E+01	1.7E-05	1.5E-04	1.6E+01	8.4E+02	1.2E+00	4.7E+02	3.6E+02
2046	7.1E+00	4.7E+03	5.9E+01	1.2E-02	1.7E+01	1.7E-02	5.7E+01	2.9E+01	1.6E-05	1.4E-04	1.5E+01	8.1E+02	1.1E+00	4.5E+02	3.5E+02
2047	6.9E+00	4.5E+03	5.6E+01	1.1E-02	1.6E+01	1.6E-02	5.5E+01	2.8E+01	1.6E-05	1.4E-04	1.5E+01	7.8E+02	1.1E+00	4.4E+02	3.3E+02
2048	6.7E+00	4.4E+03	5.5E+01	1.1E-02	1.6E+01	1.6E-02	5.4E+01	2.8E+01	1.5E-05	1.3E-04	1.4E+01	7.6E+02	1.1E+00	4.2E+02	3.2E+02
Total	**4.9E+02**	**2.5E+05**	**3.1E+03**	**8.2E-01**	**1.2E+03**	**1.1E+00**	**3.0E+03**	**2.1E+03**	**1.2E-03**	**1.0E-02**	**1.1E+03**	**4.3E+04**	**7.8E+01**	**2.4E+04**	**1.8E+04**

Projected federal, and nonfederal greenhouse gas emissions from transportation of coal produced in the CDPA under Alternative B (No Action) are shown in **Table 4-45** and **Table 4-46**, respectively.

Table 4-45
2023–2048 federal greenhouse gas emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative B (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	5,587,925.8	437.9	140.1	5,662,311.8	5,639,233.1
2024	5,406,785.3	423.7	135.6	5,478,759.9	5,456,429.4
2025	3,850,621.3	301.8	96.6	3,901,880.4	3,885,977.0
2026	4,453,067.1	349.0	111.7	4,512,346.0	4,493,954.4
2027	5,092,299.2	399.1	127.7	5,160,087.4	5,139,055.8
2028	5,042,245.8	395.2	126.5	5,109,367.8	5,088,542.8
2029	5,044,348.2	395.3	126.5	5,111,498.1	5,090,664.4
2030	4,930,919.1	386.4	123.7	4,996,559.1	4,976,193.9
2031	4,928,313.1	386.2	123.6	4,993,918.4	4,973,564.0
2032	4,971,402.6	389.6	124.7	5,037,581.5	5,017,049.1
2033	4,975,477.9	389.9	124.8	5,041,711.0	5,021,161.9
2034	5,008,266.5	392.5	125.6	5,074,936.1	5,054,251.5
2035	4,629,304.6	362.8	116.1	4,690,929.5	4,671,810.0
2036	4,682,079.8	366.9	117.4	4,744,407.3	4,725,069.8
2037	4,314,472.6	338.1	108.2	4,371,906.5	4,354,087.3
2038	4,259,656.7	333.8	106.8	4,316,360.9	4,298,768.1
2039	4,202,933.2	329.4	105.4	4,258,882.3	4,241,523.8
2040	4,140,546.5	324.5	103.8	4,195,665.1	4,178,564.3
2041	3,982,001.2	312.1	99.9	4,035,009.2	4,018,563.2
2042	3,903,542.9	305.9	97.9	3,955,506.6	3,939,384.6
2043	3,898,538.3	305.5	97.8	3,950,435.3	3,934,334.0
2044	3,935,662.6	308.4	98.7	3,988,053.8	3,971,799.1
2045	3,611,024.5	283.0	90.6	3,659,094.1	3,644,180.2
2046	3,508,019.5	274.9	88.0	3,554,717.9	3,540,229.5
2047	3,376,413.7	264.6	84.7	3,421,360.2	3,407,415.3
2048	3,296,581.1	258.4	82.7	3,340,464.9	3,326,849.7
Total	**115,032,449.0**	**9,015.1**	**2,884.8**	**116,563,750.9**	**116,088,656.1**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-46
2023–2048 nonfederal greenhouse gas emissions from the transportation of coal produced in the CDPA for Alternative B (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	134,476.5	10.5	3.4	136,266.6	135,711.2
2024	130,117.2	10.2	3.3	131,849.3	131,311.9
2025	92,667.3	7.3	2.3	93,900.9	93,518.1
2026	107,165.5	8.4	2.7	108,592.0	108,149.4
2027	122,548.9	9.6	3.1	124,180.3	123,674.2
2028	121,344.4	9.5	3.0	122,959.7	122,458.5
2029	121,395.0	9.5	3.0	123,011.0	122,509.6

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2030	118,665.2	9.3	3.0	120,244.9	119,754.8
2031	118,602.5	9.3	3.0	120,181.3	119,691.5
2032	119,639.5	9.4	3.0	121,232.1	120,738.0
2033	119,737.6	9.4	3.0	121,331.5	120,837.0
2034	120,526.6	9.4	3.0	122,131.1	121,633.3
2035	111,406.7	8.7	2.8	112,889.8	112,429.6
2036	112,676.8	8.8	2.8	114,176.7	113,711.4
2037	103,830.1	8.1	2.6	105,212.3	104,783.5
2038	102,510.9	8.0	2.6	103,875.6	103,452.2
2039	101,145.9	7.9	2.5	102,492.3	102,074.6
2040	99,644.5	7.8	2.5	100,970.9	100,559.4
2041	95,829.0	7.5	2.4	97,104.7	96,708.9
2042	93,940.9	7.4	2.4	95,191.4	94,803.4
2043	93,820.4	7.4	2.4	95,069.4	94,681.9
2044	94,713.8	7.4	2.4	95,974.7	95,583.5
2045	86,901.3	6.8	2.2	88,058.1	87,699.2
2046	84,422.4	6.6	2.1	85,546.2	85,197.5
2047	81,255.2	6.4	2.0	82,336.9	82,001.3
2048	79,334.0	6.2	2.0	80,390.1	80,062.4
Total	**2,768,318.0**	**217.0**	**69.4**	**2,805,169.6**	**2,793,736.2**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Alternative C. Limited Leasing

Projected federal and nonfederal CAP and total HAP emissions from transportation of coal produced in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-47** and **Table 4-48**, respectively.

Table 4-47
2023–2048 federal CAP and total HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative C (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	52,949.9	1,192.7	1,156.9	2,084.4	56.6	16,079.7	919.9
2024	48,189.9	1,037.4	1,006.2	1,883.2	54.8	15,558.5	830.7
2025	32,116.2	693.6	672.8	1,240.4	39.0	11,080.5	547.3
2026	34,718.2	754.1	731.5	1,377.2	45.1	12,814.1	607.5
2027	37,456.7	807.4	783.2	1,456.7	51.6	14,653.5	642.6
2028	34,865.3	742.7	720.4	1,322.8	51.1	14,509.5	583.7
2029	32,655.8	636.6	617.5	1,258.6	51.1	14,515.5	554.6
2030	29,724.2	566.8	549.7	1,169.4	50.0	14,189.1	515.0
2031	27,512.3	564.1	547.2	1,051.9	49.9	14,181.6	463.9
2032	26,050.4	513.1	497.7	999.7	50.4	14,305.6	440.6
2033	24,367.8	459.8	446.0	936.6	50.4	14,317.3	412.6
2034	22,813.3	406.5	394.3	878.4	50.8	14,411.7	386.7
2035	19,501.7	371.4	360.2	754.8	46.9	13,321.2	332.5
2036	18,603.6	325.1	315.3	703.2	47.4	13,473.1	309.6
2037	16,130.9	297.5	288.6	641.6	43.7	12,415.2	282.5
2038	14,966.8	247.8	240.4	585.1	43.2	12,257.5	257.3
2039	13,821.1	242.5	235.3	573.1	42.6	12,094.3	252.1

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2040	13,130.3	194.3	188.4	515.5	42.0	11,914.8	226.5
2041	12,627.5	186.8	181.2	495.8	40.4	11,458.5	217.8
2042	12,378.7	183.1	177.7	486.0	39.6	11,232.8	213.5
2043	12,362.9	182.9	177.4	485.4	39.5	11,218.4	213.2
2044	12,480.6	184.7	179.1	490.0	39.9	11,325.2	215.3
2045	11,451.1	169.4	164.3	449.6	36.6	10,391.0	197.5
2046	11,124.5	164.6	159.6	436.8	35.5	10,094.6	191.9
2047	10,707.1	158.4	153.7	420.4	34.2	9,715.9	184.7
2048	2,132.7	31.6	30.6	83.7	6.8	1,935.3	36.8
Total	**584,839.6**	**11,314.9**	**10,975.4**	**22,780.1**	**1,139.1**	**323,464.2**	**10036.1**

Notes: NOx = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Table 4-48
2023–2048 nonfederal CAP and total HAP emissions from the transportation of coal produced in the CDPA for Alternative C (short tons)

Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	SO_2	CO	Total HAPs
2023	1,274.3	28.7	27.8	50.2	1.4	387.0	22.1
2024	1,159.7	25.0	24.2	45.3	1.3	374.4	20.0
2025	772.9	16.7	16.2	29.8	0.9	266.7	13.2
2026	835.5	18.1	17.6	33.1	1.1	308.4	14.6
2027	901.4	19.4	18.8	35.1	1.2	352.6	15.5
2028	839.1	17.9	17.3	31.8	1.2	349.2	14.0
2029	785.9	15.3	14.9	30.3	1.2	349.3	13.3
2030	715.3	13.6	13.2	28.1	1.2	341.5	12.4
2031	662.1	13.6	13.2	25.3	1.2	341.3	11.2
2032	626.9	12.3	12.0	24.1	1.2	344.3	10.6
2033	586.4	11.1	10.7	22.5	1.2	344.6	9.9
2034	549.0	9.8	9.5	21.1	1.2	346.8	9.3
2035	469.3	8.9	8.7	18.2	1.1	320.6	8.0
2036	447.7	7.8	7.6	16.9	1.1	324.2	7.4
2037	388.2	7.2	6.9	15.4	1.1	298.8	6.8
2038	360.2	6.0	5.8	14.1	1.0	295.0	6.2
2039	332.6	5.8	5.7	13.8	1.0	291.1	6.1
2040	316.0	4.7	4.5	12.4	1.0	286.7	5.5
2041	303.9	4.5	4.4	11.9	1.0	275.8	5.2
2042	297.9	4.4	4.3	11.7	1.0	270.3	5.1
2043	297.5	4.4	4.3	11.7	1.0	270.0	5.1
2044	300.4	4.4	4.3	11.8	1.0	272.5	5.2
2045	275.6	4.1	4.0	10.8	0.9	250.1	4.8
2046	267.7	4.0	3.8	10.5	0.9	242.9	4.6
2047	257.7	3.8	3.7	10.1	0.8	233.8	4.4
2048	51.3	0.8	0.7	2.0	0.2	46.6	0.9
Total	**14,074.5**	**272.3**	**264.1**	**548.2**	**27.4**	**7,784.3**	**241.5**

Notes: Nox = Nitrogen Oxides; PM10 = Particulate matter less than 10 microns; PM2.5 = Particulate matter less than 2.5 microns; VOC = Volatile Organic Compounds; SO2 = Sulfur Dioxide; CO = Carbon Monoxide.

Projected federal HAP emissions from transportation of coal produced in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-49**, **Table 4-50** and **Table 4-51**.

Table 4-49
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative C (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	5.9E-03	1.1E-02	2.2E-03	1.2E-03	2.8E-04	8.2E-04	1.3E-03	3.8E-03	7.8E+03	3.0E+04	6.0E-03	1.8E-02	6.0E-04	1.6E+03	2.1E+03
2024	5.1E-03	9.8E-03	1.9E-03	1.0E-03	2.4E-04	7.1E-04	1.1E-03	3.3E-03	7.0E+03	2.7E+04	5.2E-03	1.5E-02	5.2E-04	1.4E+03	1.9E+03
2025	3.4E-03	6.6E-03	1.3E-03	6.7E-04	1.6E-04	4.8E-04	7.5E-04	2.2E-03	4.6E+03	1.8E+04	3.5E-03	1.0E-02	3.5E-04	9.4E+02	1.2E+03
2026	3.7E-03	7.1E-03	1.4E-03	7.3E-04	1.8E-04	5.2E-04	8.2E-04	2.4E-03	5.1E+03	2.0E+04	3.8E-03	1.1E-02	3.8E-04	1.0E+03	1.4E+03
2027	4.0E-03	7.6E-03	1.5E-03	7.8E-04	1.9E-04	5.5E-04	8.7E-04	2.5E-03	5.4E+03	2.1E+04	4.1E-03	1.2E-02	4.1E-04	1.1E+03	1.4E+03
2028	3.6E-03	7.0E-03	1.4E-03	7.1E-04	1.7E-04	5.1E-04	8.0E-04	2.3E-03	4.9E+03	1.9E+04	3.7E-03	1.1E-02	3.7E-04	1.0E+03	1.3E+03
2029	3.1E-03	6.0E-03	1.2E-03	6.1E-04	1.5E-04	4.4E-04	6.9E-04	2.0E-03	4.7E+03	1.8E+04	3.2E-03	9.3E-03	3.2E-04	9.5E+02	1.2E+03
2030	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	4.4E+03	1.7E+04	2.8E-03	8.3E-03	2.8E-04	8.9E+02	1.2E+03
2031	2.8E-03	5.3E-03	1.0E-03	5.4E-04	1.3E-04	3.9E-04	6.1E-04	1.8E-03	3.9E+03	1.5E+04	2.8E-03	8.3E-03	2.8E-04	8.0E+02	1.0E+03
2032	2.5E-03	4.8E-03	9.3E-04	4.9E-04	1.2E-04	3.5E-04	5.5E-04	1.6E-03	3.7E+03	1.4E+04	2.6E-03	7.5E-03	2.6E-04	7.6E+02	9.9E+02
2033	2.2E-03	4.3E-03	8.3E-04	4.4E-04	1.1E-04	3.1E-04	4.9E-04	1.4E-03	3.5E+03	1.3E+04	2.3E-03	6.7E-03	2.3E-04	7.1E+02	9.3E+02
2034	2.0E-03	3.8E-03	7.3E-04	3.9E-04	9.4E-05	2.8E-04	4.4E-04	1.3E-03	3.3E+03	1.3E+04	2.0E-03	5.9E-03	2.0E-04	6.7E+02	8.7E+02

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	1.8E-03	3.5E-03	6.7E-04	3.6E-04	8.7E-05	2.5E-04	4.0E-04	1.2E-03	2.8E+03	1.1E+04	1.9E-03	5.4E-03	1.9E-04	5.7E+02	7.5E+02
2036	1.6E-03	3.0E-03	5.9E-04	3.1E-04	7.6E-05	2.2E-04	3.5E-04	1.0E-03	2.6E+03	1.0E+04	1.6E-03	4.7E-03	1.6E-04	5.3E+02	7.0E+02
2037	1.4E-03	2.8E-03	5.4E-04	2.8E-04	6.9E-05	2.0E-04	3.2E-04	9.3E-04	2.4E+03	9.1E+03	1.5E-03	4.4E-03	1.5E-04	4.9E+02	6.4E+02
2038	1.2E-03	2.3E-03	4.5E-04	2.4E-04	5.7E-05	1.7E-04	2.7E-04	7.7E-04	2.2E+03	8.3E+03	1.2E-03	3.6E-03	1.2E-04	4.4E+02	5.8E+02
2039	1.2E-03	2.3E-03	4.4E-04	2.3E-04	5.6E-05	1.7E-04	2.6E-04	7.6E-04	2.1E+03	8.2E+03	1.2E-03	3.5E-03	1.2E-04	4.3E+02	5.7E+02
2040	9.4E-04	1.8E-03	3.5E-04	1.8E-04	4.5E-05	1.3E-04	2.1E-04	6.0E-04	1.9E+03	7.3E+03	9.6E-04	2.8E-03	9.6E-05	3.9E+02	5.1E+02
2041	9.0E-04	1.7E-03	3.4E-04	1.8E-04	4.3E-05	1.3E-04	2.0E-04	5.8E-04	1.8E+03	7.1E+03	9.2E-04	2.7E-03	9.3E-05	3.8E+02	4.9E+02
2042	8.8E-04	1.7E-03	3.3E-04	1.7E-04	4.2E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	6.9E+03	9.1E-04	2.7E-03	9.1E-05	3.7E+02	4.8E+02
2043	8.8E-04	1.7E-03	3.3E-04	1.7E-04	4.2E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	6.9E+03	9.1E-04	2.7E-03	9.1E-05	3.7E+02	4.8E+02
2044	8.9E-04	1.7E-03	3.3E-04	1.7E-04	4.3E-05	1.2E-04	2.0E-04	5.7E-04	1.8E+03	7.0E+03	9.1E-04	2.7E-03	9.2E-05	3.7E+02	4.9E+02
2045	8.2E-04	1.6E-03	3.0E-04	1.6E-04	3.9E-05	1.1E-04	1.8E-04	5.2E-04	1.7E+03	6.4E+03	8.4E-04	2.5E-03	8.4E-05	3.4E+02	4.5E+02
2046	7.9E-04	1.5E-03	3.0E-04	1.6E-04	3.8E-05	1.1E-04	1.8E-04	5.1E-04	1.6E+03	6.2E+03	8.1E-04	2.4E-03	8.2E-05	3.3E+02	4.3E+02
2047	7.6E-04	1.5E-03	2.8E-04	1.5E-04	3.7E-05	1.1E-04	1.7E-04	4.9E-04	1.6E+03	6.0E+03	7.8E-04	2.3E-03	7.9E-05	3.2E+02	4.2E+02
2048	1.5E-04	2.9E-04	5.7E-05	3.0E-05	7.3E-06	2.1E-05	3.4E-05	9.8E-05	3.1E+02	1.2E+03	1.6E-04	4.6E-04	1.6E-05	6.3E+01	8.3E+01
Total	**5.5E-02**	**1.1E-01**	**2.1E-02**	**1.1E-02**	**2.6E-03**	**7.7E-03**	**1.2E-02**	**3.5E-02**	**8.5E+04**	**3.2E+05**	**5.7E-02**	**1.7E-01**	**5.7E-03**	**1.7E+04**	**2.3E+04**

Table 4-50
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative C (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	3.3E+05	6.7E+04	2.3E+02	2.4E+03	2.0E+01	9.4E+04	4.9E+00	6.0E+00	8.6E+00	4.7E+00	1.2E+01	3.0E+01	2.2E+00	1.6E+04	2.5E+02
2024	2.9E+05	6.0E+04	2.0E+02	2.1E+03	1.8E+01	8.5E+04	4.3E+00	5.2E+00	7.4E+00	4.1E+00	1.0E+01	2.6E+01	1.9E+00	1.4E+04	2.2E+02
2025	1.9E+05	4.0E+04	1.3E+02	1.4E+03	1.2E+01	5.6E+04	2.9E+00	3.5E+00	5.0E+00	2.7E+00	6.7E+00	1.7E+01	1.3E+00	9.5E+03	1.4E+02
2026	2.2E+05	4.4E+04	1.4E+02	1.5E+03	1.3E+01	6.2E+04	3.1E+00	3.8E+00	5.4E+00	3.0E+00	7.3E+00	1.9E+01	1.4E+00	1.1E+04	1.6E+02
2027	2.3E+05	4.7E+04	1.5E+02	1.6E+03	1.4E+01	6.6E+04	3.3E+00	4.1E+00	5.8E+00	3.2E+00	7.8E+00	2.0E+01	1.5E+00	1.1E+04	1.7E+02
2028	2.1E+05	4.2E+04	1.4E+02	1.5E+03	1.3E+01	6.0E+04	3.1E+00	3.7E+00	5.3E+00	2.9E+00	7.2E+00	1.9E+01	1.4E+00	1.0E+04	1.5E+02
2029	2.0E+05	4.0E+04	1.2E+02	1.3E+03	1.1E+01	5.7E+04	2.6E+00	3.2E+00	4.6E+00	2.5E+00	6.1E+00	1.6E+01	1.2E+00	9.7E+03	1.3E+02
2030	1.8E+05	3.7E+04	1.1E+02	1.1E+03	9.7E+00	5.3E+04	2.3E+00	2.9E+00	4.1E+00	2.2E+00	5.5E+00	1.4E+01	1.1E+00	9.0E+03	1.2E+02
2031	1.6E+05	3.4E+04	1.1E+02	1.1E+03	9.6E+00	4.7E+04	2.3E+00	2.8E+00	4.1E+00	2.2E+00	5.4E+00	1.4E+01	1.1E+00	8.1E+03	1.2E+02
2032	1.6E+05	3.2E+04	9.9E+01	1.0E+03	8.7E+00	4.5E+04	2.1E+00	2.6E+00	3.7E+00	2.0E+00	5.0E+00	1.3E+01	9.6E-01	7.7E+03	1.1E+02
2033	1.5E+05	3.0E+04	8.9E+01	9.2E+02	7.8E+00	4.2E+04	1.9E+00	2.3E+00	3.3E+00	1.8E+00	4.4E+00	1.2E+01	8.6E-01	7.2E+03	9.6E+01
2034	1.4E+05	2.8E+04	7.9E+01	8.1E+02	6.9E+00	4.0E+04	1.7E+00	2.1E+00	2.9E+00	1.6E+00	3.9E+00	1.0E+01	7.6E-01	6.7E+03	8.5E+01
2035	1.2E+05	2.4E+04	7.1E+01	7.4E+02	6.3E+00	3.4E+04	1.5E+00	1.9E+00	2.7E+00	1.5E+00	3.6E+00	9.3E+00	6.9E-01	5.8E+03	7.7E+01
2036	1.1E+05	2.3E+04	6.3E+01	6.5E+02	5.6E+00	3.2E+04	1.3E+00	1.6E+00	2.4E+00	1.3E+00	3.1E+00	8.1E+00	6.1E-01	5.4E+03	6.8E+01
2037	1.0E+05	2.1E+04	5.7E+01	5.9E+02	5.1E+00	2.9E+04	1.2E+00	1.5E+00	2.1E+00	1.2E+00	2.9E+00	7.4E+00	5.6E-01	4.9E+03	6.2E+01
2038	9.2E+04	1.9E+04	4.8E+01	4.9E+02	4.2E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.8E-01	2.4E+00	6.2E+00	4.6E-01	4.5E+03	5.2E+01
2039	9.0E+04	1.8E+04	4.7E+01	4.8E+02	4.1E+00	2.6E+04	1.0E+00	1.2E+00	1.8E+00	9.6E-01	2.3E+00	6.1E+00	4.5E-01	4.4E+03	5.1E+01
2040	8.1E+04	1.6E+04	3.8E+01	3.8E+02	3.3E+00	2.3E+04	8.0E-01	9.8E-01	1.4E+00	7.7E-01	1.9E+00	4.9E+00	3.6E-01	4.0E+03	4.1E+01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	7.8E+04	1.6E+04	3.6E+01	3.7E+02	3.2E+00	2.2E+04	7.7E-01	9.4E-01	1.4E+00	7.4E-01	1.8E+00	4.7E+00	3.5E-01	3.8E+03	3.9E+01
2042	7.6E+04	1.6E+04	3.6E+01	3.6E+02	3.1E+00	2.2E+04	7.6E-01	9.2E-01	1.3E+00	7.2E-01	1.8E+00	4.6E+00	3.4E-01	3.7E+03	3.9E+01
2043	7.6E+04	1.6E+04	3.5E+01	3.6E+02	3.1E+00	2.2E+04	7.6E-01	9.2E-01	1.3E+00	7.2E-01	1.7E+00	4.6E+00	3.4E-01	3.7E+03	3.9E+01
2044	7.7E+04	1.6E+04	3.6E+01	3.7E+02	3.2E+00	2.2E+04	7.6E-01	9.3E-01	1.3E+00	7.3E-01	1.8E+00	4.6E+00	3.5E-01	3.8E+03	3.9E+01
2045	7.0E+04	1.4E+04	3.3E+01	3.4E+02	2.9E+00	2.0E+04	7.0E-01	8.5E-01	1.2E+00	6.7E-01	1.6E+00	4.3E+00	3.2E-01	3.5E+03	3.6E+01
2046	6.8E+04	1.4E+04	3.2E+01	3.3E+02	2.8E+00	2.0E+04	6.8E-01	8.3E-01	1.2E+00	6.5E-01	1.6E+00	4.1E+00	3.1E-01	3.4E+03	3.5E+01
2047	6.6E+04	1.3E+04	3.1E+01	3.1E+02	2.7E+00	1.9E+04	6.5E-01	8.0E-01	1.1E+00	6.2E-01	1.5E+00	4.0E+00	3.0E-01	3.2E+03	3.3E+01
2048	1.3E+04	2.7E+03	6.1E+00	6.2E+01	5.4E-01	3.8E+03	1.3E-01	1.6E-01	2.3E-01	1.2E-01	3.0E-01	7.9E-01	5.9E-02	6.4E+02	6.6E+00
Total	**3.6E+06**	**7.3E+05**	**2.2E+03**	**2.3E+04**	**1.9E+02**	**1.0E+06**	**4.7E+01**	**5.7E+01**	**8.2E+01**	**4.5E+01**	**1.1E+02**	**2.8E+02**	**2.1E+01**	**1.7E+05**	**2.4E+03**

Table 4-51
2023–2048 federal HAP emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative C (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	2.1E+03	9.3E+05	1.2E+04	3.5E+00	5.2E+03	4.5E+00	1.1E+04	9.0E+03	5.0E-03	4.4E-02	4.5E+03	1.6E+05	3.4E+02	9.0E+04	6.9E+04
2024	1.8E+03	8.4E+05	1.1E+04	3.1E+00	4.5E+03	4.0E+00	1.0E+04	7.8E+03	4.4E-03	3.8E-02	3.9E+03	1.5E+05	2.9E+02	8.1E+04	6.2E+04
2025	1.2E+03	5.5E+05	6.9E+03	2.1E+00	3.0E+03	2.6E+00	6.8E+03	5.2E+03	2.9E-03	2.5E-02	2.6E+03	9.6E+04	2.0E+02	5.3E+04	4.1E+04
2026	1.3E+03	6.1E+05	7.7E+03	2.2E+00	3.3E+03	2.9E+00	7.5E+03	5.7E+03	3.2E-03	2.8E-02	2.9E+03	1.1E+05	2.1E+02	5.9E+04	4.5E+04
2027	1.4E+03	6.5E+05	8.1E+03	2.4E+00	3.5E+03	3.1E+00	8.0E+03	6.1E+03	3.4E-03	3.0E-02	3.1E+03	1.1E+05	2.3E+02	6.3E+04	4.8E+04
2028	1.3E+03	5.9E+05	7.4E+03	2.2E+00	3.2E+03	2.9E+00	7.2E+03	5.6E+03	3.1E-03	2.7E-02	2.8E+03	1.0E+05	2.1E+02	5.7E+04	4.3E+04
2029	1.1E+03	5.6E+05	7.0E+03	1.9E+00	2.7E+03	2.6E+00	6.9E+03	4.8E+03	2.7E-03	2.3E-02	2.4E+03	9.7E+04	1.8E+02	5.4E+04	4.1E+04
2030	1.0E+03	5.2E+05	6.5E+03	1.7E+00	2.4E+03	2.3E+00	6.4E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	9.0E+04	1.6E+02	5.0E+04	3.8E+04
2031	1.0E+03	4.7E+05	5.9E+03	1.7E+00	2.4E+03	2.3E+00	5.7E+03	4.2E+03	2.4E-03	2.1E-02	2.2E+03	8.1E+04	1.6E+02	4.5E+04	3.5E+04
2032	9.1E+02	4.5E+05	5.6E+03	1.5E+00	2.2E+03	2.1E+00	5.5E+03	3.9E+03	2.1E-03	1.9E-02	2.0E+03	7.7E+04	1.5E+02	4.3E+04	3.3E+04
2033	8.2E+02	4.2E+05	5.2E+03	1.4E+00	2.0E+03	1.9E+00	5.1E+03	3.4E+03	1.9E-03	1.7E-02	1.8E+03	7.2E+04	1.3E+02	4.0E+04	3.1E+04
2034	7.3E+02	3.9E+05	4.9E+03	1.2E+00	1.7E+03	1.7E+00	4.8E+03	3.0E+03	1.7E-03	1.5E-02	1.6E+03	6.8E+04	1.2E+02	3.8E+04	2.9E+04
2035	6.6E+02	3.4E+05	4.2E+03	1.1E+00	1.6E+03	1.5E+00	4.1E+03	2.8E+03	1.6E-03	1.4E-02	1.4E+03	5.8E+04	1.1E+02	3.2E+04	2.5E+04
2036	5.8E+02	3.1E+05	3.9E+03	9.6E-01	1.4E+03	1.3E+00	3.8E+03	2.4E+03	1.4E-03	1.2E-02	1.3E+03	5.4E+04	9.3E+01	3.0E+04	2.3E+04
2037	5.3E+02	2.9E+05	3.6E+03	8.8E-01	1.3E+03	1.2E+00	3.5E+03	2.2E+03	1.2E-03	1.1E-02	1.1E+03	5.0E+04	8.5E+01	2.8E+04	2.1E+04
2038	4.4E+02	2.6E+05	3.3E+03	7.4E-01	1.1E+03	1.0E+00	3.2E+03	1.8E+03	1.0E-03	9.0E-03	9.6E+02	4.5E+04	7.1E+01	2.5E+04	1.9E+04
2039	4.3E+02	2.6E+05	3.2E+03	7.2E-01	1.0E+03	9.9E-01	3.1E+03	1.8E+03	1.0E-03	8.8E-03	9.3E+02	4.4E+04	6.9E+01	2.5E+04	1.9E+04

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	3.5E+02	2.3E+05	2.9E+03	5.8E-01	8.3E+02	8.3E-01	2.8E+03	1.4E+03	8.0E-04	7.0E-03	7.5E+02	4.0E+04	5.6E+01	2.2E+04	1.7E+04
2041	3.4E+02	2.2E+05	2.8E+03	5.5E-01	7.9E+02	8.0E-01	2.7E+03	1.4E+03	7.7E-04	6.7E-03	7.2E+02	3.8E+04	5.4E+01	2.1E+04	1.6E+04
2042	3.3E+02	2.2E+05	2.7E+03	5.4E-01	7.8E+02	7.8E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.8E+04	5.2E+01	2.1E+04	1.6E+04
2043	3.3E+02	2.2E+05	2.7E+03	5.4E-01	7.8E+02	7.8E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.7E+04	5.2E+01	2.1E+04	1.6E+04
2044	3.3E+02	2.2E+05	2.7E+03	5.5E-01	7.8E+02	7.9E-01	2.7E+03	1.4E+03	7.6E-04	6.6E-03	7.1E+02	3.8E+04	5.3E+01	2.1E+04	1.6E+04
2045	3.0E+02	2.0E+05	2.5E+03	5.0E-01	7.2E+02	7.2E-01	2.5E+03	1.3E+03	7.0E-04	6.1E-03	6.6E+02	3.5E+04	4.9E+01	1.9E+04	1.5E+04
2046	3.0E+02	1.9E+05	2.4E+03	4.9E-01	7.0E+02	7.0E-01	2.4E+03	1.2E+03	6.8E-04	5.9E-03	6.4E+02	3.4E+04	4.7E+01	1.9E+04	1.4E+04
2047	2.8E+02	1.9E+05	2.3E+03	4.7E-01	6.7E+02	6.8E-01	2.3E+03	1.2E+03	6.6E-04	5.7E-03	6.1E+02	3.2E+04	4.5E+01	1.8E+04	1.4E+04
2048	5.7E+01	3.7E+04	4.7E+02	9.4E-02	1.3E+02	1.3E-01	4.6E+02	2.3E+02	1.3E-04	1.1E-03	1.2E+02	6.5E+03	9.0E+00	3.6E+03	2.8E+03
Total	**2.0E+04**	**1.0E+07**	**1.3E+05**	**3.4E+01**	**4.9E+04**	**4.5E+01**	**1.2E+05**	**8.5E+04**	**4.7E-02**	**4.1E-01**	**4.3E+04**	**1.8E+06**	**3.2E+03**	**9.8E+05**	**7.5E+05**

Nonfederal HAP emissions from transportation of coal produced in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-52**, **Table 4-53** and **Table 4-54**.

Table 4-52
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative C (pounds) – Part 1

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2023	1.4E-04	2.7E-04	5.2E-05	2.8E-05	6.8E-06	2.0E-05	3.1E-05	9.1E-05	1.9E+02	7.1E+02	1.4E-04	4.2E-04	1.5E-05	3.8E+01	5.0E+01
2024	1.2E-04	2.4E-04	4.6E-05	2.4E-05	5.9E-06	1.7E-05	2.7E-05	7.9E-05	1.7E+02	6.5E+02	1.3E-04	3.7E-04	1.3E-05	3.4E+01	4.5E+01
2025	8.2E-05	1.6E-04	3.0E-05	1.6E-05	3.9E-06	1.2E-05	1.8E-05	5.3E-05	1.1E+02	4.3E+02	8.4E-05	2.5E-04	8.4E-06	2.3E+01	3.0E+01
2026	8.9E-05	1.7E-04	3.3E-05	1.7E-05	4.3E-06	1.2E-05	2.0E-05	5.7E-05	1.2E+02	4.7E+02	9.1E-05	2.7E-04	9.2E-06	2.5E+01	3.3E+01
2027	9.5E-05	1.8E-04	3.5E-05	1.9E-05	4.6E-06	1.3E-05	2.1E-05	6.1E-05	1.3E+02	5.0E+02	9.8E-05	2.9E-04	9.8E-06	2.7E+01	3.5E+01
2028	8.8E-05	1.7E-04	3.3E-05	1.7E-05	4.2E-06	1.2E-05	1.9E-05	5.6E-05	1.2E+02	4.5E+02	9.0E-05	2.6E-04	9.0E-06	2.4E+01	3.2E+01
2029	7.5E-05	1.4E-04	2.8E-05	1.5E-05	3.6E-06	1.0E-05	1.6E-05	4.8E-05	1.1E+02	4.3E+02	7.7E-05	2.2E-04	7.7E-06	2.3E+01	3.0E+01
2030	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.3E-05	1.0E+02	4.0E+02	6.8E-05	2.0E-04	6.8E-06	2.1E+01	2.8E+01
2031	6.6E-05	1.3E-04	2.5E-05	1.3E-05	3.2E-06	9.3E-06	1.5E-05	4.2E-05	9.4E+01	3.6E+02	6.8E-05	2.0E-04	6.8E-06	1.9E+01	2.5E+01
2032	6.0E-05	1.2E-04	2.2E-05	1.2E-05	2.9E-06	8.4E-06	1.3E-05	3.9E-05	8.9E+01	3.4E+02	6.2E-05	1.8E-04	6.2E-06	1.8E+01	2.4E+01
2033	5.4E-05	1.0E-04	2.0E-05	1.1E-05	2.6E-06	7.5E-06	1.2E-05	3.4E-05	8.4E+01	3.2E+02	5.5E-05	1.6E-04	5.5E-06	1.7E+01	2.2E+01
2034	4.7E-05	9.2E-05	1.8E-05	9.3E-06	2.3E-06	6.7E-06	1.0E-05	3.0E-05	7.9E+01	3.0E+02	4.9E-05	1.4E-04	4.9E-06	1.6E+01	2.1E+01

Year	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1,2,3,7,8-Pentachlorodibenzofuran	1,3-Butadiene	2,2,4-Trimethylpentane	2,3,4,7,8-Pentachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Acenaphthene	Acenaphthylene
2035	4.4E-05	8.4E-05	1.6E-05	8.5E-06	2.1E-06	6.1E-06	9.6E-06	2.8E-05	6.8E+01	2.6E+02	4.5E-05	1.3E-04	4.5E-06	1.4E+01	1.8E+01
2036	3.8E-05	7.3E-05	1.4E-05	7.5E-06	1.8E-06	5.3E-06	8.4E-06	2.4E-05	6.3E+01	2.4E+02	3.9E-05	1.1E-04	3.9E-06	1.3E+01	1.7E+01
2037	3.5E-05	6.7E-05	1.3E-05	6.8E-06	1.7E-06	4.9E-06	7.7E-06	2.2E-05	5.7E+01	2.2E+02	3.6E-05	1.0E-04	3.6E-06	1.2E+01	1.5E+01
2038	2.9E-05	5.6E-05	1.1E-05	5.7E-06	1.4E-06	4.1E-06	6.4E-06	1.9E-05	5.2E+01	2.0E+02	3.0E-05	8.7E-05	3.0E-06	1.1E+01	1.4E+01
2039	2.8E-05	5.5E-05	1.1E-05	5.6E-06	1.4E-06	4.0E-06	6.3E-06	1.8E-05	5.1E+01	2.0E+02	2.9E-05	8.5E-05	2.9E-06	1.0E+01	1.4E+01
2040	2.3E-05	4.4E-05	8.4E-06	4.4E-06	1.1E-06	3.2E-06	5.0E-06	1.4E-05	4.6E+01	1.8E+02	2.3E-05	6.8E-05	2.3E-06	9.4E+00	1.2E+01
2041	2.2E-05	4.2E-05	8.1E-06	4.3E-06	1.0E-06	3.0E-06	4.8E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.5E-05	2.2E-06	9.0E+00	1.2E+01
2042	2.1E-05	4.1E-05	7.9E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2043	2.1E-05	4.1E-05	7.9E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.3E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2044	2.1E-05	4.1E-05	8.0E-06	4.2E-06	1.0E-06	3.0E-06	4.7E-06	1.4E-05	4.4E+01	1.7E+02	2.2E-05	6.4E-05	2.2E-06	8.9E+00	1.2E+01
2045	2.0E-05	3.8E-05	7.3E-06	3.9E-06	9.4E-07	2.8E-06	4.3E-06	1.3E-05	4.0E+01	1.5E+02	2.0E-05	5.9E-05	2.0E-06	8.2E+00	1.1E+01
2046	1.9E-05	3.7E-05	7.1E-06	3.8E-06	9.1E-07	2.7E-06	4.2E-06	1.2E-05	3.9E+01	1.5E+02	2.0E-05	5.7E-05	2.0E-06	8.0E+00	1.0E+01
2047	1.8E-05	3.6E-05	6.8E-06	3.6E-06	8.8E-07	2.6E-06	4.1E-06	1.2E-05	3.8E+01	1.4E+02	1.9E-05	5.5E-05	1.9E-06	7.7E+00	1.0E+01
2048	3.7E-06	7.1E-06	1.4E-06	7.2E-07	1.8E-07	5.1E-07	8.1E-07	2.4E-06	7.5E+00	2.9E+01	3.8E-06	1.1E-05	3.8E-07	1.5E+00	2.0E+00
Total	**1.3E-03**	**2.6E-03**	**4.9E-04**	**2.6E-04**	**6.4E-05**	**1.9E-04**	**2.9E-04**	**8.5E-04**	**2.0E+03**	**7.8E+03**	**1.4E-03**	**4.0E-03**	**1.4E-04**	**4.2E+02**	**5.4E+02**

Table 4-53
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative C (pounds) – Part 2

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2023	7.9E+03	1.6E+03	5.5E+00	5.8E+01	4.9E-01	2.3E+03	1.2E-01	1.4E-01	2.1E-01	1.1E-01	2.8E-01	7.1E-01	5.4E-02	3.9E+02	5.9E+00
2024	7.1E+03	1.5E+03	4.8E+00	5.0E+01	4.2E-01	2.0E+03	1.0E-01	1.3E-01	1.8E-01	9.8E-02	2.4E-01	6.2E-01	4.7E-02	3.5E+02	5.2E+00
2025	4.7E+03	9.6E+02	3.2E+00	3.4E+01	2.8E-01	1.3E+03	6.9E-02	8.4E-02	1.2E-01	6.6E-02	1.6E-01	4.2E-01	3.1E-02	2.3E+02	3.5E+00
2026	5.2E+03	1.1E+03	3.5E+00	3.6E+01	3.1E-01	1.5E+03	7.5E-02	9.2E-02	1.3E-01	7.1E-02	1.8E-01	4.5E-01	3.4E-02	2.5E+02	3.8E+00
2027	5.5E+03	1.1E+03	3.7E+00	3.9E+01	3.3E-01	1.6E+03	8.0E-02	9.8E-02	1.4E-01	7.7E-02	1.9E-01	4.8E-01	3.6E-02	2.7E+02	4.0E+00
2028	5.0E+03	1.0E+03	3.4E+00	3.6E+01	3.0E-01	1.4E+03	7.4E-02	9.0E-02	1.3E-01	7.0E-02	1.7E-01	4.5E-01	3.3E-02	2.4E+02	3.7E+00
2029	4.7E+03	9.7E+02	2.9E+00	3.1E+01	2.6E-01	1.4E+03	6.3E-02	7.7E-02	1.1E-01	6.0E-02	1.5E-01	3.8E-01	2.9E-02	2.3E+02	3.2E+00
2030	4.4E+03	9.0E+02	2.6E+00	2.7E+01	2.3E-01	1.3E+03	5.6E-02	6.9E-02	9.8E-02	5.4E-02	1.3E-01	3.4E-01	2.6E-02	2.2E+02	2.8E+00
2031	4.0E+03	8.1E+02	2.6E+00	2.7E+01	2.3E-01	1.1E+03	5.6E-02	6.8E-02	9.8E-02	5.3E-02	1.3E-01	3.4E-01	2.5E-02	1.9E+02	2.8E+00
2032	3.8E+03	7.7E+02	2.4E+00	2.5E+01	2.1E-01	1.1E+03	5.1E-02	6.2E-02	8.9E-02	4.9E-02	1.2E-01	3.1E-01	2.3E-02	1.8E+02	2.6E+00
2033	3.5E+03	7.2E+02	2.1E+00	2.2E+01	1.9E-01	1.0E+03	4.6E-02	5.6E-02	8.0E-02	4.4E-02	1.1E-01	2.8E-01	2.1E-02	1.7E+02	2.3E+00
2034	3.3E+03	6.8E+02	1.9E+00	1.9E+01	1.7E-01	9.5E+02	4.0E-02	4.9E-02	7.1E-02	3.9E-02	9.4E-02	2.5E-01	1.8E-02	1.6E+02	2.1E+00
2035	2.8E+03	5.8E+02	1.7E+00	1.8E+01	1.5E-01	8.2E+02	3.7E-02	4.5E-02	6.4E-02	3.5E-02	8.6E-02	2.2E-01	1.7E-02	1.4E+02	1.9E+00
2036	2.7E+03	5.4E+02	1.5E+00	1.6E+01	1.3E-01	7.6E+02	3.2E-02	3.9E-02	5.7E-02	3.1E-02	7.5E-02	2.0E-01	1.5E-02	1.3E+02	1.6E+00
2037	2.4E+03	4.9E+02	1.4E+00	1.4E+01	1.2E-01	6.9E+02	3.0E-02	3.6E-02	5.2E-02	2.8E-02	6.9E-02	1.8E-01	1.3E-02	1.2E+02	1.5E+00
2038	2.2E+03	4.5E+02	1.2E+00	1.2E+01	1.0E-01	6.3E+02	2.5E-02	3.0E-02	4.3E-02	2.3E-02	5.7E-02	1.5E-01	1.1E-02	1.1E+02	1.3E+00
2039	2.2E+03	4.4E+02	1.1E+00	1.2E+01	1.0E-01	6.2E+02	2.4E-02	2.9E-02	4.2E-02	2.3E-02	5.6E-02	1.5E-01	1.1E-02	1.1E+02	1.2E+00
2040	1.9E+03	4.0E+02	9.1E-01	9.2E+00	8.0E-02	5.6E+02	1.9E-02	2.4E-02	3.4E-02	1.8E-02	4.5E-02	1.2E-01	8.7E-03	9.5E+01	9.8E-01

Year	Acetaldehyde	Acrolein	Anthracene	Arsenic	Benz[a]Anthracene	Benzene	Benzo[a]Pyrene	Benzo[b]Fluoranthene	Benzo[g,h,i,]Perylene	Benzo[k]Fluoranthene	Chromium (VI)	Chrysene	Dibenzo[a,h]Anthracene	Ethyl Benzene	Fluoranthene
2041	1.9E+03	3.8E+02	8.7E-01	8.9E+00	7.7E-02	5.4E+02	1.9E-02	2.3E-02	3.3E-02	1.8E-02	4.3E-02	1.1E-01	8.4E-03	9.2E+01	9.5E-01
2042	1.8E+03	3.7E+02	8.6E-01	8.7E+00	7.6E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.7E-02	4.2E-02	1.1E-01	8.2E-03	9.0E+01	9.3E-01
2043	1.8E+03	3.7E+02	8.5E-01	8.7E+00	7.5E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.7E-02	4.2E-02	1.1E-01	8.2E-03	9.0E+01	9.3E-01
2044	1.8E+03	3.8E+02	8.6E-01	8.8E+00	7.6E-02	5.3E+02	1.8E-02	2.2E-02	3.2E-02	1.8E-02	4.2E-02	1.1E-01	8.3E-03	9.1E+01	9.4E-01
2045	1.7E+03	3.5E+02	7.9E-01	8.1E+00	7.0E-02	4.9E+02	1.7E-02	2.1E-02	3.0E-02	1.6E-02	3.9E-02	1.0E-01	7.6E-03	8.3E+01	8.6E-01
2046	1.6E+03	3.4E+02	7.7E-01	7.8E+00	6.8E-02	4.7E+02	1.6E-02	2.0E-02	2.9E-02	1.6E-02	3.8E-02	1.0E-01	7.4E-03	8.1E+01	8.3E-01
2047	1.6E+03	3.2E+02	7.4E-01	7.5E+00	6.5E-02	4.6E+02	1.6E-02	1.9E-02	2.8E-02	1.5E-02	3.6E-02	9.6E-02	7.1E-03	7.8E+01	8.0E-01
2048	3.2E+02	6.4E+01	1.5E-01	1.5E+00	1.3E-02	9.1E+01	3.1E-03	3.8E-03	5.5E-03	3.0E-03	7.3E-03	1.9E-02	1.4E-03	1.5E+01	1.6E-01
Total	**8.6E+04**	**1.8E+04**	**5.2E+01**	**5.4E+02**	**4.6E+00**	**2.5E+04**	**1.1E+00**	**1.4E+00**	**2.0E+00**	**1.1E+00**	**2.6E+00**	**6.8E+00**	**5.1E-01**	**4.2E+03**	**5.7E+01**

Table 4-54
2023–2048 nonfederal HAP emissions from the transportation of coal produced in the CDPA for Alternative C (pounds) – Part 3

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2023	5.1E+01	2.2E+04	2.8E+02	8.5E-02	1.2E+02	1.1E-01	2.7E+02	2.2E+02	1.2E-04	1.1E-03	1.1E+02	3.9E+03	8.1E+00	2.2E+03	1.6E+03
2024	4.4E+01	2.0E+04	2.5E+02	7.4E-02	1.1E+02	9.6E-02	2.5E+02	1.9E+02	1.1E-04	9.1E-04	9.5E+01	3.5E+03	7.0E+00	1.9E+03	1.5E+03
2025	2.9E+01	1.3E+04	1.7E+02	5.0E-02	7.2E+01	6.4E-02	1.6E+02	1.3E+02	7.0E-05	6.1E-04	6.3E+01	2.3E+03	4.7E+00	1.3E+03	9.8E+02
2026	3.2E+01	1.5E+04	1.8E+02	5.4E-02	7.8E+01	7.0E-02	1.8E+02	1.4E+02	7.6E-05	6.6E-04	6.9E+01	2.6E+03	5.1E+00	1.4E+03	1.1E+03
2027	3.4E+01	1.6E+04	2.0E+02	5.8E-02	8.4E+01	7.5E-02	1.9E+02	1.5E+02	8.2E-05	7.1E-04	7.4E+01	2.7E+03	5.5E+00	1.5E+03	1.2E+03
2028	3.2E+01	1.4E+04	1.8E+02	5.3E-02	7.7E+01	6.9E-02	1.7E+02	1.3E+02	7.5E-05	6.5E-04	6.8E+01	2.5E+03	5.1E+00	1.4E+03	1.0E+03
2029	2.7E+01	1.4E+04	1.7E+02	4.5E-02	6.6E+01	6.2E-02	1.7E+02	1.1E+02	6.4E-05	5.6E-04	5.9E+01	2.3E+03	4.4E+00	1.3E+03	1.0E+03
2030	2.4E+01	1.3E+04	1.6E+02	4.0E-02	5.8E+01	5.5E-02	1.5E+02	1.0E+02	5.7E-05	5.0E-04	5.2E+01	2.2E+03	3.9E+00	1.2E+03	9.3E+02
2031	2.4E+01	1.1E+04	1.4E+02	4.0E-02	5.8E+01	5.4E-02	1.4E+02	1.0E+02	5.7E-05	4.9E-04	5.2E+01	2.0E+03	3.9E+00	1.1E+03	8.3E+02
2032	2.2E+01	1.1E+04	1.3E+02	3.7E-02	5.3E+01	5.0E-02	1.3E+02	9.3E+01	5.2E-05	4.5E-04	4.7E+01	1.9E+03	3.5E+00	1.0E+03	7.9E+02
2033	2.0E+01	1.0E+04	1.3E+02	3.3E-02	4.7E+01	4.5E-02	1.2E+02	8.3E+01	4.6E-05	4.0E-04	4.3E+01	1.7E+03	3.2E+00	9.7E+02	7.4E+02
2034	1.7E+01	9.4E+03	1.2E+02	2.9E-02	4.2E+01	4.0E-02	1.2E+02	7.3E+01	4.1E-05	3.5E-04	3.8E+01	1.6E+03	2.8E+00	9.1E+02	7.0E+02
2035	1.6E+01	8.1E+03	1.0E+02	2.7E-02	3.8E+01	3.6E-02	9.9E+01	6.7E+01	3.7E-05	3.2E-04	3.4E+01	1.4E+03	2.5E+00	7.8E+02	6.0E+02
2036	1.4E+01	7.5E+03	9.4E+01	2.3E-02	3.3E+01	3.2E-02	9.2E+01	5.8E+01	3.3E-05	2.8E-04	3.0E+01	1.3E+03	2.2E+00	7.3E+02	5.6E+02
2037	1.3E+01	6.9E+03	8.6E+01	2.1E-02	3.1E+01	2.9E-02	8.4E+01	5.4E+01	3.0E-05	2.6E-04	2.7E+01	1.2E+03	2.0E+00	6.6E+02	5.1E+02
2038	1.1E+01	6.3E+03	7.9E+01	1.8E-02	2.5E+01	2.5E-02	7.7E+01	4.4E+01	2.5E-05	2.2E-04	2.3E+01	1.1E+03	1.7E+00	6.1E+02	4.6E+02
2039	1.0E+01	6.2E+03	7.7E+01	1.7E-02	2.5E+01	2.4E-02	7.5E+01	4.4E+01	2.4E-05	2.1E-04	2.2E+01	1.1E+03	1.7E+00	5.9E+02	4.5E+02

Year	Fluorene	Formaldehyde	Hexane	Indeno[1,2,3-c,d]Pyrene	Manganese	Mercury	Naphthalene	Nickel	Octachlorodibenzofuran	Octachlorodibenzo-p-Dioxin	Phenanthrene	Propionaldehyde	Pyrene	Toluene	Xylenes (Mixed Isomers)
2040	8.4E+00	5.5E+03	6.9E+01	1.4E-02	2.0E+01	2.0E-02	6.8E+01	3.5E+01	1.9E-05	1.7E-04	1.8E+01	9.6E+02	1.3E+00	5.3E+02	4.1E+02
2041	8.1E+00	5.3E+03	6.7E+01	1.3E-02	1.9E+01	1.9E-02	6.5E+01	3.3E+01	1.9E-05	1.6E-04	1.7E+01	9.2E+02	1.3E+00	5.1E+02	3.9E+02
2042	7.9E+00	5.2E+03	6.5E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.0E+02	1.3E+00	5.0E+02	3.8E+02
2043	7.9E+00	5.2E+03	6.5E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.0E+02	1.3E+00	5.0E+02	3.8E+02
2044	8.0E+00	5.3E+03	6.6E+01	1.3E-02	1.9E+01	1.9E-02	6.4E+01	3.3E+01	1.8E-05	1.6E-04	1.7E+01	9.1E+02	1.3E+00	5.1E+02	3.9E+02
2045	7.3E+00	4.8E+03	6.0E+01	1.2E-02	1.7E+01	1.7E-02	5.9E+01	3.0E+01	1.7E-05	1.5E-04	1.6E+01	8.4E+02	1.2E+00	4.7E+02	3.6E+02
2046	7.1E+00	4.7E+03	5.9E+01	1.2E-02	1.7E+01	1.7E-02	5.7E+01	2.9E+01	1.6E-05	1.4E-04	1.5E+01	8.1E+02	1.1E+00	4.5E+02	3.5E+02
2047	6.9E+00	4.5E+03	5.6E+01	1.1E-02	1.6E+01	1.6E-02	5.5E+01	2.8E+01	1.6E-05	1.4E-04	1.5E+01	7.8E+02	1.1E+00	4.4E+02	3.3E+02
2048	1.4E+00	9.0E+02	1.1E+01	2.3E-03	3.2E+00	3.2E-03	1.1E+01	5.6E+00	3.1E-06	2.7E-05	2.9E+00	1.6E+02	2.2E-01	8.7E+01	6.6E+01
Total	**4.8E+02**	**2.4E+05**	**3.1E+03**	**8.1E-01**	**1.2E+03**	**1.1E+00**	**3.0E+03**	**2.0E+03**	**1.1E-03**	**9.9E-03**	**1.0E+03**	**4.2E+04**	**7.7E+01**	**2.4E+04**	**1.8E+04**

Projected federal, and nonfederal greenhouse gas emissions from transportation of coal produced in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-55** and **Table 4-56**, respectively.

Table 4-55
2023–2048 federal greenhouse gas emissions from the transportation of coal produced from existing and future federal leases in the CDPA for Alternative C (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	5,587,925.8	437.9	140.1	5,662,311.8	5,639,233.1
2024	5,406,785.3	423.7	135.6	5,478,759.9	5,456,429.4
2025	3,850,621.3	301.8	96.6	3,901,880.4	3,885,977.0
2026	4,453,067.1	349.0	111.7	4,512,346.0	4,493,954.4
2027	5,092,299.2	399.1	127.7	5,160,087.4	5,139,055.8
2028	5,042,245.8	395.2	126.5	5,109,367.8	5,088,542.8
2029	5,044,348.2	395.3	126.5	5,111,498.1	5,090,664.4
2030	4,930,919.1	386.4	123.7	4,996,559.1	4,976,193.9
2031	4,928,313.1	386.2	123.6	4,993,918.4	4,973,564.0
2032	4,971,402.6	389.6	124.7	5,037,581.5	5,017,049.1
2033	4,975,477.9	389.9	124.8	5,041,711.0	5,021,161.9
2034	5,008,266.5	392.5	125.6	5,074,936.1	5,054,251.5
2035	4,629,304.6	362.8	116.1	4,690,929.5	4,671,810.0
2036	4,682,079.8	366.9	117.4	4,744,407.3	4,725,069.8
2037	4,314,472.6	338.1	108.2	4,371,906.5	4,354,087.3
2038	4,259,656.7	333.8	106.8	4,316,360.9	4,298,768.1
2039	4,202,933.2	329.4	105.4	4,258,882.3	4,241,523.8
2040	4,140,546.5	324.5	103.8	4,195,665.1	4,178,564.3
2041	3,982,001.2	312.1	99.9	4,035,009.2	4,018,563.2
2042	3,903,542.9	305.9	97.9	3,955,506.6	3,939,384.6
2043	3,898,538.3	305.5	97.8	3,950,435.3	3,934,334.0
2044	3,935,662.6	308.4	98.7	3,988,053.8	3,971,799.1
2045	3,611,024.5	283.0	90.6	3,659,094.1	3,644,180.2
2046	3,508,019.5	274.9	88.0	3,554,717.9	3,540,229.5
2047	3,376,413.7	264.6	84.7	3,421,360.2	3,407,415.3
2048	672,527.6	52.7	16.9	681,480.3	678,702.7
Total	**112,408,395.5**	**8,809.4**	**2,819.0**	**113,904,766.2**	**113,440,509.0**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-56
2023–2048 nonfederal greenhouse gas emissions from the transportation of coal produced in the CDPA for Alternative C (metric tons)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	134,476.5	10.5	3.4	136,266.6	135,711.2
2024	130,117.2	10.2	3.3	131,849.3	131,311.9
2025	92,667.3	7.3	2.3	93,900.9	93,518.1
2026	107,165.5	8.4	2.7	108,592.0	108,149.4
2027	122,548.9	9.6	3.1	124,180.3	123,674.2
2028	121,344.4	9.5	3.0	122,959.7	122,458.5

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2029	121,395.0	9.5	3.0	123,011.0	122,509.6
2030	118,665.2	9.3	3.0	120,244.9	119,754.8
2031	118,602.5	9.3	3.0	120,181.3	119,691.5
2032	119,639.5	9.4	3.0	121,232.1	120,738.0
2033	119,737.6	9.4	3.0	121,331.5	120,837.0
2034	120,526.6	9.4	3.0	122,131.1	121,633.3
2035	111,406.7	8.7	2.8	112,889.8	112,429.6
2036	112,676.8	8.8	2.8	114,176.7	113,711.4
2037	103,830.1	8.1	2.6	105,212.3	104,783.5
2038	102,510.9	8.0	2.6	103,875.6	103,452.2
2039	101,145.9	7.9	2.5	102,492.3	102,074.6
2040	99,644.5	7.8	2.5	100,970.9	100,559.4
2041	95,829.0	7.5	2.4	97,104.7	96,708.9
2042	93,940.9	7.4	2.4	95,191.4	94,803.4
2043	93,820.4	7.4	2.4	95,069.4	94,681.9
2044	94,713.8	7.4	2.4	95,974.7	95,583.5
2045	86,901.3	6.8	2.2	88,058.1	87,699.2
2046	84,422.4	6.6	2.1	85,546.2	85,197.5
2047	81,255.2	6.4	2.0	82,336.9	82,001.3
2048	16,184.7	1.3	0.4	16,400.2	16,333.3
Total	**2,705,168.8**	**212.0**	**67.8**	**2,741,179.7**	**2,730,007.1**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

4.3.3 Downstream Combustion

Alternative A. No Leasing

Federal, nonfederal, and total emissions of greenhouse gases from downstream combustion of coal produced in the CDPA under Alternative A (No Leasing) are shown in **Table 4-57**, **Table 4-58**, and **Table 4-59**, respectively.

Table 4-57
Federal greenhouse gas emissions from downstream combustion of coal produced from existing federal leases in the CDPA under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	439,491,459	49,752	7,237	445,571,611	442,949,678
2023	256.58	430,079,153	48,687	7,082	436,029,090	433,463,310
2024	248.27	416,140,318	47,109	6,852	421,897,418	419,414,795
2025	176.95	296,594,152	33,576	4,884	300,697,389	298,927,958
2026	204.63	342,991,452	38,828	5,648	347,736,573	345,690,343
2027	234.33	392,787,221	44,465	6,468	398,221,242	395,877,939
2028	232.22	389,250,328	44,065	6,409	394,635,419	392,313,216
2029	232.30	389,383,357	44,080	6,412	394,770,287	392,447,291
2030	227.03	380,551,585	43,080	6,266	385,816,332	383,546,025
2031	226.91	380,341,197	43,056	6,263	385,603,033	383,333,981
2032	227.34	381,063,707	43,138	6,275	386,335,539	384,062,176
2033	227.63	381,547,527	43,193	6,283	386,826,053	384,549,804
2034	229.13	384,061,939	43,477	6,324	389,375,250	387,084,001
2035	211.71	354,868,092	40,172	5,843	359,777,520	357,660,436
2036	214.13	358,915,482	40,631	5,910	363,880,904	361,739,675
2037	197.37	330,822,385	37,450	5,447	335,399,153	333,425,521
2038	195.03	326,903,643	37,007	5,383	331,426,197	329,475,945
2039	192.43	322,550,446	36,514	5,311	327,012,775	325,088,493
2040	190.10	318,642,909	36,072	5,247	323,051,180	321,150,209
2041	71.25	119,427,690	13,520	1,966	121,079,915	120,367,429
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-58
Nonfederal greenhouse gas emissions from downstream combustion under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	10,576,599	1,197	174	10,722,922	10,659,823
2023	6.17	10,350,087	1,172	170	10,493,276	10,431,529
2024	5.97	10,014,642	1,134	165	10,153,189	10,093,444
2025	4.26	7,137,698	808	118	7,236,445	7,193,863
2026	4.92	8,254,275	934	136	8,368,468	8,319,225
2027	5.64	9,452,637	1,070	156	9,583,409	9,527,016
2028	5.59	9,367,519	1,060	154	9,497,115	9,441,229
2029	5.59	9,370,721	1,061	154	9,500,360	9,444,456
2030	5.46	9,158,179	1,037	151	9,284,878	9,230,242
2031	5.46	9,153,116	1,036	151	9,279,745	9,225,139
2032	5.47	9,170,504	1,038	151	9,297,373	9,242,664
2033	5.48	9,182,147	1,039	151	9,309,178	9,254,399
2034	5.51	9,242,658	1,046	152	9,370,526	9,315,386
2035	5.09	8,540,092	967	141	8,658,240	8,607,292
2036	5.15	8,637,495	978	142	8,756,991	8,705,461
2037	4.75	7,961,419	901	131	8,071,562	8,024,065
2038	4.69	7,867,113	891	130	7,975,950	7,929,017
2039	4.63	7,762,351	879	128	7,869,739	7,823,430
2040	4.57	7,668,314	868	126	7,774,401	7,728,653
2041	1.71	2,874,092	325	47	2,913,854	2,896,707
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-59
Total greenhouse gas emissions from downstream combustion of coal produced from existing federal leases and nonfederal leases in the CDPA under Alternative A for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	450,068,058	50,949	7,411	456,294,533	453,609,502
2023	262.76	440,429,240	49,858	7,252	446,522,366	443,894,838
2024	254.24	426,154,960	48,242	7,017	432,050,607	429,508,238
2025	181.20	303,731,851	34,384	5,001	307,933,834	306,121,820
2026	209.55	351,245,726	39,762	5,784	356,105,041	354,009,568
2027	239.97	402,239,858	45,535	6,623	407,804,652	405,404,956
2028	237.81	398,617,848	45,125	6,564	404,132,533	401,754,446
2029	237.89	398,754,077	45,140	6,566	404,270,647	401,891,747
2030	232.50	389,709,764	44,117	6,417	395,101,211	392,776,267
2031	232.37	389,494,313	44,092	6,413	394,882,779	392,559,121
2032	232.81	390,234,211	44,176	6,426	395,632,912	393,304,840
2033	233.11	390,729,674	44,232	6,434	396,135,230	393,804,202
2034	234.64	393,304,597	44,524	6,476	398,745,776	396,399,387
2035	216.81	363,408,184	41,139	5,984	368,435,761	366,267,728
2036	219.28	367,552,977	41,608	6,052	372,637,895	370,445,135
2037	202.12	338,783,804	38,352	5,578	343,470,714	341,449,587
2038	199.72	334,770,756	37,897	5,512	339,402,148	337,404,961
2039	197.06	330,312,797	37,393	5,439	334,882,515	332,911,924
2040	194.68	326,311,223	36,940	5,373	330,825,581	328,878,863
2041	72.96	122,301,782	13,845	2,014	123,993,768	123,264,136
2042	-	-	-	-	-	-
2043	-	-	-	-	-	-
2044	-	-	-	-	-	-
2045	-	-	-	-	-	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	-	-	-	-	-	-

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Federal, nonfederal, and total emissions of greenhouse gases from downstream combustion of coal produced in the CDPA under Alternative B (No Action) are shown in **Table 4-60**, **Table 4-61**, and **Table 4-62**, respectively.

Table 4-60
Federal greenhouse gas emissions from downstream combustion of coal produced from existing and future federal leases in the CDPA under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	439,491,459	49,752	7,237	445,571,611	442,949,678
2023	256.58	430,079,153	48,687	7,082	436,029,090	433,463,310
2024	248.27	416,140,318	47,109	6,852	421,897,418	419,414,795
2025	176.95	296,594,152	33,576	4,884	300,697,389	298,927,958
2026	204.63	342,991,452	38,828	5,648	347,736,573	345,690,343
2027	234.33	392,787,221	44,465	6,468	398,221,242	395,877,939
2028	232.22	389,250,328	44,065	6,409	394,635,419	392,313,216
2029	232.30	389,383,357	44,080	6,412	394,770,287	392,447,291
2030	227.03	380,551,585	43,080	6,266	385,816,332	383,546,025
2031	226.91	380,341,197	43,056	6,263	385,603,033	383,333,981
2032	227.34	381,063,707	43,138	6,275	386,335,539	384,062,176
2033	227.63	381,547,527	43,193	6,283	386,826,053	384,549,804
2034	229.13	384,061,939	43,477	6,324	389,375,250	387,084,001
2035	211.71	354,868,092	40,172	5,843	359,777,520	357,660,436
2036	214.13	358,915,482	40,631	5,910	363,880,904	361,739,675
2037	197.37	330,822,385	37,450	5,447	335,399,153	333,425,521
2038	195.03	326,903,643	37,007	5,383	331,426,197	329,475,945
2039	192.43	322,550,446	36,514	5,311	327,012,775	325,088,493
2040	190.10	318,642,909	36,072	5,247	323,051,180	321,150,209
2041	183.54	307,644,162	34,826	5,066	311,900,270	310,064,916
2042	180.65	302,799,048	34,278	4,986	306,988,127	305,181,678
2043	180.10	301,876,365	34,174	4,971	306,052,679	304,251,735
2044	180.43	302,429,068	34,236	4,980	306,613,028	304,808,786
2045	165.88	278,040,054	31,475	4,578	281,886,604	280,227,864
2046	161.28	270,342,319	30,604	4,451	274,082,374	272,469,557

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2047	159.15	266,768,479	30,199	4,393	270,459,092	268,867,596
2048	156.98	263,121,795	29,786	4,333	266,761,958	265,192,217

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-61
Nonfederal greenhouse gas emissions from downstream combustion under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	10,576,599	1,197	174	10,722,922	10,659,823
2023	6.17	10,350,087	1,172	170	10,493,276	10,431,529
2024	5.97	10,014,642	1,134	165	10,153,189	10,093,444
2025	4.26	7,137,698	808	118	7,236,445	7,193,863
2026	4.92	8,254,275	934	136	8,368,468	8,319,225
2027	5.64	9,452,637	1,070	156	9,583,409	9,527,016
2028	5.59	9,367,519	1,060	154	9,497,115	9,441,229
2029	5.59	9,370,721	1,061	154	9,500,360	9,444,456
2030	5.46	9,158,179	1,037	151	9,284,878	9,230,242
2031	5.46	9,153,116	1,036	151	9,279,745	9,225,139
2032	5.47	9,170,504	1,038	151	9,297,373	9,242,664
2033	5.48	9,182,147	1,039	151	9,309,178	9,254,399
2034	5.51	9,242,658	1,046	152	9,370,526	9,315,386
2035	5.09	8,540,092	967	141	8,658,240	8,607,292
2036	5.15	8,637,495	978	142	8,756,991	8,705,461
2037	4.75	7,961,419	901	131	8,071,562	8,024,065
2038	4.69	7,867,113	891	130	7,975,950	7,929,017
2039	4.63	7,762,351	879	128	7,869,739	7,823,430
2040	4.57	7,668,314	868	126	7,774,401	7,728,653
2041	4.42	7,403,623	838	122	7,506,048	7,461,880
2042	4.35	7,287,023	825	120	7,387,835	7,344,362
2043	4.33	7,264,818	822	120	7,365,323	7,321,982
2044	4.34	7,278,119	824	120	7,378,808	7,335,388

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2045	3.99	6,691,184	757	110	6,783,753	6,743,835
2046	3.88	6,505,934	736	107	6,595,940	6,557,127
2047	3.83	6,419,928	727	106	6,508,744	6,470,444
2048	3.78	6,332,168	717	104	6,419,771	6,381,994

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-62
Total greenhouse gas emissions from downstream combustion of coal produced from existing and future federal leases and nonfederal leases in the CDPA under Alternative B for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	450,068,058	50,949	7,411	456,294,533	453,609,502
2023	262.76	440,429,240	49,858	7,252	446,522,366	443,894,838
2024	254.24	426,154,960	48,242	7,017	432,050,607	429,508,238
2025	181.20	303,731,851	34,384	5,001	307,933,834	306,121,820
2026	209.55	351,245,726	39,762	5,784	356,105,041	354,009,568
2027	239.97	402,239,858	45,535	6,623	407,804,652	405,404,956
2028	237.81	398,617,848	45,125	6,564	404,132,533	401,754,446
2029	237.89	398,754,077	45,140	6,566	404,270,647	401,891,747
2030	232.50	389,709,764	44,117	6,417	395,101,211	392,776,267
2031	232.37	389,494,313	44,092	6,413	394,882,779	392,559,121
2032	232.81	390,234,211	44,176	6,426	395,632,912	393,304,840
2033	233.11	390,729,674	44,232	6,434	396,135,230	393,804,202
2034	234.64	393,304,597	44,524	6,476	398,745,776	396,399,387
2035	216.81	363,408,184	41,139	5,984	368,435,761	366,267,728
2036	219.28	367,552,977	41,608	6,052	372,637,895	370,445,135
2037	202.12	338,783,804	38,352	5,578	343,470,714	341,449,587
2038	199.72	334,770,756	37,897	5,512	339,402,148	337,404,961
2039	197.06	330,312,797	37,393	5,439	334,882,515	332,911,924
2040	194.68	326,311,223	36,940	5,373	330,825,581	328,878,863
2041	187.96	315,047,784	35,665	5,188	319,406,318	317,526,796

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2042	185.00	310,086,071	35,103	5,106	314,375,962	312,526,040
2043	184.43	309,141,183	34,996	5,090	313,418,002	311,573,717
2044	184.77	309,707,187	35,060	5,100	313,991,836	312,144,175
2045	169.87	284,731,238	32,233	4,688	288,670,357	286,971,698
2046	165.17	276,848,253	31,340	4,559	280,678,315	279,026,684
2047	162.98	273,188,407	30,926	4,498	276,967,836	275,338,040
2048	160.75	269,453,963	30,503	4,437	273,181,729	271,574,211

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Federal, nonfederal, and total emissions of greenhouse gases from downstream combustion of coal produced in the CDPA under Alternative C (Limited Leasing) are shown in **Table 4-63**, **Table 4-64**, and **Table 4-65**, respectively.

Table 4-63
Federal greenhouse gas emissions from downstream combustion of coal produced from existing and future federal leases in the CDPA under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	262.20	439,491,459	49,752	7,237	445,571,611	442,949,678
2023	256.58	430,079,153	48,687	7,082	436,029,090	433,463,310
2024	248.27	416,140,318	47,109	6,852	421,897,418	419,414,795
2025	176.95	296,594,152	33,576	4,884	300,697,389	298,927,958
2026	204.63	342,991,452	38,828	5,648	347,736,573	345,690,343
2027	234.33	392,787,221	44,465	6,468	398,221,242	395,877,939
2028	232.22	389,250,328	44,065	6,409	394,635,419	392,313,216
2029	232.30	389,383,357	44,080	6,412	394,770,287	392,447,291
2030	227.03	380,551,585	43,080	6,266	385,816,332	383,546,025
2031	226.91	380,341,197	43,056	6,263	385,603,033	383,333,981
2032	227.34	381,063,707	43,138	6,275	386,335,539	384,062,176
2033	227.63	381,547,527	43,193	6,283	386,826,053	384,549,804
2034	229.13	384,061,939	43,477	6,324	389,375,250	387,084,001

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2035	211.71	354,868,092	40,172	5,843	359,777,520	357,660,436
2036	214.13	358,915,482	40,631	5,910	363,880,904	361,739,675
2037	197.37	330,822,385	37,450	5,447	335,399,153	333,425,521
2038	195.03	326,903,643	37,007	5,383	331,426,197	329,475,945
2039	192.43	322,550,446	36,514	5,311	327,012,775	325,088,493
2040	190.10	318,642,909	36,072	5,247	323,051,180	321,150,209
2041	183.54	307,644,162	34,826	5,066	311,900,270	310,064,916
2042	180.65	302,799,048	34,278	4,986	306,988,127	305,181,678
2043	180.10	301,876,365	34,174	4,971	306,052,679	304,251,735
2044	180.43	302,429,068	34,236	4,980	306,613,028	304,808,786
2045	165.88	278,040,054	31,475	4,578	281,886,604	280,227,864
2046	161.28	270,342,319	30,604	4,451	274,082,374	272,469,557
2047	159.15	266,768,479	30,199	4,393	270,459,092	268,867,596
2048	32.02	53,678,849	6,077	884	54,421,470	54,101,231

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-64
Nonfederal greenhouse gas emissions from downstream combustion under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	6.31	10,576,599	1,197	174	10,722,922	10,659,823
2023	6.17	10,350,087	1,172	170	10,493,276	10,431,529
2024	5.97	10,014,642	1,134	165	10,153,189	10,093,444
2025	4.26	7,137,698	808	118	7,236,445	7,193,863
2026	4.92	8,254,275	934	136	8,368,468	8,319,225
2027	5.64	9,452,637	1,070	156	9,583,409	9,527,016
2028	5.59	9,367,519	1,060	154	9,497,115	9,441,229
2029	5.59	9,370,721	1,061	154	9,500,360	9,444,456
2030	5.46	9,158,179	1,037	151	9,284,878	9,230,242
2031	5.46	9,153,116	1,036	151	9,279,745	9,225,139
2032	5.47	9,170,504	1,038	151	9,297,373	9,242,664

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2033	5.48	9,182,147	1,039	151	9,309,178	9,254,399
2034	5.51	9,242,658	1,046	152	9,370,526	9,315,386
2035	5.09	8,540,092	967	141	8,658,240	8,607,292
2036	5.15	8,637,495	978	142	8,756,991	8,705,461
2037	4.75	7,961,419	901	131	8,071,562	8,024,065
2038	4.69	7,867,113	891	130	7,975,950	7,929,017
2039	4.63	7,762,351	879	128	7,869,739	7,823,430
2040	4.57	7,668,314	868	126	7,774,401	7,728,653
2041	4.42	7,403,623	838	122	7,506,048	7,461,880
2042	4.35	7,287,023	825	120	7,387,835	7,344,362
2043	4.33	7,264,818	822	120	7,365,323	7,321,982
2044	4.34	7,278,119	824	120	7,378,808	7,335,388
2045	3.99	6,691,184	757	110	6,783,753	6,743,835
2046	3.88	6,505,934	736	107	6,595,940	6,557,127
2047	3.83	6,419,928	727	106	6,508,744	6,470,444
2048	0.77	1,291,810	146	21	1,309,682	1,301,975

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-65
Total greenhouse gas emissions from downstream combustion of coal produced from existing and future federal leases and nonfederal leases in the CDPA under Alternative C for 2022 through 2048

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2022	268.51	450,068,058	50,949	7,411	456,294,533	453,609,502
2023	262.76	440,429,240	49,858	7,252	446,522,366	443,894,838
2024	254.24	426,154,960	48,242	7,017	432,050,607	429,508,238
2025	181.20	303,731,851	34,384	5,001	307,933,834	306,121,820
2026	209.55	351,245,726	39,762	5,784	356,105,041	354,009,568
2027	239.97	402,239,858	45,535	6,623	407,804,652	405,404,956
2028	237.81	398,617,848	45,125	6,564	404,132,533	401,754,446
2029	237.89	398,754,077	45,140	6,566	404,270,647	401,891,747

Year	Coal Production (million short tons per year)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	AR6 20-yr CO_2e (metric tons)	AR6 100-yr CO_2e (metric tons)
2030	232.50	389,709,764	44,117	6,417	395,101,211	392,776,267
2031	232.37	389,494,313	44,092	6,413	394,882,779	392,559,121
2032	232.81	390,234,211	44,176	6,426	395,632,912	393,304,840
2033	233.11	390,729,674	44,232	6,434	396,135,230	393,804,202
2034	234.64	393,304,597	44,524	6,476	398,745,776	396,399,387
2035	216.81	363,408,184	41,139	5,984	368,435,761	366,267,728
2036	219.28	367,552,977	41,608	6,052	372,637,895	370,445,135
2037	202.12	338,783,804	38,352	5,578	343,470,714	341,449,587
2038	199.72	334,770,756	37,897	5,512	339,402,148	337,404,961
2039	197.06	330,312,797	37,393	5,439	334,882,515	332,911,924
2040	194.68	326,311,223	36,940	5,373	330,825,581	328,878,863
2041	187.96	315,047,784	35,665	5,188	319,406,318	317,526,796
2042	185.00	310,086,071	35,103	5,106	314,375,962	312,526,040
2043	184.43	309,141,183	34,996	5,090	313,418,002	311,573,717
2044	184.77	309,707,187	35,060	5,100	313,991,836	312,144,175
2045	169.87	284,731,238	32,233	4,688	288,670,357	286,971,698
2046	165.17	276,848,253	31,340	4,559	280,678,315	279,026,684
2047	162.98	273,188,407	30,926	4,498	276,967,836	275,338,040
2048	32.80	54,970,659	6,223	905	55,731,152	55,403,206

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents; 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

4.4 OIL AND GAS EMISSIONS

4.4.1 Production and Midstream Sources

Near-Field Modeling

As described in the 2015 RMP (BLM, 2015) several air quality modeling studies for the Powder River Basin (PRB) have been performed since 2002, that have estimated impacts to air quality. The studies have analyzed the potential air quality impacts from various oil and gas and coal development scenarios. These studies include:

The PRB-1 study (as cited in BLM 2015), which included the Montana and Wyoming portions of the PRB used the California Puff Model (CALPUFF) model to estimate the potential air quality impacts from CBNG and conventional oil and gas development throughout the region. The assessment included criteria pollutants (NO_2, SO2, CO, PM_{10} and $PM_{2.5}$), and HAPs (benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde). The analysis indicated that concentration increases due to the emissions from the Wyoming project sources are expected to be less than the maximum allowable Prevention of Significant Deterioration (PSD) increments for Class II areas and that HAPs impacts (except for formaldehyde) are expected to be minimal.

The PRB Coal Review (ENSR 2005), which included most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and western Nebraska used the CALPUFF model to estimate impacts from CBNG sources, coal-related sources, coal mines, non-coal sources, and power plants. This was assessment of current conditions that included criteria pollutants (NO_2, SO2, CO, PM_{10} and $PM_{2.5}$). Modeled impacts from cumulative sources indicated concentrations greater than the 24-hour PM_{10} standards at near-field receptors, both in Wyoming and Montana. Modeled impacts of all other criteria air pollutants were shown to be well below the NAAQS as well as the individual state ambient air standard for all receptors.

Additional modeling studies (ENSR 2006, 2008; AECOM 2009) for the Wyoming and Montana PRB study areas were performed for RFD sources including coal mine development and coal-related activities, CBNG and conventional oil and gas sources. These analyses included criteria pollutants (NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) and HAPs (benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde). Modeled impacts from RFD sources indicated concentrations greater than PM_{10} and $PM_{2.5}$ ambient standards at near-field receptors. Impacts from NO_2 and SO_2 emissions were predicted to be below the NAAQS and WAAQS at Wyoming near-field receptors. Modeled HAP impacts were estimated to be above the acute Reference Exposure Level (REL) for formaldehyde but below the REL for all other HAPSs.

Air resources will be managed in accordance with the Buffalo RMP Air Resource Plan, which was developed collaboratively with EPA Region 8 and the Wyoming DEQ-Air Quality Division (AQD).

The federal and nonfederal oil production and emissions of NAAQS, GHG, and also CO2e using both the 20-year and 100-year time horizon AR6 GWPs for the years 2023-2038, from production and midstream sources associated with oil, conventional natural gas, and coalbed natural gas produced in the BFO, are shown in **Table 4-66** through **Table 4-71**. Note that these emissions are the same for all alternatives.

Table 4-66
Federal oil production and emissions in the BFO from 2023 to 2038

Year	Oil Production Rate (MMBO)	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	5.1	883	206	37	249	56	104	4	36,434	694	1.1	94,017	57,425
2024	5.6	773	180	32	225	50	91	3	31,871	632	1.0	84,305	50,978
2025	5.8	801	187	33	233	52	94	3	33,009	655	1.0	87,316	52,799
2026	6.3	870	203	36	253	56	102	4	35,855	711	1.1	94,843	57,351
2027	6.3	870	203	36	253	56	102	4	35,855	711	1.1	94,843	57,351
2028	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2029	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2030	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2031	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2032	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2033	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2034	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2035	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2036	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2037	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992
2038	6.7	925	216	38	269	60	109	4	38,131	757	1.2	100,865	60,992

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM10 =particulate matter with a diameter less than or equal to 10 microns; PM2.5 =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO2e = carbon dioxide equivalent
MMBO = millions of barrels of oil
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 4-67
Nonfederal oil production and emissions in the BFO from 2023 to 2038

Year	Oil Production Rate (MMBO)	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	5.3	934	217	39	250	58	110	4	36,973	668	1.1	92,403	57,192
2024	6.0	817	191	34	228	52	96	3	33,250	634	1.0	85,813	52,413
2025	6.2	846	197	35	236	54	99	4	34,357	655	1.0	88,668	54,158
2026	6.6	919	214	38	257	58	108	4	36,564	697	1.1	94,340	57,628
2027	6.7	919	214	38	257	58	108	4	37,125	708	1.1	95,806	58,519
2028	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2029	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2030	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2031	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2032	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2033	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2034	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2035	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2036	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2037	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008
2038	7.1	978	228	41	273	62	115	4	39,340	750	1.2	101,517	62,008

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM10 =particulate matter with a diameter less than or equal to 10 microns; PM2.5 =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO2e = carbon dioxide equivalent
MMBO = millions of barrels of oil
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 4-68
Federal conventional natural gas production and emissions in the BFO from 2023 to 2038

Year	Gas Production Rate (BCF) Total; Conventional	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	70.3; 4.5	180	82	319	54	12	1	47	54,967	2,071	0.5	225,975	116,824
2024	77.0; 10.1	167	76	297	50	11	1	44	51,237	1,936	0.5	211,078	109,054
2025	80.8; 10.6	175	80	312	52	12	1	46	53,765	2,031	0.5	221,494	114,436
2026	83.5; 11.0	181	82	322	54	12	1	48	55,562	2,099	0.5	228,896	118,260
2027	82.7; 10.9	179	82	319	54	12	1	47	55,030	2,079	0.5	226,703	117,127
2028	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2029	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2030	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2031	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2032	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2033	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2034	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2035	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2036	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2037	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736
2038	79.6; 10.5	173	79	307	52	11	1	45	52,967	2,001	0.5	218,205	112,736

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent
BCF = billions cubic feet
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 4-69
Nonfederal conventional natural gas production and emissions in the BFO from 2023 to 2038

Year	Gas Production Rate (BCF) Total; Conventional	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	119.7; 3.7	181	83	321	55	12	1	48	54,707	2,047	0.5	223,702	115,836
2024	131.0; 10.0	170	78	303	51	11	1	45	51,662	1,940	0.5	211,877	109,615
2025	137.8; 10.6	179	82	319	54	12	1	47	54,378	2,042	0.5	223,015	115,376
2026	141.8; 10.9	184	84	328	55	12	1	49	55,896	2,099	0.5	229,238	118,596
2027	140.3; 10.8	182	83	324	55	12	1	48	55,290	2,077	0.5	226,754	117,311
2028	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2029	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2030	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2031	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2032	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2033	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2034	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2035	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2036	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2037	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030
2038	134.2; 10.3	174	80	310	52	11	1	46	52,802	1,983	0.5	216,544	112,030

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent
BCF = billions cubic feet
GWP = global warming potentials
20-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 4-70
Federal coalbed natural gas production and emissions in the BFO from 2023 to 2038

Year	Gas Production Rate (BCF) Total; Coalbed	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	70.3; 65.8	56	26	3,567	191	24	1	361	10,748	6,989	0.1	587,329	219,029
2024	77.0; 66.9	45	20	2,059	132	17	1	209	7,704	4,030	0.1	340,170	127,804
2025	80.8; 70.2	47	21	2,161	139	18	1	219	8,084	4,229	0.1	356,958	134,111
2026	83.5; 72.5	49	22	2,233	143	18	1	227	8,354	4,370	0.1	368,886	138,593
2027	82.771.8	48	21	2,211	142	18	1	224	8,274	4,328	0.1	365,352	137,265
2028	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2029	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2030	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2031	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2032	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2033	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2034	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2035	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2036	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2037	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120
2038	79.6; 69.1	47	21	2,129	136	18	1	216	7,964	4,166	0.1	351,656	132,120

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent

BCF = billions cubic feet

GWP = global warming potentials

20-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

Table 4-71
Nonfederal Coalbed Natural Gas Production and Emissions in the BFO from 2023 to 2038

Year	Gas Production Rate (BCF) Total; Coalbed	NOx (short tons)	CO (short tons)	VOC (short tons)	PM_{10} (short tons)	$PM_{2.5}$ (short tons)	SO_2 (short tons)	HAPs (short tons)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	20-year GWP CO_2e (metric tons)	100-year GWP CO_2e (metric tons)
2023	119.7; 116.0	102	48	6,498	350	44	2	657	19,607	14,617	0.1	1,225,556	455,233
2024	131.0; 121.0	82	37	3,773	242	32	2	382	14,115	8,478	0.1	713,545	266,773
2025	137.8; 127.2	86	39	3,969	255	34	2	402	14,847	8,916	0.1	750,457	280,575
2026	141.8; 130.9	89	40	4,084	262	35	2	414	15,279	9,178	0.1	772,470	288,803
2027	140.3; 129.5	88	40	4,041	259	34	2	409	15,118	9,081	0.1	764,353	285,768
2028	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2029	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2030	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2031	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2032	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2033	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2034	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2035	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2036	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2037	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461
2038	134.2; 123.9	84	38	3,866	248	33	2	391	14,463	8,690	0.1	731,441	273,461

NOx = nitrogen oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; HAPs = hazardous air pollutants; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent

BCF = billions cubic feet

GWP = global warming potentials

20-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 82.5; nitrous oxide (N_2O) = 273 from the IPCC AR6. The 100-year time horizon GWPs applied to calculate CO_2e: CO_2 = 1; methane (CH_4) = 29.8; nitrous oxide (N_2O) = 273 from the IPCC AR6.

4.4.2 Transportation, Processing, and Downstream Combustion

GHG emissions of CO_2, CH_4, and N_2O from oil and gas processing, transportation and downstream combustion were calculated for years 2023-2038 using the estimated oil and gas production rates from the BFO. Emissions were calculated for both federal and nonfederal oil and gas wells.

The federal and nonfederal CO_2, CH_4, and N_2O emissions for years 2023-2038, along with CO_2e emissions using both the 20-year and 100-year time horizon AR6 GWPs , from oil processing, conventional natural gas processing, and coalbed natural gas processing emissions, are shown in **Table 4-72** through **Table 4-77**. The GHG emissions from transportation are provided in **Table 4-78** through **Table 4-83**, and the emissions from downstream combustion activities are provided in **Table 4-84** through **Table 4-89**. Note that these emissions are the same for all alternatives.

Table 4-72
Federal greenhouse gas emissions from the processing of oil produced in the BFO (metric tons) from 2023 to 2038

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	217,638	266.1	3.5	240,549	226,525
2024	238,975	292.2	3.8	264,132	248,733
2025	247,510	302.6	4.0	273,566	257,617
2026	268,847	328.7	4.3	297,149	279,825
2027	268,847	328.7	4.3	297,149	279,825
2028	285,916	349.6	4.6	316,015	297,592
2029	285,916	349.6	4.6	316,015	297,592
2030	285,916	349.6	4.6	316,015	297,592
2031	285,916	349.6	4.6	316,015	297,592
2032	285,916	349.6	4.6	316,015	297,592
2033	285,916	349.6	4.6	316,015	297,592
2034	285,916	349.6	4.6	316,015	297,592
2035	285,916	349.6	4.6	316,015	297,592
2036	285,916	349.6	4.6	316,015	297,592
2037	285,916	349.6	4.6	316,015	297,592
2038	285,916	349.6	4.6	316,015	297,592
Total	**4,386,897**	**5,363.9**	**70.7**	**4,848,714**	**4,566,036**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-73
Nonfederal greenhouse gas emissions from the processing of oil produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	226,173	276.5	3.6	249,982	235,408
2024	256,045	313.1	4.1	282,999	266,500
2025	264,579	323.5	4.3	292,432	275,383
2026	281,649	344.4	4.5	311,299	293,150
2027	285,916	349.6	4.6	316,015	297,592
2028	302,986	370.5	4.9	334,882	315,359

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2029	302,986	370.5	4.9	334,882	315,359
2030	302,986	370.5	4.9	334,882	315,359
2031	302,986	370.5	4.9	334,882	315,359
2032	302,986	370.5	4.9	334,882	315,359
2033	302,986	370.5	4.9	334,882	315,359
2034	302,986	370.5	4.9	334,882	315,359
2035	302,986	370.5	4.9	334,882	315,359
2036	302,986	370.5	4.9	334,882	315,359
2037	302,986	370.5	4.9	334,882	315,359
2038	302,986	370.5	4.9	334,882	315,359
Total	**4,647,209**	**5,682.2**	**74.9**	**5,136,430**	**4,836,978**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-74
Federal greenhouse gas emissions from the processing of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	6,482	67.3	0.02	12,037	8,493
2024	14,746	153.0	0.05	27,383	19,320
2025	15,474	160.6	0.06	28,734	20,273
2026	15,991	165.9	0.06	29,694	20,951
2027	15,837	164.3	0.06	29,410	20,750
2028	15,244	158.2	0.05	28,308	19,972
2029	15,244	158.2	0.05	28,308	19,972
2030	15,244	158.2	0.05	28,308	19,972
2031	15,244	158.2	0.05	28,308	19,972
2032	15,244	158.2	0.05	28,308	19,972
2033	15,244	158.2	0.05	28,308	19,972
2034	15,244	158.2	0.05	28,308	19,972
2035	15,244	158.2	0.05	28,308	19,972
2036	15,244	158.2	0.05	28,308	19,972
2037	15,244	158.2	0.05	28,308	19,972
2038	15,244	158.2	0.05	28,308	19,972
Total	**236,212**	**2,450.9**	**0.8**	**438,642**	**309,478**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-75
Nonfederal greenhouse gas emissions from the processing of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	5,323	55.2	0.0	9,885	6,974
2024	14,609	151.6	0.1	27,129	19,141
2025	15,368	159.5	0.1	28,538	20,134
2026	15,814	164.1	0.1	29,366	20,719
2027	15,647	162.3	0.1	29,055	20,500
2028	14,966	155.3	0.1	27,792	19,608
2029	14,966	155.3	0.1	27,792	19,608
2030	14,966	155.3	0.1	27,792	19,608
2031	14,966	155.3	0.1	27,792	19,608
2032	14,966	155.3	0.1	27,792	19,608
2033	14,966	155.3	0.1	27,792	19,608
2034	14,966	155.3	0.1	27,792	19,608
2035	14,966	155.3	0.1	27,792	19,608
2036	14,966	155.3	0.1	27,792	19,608
2037	14,966	155.3	0.1	27,792	19,608
2038	14,966	155.3	0.1	27,792	19,608
Total	**231,389**	**2,400.9**	**0.8**	**429,686**	**303,160**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-76
Federal greenhouse gas emissions from the processing of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	95,815	994.2	0.3	177,927	125,534
2024	97,301	1,009.6	0.3	180,686	127,481
2025	102,103	1,059.4	0.4	189,603	133,772
2026	105,515	1,094.8	0.4	195,939	138,242
2027	104,504	1,084.3	0.4	194,062	136,918
2028	100,586	1,043.7	0.4	186,788	131,786
2029	100,586	1,043.7	0.4	186,788	131,786
2030	100,586	1,043.7	0.4	186,788	131,786
2031	100,586	1,043.7	0.4	186,788	131,786
2032	100,586	1,043.7	0.4	186,788	131,786
2033	100,586	1,043.7	0.4	186,788	131,786
2034	100,586	1,043.7	0.4	186,788	131,786
2035	100,586	1,043.7	0.4	186,788	131,786
2036	100,586	1,043.7	0.4	186,788	131,786
2037	100,586	1,043.7	0.4	186,788	131,786
2038	100,586	1,043.7	0.4	186,788	131,786
Total	**1,611,687**	**16,722.8**	**5.7**	**2,992,881**	**2,111,591**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-77
Nonfederal greenhouse gas emissions from the processing of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	168,859	1,752	0.6	313,568	221,234
2024	176,016	1,826	0.6	326,859	230,611
2025	185,152	1,921	0.7	343,825	242,582
2026	190,527	1,977	0.7	353,806	249,623
2027	188,511	1,956	0.7	350,063	246,983
2028	180,315	1,871	0.6	334,843	236,244
2029	180,315	1,871	0.6	334,843	236,244
2030	180,315	1,871	0.6	334,843	236,244
2031	180,315	1,871	0.6	334,843	236,244
2032	180,315	1,871	0.6	334,843	236,244
2033	180,315	1,871	0.6	334,843	236,244
2034	180,315	1,871	0.6	334,843	236,244
2035	180,315	1,871	0.6	334,843	236,244
2036	180,315	1,871	0.6	334,843	236,244
2037	180,315	1,871	0.6	334,843	236,244
2038	180,315	1,871	0.6	334,843	236,244
Total	**2,892,534**	**30,013**	**10.3**	**5,371,394**	**3,789,722**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-78
Federal greenhouse gas emissions from the transport of oil produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	63,546	36.1	1.3	66,871	64,968
2024	69,776	39.6	1.4	73,427	71,337
2025	72,268	41.1	1.4	76,049	73,885
2026	78,498	44.6	1.6	82,605	80,254
2027	78,498	44.6	1.6	82,605	80,254
2028	83,482	47.4	1.7	87,850	85,350
2029	83,482	47.4	1.7	87,850	85,350
2030	83,482	47.4	1.7	87,850	85,350
2031	83,482	47.4	1.7	87,850	85,350
2032	83,482	47.4	1.7	87,850	85,350
2033	83,482	47.4	1.7	87,850	85,350
2034	83,482	47.4	1.7	87,850	85,350
2035	83,482	47.4	1.7	87,850	85,350
2036	83,482	47.4	1.7	87,850	85,350
2037	83,482	47.4	1.7	87,850	85,350
2038	83,482	47.4	1.7	87,850	85,350
Total	**1,280,888**	**727.8**	**25.5**	**1,347,902**	**1,309,546**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-79
Nonfederal greenhouse gas emissions from the transport of oil produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	66,038	37.5	1.3	69,493	67,515
2024	74,760	42.5	1.5	78,671	76,433
2025	77,252	43.9	1.5	81,294	78,980
2026	82,236	46.7	1.6	86,538	84,076
2027	83,482	47.4	1.7	87,850	85,350
2028	88,466	50.3	1.8	93,094	90,445
2029	88,466	50.3	1.8	93,094	90,445
2030	88,466	50.3	1.8	93,094	90,445
2031	88,466	50.3	1.8	93,094	90,445
2032	88,466	50.3	1.8	93,094	90,445
2033	88,466	50.3	1.8	93,094	90,445
2034	88,466	50.3	1.8	93,094	90,445
2035	88,466	50.3	1.8	93,094	90,445
2036	88,466	50.3	1.8	93,094	90,445
2037	88,466	50.3	1.8	93,094	90,445
2038	88,466	50.3	1.8	93,094	90,445
Total	**1,356,894**	**771.0**	**27.0**	**1,427,884**	**1,387,252**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-80
Federal greenhouse gas emissions from the transport of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	38,118	604.7	0.6	88,166	56,299
2024	86,710	1,375.6	1.3	200,562	128,069
2025	90,989	1,443.5	1.4	210,459	134,389
2026	94,030	1,491.7	1.5	217,492	138,879
2027	93,129	1,477.4	1.4	215,408	137,549
2028	89,638	1,422.0	1.4	207,334	132,393
2029	89,638	1,422.0	1.4	207,334	132,393
2030	89,638	1,422.0	1.4	207,334	132,393
2031	89,638	1,422.0	1.4	207,334	132,393
2032	89,638	1,422.0	1.4	207,334	132,393
2033	89,638	1,422.0	1.4	207,334	132,393
2034	89,638	1,422.0	1.4	207,334	132,393
2035	89,638	1,422.0	1.4	207,334	132,393
2036	89,638	1,422.0	1.4	207,334	132,393
2037	89,638	1,422.0	1.4	207,334	132,393
2038	89,638	1,422.0	1.4	207,334	132,393
Total	**1,388,992**	**22,035.2**	**21.5**	**3,212,759**	**2,051,506**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-81
Nonfederal greenhouse gas emissions from the transport of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	31,301	496.6	0.5	72,400	46,231
2024	85,907	1,362.8	1.3	198,705	126,883
2025	90,367	1,433.6	1.4	209,019	133,469
2026	92,990	1,475.2	1.4	215,086	137,343
2027	92,006	1,459.6	1.4	212,811	135,890
2028	88,006	1,396.1	1.4	203,558	129,982
2029	88,006	1,396.1	1.4	203,558	129,982
2030	88,006	1,396.1	1.4	203,558	129,982
2031	88,006	1,396.1	1.4	203,558	129,982
2032	88,006	1,396.1	1.4	203,558	129,982
2033	88,006	1,396.1	1.4	203,558	129,982
2034	88,006	1,396.1	1.4	203,558	129,982
2035	88,006	1,396.1	1.4	203,558	129,982
2036	88,006	1,396.1	1.4	203,558	129,982
2037	88,006	1,396.1	1.4	203,558	129,982
2038	88,006	1,396.1	1.4	203,558	129,982
Total	**1,360,633**	**21,585.3**	**21.1**	**3,147,165**	**2,009,621**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-82
Federal greenhouse gas emissions from the transport of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	563,420	8,938	8.7	1,303,198	832,157
2024	572,157	9,077	8.9	1,323,409	845,062
2025	600,393	9,525	9.3	1,388,720	886,766
2026	620,456	9,843	9.6	1,435,125	916,398
2027	614,512	9,749	9.5	1,421,375	907,618
2028	591,477	9,383	9.2	1,368,095	873,597
2029	591,477	9,383	9.2	1,368,095	873,597
2030	591,477	9,383	9.2	1,368,095	873,597
2031	591,477	9,383	9.2	1,368,095	873,597
2032	591,477	9,383	9.2	1,368,095	873,597
2033	591,477	9,383	9.2	1,368,095	873,597
2034	591,477	9,383	9.2	1,368,095	873,597
2035	591,477	9,383	9.2	1,368,095	873,597
2036	591,477	9,383	9.2	1,368,095	873,597
2037	591,477	9,383	9.2	1,368,095	873,597
2038	591,477	9,383	9.2	1,368,095	873,597
Total	**9,477,183**	**150,347**	**146.6**	**21,920,872**	**13,997,564**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-83
Nonfederal greenhouse gas emissions from the transport of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	992,938	15,752	15.4	2,296,681	1,466,544
2024	1,035,023	16,420	16.0	2,394,024	1,528,703
2025	1,088,749	17,272	16.8	2,518,293	1,608,055
2026	1,120,353	17,773	17.3	2,591,394	1,654,733
2027	1,108,501	17,585	17.2	2,563,981	1,637,229
2028	1,060,306	16,821	16.4	2,452,504	1,566,045
2029	1,060,306	16,821	16.4	2,452,504	1,566,045
2030	1,060,306	16,821	16.4	2,452,504	1,566,045
2031	1,060,306	16,821	16.4	2,452,504	1,566,045
2032	1,060,306	16,821	16.4	2,452,504	1,566,045
2033	1,060,306	16,821	16.4	2,452,504	1,566,045
2034	1,060,306	16,821	16.4	2,452,504	1,566,045
2035	1,060,306	16,821	16.4	2,452,504	1,566,045
2036	1,060,306	16,821	16.4	2,452,504	1,566,045
2037	1,060,306	16,821	16.4	2,452,504	1,566,045
2038	1,060,306	16,821	16.4	2,452,504	1,566,045
Total	**17,008,926**	**269,832**	**263.2**	**39,341,913**	**25,121,763**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-84
Federal greenhouse gas emissions from the downstream combustion of oil produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	2,203,373	88.7	17.7	2,215,530	2,210,857
2024	2,419,390	97.4	19.5	2,432,739	2,427,608
2025	2,505,796	100.9	20.2	2,519,623	2,514,308
2026	2,721,813	109.5	21.9	2,736,832	2,731,059
2027	2,721,813	109.5	21.9	2,736,832	2,731,059
2028	2,894,627	116.5	23.3	2,910,599	2,904,459
2029	2,894,627	116.5	23.3	2,910,599	2,904,459
2030	2,894,627	116.5	23.3	2,910,599	2,904,459
2031	2,894,627	116.5	23.3	2,910,599	2,904,459
2032	2,894,627	116.5	23.3	2,910,599	2,904,459
2033	2,894,627	116.5	23.3	2,910,599	2,904,459
2034	2,894,627	116.5	23.3	2,910,599	2,904,459
2035	2,894,627	116.5	23.3	2,910,599	2,904,459
2036	2,894,627	116.5	23.3	2,910,599	2,904,459
2037	2,894,627	116.5	23.3	2,910,599	2,904,459
2038	2,894,627	116.5	23.3	2,910,599	2,904,459
Total	**44,413,079**	**1,787.5**	**357.5**	**44,658,143**	**44,563,943**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-85
Nonfederal greenhouse gas emissions from the downstream combustion of oil produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	2,289,779	92.2	18.4	2,302,414	2,297,557
2024	2,592,203	104.3	20.9	2,606,506	2,601,008
2025	2,678,610	107.8	21.6	2,693,390	2,687,709
2026	2,851,423	114.8	23.0	2,867,157	2,861,109
2027	2,894,627	116.5	23.3	2,910,599	2,904,459
2028	3,067,440	123.5	24.7	3,084,366	3,077,860
2029	3,067,440	123.5	24.7	3,084,366	3,077,860
2030	3,067,440	123.5	24.7	3,084,366	3,077,860
2031	3,067,440	123.5	24.7	3,084,366	3,077,860
2032	3,067,440	123.5	24.7	3,084,366	3,077,860
2033	3,067,440	123.5	24.7	3,084,366	3,077,860
2034	3,067,440	123.5	24.7	3,084,366	3,077,860
2035	3,067,440	123.5	24.7	3,084,366	3,077,860
2036	3,067,440	123.5	24.7	3,084,366	3,077,860
2037	3,067,440	123.5	24.7	3,084,366	3,077,860
2038	3,067,440	123.5	24.7	3,084,366	3,077,860
Total	**47,048,485**	**1,893.6**	**378.7**	**47,308,091**	**47,208,301**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-86
Federal greenhouse gas emissions from the downstream combustion of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	242,511.4	4.6	0.5	243,013	242,772
2024	551,666.5	10.4	1.0	552,808	552,260
2025	578,891.8	10.9	1.1	580,090	579,515
2026	598,235.8	11.3	1.1	599,474	598,880
2027	592,504.4	11.2	1.1	593,730	593,142
2028	570,294.1	10.7	1.1	571,474	570,908
2029	570,294.1	10.7	1.1	571,474	570,908
2030	570,294.1	10.7	1.1	571,474	570,908
2031	570,294.1	10.7	1.1	571,474	570,908
2032	570,294.1	10.7	1.1	571,474	570,908
2033	570,294.1	10.7	1.1	571,474	570,908
2034	570,294.1	10.7	1.1	571,474	570,908
2035	570,294.1	10.7	1.1	571,474	570,908
2036	570,294.1	10.7	1.1	571,474	570,908
2037	570,294.1	10.7	1.1	571,474	570,908
2038	570,294.1	10.7	1.1	571,474	570,908
Total	**8,837,045**	**166.5**	**16.7**	**8,855,332**	**8,846,555**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-87
Nonfederal greenhouse gas emissions from the downstream combustion of conventional natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	199,145	3.8	0.4	199,557	199,359
2024	546,559	10.3	1.0	547,690	547,147
2025	574,930	10.8	1.1	576,120	575,549
2026	591,619	11.1	1.1	592,843	592,255
2027	585,360	11.0	1.1	586,572	585,990
2028	559,910	10.6	1.1	561,068	560,512
2029	559,910	10.6	1.1	561,068	560,512
2030	559,910	10.6	1.1	561,068	560,512
2031	559,910	10.6	1.1	561,068	560,512
2032	559,910	10.6	1.1	561,068	560,512
2033	559,910	10.6	1.1	561,068	560,512
2034	559,910	10.6	1.1	561,068	560,512
2035	559,910	10.6	1.1	561,068	560,512
2036	559,910	10.6	1.1	561,068	560,512
2037	559,910	10.6	1.1	561,068	560,512
2038	559,910	10.6	1.1	561,068	560,512
Total	**8,656,621**	**163.1**	**16.3**	**8,674,534**	**8,665,936**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-88
Federal greenhouse gas emissions from the downstream combustion of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	3,584,590	67.6	6.8	3,592,007	3,588,447
2024	3,640,180	68.6	6.9	3,647,712	3,644,097
2025	3,819,825	72.0	7.2	3,827,729	3,823,935
2026	3,947,467	74.4	7.4	3,955,636	3,951,716
2027	3,909,647	73.7	7.4	3,917,738	3,913,855
2028	3,763,095	70.9	7.1	3,770,882	3,767,144
2029	3,763,095	70.9	7.1	3,770,882	3,767,144
2030	3,763,095	70.9	7.1	3,770,882	3,767,144
2031	3,763,095	70.9	7.1	3,770,882	3,767,144
2032	3,763,095	70.9	7.1	3,770,882	3,767,144
2033	3,763,095	70.9	7.1	3,770,882	3,767,144
2034	3,763,095	70.9	7.1	3,770,882	3,767,144
2035	3,763,095	70.9	7.1	3,770,882	3,767,144
2036	3,763,095	70.9	7.1	3,770,882	3,767,144
2037	3,763,095	70.9	7.1	3,770,882	3,767,144
2038	3,763,095	70.9	7.1	3,770,882	3,767,144
Total	**60,295,752**	**1,136.4**	**113.6**	**60,420,525**	**60,360,639**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

Table 4-89
Nonfederal greenhouse gas emissions from the downstream combustion of coalbed methane natural gas produced in the BFO from 2023 to 2038 (metric tons per year)

Year	CO_2	CH_4	N_2O	20-year GWP CO_2e	100-year GWP CO_2e
2023	6,317,271	119.1	11.9	6,330,343	6,324,069
2024	6,585,023	124.1	12.4	6,598,650	6,592,110
2025	6,926,841	130.5	13.1	6,941,175	6,934,295
2026	7,127,911	134.3	13.4	7,142,661	7,135,582
2027	7,052,510	132.9	13.3	7,067,104	7,060,099
2028	6,745,879	127.1	12.7	6,759,839	6,753,139
2029	6,745,879	127.1	12.7	6,759,839	6,753,139
2030	6,745,879	127.1	12.7	6,759,839	6,753,139
2031	6,745,879	127.1	12.7	6,759,839	6,753,139
2032	6,745,879	127.1	12.7	6,759,839	6,753,139
2033	6,745,879	127.1	12.7	6,759,839	6,753,139
2034	6,745,879	127.1	12.7	6,759,839	6,753,139
2035	6,745,879	127.1	12.7	6,759,839	6,753,139
2036	6,745,879	127.1	12.7	6,759,839	6,753,139
2037	6,745,879	127.1	12.7	6,759,839	6,753,139
2038	6,745,879	127.1	12.7	6,759,839	6,753,139
Total	**108,214,227**	**2,039.5**	**203.9**	**108,438,160**	**108,330,680**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from the IPCC AR6: CO_2 = 1; CH_4 = 29.8; N_2O = 273.

4.5 Other BLM-Authorized Activities

Annual emissions of criteria and hazardous air pollutants from BLM-authorized activities other than oil and gas development and coal mining in the BFO are provided in **Table 4-90**. Annual emissions of GHGs from other BLM-authorized activities are provided in **Table 4-91**.

Table 4-90
Annual emissions of criteria and hazardous air pollutants for other BLM-authorized activities in the BFO (tons per year)

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOCs	HAPs
Locatable Minerals – Bentonite Mining	1,448	230	17	1	43	5	-
Locatable Minerals – Uranium Mining	45	7	33	1	14	3	3
Salable Minerals – Sand, Gravel, and other Minerals	1,549	170	44	6	29	14	1
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest and Woodlands Management	85	9	-	-	2	1	-
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	3	-	2	1	-

Activity	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOCs	HAPs
Land Resources – Comprehensive Trails and Travel Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	-	-	-	3	-	-
Total Other BLM Activities	**3,603**	**584**	**170**	**23**	**3,004**	**470**	**49**

Source: BLM 2015

Notes: PM_{10} =particulate matter with a diameter less than or equal to 10 microns; $PM_{2.5}$ =particulate matter with a diameter less than or equal to 2.5 microns; NOx = nitrogen oxides; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds; HAPs = hazardous air pollutants.

Table 4-91
Estimated annual greenhouse gases emissions for other BLM-authorized activities in the BFO (metric tons per year)

Activity	CO_2	CH_4	N_2O	100-year GWP CO_2e	20-year GWP CO_2e
Locatable Minerals – Bentonite Mining	9,556.3	-	-	9,556.3	9,556.3
Locatable Minerals – Uranium Mining	1,631.1	-	-	1,631.1	1,631.1
Salable Minerals – Sand, Gravel, and other Minerals	34,288.9	-	-	34,288.9	34,288.9
Fire and Fuels Management	8.2	71.7	4.5	3,382.2	7,159.0
Forest and Woodlands Management	26.3	-	-	26.3	26.3
Land Resources – Rights-of-Way and Renewable Energy Projects	1,849.7	-	-	1,849.7	1,849.7
Land Resources – Comprehensive Trails and Travel Management	11,913.2	5.4	-	12,075.4	12,362.2
Livestock Grazing Management	70.8	352.9	-	9,669.5	28,584.7
Total Other BLM Activities	**59,344.4**	**430.0**	**4.5**	**72,479.3**	**95,458.2**

Source: BLM 2015

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalents. The 20-year time horizon GWPs applied to calculate CO_2e for all activities except livestock grazing from the IPCC Sixth Assessment Report (AR6): CO_2 = 1; CH_4 (fossil) = 82.5; N_2O = 273. The 100-year time horizon GWPs applied to calculate CO_2e from all activities except for livestock grazing from the IPCC AR6: CO_2 = 1; CH_4 (fossil) = 29.8; N_2O = 273. The AR6 non-fossil 20-year and 100-year GWPs of CH_4 of 80.8 and 27.2, respectively, were applied to CH_4 emissions from livestock grazing.

4.6 Supporting Information for Downstream Combustion Impacts on Air Quality and Public Health

4.6.1 Coal Shipments from the Coal Development Potential Area

From mines located in the CDPA, coal is transported via rail, truck, and/or conveyor to coal-fired power plants, which are listed in **Table 4-92**. In addition to power plants, coal from Black Thunder, North Antelope, and Antelope mines is also sent to the Four Rivers Terminal, a rail, barge, and storage terminal in Kentucky. Coal from North Antelope mine is sent to the Calvert City Terminal (CCT) Terminal as well, a similar terminal also located in Kentucky (EIA 2023). Due to potential mine and power plant closures in future years, the destinations and shipping distances may vary over the planning period (2023-2038) and beyond.

Table 4-92
Power plants that received BFO coal in 2021 and corresponding coal shipments

Power Plant	Power Plant Location	Supplying Mines	Amount of Coal Received (million short tons)
Allen S. King	Washington, MN	Black Thunder, North Antelope	0.7
Apache Station	Cochise, AZ	Black Thunder, North Antelope	0.3
Avon Lake	Lorain, OH	Belle Ayr, Black Thunder	0.2
Baldwin Energy Complex	Douglas, KS	Belle Ayr, Black Thunder, Buckskin, Caballo, Eagle Butte, North Antelope	2.6
Big Cajun 2	Pointe Coupee, LA	Buckskin	0.5
Big Stone	Grant, SD	Rawhide	1.2
Brame Energy Center	Rapides, LA	Antelope, Belle Ayr, Black Thunder, North Antelope	1.4
Burlington	Des Moines, IA	Belle Ayr, North Antelope	0.6
Calvert City	Marshall, KY	Antelope, Black Thunder, North Antelope	0.9
Clay Boswell	Itasca, MN	Antelope, Black Thunder, Caballo, North Antelope	1.6
Clifty Creek	Jefferson, IN	Black Thunder	4.8E-02
Coleto Creek	Goliad, TX	Antelope, Belle Ayr, Black Thunder, Caballo, Coal Creek, North Antelope	1.7
Columbia	Columbia, WI	Belle Ayr, Black Thunder, Caballo, North Antelope	3.5
Comanche	Pueblo, CO	Belle Ayr, Black Thunder, Eagle Butte, North Antelope	4.4
Coronado	Apache, AZ	Antelope, Black Thunder, North Antelope	0.6
Dan E. Karn	Bay, MI	Antelope, Black Thunder, North Antelope	1.4
Dave Johnston	Converse, WY	Caballo, Coal Creek, North Antelope	2.6
Dry Fork Station	Campbell, WY	Dry Fork	2.0
E. D. Edwards	Peoria, IL	Belle Ayr, Black Thunder, Eagle Butte, North Antelope	1.4
Edgewater	Sheboygan, WI	Belle Ayr, Black Thunder, Caballo, Coal Creek, North Antelope	1.5

Power Plant	Power Plant Location	Supplying Mines	Amount of Coal Received (million short tons)
Elm Road Generating Station	Milwaukee, WI	Antelope, Black Thunder, North Antelope	2.9
Fayette Power Project	Fayette, TX	Antelope, Buckskin, Caballo, Eagle Butte, Rawhide	5.4
Flint Creek	Benton, AR	Belle Ayr, Black Thunder, North Antelope	1.7
George Neal North	Woodbury, IA	Antelope, Black Thunder, North Antelope	0.4
George Neal South	Woodbury, IA	Antelope, Black Thunder, North Antelope	0.4
Gerald Gentleman	Lincoln, NE	Belle Ayr, Caballo, Cordero Rojo	2.9
Grand River Energy Center (GREC)	Mayes, OK	Caballo	0.8
Harrington	Potter, TX	Black Thunder, North Antelope	2.9
Hawthorn	Jackson, MO	Belle Ayr, Black Thunder, Caballo, Cordero Rojo, North Antelope	1.6
Holcomb	Finney, KS	Antelope, Belle Ayr, Caballo, Cordero Rojo, North Antelope	1.1
Hugo	Choctaw, OK	Antelope, North Antelope	0.4
Iatan	Platte, MO	Belle Ayr, Black Thunder, Caballo, Cordero Rojo, Eagle Butte	4.6
Independence Steam Electric Station	Independence, AR	Antelope, Black Thunder, Cordero Rojo, North Antelope	1.8
J. H. Campbell	Ottawa, MI	Antelope, Black Thunder, North Antelope	4.0
J. K. Spruce	Bexar, TX	Cordero Rojo	3.9
James H. Miller Jr.	Jefferson, AL	Antelope, Black Thunder, Caballo, North Antelope	10.9
Jeffrey Energy Center	Pottawatomie, KS	Black Thunder, Caballo, Cordero Rojo, Eagle Butte, North Antelope	4.8
John P. Madgett	Buffalo, WI	Black Thunder, North Antelope	0.9
John Twitty Energy Center	Greene, MO	Antelope	1.3
John W. Turk Jr. Power Plant	Hempstead, AR	Black Thunder, North Antelope	1.5
Joppa Steam	Massac, IL	Antelope, Belle Ayr, Black Thunder, Eagle Butte, North Antelope	2.7
Kincaid Generation LLC	Christian, IL	Belle Ayr, Black Thunder, Eagle Butte, North Antelope	2.4
Kingston	Roane, TN	Antelope, North Antelope	0.9
La Cygne	Linn, KS	Belle Ayr, Black Thunder, Caballo, Cordero Rojo, Eagle Butte	4.6
Labadie	Franklin, MO	Antelope, Black Thunder, North Antelope	8.6
Lake Road	Buchanan, MO	Black Thunder	0.012
Lansing	Allamakee, IA	Belle Ayr, Black Thunder, Caballo	0.3
Laramie River Station	Platte, WY	Antelope, Black Thunder, Dry Fork, North Antelope	4.6
Lawrence Energy Center	Douglas, KS	Black Thunder	1.3

Power Plant	Power Plant Location	Supplying Mines	Amount of Coal Received (million short tons)
Limestone	Limestone, TX	Black Thunder, Buckskin, Caballo, Rawhide	3.5
Louisa	Louisa, IA	Antelope, Black Thunder, North Antelope	1.8
Martin Drake	El Paso, CO	North Antelope	0.1
Martin Lake	Rusk, TX	Rawhide	7.4
Meramec	St. Louis, MO	Antelope, Black Thunder, North Antelope	0.2
Michigan City	La Porte, IN	Black Thunder	0.8
Monroe	Monroe, MI	Antelope, Black Thunder, North Antelope	5.6
Muscatine Plant	Muscatine, IA	Black Thunder, Buckskin	0.5
Muskogee	Muskogee, OK	North Antelope	1.7
Nearman Creek	Wyandotte, KS	Caballo	0.7
Nebraska City	Otoe, NE	Belle Ayr, Caballo, Eagle Butte, North Antelope	4.0
New Madrid	New Madrid, MO	North Antelope	2.5
Newton	Jasper, IL	Antelope, Black Thunder, Eagle Butte, North Antelope	1.6
North Omaha	Douglas, NE	Belle Ayr, Caballo, Eagle Butte	1.0
Northeastern	Rogers, OK	Black Thunder, North Antelope	1.2
Ottumwa	Wapello, IA	Belle Ayr, Black Thunder, Buckskin, Caballo, Cordero Rojo, Eagle Butte, North Antelope	2.4
Pawnee	Morgan, CO	Belle Ayr, Buckskin, Eagle Butte	1.8
Plum Point Energy Station	Mississippi, AR	Antelope, Belle Ayr, North Antelope	2.1
Powerton	Tazewell, IL	Black Thunder, North Antelope	2.0
Prairie Creek	Linn, IA	Antelope, Belle Ayr, Black Thunder	0.3
R. M. Schahfer	Jasper, IN	Black Thunder	0.3
R. S. Nelson	Calcasieu, LA	Belle Ayr, Black Thunder, Coal Creek, North Antelope	1.1
Rawhide	Larimer, CO	Antelope	1.0
Ray D. Nixon	El Paso, CO	Antelope, North Antelope	0.6
River Valley	Le Flore, OK	North Antelope	0.7
Rush Island	Jefferson, MO	Antelope, Belle Ayr, Black Thunder, North Antelope	4.8
Sandy Creek Energy Station	McLennan, TX	Belle Ayr, Black Thunder, North Antelope	3.0
Scherer	Monroe, GA	Buckskin, Caballo, Cordero Rojo, Eagle Butte, North Antelope	4.3
Shawnee	McCracken, KY	Antelope, Black Thunder, North Antelope	3.5
Sheldon	Lancaster, NE	Belle Ayr	0.6
Sherburne County	Sherburne, MN	Black Thunder, North Antelope	3.7
Sikeston Power Station	Scott, MO	Black Thunder	0.9
Sioux	St. Charles, MO	Antelope, Belle Ayr, Black Thunder, North Antelope	1.9
Sooner	Noble, OK	Belle Ayr, Eagle Butte, North Antelope	2.0

Power Plant	Power Plant Location	Supplying Mines	Amount of Coal Received (million short tons)
South Oak Creek	Milwaukee, WI	Antelope, Black Thunder, North Antelope	2.5
Springerville	Apache, AZ	Antelope, Black Thunder, North Antelope	2.5
Thomas Hill	Randolph, MO	North Antelope	4.4
Tolk	Lamb, TX	Black Thunder, North Antelope	1.4
Transalta Centralia Generation	Lewis, WA	Rawhide	0.7
Trenton Channel	Wayne, MI	Antelope, Black Thunder, North Antelope	0.7
Trimble County	Trimble, KY	Black Thunder	0.6
T. S. Power Plant	Eureka, NV	Black Thunder	0.6
Victor J. Daniel Jr.	Jackson, MS	Black Thunder, Caballo, North Antelope	1.4
W. A. Parish	Fort Bend, TX	Black Thunder, Buckskin, Caballo, Rawhide	8.5
Walter Scott Jr. Energy Center	Pottawattamie, IA	Antelope, Black Thunder, North Antelope	3.0
Waukegan	Lake, IL	North Antelope	1.4
Welsh	Titus, TX	North Antelope	3.2
Weston	Marathon, WI	Antelope, Black Thunder, North Antelope	2.5
Whelan Energy Center	Adams, NE	Rawhide	1.0
White Bluff	Jefferson, AR	Antelope,Belle Ary, Black Thunder, Cordero Rojo, North Antelope	3.9
Will County	Will, IL	North Antelope	0.4
Wygen 1	Campbell, WY	Wyodak	0.4
Wyodak	Campbell, WY	Wyodak	1.3

Source: EIA 2023

Notes: The amount of coal received by each power plant is from the listed supplying mines only and may include coal from both federal and nonfederal lands. Plants may receive additional coal from mines outside the planning

4.6.2 Refined Petroleum Products from Oil

The U.S. EIA reports the percent yield of individual petroleum products from US refineries on a yearly basis. The average values over the 5-year period from 2017 to 2021 are presented in **Table 4-93**. Most of the crude oil produced in the Rocky Mountain region is transported to refineries within the US, so domestic averages provide a reasonable basis for this analysis. Some refinery products, such as lubricants and asphalt and road oil, are not combusted and their impacts are therefore not included in this study. Combustible petroleum products can be burned by a variety of sources including on-road and off-road vehicles and stationary sources.

Table 4-93
Average product yield from US refineries

Petroleum product	Refinery Yield (%) 2017–2021 Average
Finished motor gasoline	46.7
Distillate fuel oil	30.0
Kerosene-type jet fuel	9.2
Petroleum coke	5.1
Still gas	4.0
Hydrocarbon gas liquids	3.7
Asphalt and road oil	2.0
Residential fuel oil	2.0
Naphtha for petrochemical feedstock use	1.1
Lubricants	1.0
Other oils for petrochemical feedstock use	0.6
Miscellaneous products	0.5
Special naphthas	0.2
Finished aviation gasoline	0.1
Kerosene	0.1
Waxes	<0.0

Source: EIA 2022a
Note: The individual products do not sum to 100 percent due to refinery processing gain, which is due to crude oil having a higher specific gravity than the finished products.

Motor gasoline is the most used petroleum product in the US. Gasoline is primarily used in the transportation sector and is dominated by light-duty vehicles (e.g., cars, sport utility vehicles, small trucks), which make up 91 percent of total gasoline use (EIA 2022b). Additional uses include recreational vehicles and boats, small aircraft, equipment and tools used in various industries (e.g., construction, farming, forestry), and portable electricity generators. Distillate fuel oil, which includes diesel fuel and heating oil, is the second most used petroleum product in the US. Approximately 77 percent of diesel fuel is used in the transportation sector in freight and delivery trucks, trains, buses, boats, electricity generators, and farm, construction, and miliary vehicles and equipment. Some cars and light trucks also have diesel engines (EIA 2022c). Jet fuel is used in commercial, private, and military aircraft. Stationary source emissions are predominantly from distillate fuel combustion used for commercial and residential heating, industrial boilers, and power plant electricity generation (EIA 2022d).

4.6.3 Emissions from Coal Combustion

US annual emissions of CAPs, precursors, and HAPs from coal combustion for individual source sectors are presented in the *Affected Environment* section of the SEIS. Data for all pollutants except dioxins/furans is from the EPA 2020 NEI (EPA 2023b). Dioxins and furans are not included in the EPA NEI since the EPA has not evaluated the completeness or accuracy of emissions estimates from state, or local agencies, or sovereign tribal nations (EPA 2021). The dioxins and furans emissions value is instead the range reported by EPRI 2018a for all power plants assessed for 2017. Dioxins/furans emissions are expressed as 2,3,7,8-TCDD toxic equivalents in EPRI 2018a.

The list of HAPs focused on in this assessment was developed using coal-fired power plant emissions studies by the Electric Power Research Institute (EPRI 2018a, 2018b) and the EPA NEI (EPA 2023b). Measurement data and previous emissions inventories from EPA, the Department of Energy (DOE), and

EPRI were used by EPRI (2018a) to determine which HAPs are most relevant to coal combustion. Inhalation risk assessments by EPRI (2018a) showed that As, Cr (VI), Ni, Cl_2, acrolein, and Cd had the greatest impact on the modeled cancer risk, chronic non-cancer hazard index, and acute hazard quotients (HQ). In addition to these HAPs, a multi-pathway risk assessment (EPRI 2018b) also identified Hg, B(a)P, dioxin, and HCl as pollutants that contribute to the cancer risk and hazard index. It is highly likely that these HAPs account for the majority of cancer and non-cancer risk from coal-fired power plants. Emissions information for additional HAPs that may be emitted from coal combustion can be found in the EPA NEI (EPA 2023b) and EPRI 2018a.

The EPA NEI also provides facility-level emissions. Emissions of CAPs, precursors, and the HAPs discussed above are presented in **Table 4-94** through **Table 4-102** for each of the 104 power plants that receive BFO coal. As noted above, dioxins and furans are not included in the EPA NEI and these emissions are instead from EPRI (2018a).

Table 4-94
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 1

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		A.S. King	Apache	Avon Lake	Baldwin	Big Cajun 2	Big Stone	Brame	Burling-ton	Calvert City	Clay Boswell	Clifty Creek	Coleto Creek
NH_3	CAP precursor	4.4	—	4.0E-02	0.0E+00	27.8	4.2	74.1	0.3	—	1.0	0.8	—
CO	CAP	27.9	958.0	391.7	0.8	231.3	285.6	1.3E+03	345.4	2.3	1.5E+03	530.6	2.0E+03
NO_x	CAP	425.1	1.4E+03	312.4	1.8	717.4	785.4	2.7E+03	869.1	6.6	2.0E+03	5.3E+03	2.0E+03
PM_{10}	CAP	73.4	149.2	61.5	3.9E-02	100.4	26.3	194.6	166.1	3.8	428.7	161.1	266.8
$PM_{2.5}$	CAP	47.9	102.1	57.6	3.7E-02	6.0E+01	23.2	149.1	166.1	3.8	227.4	147.2	141.0
SO_2	CAP	490.5	95.6	853.1	4.0E-04	979.8	664.0	3.7E+03	2.7E+03	0.4	491.0	2.6E+03	7.9E+03
VOCs	CAP precursor	26.5	59.4	4.2	0.1	36.9	62.8	81.9	21.5	0.4	9.2	42.4	31.8
Pb	CAP/HAP	5.5E-03	9.8E-04	2.7E-02	—	5.1E-04	3.6E-02	0.2	2.5E-02	2.4E-04	0.4	0.1	4.2E-02
Acrolein	HAP	9.3E-03	9.9E-03	1.9E-02	—	—	—	—	0.1	9.3E-04	3.7E-01	—	0.2
As	HAP	3.5E-03	1.8E-02	2.7E-02	—	7.0E-03	1.6E-05	6.9E-04	8.3E-03	—	0.5	3.4E-02	2.3E-02
Cd	HAP	9.6E-04	1.0E-02	3.4E-03	—	6.5E-03	1.2E-05	3.8E-03	3.9E-03	—	6.5E-02	2.3E-03	9.7E-03
Cl_2	HAP	—	—	—	—	—	—	—	—	—	—	—	—
Cr	HAP	6.2E-02	1.9E-03	1.7E-02	—	2.0E-02	1.2E-05	4.9E-03	3.3E-02	—	0.3	0.1	0.3
HCl	HAP	0.7	0.4	2.5	—	—	1.8	3.7	5.1	—	14.3	49.4	12.8
Mn	HAP	1.7E-02	1.2E-02	3.3E-02	—	1.6E-02	4.2E-02	1.3E-03	7.3E-02	—	0.6	0.1	0.2
Hg	HAP	1.8E-03	2.5E-03	3.4E-03	—	1.6E-03	1.6E-03	9.4E-03	4.5E-03	2.0E-05	3.3E-03	1.9E-02	1.2E-02
Ni	HAP	1.1E-02	1.9E-02	1.8E-02	—	2.2E-02	1.2E-05	7.3E-03	3.2E-02	—	0.4	8.8E-02	8.3E-02
Dioxins/ furans	HAP	1.9E-08	1.4E-08	1.7E-08	4.5E-08	3.9E-08	1.1E-08	—	7.5E-09	—	4.8E-08	3.7E-08	—

Source: EPA 2023b; EIA 2023; EPRI 2018a

Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Emissions reported for the Baldwin Energy Complex include emissions from both the Baldwin 1 and Baldwin 2 stations. Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-95
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 2

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		Colum-bia	Coman-che	Coro-nado	D.E. Karn	D. John-ston	Dry Fork	E.D. Edward	Edge-water	Elm Road	Fayette	Flint Creek	George Neal N.
NH_3	CAP precursor	4.7	—	2.5	3.5	1.1	72.9	—	9.0	4.0	—	—	0.5
CO	CAP	2.0E+03	709.8	2.0E+03	285.9	4.9E+03	415.3	1.4E+03	252.1	1.5E+03	6.0E+03	282.3	777.1
NO_x	CAP	2.8E+03	3.2E+03	2.6E+03	663.0	5.6E+03	707.7	2.5E+03	242.6	3.4E+03	5.7E+03	1.9E+03	1.0E+03
PM_{10}	CAP	180.5	83.7	547.1	421.3	731.3	14.8	312.1	129.6	249.4	716.1	99.3	101.3
$PM_{2.5}$	CAP	115.9	54.4	547.1	413.9	257.7	1.6	178.5	92.6	122.4	695.1	30.1	79.6
SO_2	CAP	1.7E+03	1.9E+03	60.5	629.4	7.0E+03	1.0E+03	6.5E+03	294.4	584.2	913.9	536.1	1.7E+03
VOCs	CAP precursor	95.0	88.2	48.8	32.5	88.2	2.2	58.0	21.5	70.1	30.0	36.1	16.4
Pb	CAP/HAP	3.5E-02	1.7E-02	1.3E-02	4.6E-03	3.6E-02	6.6E-03	6.2E-02	8.2E-03	4.0E-05	0.1	1.1E-02	6.5E-03
Acrolein	HAP	0.5	—	0.2	3.1E-02	9.0E-02	6.5E-06	—	0.1	0.3	—	0.2	7.5E-02
As	HAP	1.3E-02	9.6E-03	5.5E-03	1.1E-03	2.4E-02	4.1E-03	0.1	7.1E-03	3.1E-02	6.5E-02	6.8E-03	0.1
Cd	HAP	9.5E-03	6.2E-04	4.0E-03	1.8E-03	6.2E-03	1.0E-03	7.3E-03	2.6E-03	1.3E-03	6.7E-02	2.4E-03	1.3E-02
Cr	HAP	8.4E-02	3.2E-02	2.9E-02	5.5E-03	7.3E-02	3.4E-02	0.2	3.1E-02	0.6	0.2	0.1	8.7E-02
HCl	HAP	2.8	5.9	0.3	0.8	10.6	1.3	19.0	4.3	4.9	9.2	4.9	2.0
Mn	HAP	0.2	5.6E-02	3.8E-02	1.0E-02	9.0E-02	5.3E-02	0.1	3.5E-02	4.9E-02	6.8E-02	3.6E-02	0.1
Hg	HAP	1.5E-02	1.3E-02	9.8E-03	7.4E-03	1.8E-02	1.9E-02	1.2E-02	3.5E-03	2.4E-02	4.1E-02	1.1E-03	1.4E-03
Ni	HAP	8.0E-02	3.9E-02	3.4E-02	4.0E-02	7.4E-02	6.7E-02	0.2	2.7E-02	7.0E-02	0.3	2.4E-02	7.2E-02
Dioxins/ furans	HAP	—	4.4E-08	—	1.4E-08	2.6E-08	—	2.2E-08	2.7E-08	—	—	4.2E-05	1.3E-08

Source: EPA 2023b; EIA 2023; EPRI 2018a
EPA NEI reports total emissions from the Oak Creek Station which includes Elm Road and South Oak Creek; the emissions reported here are therefore total power plant emissions. EPRI 2018a reports total emissions from the George Neal Power Plant rather than reporting North and South separately; the dioxins/furans emissions reported here are therefore total power plant emissions. Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; the Cr emissions reported here therefore include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-96
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 3

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		George Neal S.	G. Gentle-man	GREC	Harring-ton	Haw-thorn	Hol-comb	Hugo	Iatan	Indepen-dence	J.H. Camp-bell	J.K. Spruce	J.H. Miller
NH_3	CAP precursor	0.4	1.6	—	—	26.5	0.5	—	0.0	14.7	11.5	34.3	3.7
CO	CAP	320.0	5.4E+03	289.7	1.9E+03	342.7	645.9	36.4	788.2	704.7	968.0	720.5	3.1E+03
NO_x	CAP	634.5	6.3E+03	327.6	2.6E+03	688.5	1.4E+03	242.8	1.9E+03	3.0E+03	2.4E+03	3.3E+03	6.5E+03
PM_{10}	CAP	118.0	204.2	166.8	444.3	40.3	149.7	15.4	148.6	299.2	186.2	314.5	361.2
$PM_{2.5}$	CAP	89.8	121.8	144.8	73.3	24.6	96.0	15.4	99.5	211.2	169.7	203.3	180.7
SO_2	CAP	1.2E+03	1.8E+04	234.0	8.2E+03	929.5	1.1E+03	569.6	811.6	8.0E+03	4.0E+03	758.1	880.3
VOCs	CAP precursor	12.9	122.9	35.9	63.1	4.1	11.2	10.0	2.8	56.2	115.9	58.0	367.1
Pb	CAP/HAP	2.5E-03	6.7E-06	1.0E-03	5.9E-02	6.9E-03	7.3E-03	5.1E-03	3.4E-02	0.4	1.1E-02	0.1	0.1
Acrolein	HAP	6.0E-02	0.6	5.9E-02	—	4.5E-02	2.4E-04	2.1E-02	0.1	—	0.1	1.9E-04	0.3
As	HAP	8.4E-02	1.7E-02	9.0E-03	2.9E-02	3.5E-03	1.1E-03	5.0E-04	8.5E-03	3.6E-04	3.5E-03	1.1E-03	0.0
Cd	HAP	1.0E-02	1.6E-02	6.1E-04	9.9E-03	1.0E-03	2.1E-03	1.3E-04	3.5E-03	2.7E-04	8.7E-02	5.8E-03	1.3E-02
Cl_2	HAP	—	—	—	1.3E+00	—	2.8E+00	—	—	—	—	—	—
Cr	HAP	7.0E-02	1.4E-02	6.0E-03	9.7E-02	1.3E-02	3.3E-02	1.0E-03	3.5E-02	2.7E-04	4.3E-02	5.4E-02	0.1
HCl	HAP	0.4	22.2	1.2E-04	15.9	1.9	0.8	1.5	1.4	13.5	2.7	3.5	12.7
Mn	HAP	0.1	2.7E-02	1.1E-02	0.2	1.9E-02	1.5E-02	1.0E-03	4.7E-02	7.4E-02	2.6E-02	5.6E-02	0.2
Hg	HAP	—	2.1E-02	2.0E-04	1.5E-02	5.5E-03	3.7E-03	1.1E-03	1.6E-02	1.3E-02	2.7E-02	8.6E-02	5.0E-02
Ni	HAP	5.8E-02	2.3E-02	6.0E-03	9.7E-02	1.6E-02	0.1	1.7E-03	4.2E-02	2.7E-04	2.8E-02	6.2E-02	0.2
Dioxins/ furans	HAP	1.3E-08	6.0E-08	—	—	2.3E-08	1.0E-08	—	6.0E-08	—	6.0E-08	—	1.2E-07

Source: EPA 2023b; EIA 2023; EPRI 2018a
Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). EPRI 2018a reports total emissions from the George Neal Power Plant rather than reporting North and South separately; the dioxins/furans emissions reported here are therefore total power plant emissions. Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-97
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 4

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		Jeffrey	J.P. Madgett	J. Twitty	J.W. Turk	Joppa	Kincaid	Kings-ton	La Cygne	Labadie	Lake Road	Lansing	Laramie River
NH_3	CAP precursor	79.7	4.9	6.1	—	10.9	9.4	6.4	9.8	2.6	5.0	11.5	74.0
CO	CAP	6.4E+03	286.9	395.8	12.1	3.3E+03	122.1	222.1	453.1	2.3E+03	71.1	85.8	1.2E+03
NO_x	CAP	3.7E+03	660.9	741.9	20.5	2.5E+03	387.6	696.4	2.8E+03	7.6E+03	556.0	92.1	6.1E+03
PM_{10}	CAP	747.9	60.4	105.8	2.5	510.5	23.9	137.1	261.6	2.2E+03	21.4	140.8	380.5
$PM_{2.5}$	CAP	628.1	30.6	93.7	2.4	299.4	11.9	103.6	147.0	1.5E+03	16.9	136.0	76.2
SO_2	CAP	902.7	709.0	2.0E+03	0.2	8.2E+03	733.0	872.8	725.4	3.9E+04	184.5	111.6	5.3E+03
VOCs	CAP precursor	143.0	33.4	23.1	0.8	85.8	54.9	26.5	153.1	281.0	8.2	8.2	169.1
Pb	CAP/HAP	5.1E-02	1.7E-03	5.7E-03	—	7.3E-02	7.8E-03	1.8E-02	1.9E-02	0.1	8.1E-03	2.6E-03	4.2E-02
Acrolein	HAP	0.1	—	3.8E-03	2.4E-03	—	—	3.2E-02	0.1	2.3E-07	1.5E-03	4.0E-02	2.0E-04
As	HAP	2.9E-02	7.7E-04	3.8E-03	—	0.3	—	1.4E-02	8.3E-02	8.8E-02	7.5E-03	2.9E-03	2.8E-02
Cd	HAP	6.0E-04	5.8E-04	3.0E-03	—	2.2E-02	—	2.0E-03	1.7E-02	1.7E-02	5.0E-04	1.3E-03	5.6E-03
Cl_2	HAP	—	5.2E-07	—	—	—	—	—	—	—	—	—	—
Cr	HAP	9.1E-02	6.2	1.9E-02	—	0.1	—	2.3E-02	3.5E-02	0.2	1.2E-02	1.1E-02	6.5E-02
HCl	HAP	1.7	10.1	2.0	—	19.9	4.9	21.7	2.4	83.5	0.2	0.2	1.0
Mn	HAP	0.1	0.4	3.5E-02	—	0.2	2.5E-02	3.1E-02	4.8E-02	0.4	2.6E-02	1.6E-02	8.7E-02
Hg	HAP	2.5E-02	7.4E-03	4.9E-03	—	1.5E-02	5.1E-03	4.8E-03	1.2E-02	8.3E-02	1.5E-03	1.5E-03	3.0E-02
Ni	HAP	9.7E-02	0.2	2.4E-02	—	0.6	—	2.7E-02	4.3E-02	0.3	8.0E-03	1.0E-02	0.2
Dioxins/ furans	HAP	5.5E-08	1.1E-08	—	—	2.3E-08	3.6E-08	2.8E-08	4.9E-08	8.0E-08	—	7.0E-08	—

Source: EPA 2023b; EIA 2023; EPRI 2018a
Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-98
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 5

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		Law-rence	Lime-stone	Louisa	Martin Drake	Martin Lake	Mera-mec	Michigan City	Monroe	Musca-tine	Musko-gee	Near-man Creek	Nebra-ska City
NH_3	CAP precursor	2.8	1.8E-03	0.9	—	2.0E-04	0.9	1.1	0.9	—	—	107.6	367.1
CO	CAP	544.9	1.2E+03	2.0E+03	175.5	3.9E+04	62.8	223.1	3.0E+03	147.5	615.0	166.8	3.8E+03
NO_x	CAP	1.4E+03	5.0E+03	1.7E+03	530.5	1.0E+04	106.4	704.2	4.2E+03	2.3E+03	3.4E+03	1.4E+03	5.3E+03
PM_{10}	CAP	109.3	474.5	213.2	22.4	1.7E+03	13.2	199.4	139.5	82.2	580.5	142.6	366.3
$PM_{2.5}$	CAP	66.7	375.8	127.1	20.9	989.1	6.0	177.2	70.7	47.8	420.0	120.9	242.1
SO_2	CAP	225.8	4.9E+03	2.9E+03	67.6	4.4E+04	283.7	694.7	3.8E+03	1.6E+03	3.6E+03	1210.8	1.1E+04
VOCs	CAP precursor	39.1	29.0	2.8	9.9	261.1	3.7	47.3	36.6	22.8	69.0	21.2	95.0
Pb	CAP/HAP	8.1E-03	6.2E-02	2.8E-02	1.6E-03	4.7E-02	1.7E-03	4.5E-03	4.9E-02	3.3E-02	1.6E-02	0.1	5.6E-02
Acrolein	HAP	3.6E-02	0.6	0.2	—	—	4.9E-07	—	0.2	7.6E-02	2.9E-02	0.1	0.7
As	HAP	1.5E-04	4.5E-02	3.1E-03	7.6E-03	3.0E-02	1.0E-03	1.1E-02	3.5E-02	2.5E-02	7.9E-03	0.1	2.4E-02
Cd	HAP	8.5E-04	6.3E-03	2.4E-04	1.0E-03	5.4E-02	5.0E-04	2.9E-03	6.0E-03	4.5E-03	1.7E-03	1.8E-02	5.3E-06
Cl_2	HAP	—	—	—	—	—	—	—	—	—	—	—	—
Cr	HAP	1.5E-02	0.1	3.9E-02	1.0E-03	8.8E-02	3.0E-03	4.5E-03	0.2	0.1	3.2E-02	9.0E-02	9.0E-02
HCl	HAP	0.4	23.4	0.6	0.2	47.3	1.7	8.2E-02	28.9	2.3	6.1	4.0	15.5
Mn	HAP	2.0E-02	0.2	6.7E-02	1.1E-03	0.6	6.5E-03	1.3E-02	0.2	6.8E-02	4.0E-02	0.2	0.2
Hg	HAP	2.1E-03	5.3E-02	3.5E-03	2.0E-04	0.2	3.0E-04	3.5E-03	2.0E-02	4.4E-03	8.0E-03	4.4E-03	2.9E-02
Ni	HAP	1.8E-02	9.7E-02	8.9E-02	1.9E-03	7.2E-02	3.0E-03	2.8E-04	0.2	0.1	4.2E-02	9.7E-02	0.1
Dioxins/ furans	HAP	1.6E-08	6.5E-08	—	8.5E-09	4.6E-08	1.2E-08	1.2E-08	1.1E-07	6.0E-09	3.2E-08	9.0E-09	5.5E-08

Source: EPA 2023b; EIA 2023; EPRI 2018a

Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-99
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 6

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		New Madrid	Newton	North Omaha	North-eastern	Ottum-wa	Pawnee	Plum Point	Power-ton	Prairie Creek	R.M. Schahfer	R.S. Nelson	Raw-hide
NH_3	CAP precursor	1.0	0.5	0.9	63.6	22.4	5.0	2.2	0.3	1.4	2.7	—	—
CO	CAP	1.7E+03	1.9E+03	281.4	359.8	5.9E+02	545.5	445.4	26.9	365.8	418.4	1.3E+03	451.1
NO_x	CAP	1.8E+04	1.9E+03	3.2E+03	1.5E+03	875.0	1.1E+03	1.3E+03	623.0	848.1	2.8E+03	957.0	1.1E+03
PM_{10}	CAP	665.8	68.3	251.7	105.5	318.9	64.6	158.2	117.5	123.5	636.1	277.1	57.7
$PM_{2.5}$	CAP	394.0	38.5	175.1	89.5	310.7	55.9	106.4	88.9	123.5	466.3	123.9	32.0
SO_2	CAP	1.2E+04	4.6E+03	5.4E+03	2.3E+03	919.4	1.6E+03	2.3E+03	638.8	1.3E+03	759.9	3.7E+03	716.5
VOCs	CAP precursor	199.0	88.6	34.1	34.3	0.5	125.2	63.8	9.5	10.5	53.0	17.2	33.5
Pb	CAP/HAP	4.4E-02	2.9E-02	2.1E-02	3.6E-03	3.2E-02	4.8E-03	1.9E-02	8.6E-03	2.4E-02	6.0E-02	1.4E-01	1.4E-03
Acrolein	HAP	—	—	—	0.1	0.2	0.2	0.3	—	4.4E-02	1.6E-04	5.3E-06	3.6E-03
As	HAP	1.8E-02	2.5E-02	0.1	2.4E-03	4.9E-03	1.0E-02	1.3E-02	0.2	2.6E-03	2.7E-02	—	—
Cd	HAP	0.1	1.6E-03	6.9E-03	1.0E-02	3.8E-03	6.9E-04	2.5E-03	1.7E-02	2.1E-03	4.7E-03	—	—
Cl_2	HAP	—	—	—	—	—	—	—	—	—	—	—	—
Cr	HAP	9.4E-02	6.9E-02	0.2	8.8E-03	2.4E-02	2.2E-02	3.2E-02	0.5	1.3E-02	5.2E-02	—	—
HCl	HAP	5.1	3.6	—	1.3	1.8	8.0	3.6	0.6	1.7	35.0	44.5	0.2
Mn	HAP	0.1	3.3E-02	7.8E-02	2.6E-02	4.3E-02	2.2E-02	7.0E-02	0.5	2.8E-02	8.8E-02	3.3E-02	—
Hg	HAP	2.0E-02	1.1E-02	6.0E-03	6.3E-03	1.1E-02	1.2E-02	1.3E-02	2.6E-03	7.7E-04	1.2E-02	1.7E-02	6.2E-03
Ni	HAP	0.1	4.2E-02	0.2	1.3E-02	3.0E-02	1.8E-02	3.4E-02	0.1	1.3E-02	2.4E-04	4.5E-02	—
Dioxins/ furans	HAP	4.3E-08	3.4E-08	1.2E-08	2.2E-08	—	—	—	4.1E-08	2.0E-09	2.3E-08	2.8E-08	—

Source: EPA 2023b; EIA 2023; EPRI 2018a
Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-100
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 7

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		R.D. Nixon	River Valley	Rush Island	Sandy Creek	Scherer	Shaw-nee	Sheldon	Sher-burne	Sikes-ton	Sioux	Sooner	S. Oak Creek
NH_3	CAP precursor	71.2	—	1.2	14.5	0.2	11.2	0.3	6.5	0.3	0.5	—	4.0
CO	CAP	480.4	794.2	1.1E+03	460.9	1.1E+03	627.3	357.4	1.3E+03	843.1	414.3	1.3E+03	1.5E+03
NO_x	CAP	1.3E+03	1.3E+03	3.0E+03	1.1E+03	4.5E+03	4.6E+03	1.3E+03	6.0E+03	922.5	3.5E+03	1.7E+03	3.4E+03
PM_{10}	CAP	86.4	148.2	577.7	252.6	53.3	296.2	6.0	646.4	385.0	260.2	368.6	249.4
$PM_{2.5}$	CAP	62.6	85.9	212.8	170.7	32.4	205.0	1.7	316.2	364.8	241.8	302.0	122.4
SO_2	CAP	519.5	367.0	1.7E+04	2.3E+03	528.9	9.0E+03	1.5E+03	4.0E+03	4.3E+03	1.2E+03	356.8	584.2
VOCs	CAP precursor	27.6	2.9	129.7	14.4	117.6	75.3	18.7	157.9	29.4	91.2	45.2	70.1
Pb	CAP/HAP	2.9E-03	1.6E-02	5.2E-02	1.2E-02	1.4E-02	3.4E-02	1.0E-03	5.8E-02	1.5E-03	1.8E-02	1.4E-02	4.0E-05
Acrolein	HAP	7.2E-02	2.2E-02	3.8E-07	—	—	—	—	9.0E-02	—	—	4.6E-02	0.3
As	HAP	3.0E-04	3.3E-02	2.2E-02	0.2	1.3E-05	1.8E-01	1.5E-03	2.6E-02	8.1E-04	6.5E-03	5.5E-03	3.1E-02
Cd	HAP	3.0E-04	3.6E-04	7.0E-03	1.5E-03	9.7E-06	1.2E-02	1.5E-04	6.8E-03	6.5E-05	2.5E-03	1.7E-03	1.3E-03
Cl_2	HAP	—	—	—	—	—	—	—	—	—	—	—	—
Cr	HAP	4.3E-03	2.8E-02	9.0E-02	2.6E-02	9.7E-06	0.4	4.6E-03	9.2E-02	3.2E-03	3.2E-02	2.0E-02	0.6
HCl	HAP	1.3	9.4	33.1	1.0	1.8	17.6	2.9	6.0	5.1	5.5	10.4	4.9
Mn	HAP	5.7E-03	8.3E-02	0.1	3.6E-02	4.1E-02	8.7E-02	1.0E-03	0.3	9.7E-03	3.8E-02	2.8E-02	4.9E-02
Hg	HAP	3.3E-03	5.5E-03	3.4E-02	1.9E-02	2.0E-02	4.2E-03	5.0E-04	3.9E-02	6.1E-03	6.8E-03	9.0E-03	2.4E-02
Ni	HAP	2.2E-03	2.7E-02	9.6E-02	6.5E-02	9.7E-06	0.3	3.9E-03	0.1	2.9E-03	3.3E-02	2.3E-02	7.0E-02
Dioxins/ furans	HAP	—	—	4.9E-08	—	—	4.5E-08	7.5E-09	8.0E-08	—	3.3E-08	—	—

Source: EPA 2023b; EIA 2023; EPRI 2018a

Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). The EPA NEI reports total emissions from the Oak Creek Station, which includes Elm Road and South Oak Creek; the emissions reported here are therefore total power plant emissions. Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-101
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 8

Pollutant	Pollutant type	Total annual emissions (tons/year)											
		Spring-erville	Thomas Hill	Tolk	Cent-ralia	Trenton	Trimble	T.S.	V.J. Daniel	W.A. Parish	W. Scott	Wauke-gan	Welsh
NH_3	CAP precursor	59.1	1.2E-02	—	—	0.9	7.8	7.1	70.5	78.6	5.2	0.1	—
CO	CAP	1.1E+03	5.9E+03	2.3E+03	3.1E+03	72.1	976.4	6.0	445.3	3.0E+03	2.4E+03	436.2	8.7E+03
NO_x	CAP	5.2E+03	1.3E+04	1.8E+03	5.3E+03	267.3	2.3E+03	232.6	2.9E+03	4.0E+03	3.4E+03	484.4	3.7E+03
PM_{10}	CAP	1.3E+03	565.5	111.9	405.0	17.2	161.3	57.0	221.1	1.1E+03	423.1	133.4	61.8
$PM_{2.5}$	CAP	527.5	400.9	36.8	365.5	6.4	107.4	40.6	204.6	1.0E+03	225.8	114.6	24.5
SO_2	CAP	6.1E+03	1.4E+04	4.7E+03	1.6E+03	885.2	3.7E+03	101.4	180.2	2.4E+04	6.0E+03	416.4	8.2E+03
VOCs	CAP precursor	152.3	161.1	35.1	141.4	7.3	67.7	0.6	63.9	108.9	61.0	1.1	15.8
Pb	CAP/HAP	8.6E-03	3.7E-02	1.5E-02	1.1E-02	3.4E-03	0.4	2.7E-03	2.2E-02	3.7E-02	0.2	1.9E-02	2.1E-02
Acrolein	HAP	0.6	—	—	0.5	6.0E-03	7.8E-03	4.2E-07	0.2	0.7	0.4	—	0.3
As	HAP	5.7E-03	1.3E-02	6.9E-03	8.6E-03	1.6E-03	0.3	1.8E-02	3.9E-02	2.4E-02	0.3	—	2.1E-02
Cd	HAP	6.8E-04	1.9E-02	3.8E-03	4.1E-03	6.8E-04	7.2E-02	1.2E-03	9.6E-03	1.1E-02	3.9E-02	—	1.4E-03
Cl_2	HAP	—	—	6.0E-03	—	—	—	—	—	—	—	—	—
Cr	HAP	1.0E-02	7.5E-02	3.2E-02	5.5E-02	1.4E-03	0.3	3.7E-02	0.3	6.8E-02	0.2	—	1.7E-02
HCl	HAP	4.9	7.6	8.9	1.3	1.6	37.2	0.2	2.1	49.7	2.9	3.8E-01	13.6
Mn	HAP	4.3E-02	9.5E-02	5.5E-02	1.4E-01	1.5E-02	0.1	4.7E-03	3.5E-02	0.1	0.8	—	0.8
Hg	HAP	1.7E-02	2.6E-02	7.8E-03	2.7E-02	4.3E-04	2.1E-02	4.1E-03	1.6E-02	1.8E-02	1.0E-02	9.5E-04	8.2E-03
Ni	HAP	7.6E-03	8.5E-02	3.5E-02	5.9E-02	5.4E-03	0.3	3.0E-02	0.2	7.9E-02	0.2	—	1.8E-02
Dioxins/ furans	HAP	—	4.3E-08	—	3.7E-08	1.4E-08	5.0E-08	—	1.7E-08	4.7E-08	6.0E-08	—	2.9E-08

Source: EPA 2023b; EIA 2023; EPRI 2018a
Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

Table 4-102
Annual downstream combustion emissions from individual power plants that receive BFO coal: Part 9

Pollutant	Pollutant type	Total annual emissions (tons/year)					
		Weston	Whelan	White Bluff	Will Co.	Wygen 1	Wyodak
NH_3	CAP precursor	3.4	0.6	—	0.2	—	0.5
CO	CAP	710.0	154.4	1.9E+03	249.1	223.1	183.2
NO_x	CAP	1.1E+03	604.6	3.8E+03	207.3	596.8	2.5E+03
PM_{10}	CAP	139.3	126.6	461.6	43.0	103.8	161.0
$PM_{2.5}$	CAP	102.2	61.3	348.6	28.5	90.5	139.0
SO_2	CAP	588.8	2.0E+03	1.1E+04	230.7	426.4	1.7E+03
VOCs	CAP precursor	64.3	24.5	78.9	0.4	—	42.9
Pb	CAP/HAP	6.0E-05	4.6E-03	0.5	7.2E-03	3.8E-03	1.0E-02
Acrolein	HAP	0.3	1.0E-01	—	—	—	4.0E-02
As	HAP	6.5E-03	3.2E-06	2.0E-04	1.7E-02	1.1E-03	1.0E-02
B(a)P	HAP	—	—	—	—	—	—
Cd	HAP	4.9E-03	2.4E-06	1.5E-04	1.1E-03	1.4E-04	3.0E-05
Cl_2	HAP	—	—	—	—	—	—
Cr	HAP	4.1E-02	2.4E-06	1.5E-04	3.5E-02	4.5E-03	2.0E-02
HCl	HAP	0.7	0.3	20.4	1.3	0.3	2.9
Mn	HAP	6.0E-02	8.2E-03	0.1	4.0E-02	1.2E-02	3.0E-02
Hg	HAP	3.8E-03	5.6E-03	1.6E-02	5.4E-04	2.9E-03	1.1E-02
Ni	HAP	4.3E-02	—	1.5E-04	2.9E-02	3.2E-03	2.0E-02
Dioxins/ furans	HAP	2.8E-08	9.5E-09	4.2E-08	1.5E-08	—	2.0E-08

Source: EPA 2023b; EIA 2023; EPRI 2018a
Notes: CAP = criteria air pollutant; HAP = hazardous air pollutant. Destination data are from the EIA for 2021. Emissions data are from the EPA NEI for 2020 and for 2017 from EPRI 2018a (dioxins/furans only). Emissions presented here are total emissions, which may include both federal and nonfederal coal, as well as coal from within and outside the CDPA. Dioxins/furans emissions are expressed in EPRI 2018a as 2,3,7,8-TCDD toxic equivalents. The EPA has not evaluated the completeness or accuracy of dioxin and furan emissions estimates, so they are not included in the NEI (EPA 2021). Speciated chromium (Cr) emissions are not reported in the EPA NEI facility-level data; therefore, the Cr emissions reported here include Cr trioxide, Cr (III), Cr (VI), and chromic acid.

4.6.4 Public Health Impacts of Downstream Combustion

Studies of health impacts of fuel combustion were identified by performing separate literature searches for each fuel type through PubMed, a search engine supported by the US National Institutes of Health's National Library of Medicine (US National Library of Medicine n.d.), which contains details of journal citations and abstracts for biomedical and life science literature from around the world.

Oil Combustion Products

Two studies examine the association of oil combustion products and asthma or allergic symptoms (Lawrence et al. 2022; Sigsgaard et al. 2015). One study involved cleanup workers without prior diagnosis of asthma who were followed after the 2010 Deepwater Horizon Oil spill (Lawrence et al. 2022). These workers were exposed to oil burning and flaring so were anticipated to be exposed to oil combustion products. Examining information on asthma symptoms between 2011 and 2013, increased asthma in oil cleanup workers was observed as compared to non-workers. However, no trends were noted within the worker population based on work tasks associated with burning or flaring. The other asthma-related study (Sugiyama et al. 2020) uses source apportionment to identify oil combustion sources for school children in Fukuoka, Japan, examining the association between daily oil-attributable $PM_{2.5}$ and self-reported symptoms. They observed increased risk of nasal symptoms (e.g., sneezing, runny nose, congestion) but not ocular or dermal symptoms (e.g., itching, irritation) associated with exposure to increased daily concentrations of oil-attributable $PM_{2.5}$.

Two studies (Bell et al. 2010; Ottone et al. 2020) examined association between maternal exposure to $PM_{2.5}$ modeled to be linked with oil combustion and its potential with birth outcomes. Both studies linked PM to oil combustion based on its nickel and vanadium content. One study (Bell et al. 2010) compared average daily $PM_{2.5}$ concentrations measured between 2000 and 2004 in 4 counties in the Northeast United States and compared these values to various birth outcomes. Estimated total exposure to $PM_{2.5}$ from oil combustion was not associated with either decreased birthweight or full-term births with weights less than 2,500 grams (5.5 pounds). However, increased nickel or vanadium content of the PM was associated with an increased risk of being small for gestational age (having birthweights below the 10^{th} percentile for gestational age) and increased nickel content was associated with decreased average birthweight. The other study (Ottone et al. 2020) examined preterm birth, low birth weight, and small for gestational age outcomes in a northern Italy population. Daily average gestational exposures to $PM_{2.5}$ from 2012 to 2014 were estimated and source apportionment techniques were used to identify the influence of traffic, biomass burning, oil combustion, anthropogenic mixes, and secondary sources. Although an increased risk of preterm birth was found to be associated with exposure to oil-associated $PM_{2.5}$, especially at the highest exposures, no associations were found for low birthweight or small-at-term births. Evidence for associations with birth outcomes is limited by the small number of studies and lack of consistent results.

Chen and others (2020) examined cardiac outcomes associated with exposure to oil combustion products. Using source apportionment techniques to attribute $PM_{2.5}$ oil combustion products, daily ambient $PM_{2.5}$ concentrations were compared to heart rate measurements in the elderly population of Beijing, China. Authors reported that both increased daily cumulative $PM_{2.5}$ exposures attributable to oil combustion were associated with greater heart rate variability. No association was reported for very low frequency band results. The small sample size of individuals with measurements (22) and the cross-sectional study design limited the strength of this study.

Two studies (Samoli et al. 2016; Chen et al. 2022) examined mortality and hospitalizations patterns and their association with PM exposure believed to be associated with oil combustion. One study followed the populations of various European countries, estimating total $PM_{2.5}$ exposure in a city by using the annual 2010 average $PM_{2.5}$ concentrations measured at monitoring sites (Chen et al. 2022). High concentrations of vanadium and nickel in the $PM_{2.5}$ were used to attribute the material to oil combustion. Increasing $PM_{2.5}$ concentrations from oil combustion was found to be associated with increased risk of non-malignant respiratory-related mortality and general natural-cause mortality, but not with cardiovascular or lung cancer-related mortality. Dependence on a single year and annual average exposure data are weaknesses of this study. Samoli and others (2016) examined mortality and hospitalizations in London as compared to daily ambient PM_{10} concentrations. Source apportionment techniques were used to link PM_{10} with oil combustion sources. Authors concluded that higher concentrations PM_{10} believed to originate from oil were associated with increased respiratory-related hospitalizations in subjects aged 14 and under, but not other age groups. No associations were observed for PM_{10} in either overall or cardiovascular-specific hospitalizations or mortality.

Dai and others (2016) examined concentrations of $PM_{2.5}$ in the ambient air and markers of inflammation in blood samples. Using source apportionment techniques to link $PM_{2.5}$ concentrations to oil combustion processes, 2-day average concentrations of $PM_{2.5}$ were associated with increased blood markers for some inflammation markers (ICAM-1 and VCAM-1) but not others (IL-6 or Common Reference Point [CRP]).

One study, involving boilermakers occupationally exposed to oil combustion products (Kim et al., 2004), examined the presence of a biomarker for oxidative DNA damage (8-hydroxyguanosine; 8-OH-dG) in urine and evaluated whether there was an association with exposure to $PM_{2.5}$ from residual oil fly ash. DNA damage is not in itself a health effect but might be indicative of increased cancer risk. By comparing pre-shift and post-shift concentrations of urinary 8-OH-dG, investigators found increasing concentrations of total $PM_{2.5}$, as well as $PM_{2.5}$ with vanadium, manganese, nickel, and lead, were associated with higher urinary 8-OH-dG. The small sample size (20 workers) and brief study period (5 days) limited the conclusions that could be drawn from this study.

Taken together, these studies suggest that there may be various health impacts from exposure to oil combustion although it should be noted that there are only two studies that directly examine populations which have been exposed to oil combustion products (Kim et al., 2004; Lawrence et al., 2022), and one of these studies (Kim et al., 2004) looks at biomarkers that are only indirectly linked to health impacts.

Gas Combustion Products

A case-control study of cancer in Danish workers potentially exposure to automobile gasoline and combustion products found exposed male workers had a higher incidence of breast cancer (odds ratio 2.5; 95 percent confidence interval 1.3-4.5) compared to unexposed male workers (Hansen 2000). This finding was more pronounced among workers with longer exposures and those who were younger at first exposure. The study did not differentiate gasoline vapors from gasoline combustion products.

Table 4-103 outlines the determinations used by EPA to evaluate the health effects of criteria pollutants.

Table 4-103
Weight-of-Evidence for causality determinations

Determination	Health Effects
Causal relationship (Causal)	Evidence is sufficient to conclude that there is a causal relationship with relevant pollutant exposures (e.g., doses or exposures are generally within one to two orders of magnitude of recent concentrations). That is, the pollutant has been shown to result in health effects in studies in which chance, confounding, and other biases could be ruled out with reasonable confidence. For example: (1) controlled human exposure studies that demonstrate consistent effects, or (2) observational studies that cannot be explained by plausible alternatives or that are supported by other lines of evidence (e.g., animal studies, mode-of-action information). Generally, the determination is based on multiple high-quality studies conducted by multiple research groups.
Likely to be causal relationship (Likely)	Evidence is sufficient to conclude that a causal relationship is likely to exist with relevant pollutant exposures. That is, the pollutant has been shown to result in health effects in studies where results are not explained by chance, confounding, and other biases, but uncertainties remain in the evidence overall. For example: (1) observational studies show an association, but copollutant exposures are difficult to address and/or other lines of evidence (controlled human exposure, animal, or mode-of-action information) are limited or inconsistent or (2) animal toxicological evidence from multiple studies from different laboratories demonstrate effects but limited or no human data are available. Generally, the determination is based on multiple high-quality studies.
Suggestive of but not sufficient to infer a causal relationship (Suggestive)	Evidence is suggestive of a causal relationship with relevant pollutant exposures but is limited, and chance, confounding, and other biases cannot be ruled out. For example: (1) when the body of evidence is relatively small, at least one high-quality epidemiologic study shows an association with a given health outcome and/or at least one high-quality toxicological study shows effects relevant to humans in animal species or (2) when the body of evidence is relatively large, evidence from studies of varying quality is generally supportive but not entirely consistent, and there may be coherence across lines of evidence (e.g., animal studies, mode-of-action information) to support the determination.
Inadequate to infer the presence or absence of a causal relationship (Inadequate)	Evidence is inadequate to determine that a causal relationship exists with relevant pollutant exposures. The available studies are of insufficient quantity, quality, consistency, or statistical power to permit a conclusion regarding the presence or absence of an effect.
Not likely to be a causal relationship (Not likely)	Evidence indicates there is no causal relationship with relevant pollutant exposures. Several adequate studies, covering the full range of levels of exposure that human beings are known to encounter and considering at-risk populations and life stages, are mutually consistent in not showing an effect at any level of exposure.

Source: EPA 2015

Acrolein

The human carcinogenic potential of acrolein has been classified by the EPA as "inadequate for assessment of human carcinogenic potential" due to the lack of adequate data to evaluate oral or inhalation exposure (EPA 1999, 2003b). The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified the carcinogenicity of acrolein (ATSDR 2007a). Non-cancer endpoints have been assessed in experimental animals exposed to acrolein via inhalation. Acrolein was reported to induce increased lesions in the nasal cavity and trachea of rats, rabbits, and hamsters and induced moderate to marked effects in the bronchi and lungs of rats and rabbits (ATSDR 2007a; Feron et al. 1978; Cassee, Groten, and Feron 1996). Nasal lesions reported in rats were the basis for the reference concentration (RfC) of 2 x 10^{-5} mg/m^3 calculated for acrolein (EPA 2003b). An acute Minimal Risk Level (MRL) of 3.0 x 10^{-3} ppm was derived for acrolein based on eye, nose, and throat irritation and decreased breathing rate in humans following inhalation exposure (ATSDR 2007a). The intermediate inhalation MRL of 4.0 x 10^{-5} ppm was derived based on nasal epithelial metaplasia and bronchial inflammation in rats following exposure to acrolein (Feron et al. 1978; ATSDR 2007a). DHHS and IARC have not classified the carcinogenicity of acrolein (ATSDR 2007a).

Benzene

Benzene is classified as a known human carcinogen (Category A) by EPA (EPA 1986) for all routes of exposure (EPA 1996), a known human carcinogen by DHHS, and a human carcinogen by IARC (ATSDR 2007c). Occupational epidemiological studies support the classification of benzene as a human carcinogen via inhalation exposure, based on increased risk of cancer, specifically leukemia (ATSDR 2007c, 2015; Rinsky, Young, and Smith 1981). Chronic benzene inhalation exposure in workers resulted in anemia, leukopenia, lymphocytopenia, thrombocytopenia, pancytopenia, and aplastic anemia (ATSDR 2007c, 2015; Aksoy 1989). The target organ for benzene toxicity is the bone marrow, with expression of hematotoxicity and immunotoxicity reported as the most sensitive indicators for non-cancer toxicity in both humans and experimental animals (Aksoy 1989; Snyder, Witz, and Goldstein 1993; Rothman et al. 1996; EPA 2002b). The RfC of 3 x 10^{-2} mg/m^3 calculated for benzene was based on hematotoxicity reported in occupationally exposed workers from three factories that either manufactured rubber padding for printing presses, manufactured adhesive tape, or used benzene-based paint in a factory (Rothman et al. 1996; EPA 2002b). An acute inhalation MRL of 9.0 x 10^{-3} ppm was derived for benzene based on decreased lymphocyte proliferation following mitogen stimulation in mice (Rozen, Snyder, and Albert 1984; ATSDR 2007c). The intermediate inhalation MRL reported for benzene is 6.0 x 10^{-3} ppm, based on delayed splenic lymphocyte reaction when evaluated in vitro following inhalation exposure in mice (Rosenthal and Snyder 1987; ATSDR 2007c). A statistically significant decrease in B-lymphocyte counts was the basis for the chronic inhalation MRL of 3.0 x 10^{-3} following inhalation exposure of occupational workers from a shoe factory (Lan et al. 2004; ATSDR 2007c).

1,3-Butadiene

EPA, IARC, and the National Toxicology Program (NTP) classify 1,3-–butadiene as carcinogenic to humans via the inhalation pathway (EPA 1999; ATSDR 2012a). The target organ for 1,3-–butadiene toxicity is the lymphohematopoietic system, which includes leukemia and lymphoma as lymphohematopoietic cancers as classified by the Revised European-American Lymphoma (REAL) and the Leukemia Society of America (EPA 2002a). Increased lymphohematopoietic cancers were reported in occupational workers exposed to the monomer and polymer forms of 1,3--butadiene (ATSDR 2012a; Delzell et al. 1996). Excess leukemia was mainly reported in polymer production workers (Santos-Burgoa et al. 1992 as cited in ATSDR 2012a), while increased risk of non-Hodgkin's lymphomas were reported in monomer production workers (ATSDR 2012a; Ward et al. 1995). Non-cancer effects associated with 1,3-—butadiene exposure in experimental animals consist of decreased fetal weight in mice (Hackett et al. 1987), fetal death in mice (Brinkworth et al. 1998), ovarian atrophy in female mice (NTP 1993), and testicular atrophy in male mice (NTP 1993). Ovarian atrophy was the basis for the chronic reference concentration of 2 x 10^{-3} mg/m^3 calculated for 1,3--butadiene. There are no reproductive or developmental human inhalation data available (ATSDR 2012a; EPA 2002a). There are no acute, intermediate, or chronic MRLs derived for 1,3-–butadiene (ATSDR 2012a).

Ethylbenzene

The human carcinogenic potential of ethylbenzene has been classified by EPA as "Category D (not classifiable as to human carcinogenicity)" due to a lack of human studies and animal bioassays (EPA 1986, 1991). Carcinogenic risk for ethylbenzene was not assessed under the Integrated Risk Assessment System (IRIS) program (EPA 1991). Short-term exposure to high concentrations of ethylbenzene in the air have been reported to cause eye irritation, throat irritation, vertigo, and dizziness in humans (ATSDR 2010). Non-cancer endpoints evaluated in experimental animals following inhalation exposure to ethylbenzene showed fewer live births per litter in rabbits, increased incidence of supernumerary and rudimentary ribs and extra ribs in fetuses of exposed rats, and significantly increased absolute and relative liver, kidney, and spleen weights in pregnant rats (ATSDR 2010; Andrew et al. 1981). Hearing loss, inner ear damage, and kidney damage have also been reported in experimental animals following long-term exposure at relatively low concentrations of ethylbenzene (ATSDR 2010). Based on developmental toxicity findings, a reference concentration of 1 mg/m^3 has been derived for ethylbenzene (EPA 1991). It should be noted that ethylbenzene is currently (as of January 1, 2023) in Step 1, Draft Development, of evaluation in the IRIS program. An acute inhalation MRL of 5 ppm was derived for ethylbenzene based on auditory capacity damage reported in rats following exposure (Cappaert et al. 2000; ATSDR 2010). An intermediate MRL of 2 ppm was derived for ethylbenzene based on ototoxicity reported in rats following inhalation exposure (Gagnaire et al. 2007; ATSDR 2010). A chronic inhalation MRL of 6.0×10^{-2} ppm was derived for ethylbenzene based on chronic progressive nephropathy reported in rats following inhalation exposure (NTP 1999; ATSDR 2010).

Formaldehyde

EPA has classified formaldehyde as "Category B1 (Probable human carcinogen-based on limited evidence of carcinogenicity in humans)" (EPA 1986, 1990a, 1990b). This classification is based on an increased incidence of squamous cell carcinomas reported in rats following inhalation exposure (EPA 1990a, 1990b; Kerns et al. 1983). Another consideration to support formaldehyde's carcinogenic potential is its similar structure to acetaldehyde, the closest aldehyde to formaldehyde. Acetaldehyde causes nasal cancers in rats and cancers of the nose and trachea in hamsters following inhalation exposure. A reference concentration has not been assessed under the IRIS program for formaldehyde (EPA 1990a, 1990b). An acute MRL of 4.0×10^{-2} ppm was derived for formaldehyde based on mild eye, nose, and throat irritation, elevated eosinophil counts, and transient increased albumin content of nasal lavage fluid in humans following a 2-hour inhalation exposure (ATSDR 1999a; Pazdrak et al. 1993). An intermediate MRL of 3.0×10^{-2} ppm was derived for formaldehyde based on respiratory effects that included hoarseness, nasal congestion and discharge, and lesions in the nasal epithelium of Cynomolgus monkeys (ATSDR 1999a; Rusch et al. 1983). A chronic MRL of 8.0×10^{-3} ppm was derived for formaldehyde based on histological changes in nasal tissues reported in occupational workers exposed to formaldehyde for an average of 10.4 years (Holmström et al. 1989 as cited in ATSDR 1999a).

n-Hexane

The human carcinogenic potential of n-hexane has been classified by EPA as "inadequate information to assess carcinogenic potential" (EPA 2005a, 2005b, 2005c). Non-cancer endpoints have been assessed in experimental animals exposed to n-hexane via inhalation. A RfC of $7 \times 10\text{-}^{1}$ mg/m^3 was derived for n-hexane based on peripheral neuropathy reported in rats following inhalation exposure (Huang et al. 1989; EPA 2005b, 2005c). An MRL of 0.6 ppm was derived for n-hexane based on a chronic inhalation study that resulted in reduced motor nerve conduction velocity in occupational workers (ATSDR 1999b; Sanagi et al. 1980).

Hydrogen Chloride

The human carcinogenic potential of hydrogen chloride (HCl) has not been classified by EPA, IARC, or DHHS (ATSDR 2002) or assessed under the IRIS program (EPA 1995b). Non-cancer effects associated with HCl following inhalation exposure include epithelial or squamous hyperplasia in the nasal mucosa of rats, as well as squamous metaplasia and hyperplasia of laryngeal-tracheal segments (Albert et al. 1982 as cited in 1995b; Sellakumar et al. 1985). Hyperplasia of the nasal mucosa, larynx, and trachea is the basis for the RfC of 2×10^{-2} mg/m^3 calculated for HCl (EPA 1995b). There are no acute, intermediate, or chronic MRLs derived for HCl (ATSDR 2002).

Toluene

The carcinogenic potential of toluene has not been classified by EPA due to the lack of adequate human or animal data (EPA 2005a; 2005d). IRIS derived a RfC of 5 mg/m^3 for toluene, based on neurological effects identified in a collection of ten studies evaluating occupational workers following inhalation exposure to toluene (EPA 2005d). An acute MRL of 2 ppm was derived based on neurological effects such as impaired immediate and delayed prose memory in male and female volunteers following inhalation exposure to toluene (Little et al. 1999 as cited in ATSDR 2017). A chronic MRL of 1 ppm was derived for toluene based on neurological effects such as performance on psychomotor tasks, color vision, and hearing in occupational workers exposed to toluene via inhalation (ATSDR 2017).

Xylenes

The carcinogenic potential of xylenes has not been classified by EPA due to the lack of adequate human or animal data (EPA 1999, 2003a). There were no sufficient human data available to derive a RfC for xylenes (EPA 2003a); therefore, a RfC of 1×10^{-1} mg/m^3 was derived based on impaired motor coordination reported in rats following inhalation exposure to xylenes (Korsak, Wiśniewska-Knypl, and Swiercz 1994; ATSDR 2007d; EPA 2003a). ATSDR derived an acute, intermediate, and chronic-duration inhalation MRL of 2 ppm, 0.6 ppm, and 0.05 ppm, respectively. The acute MRL is based on neurological and respiratory effects reported in men and women volunteers following inhalation exposure to m-xylene (Ernstgård et al. 2002; ATSDR 2007d). The intermediate-duration MRL is based on neurotoxicity reported in rats following inhalation exposure to m-xylene (Korsak, Wiśniewska-Knypl, and Swiercz 1994; ATSDR 2007d). Respiratory and neurological effects were the basis of the chronic inhalation MRL, in which occupational workers were exposed to mixed xylenes for an average of 7 years (Uchida et al. 1993; ATSDR 2007d).

Arsenic

Arsenic is classified as a human carcinogen (Category A) (EPA 1986, 1995a). This classification is based on the increased incidence of lung cancer mortality mainly through inhalation exposure (EPA 1995a). A significant increase in lung cancer incidence has been reported in occupational workers from the Anaconda smelter (Brown and Chu 1983; EPA 1995a) and the American Smelter and Refining Company (ASARCO) smelter (Enterline and Marsh 1982a as cited in EPA 1995a). A RfC was not assessed under the IRIS program (EPA 1995a). No acute, intermediate, or chronic MRLs were derived for inorganic arsenic due to a lack of adequate human or animal data (ATSDR 2007b). Arsenic is currently (as of January 1, 2023) in Step 3 (Interagency Science Consultation) of evaluation in the IRIS program (EPA 1995a).

Chromium (VI)

Chromium (VI) is classified as a known human carcinogen (Category A) (EPA 1986) for the inhalation route of exposure (EPA 1996, 1998a). This classification is based on the increased incidence of lung cancer in chromate production workers exposed via inhalation to soluble and insoluble chromium (Cr) (Mancuso 1975 as cited in EPA 1998a). The RfC of 8 x 10 $^{-6}$ mg/m^3 derived for chromic acid mists and dissolved Cr (VI) aerosols was based on a subchronic occupational study in which workers from a chrome plating plant developed atrophy of the nasal septum following inhalation exposure (Lindberg and Hedenstierna 1983 as cited in EPA 1998a). The RfC of 1 x 10 $^{-4}$ mg/m^3 derived for Cr (VI) particulates was based on a subchronic study in rats in which increased lactate dehydrogenase in bronchioalveolar lavage fluid was reported following inhalation exposure (Glaser, Hochrainer, and Steinhoff 1990; EPA 1998a). However, Cr (VI) is currently in Step 4 (Public Comment and External Peer Review) of evaluation in the IRIS program.

The EPA has released an external review draft of the IRIS Toxicological Review of Hexavalent Chromium (2022) with a revised lifetime inhalation unit risk and revised reference concentrations (EPA 2022e, 2022f). The EPA's 1998 classification of Cr (VI) as a known human carcinogen by the inhalation route of exposure did not change in the 2022 draft proposal. However, a new inhalation unit risk of 2 x 10^{-2} (per µg Cr (VI)/m^3) was derived. The proposed inhalation unit risk is based on increased incidence of lung cancer in chromate production workers exposed via inhalation to Cr (VI) (Gibb et al. 2015, 2020; EPA 2022e, 2022f). The EPA has proposed new reference concentrations for Cr (VI) for the lower respiratory tract, upper respiratory tract, and an overall reference concentration. The reference concentration of 1 x 10^{-4} mg/m^3 was derived for the lower respiratory tract and based on cellular and histopathological changes reported in the lungs of rats. These changes included lactate dehydrogenase, albumin, and total protein in bronchioalveolar lavage fluid and histiocytosis and bronchioalveolar hyperplasia of the lung (Glaser, Hochrainer, and Steinhoff 1990; EPA 2022e, 2022f). The proposed reference concentration of 1 x 10^{-5} mg/m^3 derived for the upper respiratory tract was based on ulcerated nasal septum reported in occupational workers exposed to Cr (VI) (Gibb et al. 2000; EPA 2022e, 2022f).

The EPA proposes an overall reference concentration of 1 x 10^{-5} mg/m^3 for Cr (VI) based on the effect of ulcerated nasal septum in occupationally exposed workers (EPA 2022e, 2022f). A MRL of 5.0 x 10^{-6} mg/m^3, based on respiratory effects observed in occupational workers, was derived for Cr (VI) aerosol mists following intermediate and chronic inhalation exposure (Lindberg and Hedenstierna 1983 as cited in ATSDR 2012c). A MRL of 3.0 x 10^{-4} mg/m^3, based on respiratory effects in rats, was derived for Cr (VI) particulates following intermediate inhalation exposure (Glaser, Hochrainer, and Steinhoff 1990; ATSDR 2012c).

Mercury

Mercury is a naturally occurring element found in the air, water, and soil that is released primarily during the combustion of coal. ATSDR categorizes mercury into three classes of compounds, which include elemental mercury, inorganic mercury, and organic mercury. Occupational workers are mainly exposed to elemental mercury via inhalation of mercury vapor, while the majority of the population is exposed to organic mercury in the form of methylmercury through dietary ingestion. Inorganic mercury is not a leading source of mercury exposure for the general population (ATSDR 2022).

Methylmercury is highly toxic, with the nervous system being the most sensitive target organ for toxicity. Methylmercury bioaccumulates in fish and plants, in turn providing a higher source of exposure to the general public (ATSDR 2022). The EPA has classified methylmercury as a possible human carcinogen but has not derived an oral carcinogenic potency factor due to inadequate data (EPA 2001). However, methylmercury is currently in Step 1, Draft Development, of evaluation in the IRIS program. The existing oral reference concentration of 1×10^{-4} mg/kg/day was derived based on epidemiological studies in which adverse neuropsychological effects were reported in children following prenatal exposure to methylmercury via consumption of dietary fish (Budtz-Jørgensen et al. 1999; Grandjean et al. 1997; EPA 2001). A chronic oral MRL of 1.0×10^{-1} µg/kg/day was derived by ATSDR, based on neurodevelopmental effects in children whose mothers were chronically exposed to methylmercury through ingestion of dietary fish (Axelrad et al. 2007; ATSDR 2022). There is insufficient data to derive an inhalation MRL for methylmercury (ATSDR 2022).

Elemental mercury is classified by the EPA as "Category D (Not classifiable as to human carcinogenicity)" based on inadequate human and animal data (EPA 1986, 1995d). A reference concentration of 3×10^{-4} mg/m^3 was derived for elemental mercury based on neurobehavioral effects reported in a collection of epidemiological studies. Hand tremors, electroencephalogram abnormalities, memory disturbances, sleep disorders, anger, fatigue, confusion, autonomic dysfunction, motor speed, visual scanning, visuomotor coordination and concentration, visual memory, and visuomotor coordination speed were reported to be adversely affected in occupational workers exposed to low-level mercury vapor (EPA 1995d). There is insufficient data to derive an acute and intermediate MRL; however, a chronic MRL of 3.0×10^{-1} µg mercury/m^3 was derived for elemental mercury based on tremors reported in occupational workers following inhalation exposure (ATSDR 2022).

Nickel

Nickel is a component of fly ash, which is a product of coal and oil combustion. The main species of nickel found in fly ash includes nickel sulfate, nickel oxide, nickel chloride, and nickel sulfide (EPRI 1998; WHO 1987). A toxicological profile for nickel sulfate and nickel oxide, the two main species of nickel in fly ash, has not been developed under the IRIS program (WHO 1987); however, a toxicological profile for nickel subsulfide has been developed under the program. Nickel subsulfide is classified as a human carcinogen (Category A) by the EPA (EPA 1986, 1987b) and has an inhalation unit risk of 4.8×10^{-4} µg/m^3 based on the increased incidence of lung cancer in occupational workers (Enterline and Marsh 1982b as cited in EPA 1987b). ATSDR assessed the toxicity of metallic nickel, nickel sulfate, nickel chloride, nickel subsulfide, and nickel oxide following intermediate-duration inhalation exposures in experimental animals. ATSDR determined that the most sensitive target organ for nickel toxicity was the lung, and that nickel sulfate was observed to be the most toxic form evaluated (NTP 1996a, 1996b, 1996c; ATSDR 2005). An intermediate-duration MRL of 2.0×10^{-4} mg/m^3 was derived for nickel, based on respiratory effects in rats exposed via inhalation to nickel sulfate. A chronic MRL of 9×10^{-5} mg/m^3 was derived for nickel, based on respiratory effects in rats following chronic inhalation exposure to nickel sulfate (NTP 1996c; ATSDR 2005).

In addition to the key pollutants discussed in this section, health effects information on additional HAPs can be found on the EPA IRIS website and on the ATSDR website.

Chapter 5. References

AECOM. 2009. Update of the Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2020. Prepared for the Bureau of Land Management, Casper Field Office, Wyoming State Office, and Miles City Field Office. December.

Aksoy, Muzaffer. 1989. "Hematotoxicity and Carcinogenicity of Benzene." Environmental Health Perspectives 82: 193–97. Internet website: https://doi.org/10.2307/3430775.

Albert, R. E., A. R. Sellakumar, S. Laskin, M. Kuschner, N. Nelson, and C. A. Snyder. 1982. "Gaseous Formaldehyde and Hydrogen Chloride Induction of Nasal Cancer in the Rat." Journal of the National Cancer Institute 68 (4): 597–603.

Andrew, F. D., R. L. Buschbom, W. C. Cannon, R. A. Miller, L. F. Montgomery, D. W. Phelps, and M. R. Sikov. 1981. "Teratologic Assessment of Ethylbenzene and 2-Ethoxyethanol." PB 83-208074. Battelle Pacific Northwest Laboratory: National Institute for Occupational Safety and Health. Internet website: https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB83208074.xhtml.

ATSDR (US Department of Health and Human Services Agency for Toxic Substances and Disease Registry). 1999a. "Toxicological Profile for Formaldehyde." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp111.pdf.

ATSDR. 1999b. "Toxicological Profile for N-Hexane." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp113.pdf.

ATSDR. 2002. "Medical Management Guidelines (MMG) for Acute Chemical Exposure: Hydrogen Chloride." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/MHMI/mmg173.pdf.

ATSDR. 2005. "Toxicological Profile for Nickel." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp15.pdf.

ATSDR. 2007a. "Toxicological Profile for Acrolein." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp124.pdf.

ATSDR. 2007b. "Toxicological Profile for Arsenic." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf.

ATSDR. 2007c. "Toxicological Profile for Benzene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp3.pdf.

ATSDR. 2007d. "Toxicological Profile for Xylene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp71.pdf.

ATSDR. 2010. "Toxicological Profile for Ethylbenzene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/ToxProfiles/tp110.pdf.

ATSDR. 2012a. "Toxicological Profile for 1,3-Butadiene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/ToxProfiles/tp28.pdf.

ATSDR. 2012b. "Toxicological Profile for Carbon Monoxide." Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp201.pdf.

ATSDR. 2012c. "Toxicological Profile for Chromium." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp7.pdf.

ATSDR. 2015. "Addendum to the Toxicological Profile for Benzene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/Benzene_Addendum.pdf.

ATSDR. 2017. "Toxicological Profile for Toluene." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Internet website: https://www.atsdr.cdc.gov/toxprofiles/tp56.pdf.

ATSDR. 2022. "Toxicological Profile for Mercury. Draft for Public Comment." US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

Axelrad, Daniel A., David C. Bellinger, Louise M. Ryan, and Tracey J. Woodruff. 2007. "Dose-Response Relationship of Prenatal Mercury Exposure and IQ: An Integrative Analysis of Epidemiologic Data." Environmental Health Perspectives 115 (4): 609–15. Internet website: https://doi.org/10.1289/ehp.9303.

Bell, Michelle L., Kathleen Belanger, Keita Ebisu, Janneane F. Gent, Hyung Joo Lee, Petros Koutrakis, and Brian P. Leaderer. 2010. "Prenatal Exposure to Fine Particulate Matter and Birth Weight: Variations by Particulate Constituents and Sources." Epidemiology (Cambridge, Mass.) 21 (6): 884–91. Internet website: https://doi.org/10.1097/EDE.0b013e3181f2f405.

Brinkworth, M. H., D. Anderson, J. A. Hughes, L. I. Jackson, T. W. Yu, and E. Nieschlag. 1998. "Genetic Effects of 1,3-Butadiene on the Mouse Testis." Mutation Research 397 (1): 67–75. Internet website: https://doi.org/10.1016/s0027-5107(97)00196-6.

Brown, CC, and KC Chu. 1983. "A New Method for the Analysis of Cohort Studies: Implications of the Multistage Theory of Carcinogenesis Applied to Occupational Arsenic Exposure." Environmental Health Perspectives 50: 293–308. Internet website: https://doi.org/10.1289/ehp.8350293.

Budtz-Jørgensen, E, N Keiding, P Grandjean, and R F White. 1999. "Methylmercury Neurotoxicity Independent of PCB Exposure." Environmental Health Perspectives 107 (5): A236–37.

Bureau of Land Management (BLM). 2015. Proposed Resource Management Plan and Final Environmental Impact Statement for the Buffalo Field Office Planning Area.

BLM. 2019. Buffalo Field Office Draft Supplemental EIS and RMPA Errata. June 2019.

BLM. 2022a. BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends. Internet website: https://www.blm.gov/content/ghg/2022.

BLM. 2022b. Oil and Gas Leasing Greenhouse Gases Emission Inventory Tool, Version 2022c, BLM National Operations Center, Denver CO, August 1, 2022.

BLM. 2023. BLM 2028 Regional Photochemical Modeling Study.

Cappaert, N. L., S. F. Klis, A. B. Baretta, H. Muijser, and G. F. Smoorenburg. 2000. "Ethyl Benzene-Induced Ototoxicity in Rats: A Dose-Dependent Mid-Frequency Hearing Loss." Journal of the Association for Research in Otolaryngology: JARO 1 (4): 292–99. Internet website: https://doi.org/10.1007/s101620010050.

Cassee, Flemming R, John P Groten, and Victor J Feron. 1996. "Changes in the Nasal Epithelium of Rats Exposed by Inhalation to Mixtures of Formaldehyde, Acetaldehyde, and Acrolein."

Chen, Jie, Gerard Hoek, Kees de Hoogh, Sophia Rodopoulou, Zorana J. Andersen, Tom Bellander, Jørgen Brandt, et al. 2022. "Long-Term Exposure to Source-Specific Fine Particles and Mortality—A Pooled Analysis of 14 European Cohorts within the ELAPSE Project." Environmental Science & Technology 56 (13): 9277–90. Internet website: https://doi.org/10.1021/acs.est.2c01912.

Chen, Xi, Bing Qiu, Qinpei Zou, Tian Qiu, Runkui Li, Ashley Truong, Yanmin Qi, et al. 2020. "Source Specific PM2.5 Associated with Heart Rate Variability in the Elderly with Coronary Heart Disease: A Community-Based Panel Study." Chemosphere 260 (December): 127399. Internet website: https://doi.org/10.1016/j.chemosphere.2020.127399.

Dai, Lingzhen, Marie-Abele Bind, Petros Koutrakis, Brent A. Coull, David Sparrow, Pantel S. Vokonas, and Joel D. Schwartz. 2016. "Fine Particles, Genetic Pathways, and Markers of Inflammation and Endothelial Dysfunction: Analysis on Particulate Species and Sources." Journal of Exposure Science & Environmental Epidemiology 26 (4): 415–21. Internet website: https://doi.org/10.1038/jes.2015.83.

Delzell, E., N. Sathiakumar, M. Hovinga, M. Macaluso, J. Julian, R. Larson, P. Cole, and D. C. Muir. 1996. "A Follow-up Study of Synthetic Rubber Workers." Toxicology 113 (1–3): 182–89. Internet website: https://doi.org/10.1016/0300-483x(96)03443-9.

Electric Power Research Institute (EPRI). 1998. "Toxics Release Inventory; Chemical Profile: Nickel." IS-111535. Electric Power Research Institute (EPRI), Inc. Internet website: https://aep.com/assets/docs/requiredpostings/tri/chemicalprofiles/Nickel.pdf.

EPRI. 2018a. Hazardous Air Pollutants (HAPs) Emission Estimates and Inhalation Human Health Risk Assessment for U.S. Coal-Fired Electric Generating Units: 2017 Base Year Post-MATS Evaluation. EPRI, Palo Alto, CA. June 2018. 3002013577.

EPRI. 2018b. Multi-Pathway Human Health Risk Assessment for Coal-Fired Power Plants. EPRI, Palo Alto, CA. 3002013523.

Energy Information Agency (EIA). 2022a. Petroleum & Other Liquids - Refinery yield data. Internet website: https://www.eia.gov/dnav/pet/pet_pnp_pct_dc_nus_pct_a.htm.

EIA. 2022b. Gasoline explained. Internet website: https://www.eia.gov/energyexplained/gasoline/use-of-gasoline.php.

EIA. 2022c. Diesel fuel explained. Internet website: https://www.eia.gov/energyexplained/diesel-fuel/use-of-diesel.php.

EIA. 2022e. Oil and petroleum products explained. Internet website: https://www.eia.gov/energyexplained/oil-and-petroleum-products/use-of-oil.php.

EIA. 2023. Coal Data Browser. Internet website: https://www.eia.gov/coal/data/browser/.

ENSR. 2005. Task 1A Report for the Powder River Basin Coal Review Current Air Quality Conditions. Prepared for the Bureau of Land Management, Casper Field Office, Wyoming State Office, and Miles City Field Office. September.

ENSR. 2006. Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects. Prepared for the Bureau of Land Management, Casper Field Office, Wyoming State Office, and Miles City Field Office. February.

ENSR. 2008. Air Quality Technical Support Document for the Task 3A Report Update for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2015. Prepared for Bureau of Land Management, Casper Field Office, Wyoming State Office, and Miles City Field Office.

ENSR. 2009. Update of the Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2020. Prepared for the Bureau of Land Management, Casper Field Office, Wyoming State Office, and Miles City Field Office. December.

Enterline, P. E., and G. M. Marsh. 1982a. "Cancer among Workers Exposed to Arsenic and Other Substances in a Copper Smelter." American Journal of Epidemiology 116 (6): 895–911. Internet website: https://doi.org/10.1093/oxfordjournals.aje.a113492.

Enterline, P. E., and G. M. Marsh. 1982b. "Mortality among Workers in a Nickel Refinery and Alloy Manufacturing Plant in West Virginia." Journal of the National Cancer Institute 68 (6): 925–33.

Environmental Protection Agency (EPA). 1986. "Guidelines for Carcinogen Risk Assessment." EPA/630/R-00/004. United States Environmental Protection Agency, Risk Assessment Forum. Internet website: https://cfpub.epa.gov/ncea/raf/car2sab/guidelines_1986.pdf.

EPA. 1987a. "Integrated Risk Assessment System (IRIS): Cadmium CASRN 7440-43-9." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0141_summary.pdf.

EPA. 1987b. "Integrated Risk Information System (IRIS): Nickel Subsulfide. CASRN 12035-72-2." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0273_summary.pdf.

EPA. 1990a. "Integrated Risk Information System (IRIS): Formaldehyde CASRN 50-00-0." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0419_summary.pdf.

EPA. 1990b. Chemical Assessment Summary: Formaldehyde; CASRN 50-00-0. Washington, DC: National Center for Environmental Assessment.

EPA. 1991. "Integrated Risk Information System (IRIS): Ethylbenzene. CASRN 100-41-4." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0051_summary.pdf.

EPA. 1994. "Integrated Risk Information System (IRIS): Chlorine CASRN 7782-50-5." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0405_summary.pdf.

EPA. 1995a. "Integrated Risk Information System (IRIS): Arsenic, Inorganic. CASRN 7440-38-2." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0278_summary.pdf.

EPA. 1995b. "Integrated Risk Information System (IRIS): Hydrogen Chloride. CASRN 7647-01-0." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0396_summary.pdf.

EPA. 1995c. "Integrated Risk Information System (IRIS): Manganese CASRN 7439-96-5." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0373_summary.pdf.

EPA. 1995d. "Integrated Risk Information System (IRIS): Mercury, Elemental. CASRN 7439-97-6." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0370_summary.pdf.

EPA. 1996. "Proposed Guidelines for Carcinogen Risk Assessment. Federal Register. Vol. 61, No. 79." United States Environmental Protection Agency. Internet website: https://www.govinfo.gov/content/pkg/FR-1996-04-23/pdf/96-9711.pdf.

EPA. 1998a. "Toxicological Review of Hexavalent Chromium (CAS No. 18540-29-9). In Support of Summary Information on the Integrated Risk Information System (IRIS)." United States Environmental Protection Agency.

EPA. 1998b. Carcinogenic Effects of Benzene: An Update. EPA/600/P-97/001F. Washington, DC.

EPA. 1999. "Guidelines for Carcinogen Risk Assessment." NCEA-F-0644. United States Environmental Protection Agency, Risk Assessment Forum.

EPA. 2001. "Integrated Risk Information System (IRIS): Methylmercury (MeHg) CASRN 22967-92-6." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0073_summary.pdf.

EPA. 2002a. "Integrated Risk Information System (IRIS): 1,3-Butadiene. CASRN 106-99-0." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0139_summary.pdf.

EPA. 2002b. "Toxicological Review of Benzene (Non Cancer Effects) CAS No. 71-43-2. In Support of Summary Information on the Integrated Risk Information System (IRIS)." EPA/635/R-02/001F. United States Environmental Protection Agency. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0276tr.pdf.

EPA. 2003a. "Integrated Risk Information System (IRIS): Xylenes. CASRN 1330-20-7." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0270_summary.pdf.

EPA. 2003b. "Toxicological Review of Acrolein (CAS No. 107-02-8) in Support of Summary Information on the Integrated Risk Information System (IRIS)." EPA/635/R-03/003. Washington, DC: United States Environmental Protection Agency. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0364tr.pdf.

EPA. 2005a. "Guidelines for Carcinogen Risk Assessment." EPA/630/P-03/001F. United States Environmental Protection Agency, Risk Assessment Forum. Internet website: https://www.epa.gov/sites/default/files/2013-09/documents/cancer_guidelines_final_3-25-05.pdf.

EPA. 2005b. "Integrated Risk Information System (IRIS): N-Hexane. CASRN 110-54-3." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0486_summary.pdf.

EPA. 2005c. Toxicological Review of N-Hexane: In Support of Summary Information on the Integrated Risk Information System (IRIS). EPA/635/R-03/012. Washington, DC.

EPA. 2005d. "Integrated Risk Information System (IRIS): Toluene. CASRN 108-88-3." Chemical Assessment Summary. United States Environmental Protection Agency, National Center for Environmental Assessment. Internet website: https://iris.epa.gov/static/pdfs/0118_summary.pdf.

EPA. 2009. "Emission Factors for Locomotives." EPA-420-F-09-025, April 2009.

EPA. 2010. Integrated Science Assessment (ISA) for Carbon Monoxide (Final Report, Jan 2010). EPA/600/R-09/019F. Washington, DC.

EPA. 2015. Preamble to the Integrated Science Assessments (ISA). EPA/600/R-15/067. Washington, DC.

EPA. 2016. Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, Jan 2016). EPA/600/R-15/068. Washington, D.C.

EPA. 2017a. National Emissions Inventory (NEI). Internet website: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

EPA. 2017b. Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria (Final Report, Dec 2017). EPA/600/R-17/451. Washington, DC.

EPA. 2017c. "Integration Risk Assessment System (IRIS): Benzo[a]Pyrene (BaP) CASRN 50-32-8." Reports & Assessments. Internet website: https://iris.epa.gov/static/pdfs/0136tr.pdf.

EPA. 2019. Integrated Science Assessment (ISA) for Particulate Matter (Final Report, Dec 2019). EPA/600/R-19/188. Washington, DC.

EPA. 2020a. Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants (Final Report, Apr 2020). EPA/600/R-20/012. Washington, DC.

EPA. 2021a. 2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document. February 2021. Internet website: https://www.epa.gov/sites/default/files/ 2021-02/documents/nei2017_tsd_full_jan2021.pdf.

EPA. 2021b. Critical Load Mapper Tool. US Environmental Protection Agency, USDA Forest Service, and National Park Service, Washington, DC. CL Mapper version 2.2. Internet website: https://clmapper.epa.gov/.

EPA. 2022a. National Ambient Air Quality Standards (NAAQS) Table. Internet website: https://www.epa.gov/criteria-air-pollutants/naaqs-table.

EPA 2022b. Climate Change Indicators: Greenhouse Gases, Major Long-Lived Greenhouse Gases and Their Characteristics. Internet website: https://www.epa.gov/climate-indicators/greenhouse-gases.

EPA. 2022c. Ports Emissions, Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions. EPA-420-B-22-011. April 2022.

EPA. 2022d. Emission Factors for Greenhouse Gas Inventories, Table 1. U.S. EPA Center for Corporate Climate Leadership. April 1, 2022. Internet website: https://www.epa.gov/system/files/documents/2022-04/ghg_emission_factors_hub.pdf.

EPA. 2022e. Supplement to the 2019 Integrated Science Assessment for Particulate Matter (Final Report, 2022). EPA/635/R-22/028. Washington, DC.

EPA. 2022f. Particulate Matter Pollution. Accessed October 2022. Internet website: https://www.epa.gov/pmcourse/particle-pollution-exposure.

EPA. 2022g. Design Value Reports. Internet website: https://www.epa.gov/air-trends/air-quality-design-values#map.

EPA. 2022h. Wyoming Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Internet website: https://www3.epa.gov/airquality/greenbook/anayo_wy.html.

EPA. 2023a. 40 CFR Part 98 Table C-1 and Table C- eCFR :: Table C-1 to Subpart C of Part 98, Title 40 -- Default CO2 Emission Factors and High Heat Values for Various Types of Fuel, and eCFR :: Table C-2 to Subpart C of Part 98, Title 40 -- Default CH4 and N2O Emission Factors for Various Types of Fuel, accessed January 2023.

EPA. 2023b. National Emissions Inventory. Internet website: https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data.

EPA. 2023c. Green Book. Nonattainment areas.

Ernstgård, L., E. Gullstrand, A. Löf, and G. Johanson. 2002. "Are Women More Sensitive than Men to 2-Propanol and m-Xylene Vapours?" Occupational and Environmental Medicine 59 (11): 759–67. Internet website: https://doi.org/10.1136/oem.59.11.759.

Feron, V. J., A. Kruysse, H. P. Til, and H. R. Immel. 1978. "Repeated Exposure to Acrolein Vapour: Subacute Studies in Hamsters, Rats and Rabbits." Toxicology 9 (1–2): 47–57. https://doi.org/10.1016/0300-483x(78)90030-6.

Fox, D. G., A. M. Bartuska, J. G. Byrne, E. Cowling, R. Fisher, G. E. Likens, S. E. Lindberg, et al. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. US Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. Internet website: https://www.fs.usda.gov/treesearch/pubs/6242.

Gagnaire, François, Cristina Langlais, Stéphane Grossmann, and Pascal Wild. 2007. "Ototoxicity in Rats Exposed to Ethylbenzene and to Two Technical Xylene Vapours for 13 Weeks." Archives of Toxicology 81 (2): 127–43. Internet website: https://doi.org/10.1007/s00204-006-0124-y.

Gibb, H. J., P. S. Lees, P. F. Pinsky, and B. C. Rooney. 2000. "Clinical Findings of Irritation among Chromium Chemical Production Workers." American Journal of Industrial Medicine 38 (2): 127–31. Internet website: https://doi.org/10.1002/1097-0274(200008)38:2<127::aid-ajim2>3.0.co;2-q.

Gibb, Herman Jones, Peter St. John Lees, Jing Wang, and Keri Grace O'Leary. 2015. "Extended Followup of a Cohort of Chromium Production Workers." American Journal of Industrial Medicine 58 (8): 905–13. Internet website: https://doi.org/10.1002/ajim.22479.

Gibb, Herman, Jing Wang, Keri O'Leary, Chao Chen, Thomas F. Bateson, and Leonid Kopylev. 2020. "The Effect of Age on the Relative Risk of Lung Cancer Mortality in a Cohort of Chromium Production Workers." American Journal of Industrial Medicine 63 (9): 774–78. Internet website: https://doi.org/10.1002/ajim.23152.

Glaser, U., D. Hochrainer, and D. Steinhoff. 1990. "Investigation of Irritating Properties of Inhaled CrVI with Possible Influence on Its Carcinogenic Action." In Environmental Hygiene II, edited by Norbert H. Seemayer and Wolfgang Hadnagy, 239–45. Berlin, Heidelberg: Springer.

Grandjean, P., P. Weihe, R. F. White, F. Debes, S. Araki, K. Yokoyama, K. Murata, N. Sørensen, R. Dahl, and P. J. Jørgensen. 1997. "Cognitive Deficit in 7-Year-Old Children with Prenatal Exposure to Methylmercury." Neurotoxicology and Teratology 19 (6): 417–28. Internet website: https://doi.org/10.1016/s0892-0362(97)00097-4.

Hackett, P. L., M. R. Sikov, T. J. Mast, M. G. Brown, R. L. Buschbom, M. L. Clark, J. R. Decker, et al. 1987. "Inhalation Developmental Toxicology Studies: Teratology Study of 1,3-Butadiene in Mice: Final Report." PNL-6412. Pacific Northwest Lab., Richland, WA (USA). Internet website: https://doi.org/10.2172/5555439.

Hansen, J. 2000. "Elevated Risk for Male Breast Cancer after Occupational Exposure to Gasoline and Vehicular Combustion Products." American Journal of Industrial Medicine 37 (4): 349–52. Internet website: https://doi.org/10.1002/(sici)1097-0274(200004)37:4<349::aid-ajim4>3.0.co;2-l.

Holmström, M., B. Wilhelmsson, H. Hellquist, and G. Rosén. 1989. "Histological Changes in the Nasal Mucosa in Persons Occupationally Exposed to Formaldehyde Alone and in Combination with Wood Dust." Acta Oto-Laryngologica 107 (1–2): 120–29. Internet website: https://doi.org/10.3109/00016488909127488.

Huang, Jian, Kanefusa Kato, Eiji Shibata, Kimiya Sugimura, Naomi Hisanaga, Yuichiro Ono, and Yasuhiro Takeuchi. 1989. "Effects of Chronic N-Hexane Exposure on Nervous System-Specific and Muscle-Specific Proteins." Archives of Toxicology 63 (5): 381–85. Internet website: https://doi.org/10.1007/BF00303127.

Intergovernmental Panel on Climate Change (IPCC). 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.

IPCC. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou, eds.). Cambridge University Press, Cambridge, United Kingdom, and New York, New York, USA.

Kaden, D. A., C. Mandin, G. D. Nielsen, and P. Wolkoff. 2010. "Formaldehyde." In *WHO Guidelines for Indoor Air Quality: Selected Pollutants*. Bonn, Germany: World Health Organization. Internet website: https://www.who.int/europe/publications/i/item/9789289002134.

Kerns, W. D., K. L. Pavkov, D. J. Donofrio, E. J. Gralla, and J. A. Swenberg. 1983. "Carcinogenicity of Formaldehyde in Rats and Mice after Long-Term Inhalation Exposure." Cancer Research 43 (9): 4382–92.

Korsak, Z., J. Wiśniewska-Knypl, and R. Swiercz. 1994. "Toxic Effects of Subchronic Combined Exposure to N-Butyl Alcohol and m-Xylene in Rats." International Journal of Occupational Medicine and Environmental Health 7 (2): 155–66.

Lan, Qing, Luoping Zhang, Guilan Li, Roel Vermeulen, Rona S. Weinberg, Mustafa Dosemeci, Stephen M. Rappaport, et al. 2004. "Hematotoxicity in Workers Exposed to Low Levels of Benzene." Science. Internet website: https://doi.org/10.1126/science.1102443.

Lawrence, Kaitlyn G., Nicole M. Niehoff, Alexander P. Keil, W. Braxton Jackson, Kate Christenbury, Patricia A. Stewart, Mark R. Stenzel, et al. 2022. "Associations between Airborne Crude Oil Chemicals and Symptom-Based Asthma." Environment International 167 (September): 107433. Internet website: https://doi.org/10.1016/j.envint.2022.107433.

Lindberg, E., and G. Hedenstierna. 1983. "Chrome Plating: Symptoms, Findings in the Upper Airways, and Effects on Lung Function." Archives of Environmental Health 38 (6): 367–74. Internet website: https://doi.org/10.1080/00039896.1983.10545822.

Little, C. H., G. M. Georgiou, M. J. Shelton, F. Simpson, and R. E. Cone. 1999. "Clinical and Immunological Responses in Subjects Sensitive to Solvents." Archives of Environmental Health 54 (1): 6–14. Internet website: https://doi.org/10.1080/00039899909602230.

Mancuso. 1975. "International Conference on Heavy Metals in the Environment." Toronto, Canada.

National Energy Technical Laboratory (NETL). 2008. US Department of Energy National Energy Technical Laboratory, Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels. Tables 3-16, 4-55, and 5-10. DOE/NETL-2009/1346, November 26, 2008.

NETL. 2016: US Department of Energy National Energy Technical Laboratory, Life Cycle Analysis of Coal Exports from the Powder River Basin. Appendix B, Tables B-1 through B-4 and B-18 through B-21. DOE/NETL-2016/1806, August 4, 2016.

NETL. 2019. US Department of Energy National Energy Technical Laboratory, Life Cycle Analysis of Natural Gas Extraction and Power Generation. Appendix F, Tables F-1 through F-31. DOE/NETL-2019/2039, April 19, 2019.

National Toxicology Program (NTP), US Department of Health and Human Services, Public Health Service, National Institutes of Health. 1993. "Toxicology and Carcinogenesis Studies of 1,3-Butadiene in B6C3F1 Mice. CAS No. 106-99-0. Inhalation Studies." Technical Report Series NTP TR 434.

NTP. 1996a. "NTP Toxicology and Carcinogenesis Studies of Nickel Oxide (CAS No. 1313-99-1) in F344 Rats and B6C3F1 Mice (Inhalation Studies)." Technical Report Series NTP TR 451. National Toxicology Program. Internet website: https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr451.pdf.

NTP. 1996b. "NTP Toxicology and Carcinogenesis Studies of Nickel Subsulfide (CAS No. 12035-72-2) in F344 Rats and B6C3F1 Mice (Inhalation Studies)." Technical Report Series NTP TR 453. National Toxicology Program. Internet website: https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr453.pdf.

NTP. 1996c. "NTP Toxicology and Carcinogenesis Studies of Nickel Sulfate Hexahydrate (CAS No. 10101-97-0) in F344 Rats and B6C3F1 Mice (Inhalation Studies)." NTP TR 454. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Toxicology Program. Internet website: https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr454.pdf.

NTP. 1999. "Toxicology and Carcinogensis Studies of Ethylbenzene in F344/N Rats and B6C3F1 Mice. CAS No. 100-41-4. Inhalation Studies." Technical Report Series NTP TR 466. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Toxicology Program. Internet website: https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr466.pdf.

Ottone, Marta, Serena Broccoli, Federica Parmagnani, Simone Giannini, Fabiana Scotto, Laura Bonvicini, Ferdinando Luberto, et al. 2020. "Source-Related Components of Fine Particulate Matter and Risk of Adverse Birth Outcomes in Northern Italy." Environmental Research 186 (July): 109564. Internet website: https://doi.org/10.1016/j.envres.2020.109564.

Partlow, Joshua. 2022, Jan 17. How coal holds in America: In North Dakota coal country, officials rally to save a coal-fired power plant at renewable energy's expense. *The Washington Post*. Internet website: https://www.washingtonpost.com/climate-environment/2022/01/17/coal-creek-station-power-plant/.

Pazdrak, Konrad, Pawel Górski, Anna Krakowiak, and Urszula Ruta. 1993. "Changes in Nasal Lavage Fluid Due to Formaldehyde Inhalation." International Archives of Occupational and Environmental Health 64 (7): 515–19. Internet website: https://doi.org/10.1007/BF00381101.

Rinsky, R. A., R. J. Young, and A. B. Smith. 1981. "Leukemia in Benzene Workers." American Journal of Industrial Medicine 2 (3): 217–45. Internet website: https://doi.org/10.1002/ajim.4700020305.

Rosenthal, G. J., and C. A. Snyder. 1987. "Inhaled Benzene Reduces Aspects of Cell-Mediated Tumor Surveillance in Mice." Toxicology and Applied Pharmacology 88 (1): 35–43. Internet website: https://doi.org/10.1016/0041-008x(87)90267-5.

Rothman, N., G. L. Li, M. Dosemeci, W. E. Bechtold, G. E. Marti, Y. Z. Wang, M. Linet, et al. 1996. "Hematotoxicity among Chinese Workers Heavily Exposed to Benzene." American Journal of Industrial Medicine 29 (3): 236–46. https://doi.org/10.1002/(SICI)1097-0274(199603)29:3<236::AID-AJIM3>3.0.CO;2-O.

Rozen, M. G., C. A. Snyder, and R. E. Albert. 1984. "Depressions in B- and T-Lymphocyte Mitogen-Induced Blastogenesis in Mice Exposed to Low Concentrations of Benzene." Toxicology Letters 20 (3): 343–49. Internet website: https://doi.org/10.1016/0378-4274(84)90170-x.

Rusch, G. M., J. J. Clary, W. E. Rinehart, and H. F. Bolte. 1983. "A 26-Week Inhalation Toxicity Study with Formaldehyde in the Monkey, Rat, and Hamster." Toxicology and Applied Pharmacology 68 (3): 329–43. Internet website: https://doi.org/10.1016/0041-008x(83)90276-4.

Samoli, Evangelia, Richard W. Atkinson, Antonis Analitis, Gary W. Fuller, David Beddows, David C. Green, Ian S. Mudway, Roy M. Harrison, H. Ross Anderson, and Frank J. Kelly. 2016. "Differential Health Effects of Short-Term Exposure to Source-Specific Particles in London, U.K." Environment International 97 (December): 246–53. Internet website: https://doi.org/10.1016/j.envint.2016.09.017.

Sanagi, S., Y. Seki, K. Sugimoto, and M. Hirata. 1980. "Peripheral Nervous System Functions of Workers Exposed to N-Hexane at a Low Level." International Archives of Occupational and Environmental Health 47 (1): 69–79. Internet website: http://doi.org/10.1007/BF00378330.

Santos-Burgoa, C., G. M. Matanoski, S. Zeger, and L. Schwartz. 1992. "Lymphohematopoietic Cancer in Styrene-Butadiene Polymerization Workers." American Journal of Epidemiology 136 (7): 843–54. Internet website: https://doi.org/10.1093/aje/136.7.843.

Sellakumar, Arthur R., Carroll A. Snyder, Jerome J. Solomon, and Roy E. Albert. 1985. "Carcinogenicity of Formaldehyde and Hydrogen Chloride in Rats." Toxicology and Applied Pharmacology 81 (3): 401–6. Internet website: https://doi.org/10.1016/0041-008X(85)90411-9.

Sigsgaard, Torben, Bertil Forsberg, Isabella Annesi-Maesano, Anders Blomberg, Anette Bølling, Christoffer Boman, Jakob Bønløkke, et al. 2015. "Health Impacts of Anthropogenic Biomass Burning in the Developed World." The European Respiratory Journal 46 (6): 1577–88. Internet website: https://doi.org/10.1183/13993003.01865-2014.

Snyder, R, G Witz, and BD Goldstein. 1993. "The Toxicology of Benzene." Environmental Health Perspectives 100: 293–306. Internet website: https://doi.org/doi: 10.1289/ehp.93100293.

Sugiyama, Taichi, Kayo Ueda, Xerxes Tesoro Seposo, Ayako Nakashima, Makoto Kinoshita, Hiroko Matsumoto, Fumikazu Ikemori, et al. 2020. "Health Effects of PM2.5 Sources on Children's Allergic and Respiratory Symptoms in Fukuoka, Japan." The Science of the Total Environment 709 (March): 136023. Internet website: https://doi.org/10.1016/j.scitotenv.2019.136023.

Uchida, Yoko, Haruo Nakatsuka, Hirohiko Ukai, Takao Watanabe, Yu-Tang Liu, Mei-Yuan Huang, Yu-Ling Wang, Feng-Zhi Zhu, Hong Yin, and Masayuki Ikeda. 1993. "Symptoms and Signs in Workers Exposed Predominantly to Xylenes." International Archives of Occupational and Environmental Health 64 (8): 597–605. Internet website: https://doi.org/10.1007/BF00517707.

Ward, EM, JM Fajen, AM Ruder, RA Rinsky, WE Halperin, and CA Fessler-Flesch. 1995. "Mortality Study of Workers in 1,3-Butadiene Production Units Identified from a Chemical Workers Cohort." Environmental Health Perspectives 103 (6): 598–603. Internet website: https://doi.org/doi: 10.1289/ehp.95103598.

World Health Organization (WHO). 1987. "Chapter 26: Nickel." In Air Quality Guidelines for Europe., 426. 23.

Wyoming Department of Environmental Quality (WY DEQ). 2017. 2017 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2018. 2018 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2019. 2019 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2020a. IMPACT/Open Air System. Internet website: https://deq.wyoming.gov/aqd/impact-and-open-air/.

______. 2020b. 2020 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2021. 2021 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

______. 2022. 2022 Annual Network Plan. Internet website: https://deq.wyoming.gov/aqd/monitoring/.

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Appendix D

Economic Technical Support Document

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Appendix D. Economic Technical Support Document

This appendix provides additional information on the baseline social and economic conditions in the Wyoming Buffalo Field Office (BFO) local socioeconomic analysis area, as well as on the assumptions and methods used to assess impacts on socioeconomics, including attitudes, values, and beliefs (AVBs), as discussed in **Chapter 3**, Affected Environment and Environmental Consequence sections of this Supplemental Environmental Impact Statement (EIS) for the United States (US) Department of the Interior, Bureau of Land Management (BLM) BFO 2015 BFO Approved Resource Management Plan, as amended (BLM 2015).

D.1 Baseline Demographics and Economic Conditions

Table D-1 summarizes population changes between 2000 and 2020 for Campbell County, Converse County, and Wyoming. During this time, Campbell County experienced population growth (8.8 percent) higher than that of the state (6.6. percent), while Converse County experienced population growth (3.3 percent) below that of the state.

Table D-1
Socioeconomic Analysis Area Population (2000–2020)

Geographic Area	Population 2000	Population 2010	Population 2020	Percent Population Change 2010–2020
Campbell County	33,698	43,179	46,958	8.8
Converse County	12,052	13,404	13,842	3.3
Wyoming	493,782	545,579	581,348	6.6

Source: Headwater Economics 2022; US Census Bureau 2000, 2010a, 2020

Table D-2 shows projected population for the BFO local socioeconomic analysis area counties and Wyoming between 2025 and 2040. Campbell County is expected to experience a 6.4 percent population growth, with a projected population of 47,710 by 2040, while Converse County is expected to experience a 4.6 percent population growth, with a projected population of 14,650 by 2040. Wyoming is projected to experience a 4.7 percent population growth between 2025 and 2040.

Table D-2
Socioeconomic Analysis Area Projected Population Trends (2025–2040)

Geographic Area	Population 2025	Population 2030	Population 2035	Population 2040	Percent Population Change 2025–2040
Campbell County	44,860	45,090	46,410	47,710	6.4
Converse County	14,010	14,220	14,440	14,650	4.6
Wyoming	586,950	597,260	606,390	614,820	4.7

Source: Wyoming Department of Administration and Information, Economic Analysis Division 2019

Population changes in light of the decreased coal employment contributions discussed in **Section 3.5.3**, Social and Economic Considerations, indicate that other economic sectors may be of increasing importance in the local area.

Table D-3 summarizes housing costs in the socioeconomic analysis area counties and Wyoming. Economic and population changes because of coal production can also impact demand for housing, as well as the value of real estate within the analysis area. In 2021, median housing cost in Campbell County was $1,164 per month, while median housing cost in Converse County was $915 per month. Housing cost as a percent of household income was 16 percent in Campbell County and 14.9 in Converse County. By comparison, median housing cost in Wyoming at $966 per month, or 17 percent of the household income, in 2021.

Table D-3
Socioeconomic Analysis Area Monthly Housing Costs, 2010–2021

Geographic Area	Median Housing Cost (2010)	Median Housing Cost (2021)	Housing Cost as a Percent of Household Income (2010)	Housing Cost as a Percent of Household Income (2021)
Campbell County	$955	$1,164	15.2	16
Converse County	$703	$915	15.5	14.9
Wyoming	$759	$966	16.9	17

Source: US Census Bureau 2010b, 2021

Table D-4 shows employment by industry for industries that employed at least 5 percent or more of total workforce in the socioeconomic analysis area counties or Wyoming. Mining and oil and gas extraction represented a significant source of employment in both Campbell and Converse Counties (17.3 percent and 14.5 percent, respectively). For comparison, mining employment in Wyoming accounted for 4.6 percent of total employment. Other industries with top employment in the socioeconomic analysis area included government and government enterprises, as well as retail trade.

Campbell County is currently home to about 1,480 business establishments, including 120 in the mining, quarrying and oil and gas extraction industries. As of 2020, the largest employers in Campbell County included a number of energy, mining, mining support companies, and governmental agencies, including the Campbell County School District, Peabody Energy, Thunder Basin Coal, Campbell County Health, and Navajo Transitional Energy Company (Campbell County 2022).

Table D-4
Socioeconomic Analysis Area Employment by Industry (2021)

Industry Type	Campbell County	Converse County	Wyoming
Total Employment[1]	32,069	8,763	409,176
Wage and Salary Employment	24,482	6,266	284,326
Proprietors Employment	7,587	2,497	124,850
Employment by Industry (Total and Percent[2])			
Farming Employment	917	533	14,277
	2.9%	6.1%	3.5%

Industry Type	Campbell County	Converse County	Wyoming
Non-Farm Employment	31,152	8,230	394,899
	97.1%	93.9%	96.5%
Mining, Quarrying, and Oil and Gas Extraction	5,532	1,266	18,824
	17.3%	14.5%	4.6%
Construction	2,457	589	29,989
	7.7%	6.7%	7.3%
Retail Trade	3,263	661	39,259
	10.2%	7.5%	9.6%
Transportation and Warehousing	1,396	471	16,124
	4.4%	5.4%	3.9%
Finance and Insurance	994	341	26,587
	3.1%	3.9%	6.5%
Real Estate Rental and Leasing	1,748	420	27,667
	5.5%	4.8%	6.8%
Health Care and Social Assistance	1,469	397	30,657
	4.6%	4.5%	7.5%
Accommodation and Food Services	2,353	582	35,231
	7.3%	6.6%	8.6%
Government and Government Enterprises	4,775	1,694	73,911
	14.9%	19.3%	18.1%

Source: Bureau of Economic Analysis 2021a
[1]Employment represents the number of full-time, part-time, and seasonal jobs.
[2]Percentages represent percent of total employment.

Table D-5 shows personal income and earnings by place of work for industries with earnings of 5 percent or more of total earnings in the socioeconomic analysis area counties. Mining and oil and gas extraction represented a significant source of income in both Campbell and Converse Counties (26.7 percent and 23.4 percent, respectively). In Wyoming, earnings from mining accounted for 8.6 percent of total earnings. Other industries with top earnings in the analysis area included government and government enterprises, as well as transportation and warehousing.

Table D-5
Socioeconomic Analysis Area Personal Income and Earnings by Place of Work (2021)

Income or Earnings Classification	Campbell County	Converse County[1]	Wyoming
Personal Income ($1,000s)	2,598,834	951,343	40,322,831
Per Capita Personal Income	$56,008	$69,583	$69,666
Earnings by Place of Work	$2,117,995	$604,083	$24,273,866
Wages and Salaries	$1,476,323	$373,264	$15,426,455
Supplements to Wages and Salaries	$368,010	$105,142	$4,219,422
Proprietor's Income	$273,662	$125,677	$4,627,989
Earnings by Industry (Total and Percent[2] of Earnings)			
Non-Farm Earnings	$2,104,039	$595,552	$23,986,306
	99.3%	98.6%	98.8%
Mining, Quarrying, and Oil and Gas Extraction	$565,972	$141,535	$2,091,152
	26.7%	23.4%	8.6%
Wholesale Trade	$125372	(D)	$650,287
	5.9%	(D)	2.7

Income or Earnings Classification	Campbell County	Converse County[1]	Wyoming
Retail Trade	$135,153	$20,138	$1,454,718
	6.4%	3.3%	6.0%
Transportation and Warehousing	$159,480	$54,316	$2,791,054
	7.5%	9.0%	11.5%
Information	$18,043	$2,318	$2,791,054
	0.9%	0.4%	11.5%
Real Estate Rental and Leasing	$62,395	$41,659	$746,346
	2.9%	6.9%	3.1%
Professional, Scientific, and	$57,559	(D)	$1,282,758
Technical Services	2.7%	(D)	5.3%
Health Care and Social Assistance	$78,163	$20,062	$1,790,081
	3.7%	3.3%	7.4%
Government and	$368,206	$140,401	$5,705,302
Government Enterprises	17.4%	23.2%	23.5%

Source: Bureau of Economic Analysis 2021b
[1](D) = Not shown to avoid disclosure of confidential information; estimates are included in higher-level totals.
[2]Percentages represent percent of total earnings by place of work.

Table D-6 displays per capita income and average earnings per job for socioeconomic analysis area counties and Wyoming. Converse County had a higher per capita income ($69,583) and average earnings per job ($68,936) than Campbell County. This may be in part due to the lower level of service industry jobs in Campbell County, as these jobs typically have lower wages than non-service industries. While Wyoming had a higher per capita income ($69,666) than both counties, it had a lower average earnings per job value ($59,324) than either county.

Table D-6
Socioeconomic Analysis Area Per Capita Income and Average Earnings Income (2021)

Income and Earnings	Campbell County	Converse County	Wyoming
Per Capita Income	$56,008	$69,583	$69,666
Average Earnings Per Job	$66,054	$68,936	$59,324

Source: Bureau of Economic Analysis 2021c

Unemployment trends for the past decade in the socioeconomic analysis area and Wyoming are shown in **Table D-7**. Unemployment rates in both counties were generally lower than that of Wyoming until 2016, when unemployment rates surpassed the state rate, potentially influenced by a slump in oil prices. In 2018 and 2019, unemployment rates decreased in the analysis area counties back to levels comparable with Wyoming. Unemployment rates generally followed a similar trend across both counties and in Wyoming, peaking in 2016 and again in 2020, the latter due to the impacts of the coronavirus (COVID-19) pandemic.

Lower unemployment and higher per capita earnings in Converse County may be in part to energy sector development, including oil and gas as well as wind. The Gateway West transmission line project, which starts in Glenrock, may also be an influence.

Table D-7
Socioeconomic Analysis Area Unemployment, 2015–2020 (percent)

Annual Average Unemployment	Campbell County	Converse County	Wyoming
2015	3.9	3.6	4.2
2016	7.2	6.3	5.4
2017	5.0	4.6	4.3
2018	4.1	3.7	4.1
2019	3.8	2.9	3.7
2020	6.8	5.9	5.8

Source: Bureau of Labor Statistics 2022

D.2 Economic Contribution Analysis Methods

While there is no fixed definition for economic opportunity, it is generally agreed 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**, the BLM limited the focus of the analysis in this appendix to local economic opportunities and employment supported by economic activity in the coal sector. Qualitative and quantitative data were collected to assist in determining the significance of the coal industry to the regional social and economic environment. An economic contribution analysis was conducted to measure how employment and labor income generated in the coal sector create 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 2021 production and employment data for the 12 mines operating in the coal development potential area (CDPA; MSHA 2022). These data were then used to estimate an average production volume per job that could be applied to annual federal production levels forecasted in the coal reasonably foreseeable development (RFD) scenario (**Appendix B**). Next, a regional input-output model for Campbell and Converse Counties was generated using Impact Analysis for Planning Model (IMPLAN) 2021 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 scenario (**Appendix B**) to estimate its annual direct, indirect, and induced economic contributions. Annual direct, indirect, and induced economic contributions were measured in terms of jobs, income, and economic output (that is, the value of production).

An input-output analysis is a means of examining relationships within an economy, both among businesses and between businesses and final consumers. The analysis captures monetary market transactions for consumption in a given time period. An economic contribution analysis is defined as "the gross change in economic activity associated with an industry, event, or policy in an existing regional economy" (Watson et al. 2007, p. 142). Input-output models (that is, IMPLAN) are static models that measure output in an economy at a point in time. The model is used to describe an economy at a single point in time, to introduce

[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/.

a change to the economy, and to evaluate the economy after it has responded to the change. Static models do not describe how an economy moves from one equilibrium to the next; they assume there are no changes in wage rates, input prices, economic linkages, and property values. Over a given planning horizon, static models compare the annual changes in an economy to the baseline economic condition initially described.

To calculate the economic contribution of US Energy Information Administration (EIA)-forecasted federal coal production in the socioeconomic analysis area, the BLM used IMPLAN to estimate changes in jobs, incomes, and output in the region resulting from employment shocks tied to changes in coal production. The model accounts for the "multiplier effect" that occurs as dollars circulate throughout the economy. Direct effects, or contributions, can be described as the direct jobs and incomes associated with coal production. Indirect effects are the economic changes associated with backward-linked industries, such as the purchases made by suppliers to coal production in the planning area. Induced effects are the economic changes resulting from household spending from changes in household income. Taken together, these combined economic impacts describe the contribution of employment shocks from changes in the level of coal production over the planning horizon; they are described in terms of output, income, and jobs. The types of contributions are:

- Direct contributions: the contributions accruing to the original or "direct" industries providing goods and services connected to management activities
- Indirect contributions: the contributions accruing to the local sectors or industries providing inputs of goods and services to the directly affected industries
- Induced contributions: the contributions arising from employees in the direct and indirect industries spending their earnings in the local economy

The economic contribution analysis uses an employment shock model to estimate the economic effects associated with direct employment changes associated with forecasted federal coal production volumes. Changes in direct employment were estimated by assuming 2021 production output per worker would remain constant over the planning horizon. The economic output estimated by the IMPLAN model excludes monetary transfers to government agencies in the form of taxes. These payments and their estimates are discussed further in **Section 3.5** and in **Section D.3**. It should also be noted that IMPLAN estimates for changes in employment are limited to those associated with anticipated federal production; therefore, they differ from any estimates for recent coal mining jobs already supported at the 12 mines operating within the BFO boundaries, as depicted in the Mine Safety and Health Administration data.

Projected annual average contributions are reported in **Section 3.5.3**, Social and Economic Considerations, Direct and Indirect Impacts. Economic activity (that is, jobs, income, and the value of output in impacted industries) will fluctuate with production levels in coal mining sector(s). As a result, the actual contribution level could vary from the forecasted level, depending on the production level at a given time. Note that this contribution analysis is limited to the production level of federal coal as anticipated and detailed in **Appendix B**. This analysis and the associated input-output model are not able to quantitatively capture an analysis for a reduction in nonfederal coal, should the absence of future leases limit the economic viability of continued mining operations and result in nonfederal mine closures.

Current leases provide sufficient reserves to support development and associated demand at EIA-forecasted levels through the planning period of 2022 to 2038. As a result, economic contributions from coal development over this time period would not vary by alternative; these are discussed in **Section 3.5.3**, Social and Economic Considerations, Affected Environment and displayed in **Table D-8**, **Table D-9**, and **Table D-10**. The No Action and Limited Leasing Alternatives include a quantitative discussion of impacts from 2040 to 2048, and the No Action Alternative includes a qualitative discussion of potential impacts extending beyond this period. This is due to the level of uncertainty related to forecast levels of production and market price increases for an analysis beyond this period due to EIA-forecasted data availability extending only to 2050. Under the No Leasing Alternative (Alternative A), economic contributions would be limited to existing leases. Estimated contributions from future leases under Alternatives B (No Action) and Alternative C (Limited Leases) are displayed in **Table D-11** and **Table D-12**.

Table D-8
Average Annual Economic Impacts from Existing Federal Leases 2023–2027

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	2,982	400,172,817	1,972,512,742
Indirect effect[2]	1,163	86,286,190	365,519,942
Induced effect[3]	1,133	43,561,127	170,862,261
Total effect[4]	5,278	530,020,134	2,508,894,945

Source: Calculated based on the RFD scenario using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table D-9
Average Annual Economic Impacts from Existing Federal Leases 2028–2032

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	3,049	409,119,095	2,016,610,308
Indirect effect[2]	1,189	88,215,207	373,691,520
Induced effect[3]	1,159	44,534,981	174,682,064
Total effect[4]	5,397	541,869,283	2,564,983,892

Source: Calculated based on the RFD scenario using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table D-10
Average Annual Economic Impacts from Existing Federal Leases 2033–2038

Impact Type	Employment (Number of Jobs)	Labor Income ($)	Output ($)
Direct effect[1]	2,789	374,251,690	1,869,970,492
Indirect effect[2]	1,088	80,697,017	341,843,450
Induced effect[3]	1,060	40,739,462	161,979,885
Total effect[4]	4,937	495,688,169	2,373,793,827

Source: Calculated based on the RFD scenario using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table D-11
Average Annual Economic Effects 2039–2048 (Alternative B – No Action Alternative)

Impact Type	Employment (Number of Jobs)	Labor Income ($)[2]	Output ($)[3]
Direct effect[1]	2,329	312,519,364	1,540,455,528
Indirect effect[2]	908	67,386,150	285,456,821
Induced effect[3]	885	34,019,541	133,436,763
Total effect[4]	4,122	413,925,055	1,959,349,112

Source: Calculated based on the RFD scenario using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Table D-12
Average Annual Economic Effects 2039–2048 (Alternative C – Limited Leasing Alternative)

Impact Type	Employment (Number of Jobs)	Labor Income ($)[2]	Output ($)[3]
Direct effect[1]	1,908	256,081,444	1,262,264,427
Indirect effect[2]	744	55,216,875	233,906,130
Induced effect[3]	725	27,875,947	109,339,397
Total effect[4]	3,377	339,174,266	1,496,170,557

Source: Calculated based on the RFD scenario using IMPLAN 2021
[1] Direct effects measure the economic activity directly attributable to Powder River Basin coal production. For example, direct income and employment include mine employment supported by federal mineral production.
[2, 3] Indirect and induced effects measure ripple effects through the economy resulting from a given direct effect. For example, indirect employment and labor income include industries that supply goods and services to the coal industry, such as drilling equipment. Induced employment and labor income include industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income, such as restaurants and retail stores.
[4] Total effects include direct effects plus their ripple effects throughout the economy.

Because the model relies on existing linkages as they existed in previous years, the following assumptions are implied: constant returns to scale; no supply constraints; fixed input structure; industry technology assumption; constant byproducts coefficients; and the underlying model linkages are not affected by Project input values. These assumptions lead to the following key limitations in input-output models (IMPLAN 2023):

- Feasibility: The assumption that there are no supply constraints and there is fixed input structure means that, even if input resources required are scarce, the model assumes the same portion of production value will always be required to acquire that input. The assumption of no supply constraints also applies to workers; essentially, the model assumes there are no constraint on the workforce from which a business or organization can draw.
- Backward-linked and static model: Input-output models do not account for forward linkages, nor do input-output models account for offsetting effects, such as cannibalization of other existing businesses, diverting funds used for the land use management decision from other potential or existing management decisions, etc.
- Each model run assumes that, in the absence of this land use management decision, the allocated funds would not be spent in the area. Therefore, this economic impact study reports gross impacts of the land use management decision and does not attempt to estimate impacts of alternative spending options.

D.3 Mineral Revenues and Funding for Public Services

As discussed in **Section 3.5.3**, Affected Environment, Wyoming and local governments, municipalities, and special districts rely heavily on revenues generated from mineral leasing and production.

Primary coal-related revenue collected includes federal mineral receipts, as well as severance and ad valorem taxes. Forty-nine percent of federal mineral royalties 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 receive mineral revenue disbursements from the state, ad valorem taxes (or property taxes) from mineral development and production generally account for a large share of total revenues at the county level each year. Campbell County further generates coal-related revenue through a gross products tax, which is an ad valorem property tax based on the taxable value of the coal produced the previous year. Campbell County bills and collects this tax directly, based on the applicable tax district mill levy, and uses the revenue to fund local schools, infrastructure, and public services. These taxes, in addition to severance tax revenues from federal coal production in the CDPA, comprise the majority of coal-related revenues funding the general operations of Wyoming's government, including school major maintenance and capital construction for all Wyoming school districts.

AVBs associated with the provision of these public services would be supported by mineral revenues generated from the production of coal; alternatively, declines in the funding for, and provision of, these services would be considered not to support such AVBs or associated Wyoming livelihoods. For example, in fiscal year 2022, Campbell County had a surface coal taxable valuation of $1,928,316,014 based on coal production that occurred in 2021. This assessed valuation of Campbell County comprises over 90 percent of Wyoming's total assessed valuation on coal statewide. Coal accounted for approximately 51.6 percent of the county's assessed value in 2021. In fiscal year 2020, coal-related property and production taxes accounted for about $47.4 million, nearly half of total county revenues. This revenue supported county expenditures that amounted to about $104.7 million and supported services, including, but not limited to, the sheriff's office, emergency management, the Joint Powers Fire Board, and public works, including road and bridge projects (Campbell County 2022). The above data include both federal and nonfederal coal production.

Because 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 in the RFD scenario (**Appendix B**) were estimated based on a number of assumptions, including annual production levels, projected coal prices over the planning period, royalty and tax rates, and the number of federal coal acres under lease. Assumptions for the various calculations are reported in **Table D-13**.

Calculated estimates for federal royalty revenue and Wyoming state severance tax contributions are included in **Table D-14** and **Table D-15**, below.

Table D-13
Assumptions and Analysis Approach for Estimating Mineral Revenues, 2019–2038

Type	Assumptions
Production	Annual production was provided by the RFD scenario (**Appendix B**). Total annual production ranged from 262,750,000 short tons in 2023 to 160,760,000 short tons in 2048.
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 scenario (**Appendix B**). The average price ranged from $12.2776165 per short ton in 2023 to $11.8504705 per short ton in 2048.
Federal royalties	Federal royalties were estimated at 12.5 percent of the market value of federal mineral production. In total, 49 percent of federal mineral royalty revenue collected is disbursed to the state.
Federal rents	Rents on federal leases were estimated at $3 per acre. Because it is highly uncertain how many acres will be held under lease over the next 20 years, acres subject to annual rents were held constant, even though acres may change as areas are mined out or additional tracts are leased.
Severance taxes	State severance taxes were estimated at 7 percent of market value of federal mineral production. While Wyoming statute provides a 3 percent severance tax exemption for coal that is transported to markets outside North America through coal export terminals in Canada or Mexico, no federal coal is exported internationally from the CDPA considered in this Supplemental EIS (EIA 2022b, 2022c).

Table D-14
Estimated Revenues from Existing Federal Leases (2022$)

Time Frame	2023–2038 ($)
Federal royalty revenue	338,529,710
Federal royalty disbursements to Wyoming	165,879,558
Wyoming severance tax distributions	189,576,638

Source: Calculated based on the RFD scenario and EIA 2022a forecast prices

Table D-15
Estimated Average Annual Federal Mineral Revenue (2022$)

Time Frame	Federal Royalty Revenue ($)	Federal Royalty Disbursements ($)	State Severance Taxes ($)
2039–2048 (Alternative B – No Action Alternative)	266,267,647	130,471,147	133,355,715
2039–2048 (Alternative C – Limited Leasing Alternative)	218,297,960	106,966,000	122,246,858

Source: Calculated based on the RFD scenario and EIA 2022a forecast prices

D.4 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 person 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 nonuse values can include those derived from knowing the resource exists, knowing one will have the option to use the resource in the future, off-site interactions, and knowing that those in the future will also have the ability to derive value from the resource.

Collectively, these use and passive use values influence the AVBs that shape the lens in which individuals view resources and impacts on these resources. AVBs associated with biological and physical resources are supported when actions do not adversely affect these resources, and adverse impacts on these resources would be considered not to support these AVBs.

D.4.1 Biological and Physical Resources

AVBs associated with air, water, and wildlife populations generally relate to their overall quality. People often acknowledge that they care about and derive value from clean air and water, and healthy wildlife populations. 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, gas, and coal development forecasted in the RFD scenario (**Appendix B**) of this Supplemental EIS and are discussed in detail in **Sections 3.5.1** and **3.5.2.** Impacts on water and wildlife were determined based on possible surface disturbances in areas with development potential carried forward through the suitability screen.

Potential adverse impacts on these resources would be considered not to support the previously described AVBs.

D.4.2 Social Cost of Greenhouse Gas Emissions

Impacts on air resources were analyzed in terms of emissions generated from oil, gas, and coal development forecasted in the RFD scenario (**Appendix B**) of this Supplemental EIS. Details for greenhouse gas emission calculations and the associated methodology and assumptions are included in **Section 3.5.2**, Greenhouse Gases, Including Climate Change.

D.5 References

BLM (United States Department of Interior, Bureau of Land Management). 2015. Buffalo Field Office Proposed Resource Management Plan and Final EIS. BLM/WY/PL-15/022+1610. Buffalo, Wyoming. September 2015.

Bureau of Economic Analysis. 2021a. Table CAEMP25N. Total full-time and part-time employment by North American Industry Classification System (NAICS) for Campbell and Converse Counties in Wyoming. Internet website: https://apps.bea.gov/iTable/?reqid=70&step=1&acrdn=6#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMyJdLFsiQ2xhc3NpZmljYXRpb24iLCJOQUlDUyJdLFsiTWFqb3JfQXJlYSIsIjQiXSxbIlN0YXRlIixbIjU2MDAwIl1dLFsiQXJlYSIsWyI1NjAwMCIsIjU2MDA1IiwiNTYwMDkiXV0sWyJTdGF0aXN0aWMiLFsiLTEiXV0sWyJVbml0X29mX21lYXN1cmUiLCJMZXZlbHMiXSxbIlllYXIiLFsiMjAyMSIsIjIwMTUiLCIyMDEwIl1dLFsiWWVhckJlZ2luIiwiLTEiXSxbIlllYXJfRW5kIiwiLTEiXV19.

______. 2021b. Table CAINC5N. Personal Income by Major Component and Earnings by North American Industry Classification System (NAICS) Industry for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties in Wyoming. Internet website: https://apps.bea.gov/iTable/?reqid=70&step=1&acrdn=6#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMiJdLFsiQ2xhc3NpZmljYXRpb24iLCJOQUlDUyJdLFsiTWFqb3JfQXJlYSIsIjQiXSxbIlN0YXRlIixbIjU2MDAwIl1dLFsiQXJlYSIsWyI1NjAwMCIsIjU2MDA1IiwiNTYwMDkiLCI1NjAxMSIsIjU2MDE5IiwiNTYwMjUiLCI1NjAzMyIsIjU2MDQ1Il1dLFsiU3RhdGlzdGljIixbIi0xIl1dLFsiVW5pdF9vZl9tZWFzdXJlIiwiTGV2ZWxzIl0sWyJZZWFyIixbIjIwMjEiLCIyMDE1IiwiMjAxMCJdXSxbIlllYXJCZWdpbiIsIi0xIl0sWyJZZWFyX0VuZCIsIi0xIl1dfQ==.

______. 2021c. Table CAIN30 Economic Profile for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties in Wyoming. Internet website: https://apps.bea.gov/iTable/?reqid=70&step=1&acrdn=6#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIxMiJdLFsiQ2xhc3NpZmljYXRpb24iLCJOb24tSW5kdXN0cnkiXSxbIk1ham9yX0FyZWEiLCI0Il0sWyJTdGF0ZSIsWyI1NjAwMCJdXSxbIkFyZWEiLFsiNTYwMDAiLCI1NjAwNSIsIjU2MDA5IiwiNTYwMTEiLCI1NjAxOSIsIjU2MDI1IiwiNTYwMzMiLCI1NjA0NSJdXSxbIlN0YXRpc3RpYyIsWyItMSJdXSxbIlVuaXRfb2ZfbWVhc3VyZSIsIkxldmVscyJdLFsiWWVhciIsWyIyMDIxIiwiMjAxNSIsIjIwMTAiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=.

Campbell County. 2022. Campbell County Natural Resources and Land Use Plan. Internet website: https://www.campbellcountywy.gov/DocumentCenter/View/20880/2022-Natural-Resource-Land-Use-Plan-Final-Draft-and-Comments

Headwaters Economics. 2022. Economic Profile System for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties. Internet website: https://headwaterseconomics.org/apps/economic-profile-system/.

IWG (Interagency Working Group). 2021. *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, Interim Estimates under Executive Order 13990*. Interagency Working Group on Social Cost of Greenhouse Gasses, February 2021.

MSHA (Mine Safety Health Administration). 2022. Mine Safety Health Administration Mine Data. Internet website: https://www.msha.gov/data-and-reports/mine-data-retrieval-system.

US Bureau of Labor Statistics. 2022. Local Area Employment Statistics. Internet website: https://www.bls.gov/data/home.htm.

US Census Bureau. 2000. Table DP1. Profile of General Demographic Characteristics for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties in Wyoming: 2000. Internet website: https://data.census.gov/table?t=Populations+and+People&g=0500000US56005,56009,56011,56019,56025,56033,56045&y=2000&tid=DECENNIALDPSF22000.DP1.

______. 2010a. Table S0101. Age and Sex. 2010: American Community Survey (ACS) 5-Year Estimates Subject Tables for Campbell and Converse Counties in Wyoming. Internet website: https://data.census.gov/table?g=0400000US56_0500000US56005,56009&tid=ACSST5Y2010.S0101.

______. 2010b. Table S2503. Financial Characteristics. 2010: American Community Survey (ACS)5-Year Estimates Subject Tables for Campbell and Converse Counties in Wyoming. Internet website: https://data.census.gov/table?q=Housing+costs&g=0400000US56_0500000US56005,56009&d=ACS+5-Year+Estimates+Subject+Tables&tid=ACSST5Y2010.S2503.

______. 2020. Table S0101. Age and Sex. 2020: American Community Survey (ACS) 5-Year Estimates Subject Tables for Campbell and Converse Counties in Wyoming. Internet website: https://data.census.gov/table?t=Populations+and+People&g=0400000US56_0500000US56005,56009&y=2020&tid=ACSST5Y2020.S0101&moe=false.

______. 2021. Table S2503. Financial Characteristics. 2021: American Community Survey (ACS) 5-Year Estimates Subject Tables for Campbell, Johnson, Sheridan, Converse, Crook, Natrona, and Weston Counties in Wyoming. Internet website: https://data.census.gov/table?q=Housing+costs&g=0500000US56005,56009,56011,56019,56025,56033,56045&d=ACS+5-Year+Estimates+Subject+Tables&tid=ACSST5Y2021.S2503.

Watson, P., J. Wilson, D. D. Thilmany, and S. Winter. 2007. "Determining Economic Contributions and Impacts: What is the difference and why do we care?," *Journal of Regional Analysis and Policy* 37 (2): 1-7. http://dx.doi.org/10.22004/ag.econ.132414.

Wyoming Department of Administration and Information, Economic Analysis Division. 2019. Population forecast. Internet website: eadiv.state.wy.us/pop/wyc&sc40.htm.

Appendix E

Environmental Justice Support Document

Appendix E. Environmental Justice Support Document

This appendix supports the environmental justice (EJ) review of the local socioeconomic analysis area (Campbell and Converse Counties, Wyoming), as well as for communities adjacent to downstream combustion points (104 total combustion points in 25 states), as discussed in **Section 3.5.4**, Environmental Justice, of this supplemental environmental impact statement for the United States (US) Department of the Interior, Bureau of Land Management (BLM) Wyoming Buffalo Field Office (BFO) 2015 BFO Approved Resource Management Plan, as amended (BLM 2015). There are five downstream combustion points in Wyoming (three in Campbell County, one in Converse County, and one in Platte County). An additional 99 out-of-state combustion points (Energy Information Administration 2022) also receive federal Powder River Basin coal.

E.1 Local Analysis Area

As discussed above, the local analysis area includes Campbell and Converse Counties, Wyoming, and all block groups within the two local analysis area counties. Block groups are statistical, geographic divisions of census tracts and are generally defined to contain between 600 and 3,000 people. A block group usually covers a contiguous area. Each census tract contains at least one block group, and block groups are uniquely numbered within the census tract.

Executive Order 12898 uses the terms "minority" and "low income" to identify two sets of populations whose members have been regularly excluded from important decision-making processes in ways that adversely impact their health and environment and that have created a disproportionate distribution of environmental amenities and burdens. The BFO uses the term "minority" in that context, while recognizing that it is becoming increasingly inaccurate from a demographic perspective, and it hides significant differences between groups of people and their experiences. Minority populations are defined as those identifying as American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, Black or African American, some other race (other than White), a combination of two or more races, or Hispanic. The US Census Bureau—the source used most often to identify minority populations—collects data based on separate definitions of race and ethnicity:

- **Race:** People identify their own race on census forms as White, Black or African American, American Indian or Alaska Native, Asian, and Native Hawaiian or other Pacific Islander. These are the minimum categories required by the Office of Management and Budget, which, as of the 1997 guidance, allows people to self-identity as more than one race.
- **Ethnicity:** People identify their own ethnicity on census forms as Hispanic or Latino, or not Hispanic or Latino. Hispanic or Latino refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin. The person may be of any race. Many people who describe their race as White also describe their ethnicity as Hispanic or Latino; these people would be considered members of a minority group for EJ purposes.

The US Census Bureau combines these two definitions by providing data on the White alone, non-Hispanic population. Then, those remaining are considered members of one or more minority groups. A minority population is then identified in an EJ analysis when either the 50 percent threshold or the "meaningfully greater" threshold is met. The 50 percent threshold analysis involves identifying any block groups with a total minority population of 50 percent or greater. Based on 2020 US Census Bureau data, no block groups met this threshold. For the meaningfully greater threshold, the BLM used 110 percent of the minority percentage of the geographic reference area as the threshold for meaningfully greater (BLM 2022). In this case, 110 percent of the total minority population for Wyoming (the reference area) is 18.7 percent. Based on 2020 US Census Bureau data, 10 block groups met the minority threshold criteria for the meaningfully greater component of the associated EJ screening.

For the purpose of this analysis, Indigenous populations include those who identify as American Indian or Alaska Native alone or in combination with one or more other races. The BLM used these US Census Bureau data to provide more comprehensive information on Indigenous populations. For instance, this data set includes those who identify as American Indian or Alaska Native alone or in combination with one or more other races, who may not have tribal membership, or who are a part of non-federally recognized tribes; these people are typically excluded from the general minority population estimates discussed previously.

The BLM also used a threshold analysis and meaningfully greater analysis to identify Indigenous populations who meet the criteria for EJ consideration. Based on 2020 US Census Bureau data, no counties or block groups met this threshold. The BLM also considered block groups at or above the total state Indigenous population to be EJ communities of potential concern. In this case, the total Indigenous population for Wyoming (the reference area) is 3.67 percent. Based on 2020 US Census Bureau data, no Wyoming counties met this criterion; however a total of 12 block groups met this criterion for the meaningfully greater analysis.

The BLM defines low-income populations as people whose income is less than or equal to twice (200 percent of) the federal poverty level, relative to the annual statistical poverty thresholds from the US Census Bureau (Council on Environmental Quality 1997; BLM 2022). For low-income criteria screening, the BLM used the 50 percent threshold analysis and the BLM's low-income threshold analysis. For the 50 percent threshold analysis, areas where income is less than or equal to twice (200 percent of) the federal poverty level for 50 percent or more of a total block group population are considered populations meeting low-income EJ criteria.

Based on 2020 US Census Bureau data, no counties and two block groups met this threshold. For the low-income threshold analysis, any study area that has a low-income percentage of the population equal to or higher than the reference area is identified as meeting low-income EJ criteria. In this case, the reference area is Wyoming for the local analysis area. Based on 2020 US Census Bureau data, Converse County and 14 block groups within the local analysis area met the low-income threshold criteria and have been identified as having low-income EJ communities of concern.

Table E-1 provides an overview of the EJ screening for block groups within the local analysis area. A total of 21 block groups (72 percent of the local analysis area block groups) in Campbell County and 7 block groups (64 percent of the local analysis area block groups) in Converse County met one or more criteria for consideration as EJ communities of concern. As such, a total of 28 block groups met criteria for consideration as EJ communities of potential concern within the local analysis area. An asterisk indicates data that meet EJ criteria for a given data set.

Table E-1
Local Analysis Area Environmental Justice Screening Results

Geographic Area	Total Population	Minority Population Percentage of Geographic Area	Native American Population Percentage of Geographic Area	Low-Income Population Percentage of Geographic Area	Meets EJ Criteria?
Reference Area: Wyoming	576,641	17.02% (18.7% is meaningfully greater)	3.67%	27.0%	—
Campbell County	46,758	13.29	2.61	22.0	No
Converse County	13,702	11.66	2.63	33.0*	Yes
Block group 1, Census Tract 1.01, Campbell County	1,708	1.29	1.29	6.0	No
Block group 1, Census Tract 1.02, Campbell County	2,704	9.13	0.00	17.0	No
Block group 2, Census Tract 1.02, Campbell County	3,170	7.22	4.98*	35.0*	Yes
Block group 1, Census Tract 1.03, Campbell County	2,011	22.77*	6.02*	29.0*	Yes
Block group 1, Census Tract 2, Campbell County	3,213	38.38*	0.06	16.0	Yes
Block group 2, Census Tract 2, Campbell County	1,424	3.86	1.26	11.0	No
Block group 3, Census Tract 2, Campbell County	1,889	19.00*	0.00	23.0	Yes
Block group 4, Census Tract 2, Campbell County	1,558	17.39	0.51	82.0*	Yes
Block group 1, Census Tract 3, Campbell County	518	0.00	0.00	49.0*	Yes
Block group 2, Census Tract 3, Campbell County	1,831	18.30	0.00	51.0*	Yes
Block group 3, Census Tract 3, Campbell County	1,741	19.18*	0.00	21.0	Yes
Block group 4, Census Tract 3, Campbell County	833	41.90*	0.00	23.0	Yes
Block group 1, Census Tract 4, Campbell County	1,183	12.43	7.61*	19.0	Yes
Block group 2, Census Tract 4, Campbell County	751	1.73	1.73	13.0	No
Block group 3, Census Tract 4, Campbell County	1,073	15.10	4.66*	10.0	Yes
Block group 4, Census Tract 4, Campbell County	545	24.40*	1.47	22.0	Yes
Block group 1, Census Tract 5, Campbell County	1,315	13.08	3.50	19.0	No
Block group 2, Census Tract 5, Campbell County	2,239	7.41	3.04	2.0	No
Block group 3, Census Tract 5, Campbell County	1,905	12.23	7.14*	27.0*	Yes

Geographic Area	Total Population	Minority Population Percentage of Geographic Area	Native American Population Percentage of Geographic Area	Low-Income Population Percentage of Geographic Area	Meets EJ Criteria?
Block group 4, Census Tract 5, Campbell County	1,011	0.00	0.00	45.0*	Yes
Block group 1, Census Tract 6, Campbell County	1,946	22.82*	11.25*	18.0	Yes
Block group 2, Census Tract 6, Campbell County	2,923	15.40	3.73*	42.0*	Yes
Block group 3, Census Tract 6, Campbell County	925	19.14*	9.51*	4.0	Yes
Block group 1, Census Tract 7.01, Campbell County	1,757	3.70	3.70*	10.0	Yes
Block group 1, Census Tract 7.02, Campbell County	327	0.00	0.00	37.0*	Yes
Block group 2, Census Tract 7.02, Campbell County	958	13.88	0.00	9.0	No
Block group 3, Census Tract 7.02, Campbell County	1,493	0.00	0.00	27.0*	Yes
Block group 4, Census Tract 7.02, Campbell County	769	2.47	0.00	43.0*	Yes
Block group 5, Census Tract 7.02, Campbell County	3,038	0.33	0.00	0.0	No
Block group 1, Census Tract 9564, Converse County	621	38.00*	0.16	6.0	Yes
Block group 2, Census Tract 9564, Converse County	1,036	4.83	0.29	19.0	No
Block group 3, Census Tract 9564, Converse County	714	12.04	3.36	24.0	No
Block group 4, Census Tract 9564, Converse County	1,985	27.76*	3.02	14.0	Yes
Block group 1, Census Tract 9565, Converse County	1,783	11.05	4.21*	14.0	Yes
Block group 2, Census Tract 9565, Converse County	1,576	6.54	3.68*	38.0*	Yes
Block group 1, Census Tract 9566, Converse County	1,045	10.91	5.07*	19.0	Yes
Block group 2, Census Tract 9566, Converse County	786	5.09	2.04	28.0*	Yes
Block group 3, Census Tract 9566, Converse County	1,106	5.24	1.45	23.0	No
Block group 1, Census Tract 9567, Converse County	1,423	4.92	0.00	40.0*	Yes
Block group 2, Census Tract 9567, Converse County	1,627	5.72	3.32	20.0	No

Source: Environmental Protection Agency 2022; US Census Bureau 2021
* Indicates data meet or exceeds EJ criteria for a given data set

Table E-2 provides an overview of select health disparities indicators in local analysis area counties. Indicators such as asthma and heart disease prevalence provide information about a population's health status with respect to environmental factors. Research has shown that some people are more susceptible than others to air pollutants. These groups include children, pregnant women, older adults, and individuals with pre-existing heart and lung disease (EPA 2023a).

Asthma prevalence describes the size of a state's population with asthma, as well as the overall asthma prevalence relative to other chronic conditions. The greater the prevalence of asthma, the greater the likelihood of adverse outcomes from asthma, including emergency department visits, hospitalizations, and death. In Wyoming, asthma prevalence among adults ranges from 8.8 percent to 11.2 percent, according to Center for Disease Control 2020 data. Compared with the United States, both local analysis area counties have slightly higher asthma prevalence (less than 1 percent).

Heart disease prevalence describes the size of a state's population with coronary heart disease. Compared with the United States, heart disease prevalence at the same level in Converse County (5.5 percent) and slightly higher in Campbell County (5.6 percent), according to Center for Disease Control 2020 data.

Table E-2
Local Analysis Area Health Disparities Indicators

Geographic Area	Asthma Prevalence among Adults Aged 18 Years and Older (2020)	Heart Disease Prevalence among Adults Aged 18 Years and Older (2020)
Campbell County	9.8%	5.6%
Converse County	9.9%	5.5%
United States	9.2%	5.5%

Source: US Center for Disease Control 2020a, 2020b

Table E-3 provides an overview of select environmental and public health indices for local analysis area block groups. This table shows select data from the US Environmental Protection Agency's Environmental Justice Screen (EJScreen) tool, known as the Environmental Justice Indices. An EJ index combines demographic factors with a single environmental factor. For example, the EJ index for traffic is a combination of the following populations residing in a given census block group:

- The traffic indicator
- The low-income population
- The people of color populations

The indices show environmental and demographic raw data (such as the estimated concentration of ozone in the air), and also show what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares with the entire state, US Environmental Protection Agency region, or country. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. Data provided in standard reports include the following:

- Environmental Justice Index for Particulate Matter 2.5
- Environmental Justice Index for Ozone
- Environmental Justice Index for Diesel Particulate Matter
- Environmental Justice Index for Air Toxics Cancer Risk

- Environmental Justice Index for Air Toxics Respiratory Hazard Index
- Environmental Justice Index for Underground Storage Tanks
- Environmental Justice Index for Traffic Proximity
- Environmental Justice Index for Lead Paint
- Environmental Justice Index for Superfund Proximity
- Environmental Justice Index for Risk Management Plan Facility Proximity
- Environmental Justice Index for Hazardous Waste Proximity
- Environmental Justice Index for Wastewater Discharge

For this appendix, select information is presented related to the overall comparison of the above indices with state and national levels. In addition, detailed information is provided for indices likely to have cumulative impacts from coal mining and combustion, specifically the EJ indices for air toxics cancer risk, air toxics respiratory hazard index, particulate matter 2.5, ozone, traffic proximity, hazardous waste proximity, and wastewater discharge. The particulate matter 2.5 and ozone indicators in the EJScreen tool are measures of potential exposure rather than a measure of risk, like the air toxics cancer risk indicator. The traffic proximity indicator is presented alongside these other selected EJ indices because, while proximity to roads can provide access to jobs, health care, food, recreational opportunities, and other benefits, there are also negative aspects associated with high volumes of traffic and residential proximity, such as asthma, cardiovascular and heart disease, and others (EPA 2023b).

Note that an EJ index does not combine various environmental factors into a cumulative score; each environmental indicator has its own EJ index. Further, the indicators discussed are only screening-level proxies for actual health impacts. This is particularly true for proximity indicators. Even for indicators that directly estimate risks or hazards, as with the air toxics cancer risk indicator, estimates have substantial uncertainty because the following indicators are uncertain:

- Emissions
- Ambient levels in the air
- Exposure of individuals
- Toxicity

Additionally, the EJScreen tool relies on demographic and environmental estimates that involve substantial uncertainty. This is especially true when looking at a small geographic area, such as a single census block group, which is often small and has uncertain estimates. The demographic estimates, such as the percentage of low income, come from surveys, not a full census of all households. This means the Census Bureau may estimate that a block group is 30 percent low income, for example, but the block group might actually be 20 percent or 40 percent in some cases (EPA 2023c). The EJScreen tool also assumes block group residents are distributed evenly across each block group; however, in reality, housing distribution patterns are not identical across block groups.

Data are presented for these criteria compared with state levels; those indices where block group levels were 80th percentile or higher when compared with state levels are identified in bold text. In addition, columns at the right side of the table indicate where any of the 12 EJ indices identified above fall at or above the associated state or national 80th percentiles. Block groups indicated with an asterisk are those that meet qualifications as potential EJ communities based on one or more criteria, as identified in **Table E-1**.

Table E-3
Local Analysis Area Select Environmental and Health Indices

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Reference Area Values									
US (National Average)	28	0.36	8.67	42.5	760	2.2	12	—	—
Wyoming (State Average)	12	0.17	4.96	50.2	270	0.4	0.0091	—	—
Campbell County (County level)	18	0.2	4.73	47.3	150	0.0089	0.0071	—	—
Converse County (county level)	10	0.2	4.59	48.8	140	0.02	0.007	—	—
Block Group State Percentile									
Block Group 1, Census Tract 1.01, Campbell County	84	58	0	33	4	0.01	0.013	Yes	No
Block Group 1, Census Tract 1.02, Campbell County	77	38	0	14	20	0.0083	.00008	No	No
Block Group 2, Census Tract 1.02, Campbell County*	80	46	0	22	51	0.0088	N/A	Yes	No
Block Group 1, Census Tract 1.03, Campbell County*	92	83	0	52	10	0.0096	0.0011	Yes	No

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Block Group 1, Census Tract 2, Campbell County*	93	85	63	47	110	0.009	0.0038	Yes	No
Block Group 2, Census Tract 2, Campbell County	79	45	31	19	210	0.0092	N/A	No	No
Block Group 3, Census Tract 2, Campbell County*	77	39	21	12	26	0.0095	0.027	No	No
Block Group 4, Census Tract 2, Campbell County*	89	72	51	36	140	0.0089	0.000014	Yes	Yes
Block Group 1, Census Tract 3, Campbell County*	97	94	94	54	760	0.0088	0.0025	Yes	Yes
Block Group 2, Census Tract 3, Campbell County*	94	88	89	47	270	0.0088	0.0021	Yes	Yes
Block Group 3, Census Tract 3, Campbell County*	96	92	92	50	74	0.0091	0.007	Yes	Yes
Block Group 4, Census Tract 3, Campbell County*	79	44	41	15	370	0.0089	0.033	No	No

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Block Group 1, Census Tract 4, Campbell County*	86	62	66	25	120	0.0089	0.014	Yes	No
Block Group 2, Census Tract 4, Campbell County	80	47	49	18	810	0.0087	0.004	Yes	No
Block Group 3, Census Tract 4, Campbell County*	81	48	50	18	710	0.0087	0.0033	Yes	No
Block Group 4, Census Tract 4, Campbell County*	81	51	52	20	1600	0.0088	0.009	Yes	No
Block Group 1, Census Tract 5, Campbell County	83	54	56	22	120	0.0087	N/A	Yes	No
Block Group 2, Census Tract 5, Campbell County	79	44	43	17	34	0.0085	N/A	No	No
Block Group 3, Census Tract 5, Campbell County*	0	36	20	8	130	0.0087	0.00052	No	No
Block Group 4, Census Tract 5, Campbell County*	81	50	51	21	34	0.0086	N/A	Yes	No

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Block Group 1, Census Tract 6, Campbell County*	96	93	97	49	230	0.0086	0.0018	Yes	Yes
Block Group 2, Census Tract 6, Campbell County*	85	61	70	24	49	0.0085	N/A	Yes	No
Block Group 3, Census Tract 6, Campbell County*	92	83	90	38	730	0.0086	0.0016	Yes	No
Block Group 1, Census Tract 7.01, Campbell County*	0	36	10	3	4	0.0078	0.00000095	No	No
Block Group 1, Census Tract 7.02, Campbell County*	0	37	22	5	250	0.0089	0.0034	No	No
Block Group 2, Census Tract 7.02, Campbell County	0	66	67	17	7	0.0088	0.0014	No	No
Block Group 3, Census Tract 7.02, Campbell County*	0	36	21	5	1.3	0.0095	0.0054	No	No
Block Group 4, Census Tract 7.02, Campbell County*	0	81	80	22	54	0.0094	0.12	Yes	No

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Block Group 5, Census Tract 7.02, Campbell County	0	68	69	18	25	0.0069	0.0027	Yes	No
Block Group 1, Census Tract 9564, Converse County*	0	74	44	61	220	0.014	0.0073	Yes	No
Block Group 2, Census Tract 9564, Converse County	0	44	24	30	540	0.015	0.014	No	No
Block Group 3, Census Tract 9564, Converse County	0	76	44	62	190	0.014	0.012	Yes	No
Block Group 4, Census Tract 9564, Converse County*	0	65	38	52	150	0.014	0.0037	No	No
Block Group 1, Census Tract 9565, Converse County*	0	43	16	27	140	0.015	0.014	No	No
Block Group 2, Census Tract 9565, Converse County*	0	70	34	57	290	0.015	0.021	Yes	No
Block Group 1, Census Tract 9566, Converse County*	0	50	12	37	1.2	0.028	0.0013	No	No

Geographic Area	Percentile in State of Wyoming							One or More Indices at or above 80th Percentile for the State[2]	One or More Indices at or above the 80th Percentile for the Country[2]
	Index for Air Toxics Cancer Risk[1] (lifetime risk per million)	Air Toxics Respiratory Hazard Index[1]	Index for Particulate Matter 2.5	Index for Ozone	Traffic Proximity (daily traffic count/distance to road)	Hazardous Waste Proximity (facility count/km distance)	Wastewater Discharge (toxicity-weighted concentration/m distance)		
Block Group 2, Census Tract 9566, Converse County*	0	52	13	40	14	0.027	0.0012	No	No
Block Group 3, Census Tract 9566, Converse County	0	49	12	35	18	0.013	0.0023	No	No
Block Group 1, Census Tract 9567, Converse County*	0	71	25	46	2.6	0.035	0.000011	No	No
Block Group 2, Census Tract 9567, Converse County	0	47	15	24	7.1	0.035	.000047	No	No

Source: Environmental Protection Agency 2022; US Census Bureau 2021

Note: *Geographic areas with an asterisk indicates data that meet or exceed EJ criteria for one or more criteria, as detailed in Table E-1.

To calculate a specific EJ index, the Environmental Protection Agency's EJScreen tool uses a formula to combine a single environmental factor with the demographic index (which averages low income and people of color populations). The percentile for a given indicator value is calculated as the number of state or US residents of block groups with that value or lower, divided by the total population with known indicator values.

[1]Air toxics cancer risk and air toxics respiratory hazard index are from the US Environmental Protection Agency's Air Toxics Data Update, which is the agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure, and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at https://www.epa.gov/haps/air-toxics-data-update.

[2] Columns indicate where any of the 12 US Environmental Protection Agency EJ indices fall at or above the 80 percent threshold for the state or nation.

Many environmental concerns are not yet included in comprehensive, nationwide databases utilized by the EJScreen tool. For example, data on environmental factors such as drinking water quality and indoor air quality are not available with adequate quality, coverage, or resolution to be included in this national screening tool. The EJScreen tool cannot provide data on every environmental impact and demographic factor that may be important to any location. Therefore, its initial results should be supplemented with additional information and local knowledge, whenever appropriate, for a more complete picture of a location.

E.2 Downstream Combustion Analysis Areas

Table E-4 provides the EJ screening results for the downstream EJ analysis area. The BLM identified 104 power plant locations within 25 states that receive BFO coal (Energy Information Administration 2022). The BLM used the US Environmental Protection Agency's EJScreen tool to identify all block groups within a 1-mile radius of each power plant location (Environmental Protection Agency 2022).[1] The BLM also used the EJScreen tool to gather the minority and low-income populations. To gather information on the Indigenous populations, the BLM used US Census Bureau data for those who identify as American Indian and Alaska Native alone or in combination with one or more other races (US Census Bureau 2020). The BLM used these US Census Bureau data to provide more comprehensive information on Indigenous populations. For instance, this data set includes those who identify as American Indian or Alaska Native, who may not have tribal membership, or who are a part of non-federally recognized tribes; these people are typically excluded from the general minority population estimates discussed previously.

The total minority, Indigenous, and low-income populations are displayed in **Table E-4** for each block group. The BLM then used each state as a reference population to determine whether the block groups had minority, Indigenous, or low-income populations that meet the criteria for EJ communities of concern. Of the block groups identified (315), 63.5 percent met the criteria for consideration as an EJ community for at least one of the three demographic indicators. As such, a total of 200 EJ communities exist within the downstream analysis area.

Table E-4
Downstream Analysis Area Environmental Justice Screening Results

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Alabama				
James H. Miller (West Jefferson, Jefferson County)				
Block group 010730122001	1	28	0	No
Block group 010730123021	6	37*	1	Yes
Block group 010730121041	20	24	0	No
Arizona				
Apache Station (Cochise, Cochise County)				
Block group 040030002031	18	44*	0	Yes
Coronado (St. Johns, Apache County)				
Block group 040019703001	47	44*	21*	Yes
Block group 040019702011	26	37*	1	Yes

[1] To identify block groups within a 1-mile radius, the BLM first searched for each power plant location on the EJScreen tool. In cases where the EJScreen tool did not come up with results when searching for power plants by name, additional sources were used to determine the location (Global Energy Monitor Wiki 2023).

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Block group 040019702012	56*	19	26*	Yes
Block group 040019703002	57*	38*	2	Yes
Springerville (Springerville, Apache County)				
Block group 040019703001	47	44*	21*	Yes
Arkansas				
Flint Creek (Gentry, Benton County)				
Block group 050070210043	18	50*	7*	Yes
Independence (Newark, Independence County)				
Block group 050634904002	5	58*	0	Yes
John W. Turk (Fulton, Hempstead County)				
Block group 050574802001	41*	40*	0	Yes
Block group 050574802002	15	44*	2	Yes
Plum Point (Osceola, Mississippi County)				
Block group 050930110004	64*	28	0	Yes
Block group 050930112002	10	59*	4*	Yes
White Bluff (Redfield, Jefferson County)				
Block group 050690024002	12	29	0	No
Colorado				
Comanche (Pueblo, Pueblo County)				
Block group 081010031061	55*	21	7*	Yes
Martin Drake (Colorado Springs, El Paso County)				
Block group 080410030011	29	40*	9*	Yes
Block group 080410023002	24	45*	4*	Yes
Block group 080410030012	22	16	0	No
Block group 080410024022	32	23	0	No
Block group 080410025022	35*	18	5*	Yes
Pawnee (Fort Morgan, Morgan County)				
Block group 080870008001	22	21	3*	Yes
Rawhide (Wellington, Larimer County)				
Block group 080690025031	26	2	6*	Yes
Block group 080690025033	33	27*	3*	Yes
Ray D. Nixon (Fountain, El Paso County)				
Block group 080410045162	32	26*	4*	Yes
Block group 080410044031	47*	40*	0	Yes
Georgia				
Scherer (Juliette, Monroe County)				
Block group 132070501023	17	38*	1.1*	Yes
Block group 131690302004	54*	41*	6.5*	Yes
Illinois				
Baldwin Energy Complex (Baldwin, Randolph County)				
Block group 171579507003	16	0	0	No
E. D. Edwards (Bartonville, Peoria County)				
Block group 171430049014†	1	19	0	No
Block group 171430046003	2	27	0	No
Block group 171790205002	2	29	0	No
Block group 171790208001	0	66*	0	Yes
Block group 171430046002	0	10	0	No

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Joppa Steam (Joppa, Massac County)				
Block group 211450315011, (Kentucky)	10	21	0	No
Block group 170219582003	1	24	0	No
Kincaid (Kincaid, Christian County)				
Block group 170219582003	1	24	0	No
Block group 170219582001	1	31*	0	Yes
Block group 170219582002	0	33*	0	Yes
Newton (Newton, Jasper County)				
Block group 170799775002	5	7	0	No
Powerton (Pekin, Tazewell County)				
Block group 171790218021	2	21	1*	Yes
Block group 171430049014†	1	19	0	No
Block group 171790209001	5	50*	1	Yes
Block group 171790218012	32	23	3*	Yes
Waukegan (Waukegan, Lake County)				
Block group 170978622003	65*	20	0	Yes
Block group 170978617011	66*	22	1*	Yes
Block group 170978617021	81*	22	2*	Yes
Block group 170978617023	92*	35*	0	Yes
Block group 170978622001	55*	11	0	Yes
Will County (Romeoville, Will County)				
Block group 171978841013	37	4	0	No
Block group 171978805021	3	29	0	No
Block group 171978805091	83*	41*	13*	Yes
Block group 171978805093	14	4	0	No
Block group 171978802021	18	25	0	No
Indiana				
Clifty Creek (Madison, Jefferson County)				
Block group 180779664003	12	36*	1	Yes
Block group 212231001001 (Kentucky)	4	52*	0	Yes
Block group 180779666002	40*	48*	1*	Yes
Michigan City (Michigan City, LaPorte County)				
Block group 180910430003	78*	5	0	Yes
Block group 180910430001	31*	21	4*	Yes
Block group 180910401002	70*	55*	0	Yes
Block group 180910401001	56*	20	1	Yes
Block group 180910403002	43*	18	0	Yes
Block group 180910430002	46*	63*	0	Yes
Block group 180910409001	79*	56*	1*	Yes
Block group 180910403003	25*	48*	0	Yes
Block group 180910403001	34*	49*	2*	Yes
Block group 180910408002	46*	65*	0	Yes
Block group 180910408001	32*	31*	1*	Yes
R. M. Schahfer (Wheatfield, Jasper County)				
Block group 180731008002	8	25	0	No
Block group 180731008004	9	33*	3*	Yes

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Indiana				
Burlington (Burlington, Des Moines County)				
Block group 190570012002	16*	4	0	Yes
Block group 190570007002	4	3	0	No
Block group 170719734002	4	25	0	No
Block group 170719735002	2	11	0	No
George Neal North (Sergeant Buff, Woodbury County)				
Block group 191930035002†	3	16	2*	Yes
Block group 310430104002†	9	20	3*	Yes
George Neal South (Salix, Woodbury County)				
Block group 191930035002†	3	16	2*	Yes
Block group 310430104002†	9	20	3*	Yes
Lansing (Lansing, Allamakee County)				
Block group 190059601001	11	14	11*	Yes
Block group 190059601002	3	34*	0	Yes
Block group 550239602003, (Wisconsin)	2	21	0	No
Louisa (Muscatine, Louisa County)				
Block group 191390501001	21*	44*	0	Yes
Block group 191390501003	9	23	3*	Yes
Block group 191390502002	6	4	0	No
Block group 191390507001	0	28*	0	Yes
Muscatine (Muscatine, Muscatine County)				
Block group 191390504003	8	24	0	No
Block group 191390510002	15*	48*	0	Yes
Block group 191390510001	40*	50*	0	Yes
Block group 171610241031	6	10	0	No
Block group 191390504002	15*	12	0	Yes
Ottumwa (Ottumwa, Wapello County)				
Block group 191799601003	1	15	0	No
Prairie Creek (Cedar Rapids, Linn County)				
Block group 191130030041	15*	74*	2*	Yes
Block group 191130029003	26*	43*	0	Yes
Block group 191130029001	10	3	0	No
Block group 191130026001	33*	55*	0	Yes
Block group 191130028003	20*	34*	0	Yes
Block group 191130030033	17*	3	0	Yes
Walter Scott Jr. (Council Bluffs, Pottawattamie County)				
Block group 191550319002	8	23	1*	Yes
Block group 191550319001	3	23	3*	Yes
Block group 311530101034	19*	13	0	Yes
Block group 191550319003	15*	32*	2*	Yes
Kentucky				
Calvert City (Calvert City, Marshall County)				
Block group 211579501023	1	51*	0	Yes
Block group 211579501021	2	45*	2*	Yes
Block group 211579501012	9	42*	4*	Yes

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Calvert City Terminal (Calvert City, Marshall County)				
Block group 211579501023	1	51*	0	Yes
Block group 211579501021	2	45*	2*	Yes
Block group 211450315012	10	41*	2*	Yes
Four Rivers Terminal (West Paducah, McCracken County)				
Block group 211450315012	10	41*	2*	Yes
Block group 171279704001	0	63*	0	Yes
Block group 211450314012	9	45*	0	Yes
Shawnee (West Paducah, McCracken County)				
Block group 211450315012	9	45*	3*	Yes
Trimble County (Bedford, Trimble County)				
Block group 212231002001	15	41*	0	Yes
Block group 180190510001	7	29	0	No
Kansas				
Holcomb Station (Holcomb, Finney County)				
Block group 200559601003	38*	19	1	Yes
Jefferey Energy Center (St. Marys, Pottawatomie County)				
Block group 201490003001	11	43*	1	Yes
La Cygne (La Cygne, Linn County)				
Block group 201079551022	1	50*	0	Yes
Lawrence (Lawrence, Douglas County)				
Block group 200450002011	19	52*	0	Yes
Block group 200450001003	23	50*	9*	Yes
Block group 200450001001	18	32*	2	Yes
Block group 200450001002	7	21	2*	Yes
Block group 200450005011	22	49*	3*	Yes
Block group 200450005012	33*	45*	1	Yes
Block group 200450005021	19	36*	1	Yes
Block group 200450005023	33*	24	0	Yes
Block group 200450002021	11	62*	3*	Yes
Block group 200450003012	25	74*	3*	Yes
Block group 200450003011	6	83*	0	Yes
Block group 200450003013	13	79*	5*	Yes
Block group 200450004001	21	58*	8*	Yes
Block group 200450005022	23	41*	3*	Yes
Block group 200450002022	42*	51*	4*	Yes
Nearman Creek (Kansas City, Wyandotte County)				
Block group 202090446031	0	0	0	No
Block group 291650303064, (Missouri)	0	0	0	No
Block group 202090446012	62*	20	1	Yes
Block group 202090445001	80*	47*	0	Yes
Block group 202090445002	84*	50*	2*	Yes
Louisiana				
Big Cajun 2 (New Roads, Pointe Coupee Parish)				
Block group 220779519001	21	18	0	No
Block group 221259518033	39	37	2*	Yes
Brame Energy Center (Lena, Rapides Parish)				
Block group 220790106001	10	26	7*	Yes

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
R. S. Nelson (Westlake, Calcasieu Parish)				
Block group 220190027023	10	55*	0	Yes
Block group 220190023001	31	49*	0	Yes
Block group 220190025002	4	22	1	No
Michigan				
Dan E. Karn (Essexville, Bay County)				
Block group 260172852021	15	29	2*	Yes
Block group 260172859001	9	37*	0	Yes
J. H. Campbell (West Olive, Ottawa County)				
Block group 261390220023	13	37*	0	Yes
Block group 261390220021	6	11	3*	Yes
Monroe (Monroe, Monroe County)				
Block group 261158318002	0	0	0	No
Block group 261158317005	0	0	0	No
Block group 261159900000	0	0	0	No
Block group 261158325002	0	0	0	No
Trenton Channel (Trenton, Wayne County)				
Block group 261639823013	0	0	0	No
Block group 261639823021	0	0	0	No
Block group 261635944013	15	25	1	No
Block group 261639823011	0	0	0	No
Block group 261639823012	0	0	0	No
Block group 261635944012	16	27	2*	Yes
Block group 261635945001	16	16	2*	Yes
Block group 261635945002	4	10	0	No
Block group 261635944011	20	38*	2*	Yes
Block group 261635943002	20	8	5*	Yes
Block group 261635943003	15	1	0	No
Block group 261635963002	4	0	0	No
Block group 261635962001	8	19	0	No
Block group 261635961001	6	19	0	No
Block group 261635970001	3	15	0	No
Minnesota				
Allen S King (Bayport, Washington County)				
Block group 271630707033	19	23	0	No
Block group 271630708011	64*	0	15*	Yes
Block group 271630707042	2	19	1	No
Block group 271630707041	8	9	1	No
Block group 271630708021	62*	0	22*	Yes
Block group 271630707032	9	17	1	No
Block group 271630706021	17	7	0	No
Block group 551091204022, (Wisconsin)	1	6	0	No
Clay Boswell (Cohasset, Itasca County)				
Block group 270614807022	11	37*	3*	Yes
Block group 270614803011	9	34*	0	Yes
Sherburne County (Becker, Sherburne County)				
Block group 271410304072	6	12	3*	Yes

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Mississippi				
Victor J. Daniel Jr. (Escatawpa, Jackson County)				
Block group 280590401033	39	81*	0	Yes
Block group 280590401031	0	22	0	No
Block group 280590413011	28	33	0	No
Missouri				
Hawthorn (Kansas City, Jackson County)				
Block group 290950155002	0	0	0	No
Block group 290470222003	18	34*	0	Yes
Block group 290950110011	5	22	1*	Yes
Block group 290950155001	55*	65*	0	Yes
Iatan (Weston, Platte County)				
Block group 291650307003	0	0	0	No
Block group 291650307004	9	9	6*	Yes
John Twitty (Springfield, Greene County)				
Block group 290770042021	19	48*	0	Yes
Block group 290770048041	30*	67*	0	Yes
Block group 290770041051	2	0	2*	Yes
Block group 290770042011	18	40*	1	Yes
Labadie (Boles Township, Franklin County)				
Block group 290718001021	4	27	0	Yes
Block group 290718001011	2	35*	0	No
Lake Road (Saint Joseph, Buchanan County)				
Block group 290210029001	20	62*	0	Yes
Block group 200430203004, (Kansas)	8	48*	1	Yes
Block group 290210030011	4	37*	1	Yes
Block group 290210021003	52*	50*	0	Yes
Block group 290210024002	9	59*	0	Yes
Block group 290210024001	13	61*	0	Yes
Block group 290210025001	13	18	0	No
Block group 290210025003	3	47*	0	Yes
Meramec (Oakville, St. Louis County)				
Block group 291892204522	9	2	1*	Yes
Block group 290997001151	3	11	0	No
Block group 290997001152	9	14	3*	Yes
Block group 171336004021	10	8	0	No
Block group 171336001021	3	4	0	No
New Madrid (Marston, New Madrid County)				
Block group 291439604002	1	28	0	No
Block group 210759602004	7	26	0	No
Rush Island (Festus, Jefferson County)				
Block group 290997014042	0	10	0	No
Block group 291869601013	5	21	0	No
Block group 171336005022, (Illinois)	1	14	0	No

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Sikeston (Sikeston, Scott County)				
Block group 292017807001	15	16	2*	Yes
Block group 292017804002	2	19	1	No
Block group 292017813001	9	8	0	No
Block group 292017807003	97*	65*	0	Yes
Block group 292017807002	72*	67*	2*	Yes
Sioux (West Alton, St. Charles County)				
Block group 291833101001	4	31	3*	Yes
Block group 291833101002	3	13	0	No
Thomas Hill (Clifton Hill, Randolph County)				
Block group 291754901001	9	30	1	No
Nebraska				
Gerald Gentleman (Sutherland, Lincoln County)				
Block group 311119606002	9	12	3*	Yes
Nebraska City (Nebraska City, Otoe County)				
Block group 311319666001	6	40*	0	Yes
Block group 311319669002	23*	37*	0	Yes
Block group 190719703002	6	25	2	No
North Omaha (Omaha, Douglas County)				
Block group 310550002003	21	38*	0	Yes
Block group 310550002001	30*	36*	0	Yes
Block group 191550318003, (Iowa)	8	34*	0	Yes
Block group 310550004001	59*	64*	1	Yes
Block group 310550002002	44*	42*	2	Yes
Block group 310550003002	61*	57*	6*	Yes
Block group 310550062025	44*	33*	0	Yes
Block group 310550062024	69*	67*	1	Yes
Block group 310550062022	44*	12	3*	Yes
Block group 310550062021	20	30*	0	Yes
Sheldon (Hallam, Lancaster County)				
Block group 311090103003	3	7	3*	Yes
Whelan Energy (Hastings, Adams County)				
Block group 310019662002	5	20	0	No
Block group 310019654001	2	2	0	No
Block group 310019661002	46*	81*	4*	Yes
Nevada				
TS Power Plant (Battle Mountain, Eureka County)				
Block group 320110001001	15	17	8*	Yes
Ohio				
Avon Lake (Avon Lake, Lorain County)				
Block group 390930104001	17	29	1	No
Block group 390930103003	8	6	1*	Yes
Block group 390939902000	0	0	0	No
Block group 390930211001	10	17	0	No
Block group 390930211002	20	18	5*	Yes
Block group 390930104002	0	0	0	No
Block group 390930104003	8	9	0	No
Block group 390930103001	0	13	0	No

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Oklahoma				
Grand River Energy Center (Chouteau, Mayes County)				
Block group 400970404003	32	38*	32*	Yes
Block group 400970404002	38	46*	32*	Yes
Block group 400970404004	28	34	23*	Yes
Block group 400970404001	25	49*	15*	Yes
Hugo (Fort Towson, Choctaw County)				
Block group 400239670002	42*	33	32*	Yes
Block group 400239673001	34	45*	29*	Yes
Muskogee (Fort Gibson, Cherokee and Muskogee County)				
Block group 401010014021	34	16	34*	Yes
Block group 401010013011	43*	69*	29*	Yes
Block group 401010004001	69*	77*	17*	Yes
Block group 401010014012	46*	32	44*	Yes
Northeastern (Oologah, Rogers County)				
Block group 401310508011	34	42*	32*	Yes
Block group 401310508022	28	27	23*	Yes
Block group 401310508013	24	16	14*	Yes
River Valley (Panama, Le Flore County)				
Block group 400790403032	33	38*	20*	Yes
Block group 400790403013	23	53*	17*	Yes
Block group 400790403012	34	58*	25*	Yes
Sooner (Red Rock, Noble County)				
Block group 401039566001	56*	43*	48*	Yes
South Dakota				
Big Stone (Big Stone, Grant County)				
Block group 460519531001	7	29	0	No
Block group 460519531002	14	29	7	No
Tennessee				
Kingston (Kingston, Roane County)				
Block group 471450307002	26	41*	2*	Yes
Block group 471450309002	3	27	0	No
Block group 471450302032	4	18	0	No
Block group 471450302042	25	17	0	No
Block group 471450306002	7	39*	1	Yes
Block group 471450306001	3	40*	0	Yes
Texas				
Coleto Creek (Fannin, Golland County)				
Block group 481759601003	24	36*	0	Yes
Block group 481759601001	29	24	0	No
Fayette (La Grange, Fayette County)				
Block group 481499702001	5	18	0	No
Block group 481499707002	19	30	0	No
Harrington (Amarillo, Potter County)				
Block group 483750144011	66*	69*	3*	Yes
Block group 483750141001	75*	64*	0	Yes
Block group 483750143001	25	22	19*	Yes
J.K. Spruce (San Antonio, Bexar County)				
Block group 480291419003	51*	31	0	Yes

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Limestone (Jewett, Limestone County)				
Block group 482939707002	12	32	3*	Yes
Block group 481610006001	20	25	0	No
Block group 481610006003	32	36*	0	Yes
Martin Lake (Tatum, Rusk County)				
Block group 484019501022	5	23	0	No
Block group 484019501011	37	15	1	No
Sandy Creek (Riesel, McLennan County)				
Block group 483090036021	21	27	0	No
Tolk (Earth, Lamb County)				
Block group 482799503001	66*	60*	0	Yes
W. A. Parish				
Block group 481576755032	44	17	3*	Yes
Welsh (Pittsburg, Titus County)				
Block group 484499504004	41	29	1	No
Washington				
Transalta Centralia (Centralia, Lewis County)				
Block group 530419711001	7	19	3	No
Block group 530670126205	9	41*	2	Yes
Wisconsin				
Columbia Energy Center (Pacific, Columbia County)				
Block group 550219706002	3	11	1	No
Block group 550219704024	6	13	4*	Yes
Block group 550219706001	6	14	1	No
Block group 550219707001	19	12	1	No
Edgewater (Sheboygan, Sheboygan County)				
Block group 551170011002	34*	25	0	Yes
Block group 551170011001	22*	28*	2	Yes
Block group 551170010001	31*	30*	1	Yes
Block group 551170010002	22*	5	6*	Yes
Block group 551170010003	14	21	0	No
Block group 551170108002	7	18	0	No
Block group 551179900000	0	0	0	No
Elm Road (Oak Creek, Milwaukee County)				
Block group 550791603011†	13	9	7*	Yes
Block group 551010015012†	12	15	0	No
Block group 551019900000	0	0	0	No
Block group 550799900000†	0	0	0	No
John P Madgett (Alma, Buffalo County)				
Block group 550119603002	9	22	1	No
Block group 271574902002	2	12	0	No
Block group 550119604001	0	20	0	No
South Oak Creek (Oak Creek, Milwaukee County)				
Block group 550791603011†	13	9	7*	Yes
Block group 550799900000†	0	0	0	No
Block group 551010015012†	12	15	0	No
Block group 550791603013	11	10	0	No

Geographic Area	Minority Population Percentage	Low-Income Population Percentage	Indigenous Population Percentage	Meets Criteria for EJ Communities of Concern?
Weston (Kronenwetter, Marathon County)				
Block group 550730011061	2	20	0	No
Block group 550730012024	4	19	3*	Yes
Block group 550730012042	3	15	0	No
Block group 550730012043	1	8	0	No
Block group 550730010003	8	26	2	No
Block group 550730010001	0	22	0	No
Block group 550730013002	2	29*	1	Yes
Wyoming				
Dave Johnson (Glenrock, Converse County) ‡				
Block group 560099566001	8	19	4*	Yes
Block group 560099566002	1	28*	0	Yes
Dry Fork (Gillette, Campbell County) ‡				
Block group 560050007022	4	37*	0	Yes
Block group 560050007023	0	9	0	No
Block group 560050007011	0	4	0	No
Laramie River (Wheatland, Platte County)				
Block group 560319594021	7	30*	0	Yes
Wygen (Gillette, Campbell County) ‡				
Block group 560050003003†	24*	51*	0	Yes
Block group 560050007024†	29*	27*	0	Yes
Block group 560050002003†	4	11	0	No
Wyodak (Gillette, Campbell County) ‡				
Block group 560050007024†	29*	27*	0	Yes
Block group 560050002003†	4	11	0	No
Block group 560050003003†	24*	51*	0	Yes
Total number of block groups that meet the criteria for 1 or more measures				**200 §**
Percentage of block groups that meet the criteria for 1 or more measures				**63.5**

Sources: Energy Information Administration 2022, Environmental Protection Agency 2022; US Census Bureau 2021
* Indicates data meet or exceed EJ criteria for a given data set.
† Indicates the block group is within a 1-mile radius of another power plant.
‡ Indicates the power plant is located within the local analysis area.
§ The total is less than the number of block groups meeting the criteria in the table above because some block groups are within 1 mile of multiple plants; duplicate block groups meeting the EJ criteria are only counted once in the total.

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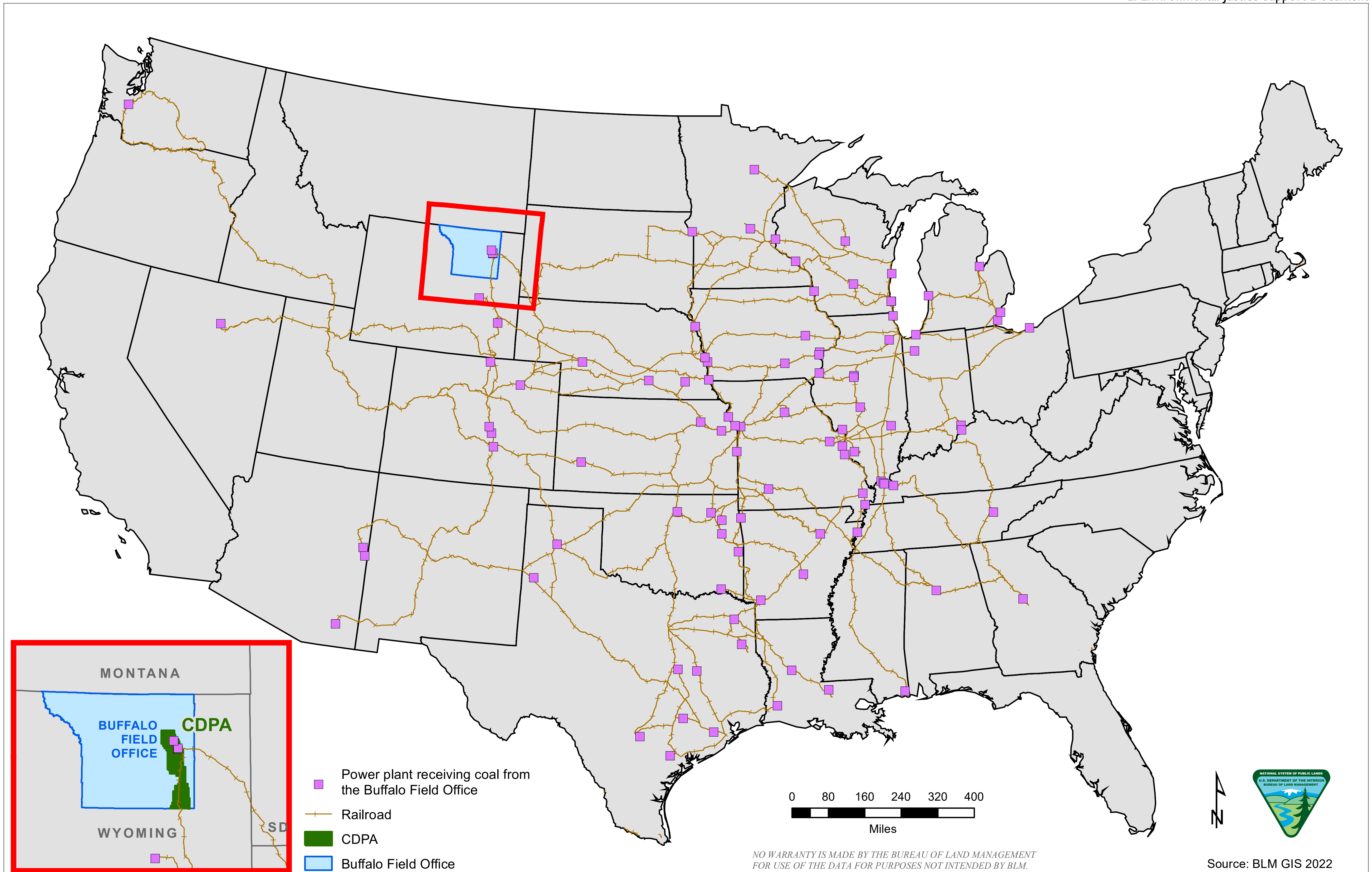

Figure E-1
Buffalo Field Office Coal Usage

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E.3 References

BLM (United States US Department of Interior, Bureau of Land Management). 2015. Buffalo Field Office Proposed Resource Management Plan and Final EIS. BLM/WY/PL-15/022+1610. Buffalo, Wyoming. September 2015.

______. 2022. Addressing Environmental Justice in NEPA Documents: Frequently Asked Questions. U.S. Department of the Interior, Bureau of Land Management, Socioeconomics Program, Washington, DC. Internet website: https://www.blm.gov/sites/default/files/docs/2022-09/IM2022-059_att1.pdf

Energy Information Administration. 2022. Coal Data Browser. Internet website: https://www.eia.gov/coal/data/browser/.

Global Energy Monitor Wiki. 2023. Internet website: https://www.gem.wiki/Main_Page.

US Census Bureau. 2021. American Community Survey (ACS) 5-Year Estimates. Table B02010: American Indian and Alaska Native Alone or In Combination with One or More Other Races. Internet website: https://data.census.gov/table?q=B02010&g=0500000US04001$1500000,26017$1500000,26147$1500000,27061$1500000,27111$1500000,53041$1500000,53067$1500000&d=ACS+5-Year+Estimates+Detailed+Tables&tid=ACSDT5Y2020.B02010&moe=false.

US Centers for Disease Control. 2020a. Prevalence of Asthma among Adults | Age-adjusted Prevalence of Current Asthma among Adults >=18 Years of Age (Model-based; County). Internet website: https://ephtracking.cdc.gov/DataExplorer. Accessed on March 24, 2023.

______. 2020b. Prevalence of Coronary Heart Disease among Adults | Age-adjusted Prevalence of Current Coronary Heart Disease among Adults >=18 Years of Age (Model-based; County). Internet website: https://ephtracking.cdc.gov/DataExplorer. Accessed on Accessed on March 24, 2023.

US Environmental Protection Agency 2022. EPA's Environmental Justice Screening and Mapping Tool (Version 2.1). Internet website: https://ejscreen.epa.gov/mapper/.

______. 2023a. Research on Health Effects from Air Pollution. Internet website: https://www.epa.gov/air-research/research-health-effects-air-pollution

______. 2023b. Environmental Justice Mapping and Screening Tool EJScreen Technical Documentation for Version 2.2. Internet website: https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf.

______. 2023c. Limitations and Caveats in Using EJScreen. Internet website: https://www.epa.gov/ejscreen/limitations-and-caveats-using-ejscreen.

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Appendix F

Coal Distribution from Mines within the Buffalo Field Office

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Appendix F. Coal Distribution from Mines within the Buffalo Field Office

Table F-1 shows the names of the 104 power plants receiving coal from mines in the coal development potential area in 2021, as well as power plant locations, distance, mines supplying the coal, amount of coal delivered, and identified power plant retirement dates and future plans for the site, where known. The locations of these generating units are shown in **Figure 3-11**, Buffalo Coal Development Potential Area Coal Distribution, in the main document.

In 2021, 104 power plants received a total of 219.686 million short tons of coal from the Buffalo Field Office planning area coal mines. One receiving power plant was retired during 2021, and another 10 were retired during 2022. An additional 48 power plants are scheduled for retirement before the end of the Supplemental Environmental Impacts Statement planning period in 2038. Of the remaining power plants receiving coal from Buffalo Field Office planning area coal mines, 8 have identified retirement dates after 2038, and 37 have not announced a retirement date. For power plants that have multiple electricity-generating units, the identified retirement date is the date for the closure of the final electricity-generating unit. Some of the retiring power plants are planning conversions to other electricity-generating sources, including natural gas (10 plants), solar (5 plants), wind (1 plant), oil (1 plant), or a renewable source of which the type has not been announced or identified at this time (5 plants). Three of the retiring plants have announced plans to add or convert to electrical storage units. The numbers identified for generating source conversions do not equal the number of power plants conversions identified in the table above; this is because some power plants with multiple electricity-generating units are planning conversions to more than one alternative energy generation source, and some plants are researching more than one alternative energy source but have not chosen the final source(s) yet. Three of the power plants not scheduled for closure have announced that they are proposing to install carbon capture infrastructure.

Table F-1
Names and Locations of Electricity-Generating Units Receiving Coal from the Buffalo Field Office in 2022

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
AL	James H. Miller	West Jefferson	Jefferson	1,509	Caballo (1.49) Black Thunder (6.99) North Antelope (0.19) Antelope (2.25)	10.899	Not scheduled
AR	Flint Creek	Gentry	Benton	1,060	Belle Ayr (0.20) Black Thunder (0.37) North Antelope (1.15)	1.723	2038
AR	Independence	Newark	Independence	1,216	Cordero Rojo (0.06) Black Thunder (0.81) North Antelope (0.58) Antelope (0.35)	1.803	2030
AR	John W Turk	Fulton	Hempstead	1,274	Black Thunder (0.55) North Antelope (0.91)	1.455	Not scheduled
AR	Plum Point	Osceola	Mississippi	1,308	Belle Ayr (0.05) North Antelope (1.21) Antelope (0.88)	2.146	Not scheduled
AR	White Bluff	Redfield	Jefferson	1,292	Belle Ayr (0.23) Cordero Rojo (0.28) Black Thunder (1.65) North Antelope (1.15) Antelope (0.64)	3.940	2028
AZ	Apache Station	Cochise	Cochise	1,174	Black Thunder (0.00) North Antelope (0.34)	0.344	Not scheduled
AZ	Coronado	St. Johns	Apache	920	Black Thunder (0.06) North Antelope (0.27) Antelope (0.25)	0.585	2034
AZ	Springerville	Springerville	Apache	982	Black Thunder (0.06) North Antelope (1.68) Antelope (0.73)	2.474	2032

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
CO	Comanche	Pueblo	Pueblo	461	Eagle Butte (0.04) Belle Ayr (1.45) Black Thunder (2.11) North Antelope (0.76)	4.368	2031
CO	Martin Drake	Colorado Springs	El Paso	376	North Antelope (0.13)	0.125	2022
CO	Pawnee	Fort Morgan	Morgan	361	Eagle Butte (0.87) Buckskin (0.85) Belle Ayr (0.07)	1.794	2026 Conversion to gas
CO	Rawhide	Wellington	Larimer	271	Antelope (1.03)	1.026	2029
CO	Ray D Nixon	Fountain	El Paso	393	North Antelope (0.48) Antelope (0.10)	0.577	2030
GA	Scherer	Juliette	Monroe	1,713	Eagle Butte (2.14) Buckskin (0.83) Caballo (0.58) Cordero Rojo (0.30) North Antelope (0.42)	4.270	2022
IA	Burlington	Burlington	Des Moines	934	Belle Ayr (0.47) North Antelope (0.12)	0.599	2021 Conversion to gas
IA	George Neal North	Sergeant Buff	Woodbury	573	Black Thunder (0.26) North Antelope (0.09) Antelope (0.05)	0.405	Not scheduled
IA	George Neal South	Salix	Woodbury	582	Black Thunder (0.19) North Antelope (0.05) Antelope (0.10)	0.353	Not scheduled
IA	Lansing	Lansing	Allamakee	785	Caballo (0.18) Belle Ayr (0.09) Black Thunder (0.01)	0.283	2022
IA	Louisa	Muscatine	Louisa	903	Black Thunder (0.77) North Antelope (0.41) Antelope (0.59)	1.764	2040
IA	Muscatine	Muscatine	Muscatine	897	Buckskin (0.50) Black Thunder (0.01)	0.511	2028 Conversion to renewables

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
IA	Ottumwa	Ottumwa	Wapello	913	Eagle Butte (0.07) Buckskin (1.22) Caballo (0.30) Belle Ayr (0.01) Cordero Rojo (0.73) Black Thunder (0.02) North Antelope (0.04)	2.398	2040
IA	Prairie Creek	Cedar Rapids	Linn	840	Belle Ayr (0.16) Black Thunder (0.10) Antelope (0.07)	0.337	2025
IA	Walter Scott Jr	Council Bluffs	Pottawattamie	675	Black Thunder (1.20) North Antelope (0.52) Antelope (1.24)	2.961	Not scheduled
IL	Baldwin Energy Complex	Baldwin	Randolph	1,127	Buckskin (0.59) Caballo (0.20) Belle Ayr (0.02) Black Thunder (0.02) North Antelope (1.75)	2.585	2025
IL	E.D. Edwards	Bartonville	Peoria	1,010	Eagle Butte (0.02) Belle Ayr (0.02) Black Thunder (0.54) North Antelope (0.84)	1.412	2022
IL	Joppa Steam	Joppa	Massac	1,243	Eagle Butte (0.37) Belle Ayr (0.06) Black Thunder (0.58) North Antelope (1.36) Antelope (0.30)	2.682	2022
IL	Kincaid	Kincaid	Christian	1,094	Eagle Butte (0.17) Belle Ayr (0.12) Black Thunder (0.03) North Antelope (2.11)	2.442	2027

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
IL	Newton	Newton	Jasper	1,186	Eagle Butte (1.02) Black Thunder (0.06) North Antelope (0.43) Antelope (0.10)	1.611	2027
IL	Powerton	Pekin	Tazewell	1,020	Black Thunder (0.02) North Antelope (2.01)	2.028	2028
IL	Waukegan	Waukegan	Lake	1,038	North Antelope (1.41)	1.411	2022
IL	Will County	Romeoville	Will	1,069	North Antelope (0.41)	0.413	2022
IN	Clifty Creek	Madison	Jefferson	1,318	Black Thunder (0.05)	0.048	Not scheduled
IN	Michigan City	Michigan City	LaPorte	1,111	Black Thunder (0.75)	0.754	2028
IN	R M Schahfer	Wheatfield	Jasper	1,122	Black Thunder (0.26)	0.255	2025
KS	Holcomb Station	Holcomb	Finney	635	Caballo (0.39) Belle Ayr (0.09) Cordero Rojo (0.15) North Antelope (0.19) Antelope (0.25)	1.068	Not scheduled
KS	Jefferey Energy Center	St. Marys	Pottawatomie	819	Eagle Butte (0.04) Caballo (0.01) Cordero Rojo (3.24) Black Thunder (1.41) North Antelope (0.12)	4.820	2030 Conversion to solar and wind
KS	La Cygne	La Cygne	Linn	896	Eagle Butte (0.03) Caballo (2.23) Belle Ayr (1.04) Cordero Rojo (1.11) Black Thunder (0.19)	4.614	2032
KS	Lawrence	Lawrence	Douglas	834	Black Thunder (1.28)	1.283	2028 Conversion to solar
KS	Nearman Creek	Kansas City	Wyandotte	862	Caballo (0.67)	0.671	Not scheduled
KY	Calvert City	Calvert City	Marshall	1,275	Black Thunder (0.44) North Antelope (0.22) Antelope (0.19)	0.852	Not scheduled
KY	CCT Terminal	Calvert City	Marshall	1,275	North Antelope (0.56)	0.562	Not scheduled

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
KY	Four Rivers Terminal	West Paducah	McCracken	1,254	Black Thunder (0.05) North Antelope (0.14) Antelope (0.24)	0.427	Not scheduled
KY	Shawnee	West Paducah	McCracken	1,263	Black Thunder (1.81) North Antelope (0.84) Antelope (0.84)	3.492	2035 Conversion to renewables
KY	Trimble County	Bedford	Trimble	1,350	Black Thunder (0.61)	0.608	2066
LA	Big Cajun 2	New Roads	Pointe Coupee Parish	1,529	Buckskin (0.51)	0.511	2025
LA	Brame Energy Center	Lena	Rapides	1,422	Belle Ayr (023) Black Thunder (0.05) North Antelope (0.88) Antelope (0.23)	1.389	2028 Conversion to gas
LA	R.S. Nelson	Westlake	Calcasieu Parish	1,517	Belle Ayr (0.15) Coal Creek (0.15) Black Thunder (0.60) North Antelope (0.21)	1.112	Not scheduled
MI	J. H. Campbell	West Olive	Ottawa	1,220	Black Thunder (2.39) North Antelope (1.31) Antelope (0.30)	4.006	2025
MI	Dan E Karn	Essexville	Bay	1,375	Black Thunder (0.93) North Antelope (0.28) Antelope (0.17)	1.387	2023 Conversion to gas and oil
MI	Monroe	Monroe	Monroe	1,316	Black Thunder (2.87) North Antelope (1.91) Antelope (0.80)	5.582	2032 Conversion to renewables
MI	Trenton Channel	Trenton	Wayne	1,336	Black Thunder (0.45) North Antelope (0.20) Antelope (0.08)	0.737	2022
MN	Allen S King	Bayport	Washington	738	Black Thunder (0.65) North Antelope (0.05)	0.708	2028

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
MN	Clay Boswell	Cohasset	Itasca	746	Caballo (0.33) Black Thunder (1.10) North Antelope (0.11) Antelope (0.11)	1.639	2035 Conversion to renewables and storage
MN	Sherburne County	Becker	Sherburne	709	Black Thunder (3.10) North Antelope (0.60)	3.705	2030 Conversion to solar
MO	Hawthorn	Kansas City	Jackson	845	Caballo (0.03) Belle Ayr (0.03) Cordero Rojo (0.03) Black Thunder (1.33) North Antelope (0.13)	1.555	2040 Conversion to solar
MO	Iatan	Weston	Platte	817	Eagle Butte (0.03) Caballo (1.95) Belle Ayr (1.05) Cordero Rojo (1.37) Black Thunder (0.16)	4.573	post 2040
MO	John Twitty	Springfield	Greene	968	Antelope (1.32)	1.316	2027
MO	Labadie	Boles Township	Franklin	1,066	Black Thunder (7.71) North Antelope (0.55) Antelope (0.36)	8.626	2042
MO	Lake Road	Saint Joseph	Buchanan	790	Black Thunder (0.01)	0.012	Not scheduled
MO	Meramec	Oakville	St. Louis	1,095	Black Thunder (0.18) North Antelope (0.03) Antelope (0.03)	0.240	2022
MO	New Madrid	Marston	New Madrid	1,244	North Antelope (2.51)	2.514	Not scheduled
MO	Rush Island	Festus	Jefferson	1,106	Belle Ayr (1.88) Black Thunder (1.19) North Antelope (0.96) Antelope (0.77)	4.799	2024
MO	Sikeston	Sikeston	—	1,223	Black Thunder (0.93)	0.933	Not scheduled, carbon capture proposed

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
MO	Sioux	West Alton	St. Charles	1,083	Belle Ayr (0.03) Black Thunder (1.08) North Antelope (0.03) Antelope (0.80)	1.946	2030
MO	Thomas Hill	Clifton Hill	Randolph	927	North Antelope (4.42)	4.419	Not scheduled
MS	Victor J Daniel Jr.	Escatawpa	Jackson	1,675	Caballo (0.15) Black Thunder (0.86) North Antelope (0.43)	1.450	2027
NE	Gerald Gentleman	Sutherland	Lincoln	407	Caballo (1.16) Belle Ayr (0.89) Cordero Rojo (0.80)	2.853	Not scheduled, carbon capture proposed
NE	Nebraska City	Nebraska City	Otoe	700	Eagle Butte (0.47) Caballo (0.15) Belle Ayr (1.68) North Antelope (1.67)	3.973	2026
NE	North Omaha	Omaha	Douglas	657	Eagle Butte (0.02) Caballo (0.72) Belle Ayr (0.22)	0.962	2026 Conversion to gas
NE	Sheldon	Hallam	—	—	Belle Ayr (0.59)	0.588	Not scheduled
NE	Whelan Energy	Hastings	Adams	567	Rawhide (1.01)	1.012	Not scheduled
NV	TS Power Plant	Battle Mountain	Eureka	792	Black Thunder (0.65)	0.649	2022 Conversion to gas
OH	Avon Lake	Avon Lake	Lorain	1,445	Belle Ayr (0.05) Black Thunder (0.10)	0.157	2022
OK	Grand River Energy Center (GREC)	Chouteau	Mayes	1,068	Caballo (0.80)	0.802	Not scheduled
OK	Hugo	Fort Towson	Choctaw	1,106	North Antelope (0.39) Antelope (0.05)	0.439	Not scheduled
OK	Muskogee	Fort Gibson	Cherokee and Muskogee	1079	North Antelope (1.68)	1.684	2049
OK	Northeastern	Oologah	Rogers	1,020	Black Thunder (0.42) North Antelope (0.79)	1.214	2026
OK	River Valley	Panama	Le Flore	1,106	North Antelope (0.73)	0.727	Not scheduled

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
OK	Sooner	Red Rock	Noble	944	Eagle Butte (0.27) Belle Ayr (0.71) North Antelope (0.99)	1.970	Not scheduled
SD	Big Stone	Big Stone	Grant	506	Rawhide (1.24)	1.244	Not scheduled
TN	Kingston	Kingston	Roane	1,491	North Antelope (0.07) Antelope (0.79)	0.861	2033 Conversion to gas or solar
TX	Coleto Creek	Fannin	Golland	1,379	Caballo (0.48) Belle Ayr (0.34) Coal Creek (0.05) Black Thunder (0.19) North Antelope (0.04) Antelope (0.54)	1.655	2027
TX	Fayette	La Grange	Fayette	1,328	Eagle Butte (2.06) Buckskin (0.39) Rawhide (2.24) Caballo (0.22) Antelope (0.46)	5.371	Not scheduled
TX	Harrington	Amarillo	Potter	758	Black Thunder (1.07) North Antelope (1.81)	2.883	2025 Conversion to gas
TX	J.K. Spruce	San Antonio	Bexar	1,290	Cordero Rojo (3.88)	3.878	2028 Conversion to gas
TX	Limestone	Jewett	Limestone	1,233	Buckskin (1.03) Rawhide (2.00) Caballo (0.16) Black Thunder (0.30)	3.502	Not scheduled
TX	Martin Lake	Tatum	Rusk	1,282	Rawhide (7.37)	7.375	Not scheduled
TX	Sandy Creek	Riesel	McLennan	1,194	Belle Ayr (1.50) Black Thunder (0.34) North Antelope (1.17)	3.017	Not scheduled
TX	Tolk	Earth	Lamb	865	Black Thunder (0.88) North Antelope (0.53)	1.418	2028

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
TX	W.A. Parish	Thompsons	Fort Bend	1,391	Buckskin (3.92) Rawhide (3.39) Caballo (0.27) Black Thunder (0.91)	8.498	Not scheduled
TX	Welsh (J Robert Welsh)	Pittsburg	Titus	1,250	North Antelope (0.71)	3.165	2028 Conversion to gas
WA	TransAlta Centralia	Centralia	Lewis	1,120	Rawhide (0.71)	0.712	2025
WI	Columbia Energy Center	Pacific	Columbia	885	Rawhide (1.16) Belle Ayr (1.11) Black Thunder (0.59) North Antelope (0.66)	3.517	2026
WI	Edgewater	Sheboygan	Sheboygan	1,322	Caballo (0.58) Belle Ayr (0.09) Coal Creek (0.13) Black Thunder (0.04) North Antelope (0.61)	1.463	2025
WI	Elm Road	Oak Creek	Milwaukee	992	Black Thunder (1.31) North Antelope (1.15) Antelope (0.48)	2.946	2035
WI	John P Madgett	Alma	Buffalo	765	Black Thunder (0.75) North Antelope (0.15)	0.900	Not scheduled
WI	South Oak Creek	Oak Creek	Milwaukee	992	Black Thunder (1.10) North Antelope (0.94) Antelope (0.41)	2.462	2024 Conversion to renewables, gas, and storage
WI	Weston	Kronenwetter	Marathon	895	Black Thunder (0.86) North Antelope (1.16) Antelope (0.48)	2.502	Not scheduled
WY	Dave Johnston	Glenrock	Converse	137	Caballo (0.93) Coal Creek (1.47) North Antelope (0.17)	2.578	2039

State	Power Plant	Nearest City	County	Approximate Rail Distance (miles)	Mines Supplying (millions of tons supplied)	Millions of Short Tons Received	Scheduled Coal Retirement and Plans for Conversion
WY	Dry Fork	Gillette	Campbell	0	Dry Fork (2.03)	2.036	Not scheduled, carbon capture proposed
WY	Laramie River	Wheatland	Platte	179	Dry Fork (1.70) Black Thunder (1.00) North Antelope (0.91) Antelope (0.99)	4.602	2033
WY	Wygen	Gillette	Campbell	0	Wyodak (0.39)	0.392	Not scheduled
WY	Wyodak	Gillette	Campbell	0	Wyodak (1.34)	1.341	Not scheduled
Total	**104**	—	—	—	—	**219.686**	—

Sources: EIA 2022.
Cities and counties were identified through internet searches. Distance calculated using Google Maps; distance is in road miles.

F.1 References

EIA (US Energy Information Administration). 2022. Annual Coal Report. Internet website: https://www.eia.gov/coal/annual/.

Appendix G

Glossary

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Appendix G. 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.

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 (CDPA). 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.

Community. Either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions.

Connectivity habitat. Connectivity habitats (as defined in Wyoming EO 2015-4) are state-designated areas identified as important 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).

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, also known as the CDPA.

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.

Environmental Justice. The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies (EPA 2022g).

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.

Intergovernmental Department Panel on Climate Change. The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

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.

Location quotients. A regional economic measurement intended to identify the concentration of a particular industry within a specified region compared with a larger reference region.

Low-income population. A county has a meaningfully greater low-income population if it has a low-income population at or above the state population (DOI 2022).

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 plants that purchase directly from coal mines. They report prices to the Energy Information Administration Agency (EIA) within the US Department of Energy.

Minority population. Individuals who identify as being one or more of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997).

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.

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.

Qualified surface owner. The natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

(1) Hold legal or equitable title to the surface of split-estate lands

(2) Have their principal place of residence on the land, or personally conduct farming or ranching operations upon 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

(3) Have met the conditions of paragraphs (1) and (2) for a period of at least 3 years, except for persons who gave written consent less than 3 years after they met the requirements of both paragraphs (1) and (2). In computing the 3-year period, the BLM Authorized Officer shall include periods during which 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 (43 Code of Federal Regulations 3400.0-5).

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.

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.

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.

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, the same as a short ton. All tons in this EIS are referred to as short tons.

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 H

Public Comments and BLM Response

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Appendix H. Public Comments and BLM Response

This appendix presents comments the Bureau of Land Management (BLM) received on the Buffalo Field Office Draft Supplemental Environmental Impact Statement (SEIS) and Resource Management Plan Amendment (RMPA). It also includes a description of the public comment process, how all comments were considered, and responses to all substantive comments.

H.1 Draft RMPA/SEIS Comment Process

The National Environmental Policy Act (NEPA) requires that all substantive comments received before reaching a decision 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 environmental impact statement (EIS; 40 Code of Federal Regulations 1503.4). To merit a written response, 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.

Although the BLM diligently considered each comment letter, the comment analysis process involved determining whether 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:

- <u>Comments on the Adequacy of the Analysis</u>—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.
- <u>Comments that Identify New Impacts, Alternatives, or Mitigation Measures</u>—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 whether the comment warrants further consideration; if so, he or she must determine whether 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 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.

After publishing the Draft SEIS/RMPA in the *Federal Register* on May 5, 2023, the 90-day comment period officially ended on August 3, 2023. The BLM received written comments by mail, fax, email, online comment form via the project website in ePlanning (https://eplanning.blm.gov/eplanning-ui/project/2021239/510), and hard copy.

The BLM held two public meetings during the comment period. One was in person and held on May 31, 2023, in Gillette, Wyoming. The second meeting was virtual and held on June 5, 2023.

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 SEIS/RMPA. The agency developed a comment analysis method to ensure all comments were considered, as directed by NEPA regulations. This systematic process ensured all 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. 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 SEIS/RMPA, though some related to the planning process or editorial concerns.

The BLM received a total of 25 comment letter submissions. Some comments received throughout the comment analysis process expressed personal opinions or preferences, had little relevance to the adequacy or accuracy of the Draft SEIS/RMPA, or 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 SEIS/RMPA; these comments are not substantive.

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 not an election, and it does not 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.

Comments that 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 EIS has been technically edited and revised to fix typos, missing references, definitions, and acronyms; it also provides other clarifications as needed.

H.2 How to Read this Appendix

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

Table H-1
Substantive Public Comments and BLM Responses

Row #	Organization Name	Comment Text	Comment Response
1.	U.S. Environmental Protection Agency	The Draft SEIS relies on the 2017 EPA National Emissions Inventory (NEI) data to assess air quality impacts related to downstream combustion of coal. **EPA's 2020 NEI is now available and would be a more accurate source of data** to analyze downstream coal combustion. For the Final SEIS, we recommend BLM update the data using EPA's 2020 NEI[2] and revise the associated analysis on pages 3-25 and 3-26, as appropriate. 2 EPA 2020 Emissions Inventory Data: https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data	The downstream combustion emission tables and associated analysis in Sections 3.5.1 have been updated to use the recently published 2020 NEI data.
2.	U.S. Environmental Protection Agency	We recommend **verifying the units in which wet mercury deposition is reported in Figure 3-10**. While other depositional data are presented in kg/ha on pages 3-18 through 3-20, **mercury should instead be reported in µg/m2 as it is in Figure 3-9 due to scientific convention.[3] We also recommend providing context for how the wet deposition values presented in Section 3.5.1 compare to benchmarks for very low, low, medium, high, and very high rates of deposition.[4]** 3. National Park Service air quality analysis methods: https://www.nps.gov/articles/air-analysis-methods-latest.htm 4. National Park Service air quality analysis methods: https://www.nps.gov/articles/air-analysis-methods-latest.htm;	The units in the wet mercury deposition Figure 3-10 have been updated to µg/m^2 as requested by EPA Region 8 to be consistent with methodologies that the National Atmospheric Deposition Program (NADP) uses to calculate and report mercury (Hg) wet deposition data. The Hg wet deposition values have been converted into µg/m^2. EPA Region 8 also suggested that the BLM utilize benchmarks created by the National Park Service (NPS) Air Resources Division to provide context to the deposition values. According to documentation provided on the websites cited by EPA Region 8, the NPS Air Resources Division utilizes the Jenks natural breaks algorithm. The Jenks method is a data-clustering method designed to determine the best arrangement of values into different classes. The BLM does not contest the NPS's use of the Jenks method for creating logical break points in a data distribution; however, the adjective descriptors used from very low to very high only represent a qualitative descriptor of the range the specific data class represents across the entirety of a data distribution. The adjective descriptors do not provide any tangible information regarding the impact of Hg deposition values on biological resources. Moreover, according to the NPS documentation cited by EPA Region 8, "Wet deposition of mercury does not correlate with mercury risk to biota and park mercury condition. Biotic risk is more closely associated with the methylmercury availability, which depends on a variety of abiotic and biotic factors that include mercury deposition." Therefore, while the BLM has converted Hg wet deposition values into µg/m^2, as requested, the BLM will not use the NPS classification scheme to provide "context," as the NPS classification scheme does not have any documented relationship to the potential biological impact of Hg wet deposition.

Row #	Organization Name	Comment Text	Comment Response
3.	State of Wyoming, Office of the Governor	Only coal from the PRB is being analyzed for any downstream impact in this document, but **there is no discussion around the fact that coal will continue to be used globally**, regardless of if this Administration is successful in eliminating federal leasing from this area. PRB coal is proven to be low-sulfur and burned with fewer emissions than other sources. The U.S. and the world requires more energy going forward, not less. **Any decrease in mining from the PRB will be made up for from regions that do not have the environmental standards, good mineland reclamation reputations, and low-sulfur qualities that we enjoy in Wyoming.** According to the EIA, in 2022, coal provided approximately 19.5 percent of the nation's electricity and about 34 percent of the world's electricity. To single out the PRB in this process while **extrapolating climate deaths on a separate continent decades from now is intellectually and scientifically dishonest and improper**.	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal is not exported. Coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3). The export of Wyoming Powder River Basin coal out of the United States is highly unlikely. The predominant international consumers, China and India, also have their own large coal reserves. China is the world's leading producer of subbituminous coal National Geographic 2023; EIA 2023. A new coal export terminal on the US West Coast is unlikely, as illustrated by the 2021 denial of the U.S. Supreme Court's acceptance to hear Montana and Wyoming's complaint that Washington State interfered with their lawful interstate commerce by failing to permit a proposed coal export terminal (Gruver 2021). While a small amount of Montana Powder River Basin coal has been exported, between the uncertain international market, lack of US export terminals, and the transportation costs, the exportation of Wyoming coal is not foreseeable. Inclusion of the 2007 European study in the DEIS was meant as a general comparison of the level of health impacts from different energy sources (coal, oil, and natural gas). The discussion of the European study was revised in the FEIS to clarify that extrapolation to the US is not appropriate.

Row #	Organization Name	Comment Text	Comment Response
4.	Campbell County Board of Commissioners	Chapter 3, Affected Environment, Pages 8-9 -- BLM notes several recent EPA proposed actions in this section. **EPA has proposed at least two other relevant actions recently and should be considered in this document:** - On May 23, 2023, EPA proposed five separate actions under section 111 of the Clean Air Act **addressing greenhouse gas emissions from new, modified, reconstructed, and existing fossil fuel-fired electric generating units** (88 Fed. Reg. 33240). This proposal focuses on reducing greenhouse gas emissions from fossil fuel-fired EGUs. - On April 24, 2023, EPA proposed amendments to the National Emission Standards for Hazardous Air Pollutants for Coal and Oil-fired Electric Utility Steam Generating Units (EGUS) (88 Fed. Reg. 24854). Those standards are commonly known as the **Mercury and Air Toxics Standards** (MATS).	A discussion of these new EPA actions has been added to the Regulatory and Policy Framework sections of Sections 3.5.1 and 3.5.2.
5.	U.S. Environmental Protection Agency	EPA appreciates the discussion on public health impacts from the combustion of fossil fuels. Table 3-33 shows the associated health effects from electricity generation by coal, gas, and oil in Europe and the Draft SEIS states that the relative health impacts can be extrapolated to US-based use. **It would be beneficial to readers and decision makers to understand why and how these data are applicable to US generators and more specifically the coal mined within the planning area. We therefore recommend expanding the discussion of public health impacts starting on page 3-45 to clarify and support the relevance of the information presented in Table 3-33.**	Additional public health summary information has been presented in Section 3.5.1 to clarify and support the relevance of the information presented in Table 3-33 in the Draft SEIS. Additional details are presented in the following public health comment responses.
6.	Center For Biological Diversity	III. BLM Should Include a Quantitative, as well as Qualitative Analysis of Human Health Impacts. Drilling, mining, shipping, and burning coal, oil, and gas causes significant non-climate harms to the environment and public health. As the District Court here previously held, BLM "must disclose the public health impacts, both climate and non-climate, of burning fossil fuels from the planning areas." WORC v. BLM, No. 4:20-CV-00076-GF-BMM, 2022 WL 3082475, at *8(D. Mont. Aug. 3, 2022) ("WORC v. BLM"). In the draft EIS/RMPs for both the Buffalo and Miles City field offices, **BLM provided a qualitative assessment of public health impacts, despite the availability of tools and peer-reviewed methodologies that would readily allow BLM to quantify the public health effects** of its choices regarding fossil fuel extraction on public lands in Montana and Wyoming.	A rigorous qualitative analysis of the health impacts of downstream combustion of federal coal, oil, and gas from the planning area was performed in the Draft SEIS (Section 3.3.2). A quantitative assessment of health impacts was not performed due to numerous limitations and uncertainties, which are described in the following comment responses. The commenter cites the following: the 2023 Boston University study (Buonocore et al. 2023), the 2007 Europe study (Markandya and Wilkinson 2007), the Clean Air Task Force (CATF) *Toll from Coal* web tool, Epstein et al. 2011, Muller et al. 2011, and Machol and Rizk 2013. In the comment responses below, we explain why these studies were not (or were) applied in the Draft SEIS. In addition, we reiterate the analysis that was performed in the Draft SEIS.

Row #	Organization Name	Comment Text	Comment Response
7.	Center For Biological Diversity	In the Buffalo DSEIS, BLM also included data from a 2007 study of air pollution in Europe that quantified deaths, serious illness, and minor illness associated with coal (24.5 deaths per year), oil (18.4 deaths per year), and gas (2.8 deaths per year) combustion in the electricity generating sector.30 And while BLM states, "[a]lthough these projections are based on European electricity generation, the relative health impacts can be extrapolated to US-based use,"31 **BLM failed to take the next step and actually extrapolate annual U.S. deaths based on U.S. fossil fuels burned to generate electricity.** 30 Id. at 3-46. 31 Id. BLM should, at a minimum, apply the 2007 European study's methodology to disclose the amount of deaths attributable to fossil fuels produced for electricity generation under the Buffalo and Miles City DEISs. Notably, **this information is available through the Clean Air Task Force's Toll from Coal web tool**, which identifies mortality and morbidity from coal plants, using EPA's own methodology.32 Moreover, numerous other analyses from the past decade have calculated the mortality impacts of coal combustion in the United States.33 Further, given the BLM knows the plants that receive coal from the planning areas, it could easily calculate and disclose this quantitative information. Moreover, given the far more **recent 2023 Boston University study quantifying the public health effects of oil and gas production in the U.S., BLM should must utilize that study's methodology** and use it to provide useful information to the public and decisionmakers in understanding the impacts of oil and gas generated under the plans. In short, BLM's purely qualitative analysis of impacts of the alternatives with extremely generic terms like "same," "similar," and "less" is insufficient. A more detailed quantitative analysis can be conducted and must be. The public is entitled to know how many additional deaths and sicknesses will result from alternatives that continue fossil fuel development in the PRB. 33 Exhibit 35, Epstein et al., Full Cost Accounting of the Life Cycle of Coal, Ann. N.Y. Acad. Sci. (2011); Exhibit 36, Muller et al., Environmental Accounting for Pollution in the United States Economy, 101 Am. Econ. Rev. 1649 (2012); Exhibit 37, Machol & Rizk, Economic Value of U.S. Fossil Fuel Electricity Health Impacts 52 Env't Int'l 75 (2013).	A quantitative assessment of health impacts was not performed due to numerous limitations and uncertainties, such as: • Final destinations and end uses of the federal oil and gas from the planning area are uncertain. Final destinations and volumes of coal from the planning area change annually. For example, 11 of the EGUs receiving BFO produced coal in 2021 were retired by the end of 2022. • Emissions from the downstream combustion sources vary widely depending on the type of source, mass of fuel burned, and operational and control configurations. For example, vehicular emissions vary based on the type and age of the vehicle and driving patterns, and coal power plant emissions vary depending on boiler type, mass of coal burned, applicable control measures, and local and regional policies. • Ambient air concentrations result from complex physical and chemical transformations at a local or regional level that are influenced by local and regional emissions and meteorology that vary over time. • Impacts from downstream combustion would be affected by future changes in background concentrations, which are uncertain and vary over time. • The concentration-response function used to translate specific pollutant concentration exposures to health impacts is based on epidemiological studies, which have many inherent uncertainties. • Studies quantitatively examining the relationship between exposure to $PM_{2.5}$ and health impacts assume that all $PM_{2.5}$, regardless of source, have the same effects on health, although the chemical composition of $PM_{2.5}$ varies with the source. The Draft SEIS stated that "[a]lthough these projections are based on European electricity generation, the relative health impacts can be extrapolated to U.S.-based use." This was meant to imply that as long as the technologies used to control emissions from combustion of coal, gas, and oil in the US (and specifically federal coal, gas, and oil from the planning area) are comparable to those in Europe, the relative results (that is, the relative ranking of impacts of coal versus gas versus oil) should be similar to those in the 2007

Row #	Organization Name	Comment Text	Comment Response
7. *(cont.)*	Center For Biological Diversity *(continued)*	*(see above)*	Europe study (Markandya and Wilkinson 2007). However, the quantitative estimates of health effects from each type of fossil fuel cannot be simply replicated for the US. The text has been revised to clarify that the relative risk is applicable, but the quantitative estimates of health outcomes are not; for this reason, Table 3-33 of the Draft SEIS with quantitative estimates of health outcomes in Europe was removed. The European methodology (Markandya and Wilkinson 2007) is based on a European Commission report where emissions are first quantified, and dispersion modeling is used to calculate pollutant concentration increases in all affected regions. Health impacts are then calculated based on the cumulated exposure from the increased concentration, and an exposure-response function is applied. Applying the Europe study's methodology to the US to quantitatively calculate the annual mortality due to coal, oil, and gas is a large and complex task and is subject to numerous uncertainties, which are described below. Since the exact final destinations and end uses of federal oil and gas produced in the planning area are unknown, emissions at the combustion locations and sources cannot be accurately quantified. In the Draft SEIS (Section 3.5.1), the general distribution of planning area oil and gas, typical combustion uses, and annual US combustion emissions are provided to characterize the types of pollutants that will likely be emitted from combustion of planning area oil and gas. These emissions, however, are national averages and include the combustion of oil and gas from outside the planning area and from nonfederal production; therefore, they cannot be used to quantify emissions from federal planning area oil and gas combustion. While there is some information on the destinations of planning area coal, which is provided in the Draft SEIS (Section 3.5.1), the exact power plants that will receive coal in the future are increasingly uncertain over time; for example, 11 power plants receiving BFO planning area coal in 2021 retired by the end of 2022; by the end of 2038, 60 percent of the 2021 receiving power plants are scheduled to be retired. The emissions provided in the Draft SEIS for individual coal power plants also include combustion of coal from outside the planning area and from nonfederal production.

Row #	Organization Name	Comment Text	Comment Response
7. *(cont.)*	Center For Biological Diversity *(continued)*	*(see above)*	There are also significant uncertainties in the concentration-response functions that are used to quantify estimates of potential health impacts resulting from the emissions. This is highlighted by Levy et al. 2009 (Levy, J. I., L. K. Baxter, and J. Schwartz. 2009. "Uncertainty and variability in health-related damages from coal-fired power plants in the United States." *Risk Analysis: An International Journal* 29(7): 1000–1014), who found premature mortality due to coal-fired power plants can vary by a factor of 17 by adjusting a single concentration-response function for $PM_{2.5}$. The Epstein et al. 2011 study (which is cited by the commenter) also points out that the choice of concentration-response functions can result in large variations in the number of individuals impacted. For example, the excess cardiovascular disease from mercury emissions reported in the study yields numbers that differ 73-fold depending on the choice of concentration-response function. The variability in concentration-response functions is due partially to the fact that they are derived from epidemiology studies in human populations across a large number of cities. Since exposures are not controlled, participants in epidemiology studies often have exposures to other substances that may also be responsible for the observed disease (known as potential confounders). Statistical techniques may be used to differentiate between the exposure of interest and potential confounders, if sufficient data were collected as part of the study. In studies examining the health effects of air pollutants, such as combustion products, potential confounders include age, sex, and other risk factors for the health effect being considered; the underlying health of the populations being studied; their exposure to other health hazards; and the composition of the air pollutants in question. In addition, these factors differ between studies, confounding the calculation of definitive, quantitative results linking an exposure to a health outcome. These epidemiology studies also do not consider the variation in $PM_{2.5}$ chemical makeup between the different locations, even though this can impact health outcomes. Additionally, concentration-response curves are themselves overestimates (generally the 95th percentile value), and the

Row #	Organization Name	Comment Text	Comment Response
7. *(cont.)*	Center For Biological Diversity *(continued)*	*(see above)*	concentrations in the curve functions often go well below those concentrations where health effects are observed. Therefore, the uncertainties introduced by choice and application of a concentration-response function can be large. This would likely lead to unreliable estimates in health outcomes due to combustion of federal planning area coal, oil, and gas. The 2023 BU study (Buonocore et al. 2023) discusses modeling health risks for $PM_{2.5}$, ozone, and NO_2 from oil and gas production (using historical 2016 EPA NEI emissions data), but it does not address downstream combustion. In contrast, the Draft SEIS (in Section 3.5.1) assesses health impacts from both production and downstream combustion for criteria air pollutants (CAPs) and hazardous air pollutants (HAPs). The Draft SEIS uses modeling studies to assess air quality and health risks within the state and near drilling sites. Regional photochemical source apportionment modeling performed by the BLM and described in the Draft SEIS (Section 3.5.1) evaluated impacts from federal oil and gas development and federal coal mining in Wyoming. Results showed that federal oil and gas development and federal coal mining in Wyoming are not anticipated to contribute to regional exceedances of the NAAQS and WAAQS, which are national and state health-based standards, respectively. The Draft SEIS (in Section 3.5.1) also incorporates numerous additional near-field studies for the Powder River Basin, which found exceedances of PM_{10} and $PM_{2.5}$ NAAQS and formaldehyde health standards at some near-field receptors. Potential elevated pollutant levels near the production sites will be addressed through the BLM's implementation of mitigation measures described in the Air Resource Management Plan in the 2015 RMP. The other CAPs and HAPs included in the studies were below their respective standards. The CATF *Toll from Coal* web tool estimates potential health impacts of $PM_{2.5}$ using emissions data and modeling. However, the tool includes all emissions from individual plants and not emissions just from federal planning area coal. The estimates of health outcomes are therefore overestimates of the outcomes due to planning area coal. The emissions used in the tool are also estimates for a

Row #	Organization Name	Comment Text	Comment Response
7. *(cont.)*	Center For Biological Diversity *(continued)*	*(see above)*	limited number of pollutants (SO_2, NOx, and $PM_{2.5}$) for 2019. The Draft SEIS (in Section 3.5.1) presents power plant emissions (from the 2020 EPA NEI) for many additional pollutants (CAPs and HAPs) for a more recent year (2020). The CATF *Toll from Coal* web tool provides single values (that is, the number of deaths), instead of providing a range or confidence intervals. The CATF *Toll from Coal* web tool uses the Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA), which has several uncertainties and limitations. The COBRA user's manual (https://www.epa.gov/system/files/documents/2021-11/cobra-user-manual-nov-2021_4.1_0.pdf) states, "Because COBRA is intended primarily as a screening tool, it uses a relatively simple air quality model, which introduces additional uncertainty. While comparative work to test the performance of COBRA's air quality model is ongoing, it is not yet fully validated. As with more complex air pollution benefits models, there is substantial uncertainty surrounding the values of key inputs to COBRA – in the air quality model, emissions inventory, health impact functions, and economic values – and users should exercise caution when interpreting the results of analyses. Some of the uncertainty in COBRA reflects variability (for example, a health impact function that is appropriate for one location may not be appropriate for another location if the function actually varies across locations). Much of the uncertainty, however, reflects the insufficient level of knowledge about the true values of model inputs." Several different concentration-response functions are used within COBRA to estimate health outcomes, and these are subject to the same uncertainties discussed above. The choice of concentration-response function will influence the resulting estimate of health impacts. The commenter also cites three additional studies: Epstein et al. 2011, Muller et al. 2011, and Machol and Rizk 2013 (Exhibits 35, 36, and 37, respectively). Each of these studies uses different modeling methods to estimate health impacts and then monetizes the impacts. They all depend on the concentration-response functions, which are uncertain, as discussed above.

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8.	Center For Biological Diversity	**Data exists to support the inclusion of a quantitative, as well as a qualitative, discussion of climate and non-climate public health impacts, and BLM should include such an analysis in the final SEIS's for these RMPs**	The non-climate health effects of downstream combustion (that is, from criteria and hazardous pollutants) were assessed in the Draft SEIS in Section 3.5.1 through a rigorous analysis. The reasons why a qualitative analysis—rather than a quantitative analysis—was performed have been described in detail in the comment response above.
9.	Center For Biological Diversity	**Recent peer-reviewed scholarship demonstrates at least one relevant methodology that exists and should be used to assist BLM in analyzing public health impacts** of fossil fuel combustion. For example, in findings published in May 2023, a team led by experts at Boston University's School of Public Health found that air pollution from the oil and gas sector in the U.S. resulted in 2,200 new cases of childhood asthma, 410,000 asthma exacerbations, and 7,500 excess deaths per year.20 The study concluded that oil and gas production in the U.S. costs Americans $77 billion in annual health care costs, including respiratory and cardiovascular-related hospitalizations, adverse pregnancy outcomes, and other health challenges21-all of which is suffered and paid for by community members instead of oil and gas executives. BLM can use this methodology to analyze and compare the impacts on human health of oil and gas produced under the various alternatives in its upcoming Draft RMP amendment / Draft EIS. 20 Exhibit 19, **Jillian McKoy, Boston University School of Public Health, Air Pollution from Oil and Gas Production Contributes to Thousands of Early Deaths, Childhood Asthma Cases Nationwide, (May 8, 2023), available at https://www.bu.edu/sph/news/articles/2023/air-pollution-from-oil-and-gas-production-contributes-to-thousands-of-early-deaths-childhood-asthm a-cases-nationwide/.** 21 Exhibit 20, **Jonathan J Buonocore et al, Air pollution and health impacts of oil & gas production in the United States, 2023 Environ. Res.: Health 1, 021006, available at https://iopscience.iop.org/article/10.1088/2752-5309/acc886.**	The 2023 Boston University study (Buonocore et al. 2023) does not address downstream combustion; it focuses on oil and gas production-related health risks for some criteria air pollutants ($PM_{2.5}$, ozone, and NO_2) using historical 2016 EPA NEI emissions data. There are significant uncertainties in the concentration-response functions that are used in the Boston University study to quantify estimates of potential health impacts resulting from the emissions. The Epstein et al. 2011 study (which is cited by the commenter) points out that the choice of concentration-response functions can result in large variations in the number of individuals impacted. For example, the excess cardiovascular disease from mercury emissions reported in the study yields numbers that differ 73-fold, depending on the choice of concentration-response function. The variability in concentration-response functions is due partially to the fact that they are derived from epidemiology studies in human populations across a large number of cities. These studies do not consider the variation in $PM_{2.5}$ chemical makeup between the different locations, even though this can impact health outcomes. Additionally, concentration-response curves are themselves overestimates (generally the 95th percentile value), and the concentrations in the curve functions often go well below those concentrations where health effects are observed. Therefore, the uncertainties introduced by choice and application of a concentration-response function can be large. This would likely lead to unreliable estimates in health outcomes due to combustion of oil and gas in the planning area. Moreover, the study evaluated impacts from national oil and gas production emissions and was not specific to federal oil and gas produced in Wyoming. In contrast to the Boston University study, the Draft SEIS (in Section 3.5.1) assesses health impacts from both production and downstream combustion for criteria pollutants and

Row #	Organization Name	Comment Text	Comment Response
9. *(cont.)*	Center For Biological Diversity *(continued)*	*(see above)*	hazardous air pollutants. The Draft SEIS incorporates previous near-field studies of oil and gas production that showed exceedances of PM_{10} and $PM_{2.5}$ NAAQS, and formaldehyde health standards at some near-field receptors. The other CAPs and HAPs included in the studies were below their respective standards. The Draft SEIS also included results from a BLM regional photochemical modeling study that evaluated impacts from federal oil and gas development in Wyoming. This study showed that federal oil and gas development in Wyoming are not anticipated to contribute to regional exceedances of the health-based federal and state ambient air quality standards.
10.	Wyoming Mining Association	The impact federally leased coal has at the personal level for Wyoming is simply huge. Real jobs, real people. The idea that a no leasing alternative would even be considered by BLM, yet alone preferred, is astonishing. WMA questions the legal basis for consideration of this alternative. **The no leasing alternative constitutes a de facto mineral withdrawal. WMA believes it is inappropriate to attempt to implement a mineral withdrawal** by judicial fiat in an end run around established process for such a withdrawal under federal law.112	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204.

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10 (*cont.*)	Wyoming Mining Association *(continued)*	*(see above)*	The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.
11.	Center For Biological Diversity	IV. **BLM Should Select No Future Coal Leasing as it Preferred Alternative** for Both Plans. The only responsible and lawful choice is for BLM to select the No Future Coal Leasing alternative in both the Buffalo and Miles City RMPs. In early July, we saw the four hottest days in recorded human history.34 As of July 11, the U.S. has suffered 12 climate-related weather disasters that each caused at least $1 billion in damage since the start of 2023,35 and that's before we tally the costs of widespread flooding in New York and Vermont. American cities like Detroit36 and Boston37 suffer poor air quality polluted by Canadian wildfires that have burned an area the size of Kentucky. 34 Exhibit 21, Julia Jacobo, ABC News, "Earth Reaches Hottest Day on Record Four Days in a Row" (July 7, 2023), https://abcnews.go.com/US/4th-july-breaks-record-highest-temperature-measured/story?id=100702850 35 Exhibit 22, https://www.ncei.noaa.gov/access/billions/. 36 Exhibit 23, Bill Laytner, Detroit Free Press, "Canadian wildfire smoke threatens Michigan air quality - again," (July 24, 2023),	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.

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11. *(cont.)*	Center For Biological Diversity *(continued)*	https://www.freep.com/story/news/local/michigan/2023/07/24/wildfires-canada-air-quality-alert-michiganders-stay-inside/70459645007/. 37 Exhibit 24, U.S. Environmental Protection Agency, "New England Continues to Experience Poor Air Quality due to Smoke from *(see above)*Canadian Wildfires" (June 28, 2023), https://www.epa.gov/newsreleases/new-england-continues-experience-poor-air-quality-due-smoke-canadian-wildfires-0. The world's leading climate scientists have spoken: if we want a liveable planet, we must leave the vast majority of our coal, oil, and gas in the ground. In April 2022 the United Nations Secretary General offered this frank assessment: We are on a fast track to climate disaster. Major cities under water. Unprecedented heatwaves. Terrifying storms. Widespread water shortages. The extinction of a million species of plants and animals. This is not fiction or exaggeration. It is what science tells us will result from our current energy policies....Investing in new fossil fuels infrastructure is moral and economic madness.38 38 Exhibit 25, United Nations, "Secretary-General Warns of Climate Emergency, Calling Intergovernmental Panel's Report 'a File of Shame', While Saying Leaders 'Are Lying', Fuelling Flames," (April 4, 2022), https://press.un.org/en/2022/sgsm21228.doc.htm. We cannot afford-and fossil fuel companies will not pay for-the damage caused by another two decades of coal extraction from public lands. On top of the devastating climate pollution, burning coal, oil, and gas has widespread human health impacts. The Boston University study discussion above found that oil and gas production in the U.S. costs Americans $77 billion per year in health care costs, including respiratory and cardiovascular-related hospitalizations, adverse pregnancy outcomes, and other health challenges39-all of which is suffered and paid for by community members instead of oil and gas corporations. The economic impacts of coal-a still dirtier fossil fuel-are even worse and certainly exceed the value of the coal (especially the extremely cheap coal from the PRB).40 39 Exhibit 19, Jillian McKoy, Boston University School of Public Health, "Air Pollution from Oil and Gas Production Contributes to Thousands of Early Deaths, Childhood Asthma Cases Nationwide," (May 8, 2023). 40 Exhibit 36, Epstein et al., Full Cost Accounting Muller et al., Exhibit 37, Environmental Accounting for Pollution in the United States Economy; Exhibit 38, Machol & Rizk, Economic Value of U.S. Fossil Fuel Electricity Health Impacts	*(see above)*

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12.	Center For Biological Diversity	The simple reality is that there is no justification for incurring such costs. The science is clear: t**here is simply no room for continuation of BLM's "business as usual" approach on the federal mineral estate** if humanity is to have a meaningful chance of curtailing truly catastrophic warming. Global fossil fuel production must decrease by approximately 6% per year between 2020 and 2030 if we hope to limit warming to 1.5°C.6 Even this type of managed decline of fossil fuel production may be insufficient to achieve this goal. According to a recent study, to maintain a coin-flip chance of holding warming at 1.5°C, approximately 60% of global oil and gas must be left in the ground.7 Even more recently, researchers at the University of Manchester's Tyndall Centre in 2022 published an analysis of phaseout pathways for coal, oil, and gas production compliant with carbon budgets for avoiding 1.5° C of warming. Their analysis finds that for developed nations, including the U.S., in order to maintain a 50% or better chance of avoiding 1.5° C of warming, "coal production needs to fall by 50% within five years and be effectively eliminated by 2030," while oil and gas production must be cut by 74% by 2030 and end by 2035.8 To maintain a 67% chance of avoiding 1.5° C of warming, the U.S. must end oil and gas production by 2031.9 In light of ongoing production, BLM must not lease any further parcels for development, as doing so jeopardizes meeting the 1.5° C target.10 6 Exhibit 4, SEI, IISD, ODI, E3G, and UNEP, The Production Gap Report: 2020 Special Report (2021). 7 Exhibit 5, Welsby, D., Price, J., Pye, S. et al. Unextractable fossil fuels in a 1.5 °C world. Nature 597, 230-234 (2021) (if 60% of remaining oil and gas is left in situ, we will retain a 50% chance of limiting warming to 1.5°C). 8 Exhibit 6,Phaseout pathways for fossil fuel production within Paris-compliant carbon budgets. 9 Phaseout Pathways, see also Exhibit 7, United Nations Environment Programme (2022). Emissions Gap Report 2022: The Closing Window - Climate crisis calls for rapid transformation of societies. Nairobi. https://www.unep.org/emissions-gap-report-2022. 10 Exhibit 8, International Institute for Sustainable Development, Navigating Energy Transitions: Mapping the Road to 1.5° C, October 2022. Additional development also risks leaving stranded assets, as fields will need to be decommissioned before the end of their lifespan. Id.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.

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13.	Center For Biological Diversity	Yet the BLM, under the imprimatur of the Department of Interior, is very much continuing with business as usual when it comes to fossil fuel development on federal lands. Thus, selection of **the "no leasing" alternative is truly the only viable option that remains to BLM on both scientific and legal grounds, which requires the agency to avoid unnecessary or undue degradation** in its management of public lands. 43 U.S.C § 1732(b). 3 Exhibit 2, U.S. Dep't of State & U.S. Exec. Office of the President, The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050, at 1 (Nov. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternative Development, for further details. Unnecessary or undue degradation is avoided by (a) complying with the lease terms and conditions; approved mine plan of operations; and federal and state laws related to environmental protection and protection of cultural resources; and (b) assuring that operations are "reasonably incident" to mining or processing operations.
14.	Center For Biological Diversity	Given the widespread harm that mining and burning fossil fuels has on our climate and public health, **our organizations urge BLM to select the No Future Coal Leasing alternative** in both the Buffalo and Miles City plans.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.
15.	Center For Biological Diversity	It is possible that humanity has already pushed earth's climate past the point of no return, but there is nonetheless strong scientific evidence that we can still mitigate much of the worst damage. Every tenth of a degree of warming that can be averted by actions taken now will have life sustaining impacts long into the future. President Biden recognized this in Executive Order 14008: "The United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents." The issuance of EO 14008 and its implementing secretarial orders represents both an opportunity and a demand for comprehensive action by the Department of Interior and BLM - an opportunity and imprimatur the Department has yet to heed. **It is well past time for BLM to devote any energy to a consideration of a "reduced leasing" alternative** when the crisis is so far advanced.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.

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16.	Center For Biological Diversity	**The "no leasing" option is consistent with a continued moratorium on coal leasing**, as well as a more concerted phase-out of coal production from existing leases, which some groups called for in recent comments on the Department's Notice of Intent to Prepare an EIS regarding the existing coal moratorium	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.
17.	Board of Commissioners Converse County, Wyoming	Finally, BLM is scheduled to initiate a Resource Management Plan Revision in 2035 and this timeframe would be more appropriate to look at land allocations and leasing. The market should be at a place where we can better determine actual coal needs for both thermal and non-thermal uses. Until then, the CDPA should remain intact and coal should be made available for lease. **Therefore, Converse County contends that the only responsible and practical option is to support Alternative B (No Action)**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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18.	Board of Commissioners Converse County, Wyoming	In conclusion, Converse County is committed to ensuring that we are part of the energy solution both domestically and abroad. **Limited or no leasing of our fossil fuels is not the answer ¬advanced technology and innovation should be our focus.** For all the reasons outlined above and more, we believe **the only reasonable and responsible path forward is to support Alternative B (No Action)**, which gives us the latitude we need to explore advanced technologies for coal in the future, promote CCUS and reduce carbon emissions while still maintaining a reliable, affordable and abundant energy source for grid stability in this country.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
19.	Board of Commissioners Converse County, Wyoming	Federal Coal Leasing Alternatives - As you are aware, in August of 2022 the United States District Court for the District of Montana Court invalidated the Buffalo RMP based upon an inadequate environmental analysis violating NEPA and is once again requiring additional analysis to be completed. The court order specifically requires: "1) The BLM must complete new coal screening and NEPA analysis that considers a no leasing and limited coal leasing alternatives; and 2) The BLM must disclose the public health impacts, both climate and non-climate of burning fossil fuels (coal, and oil and gas) from the planning area." While Converse County believes the BLM has satisfied the court order in the development of its alternatives in this SEIS, the court did not mandate a particular outcome only that additional analysis be completed. Therefore, **the County strongly opposes BLMs identified preferred alternatives A (no leasing) and C (limited leasing). We believe that Alternative B (No Action) is still the appropriate management decision.**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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20.	National Mining Association	The NMA appreciates the opportunity to provide these comments. **Due to the substantial flaws identified by with the co-preferred alternatives A and C, we urge BLM to adopt alternative B** to provide for a reasonable balance of multiple uses across the planning area that includes the continued leasing and development of federal coal in Wyoming. As articulated in NTEC's comments, coal mining in Wyoming is a central pillar of the economy in the Powder River Basin area, providing over 15 percent of all jobs locally - jobs that are high-paying and desperately needed in a region with a majority of census blocks characterized as environmental justice communities. Allowing for continued federal coal leasing of lands previously identified as suitable best reflects congressional intent to prioritize the efficient development of domestic coal reserves to meet America's energy, economic, and security needs while ensuring adequate protection of the environment.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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21.	Navajo Transitional Energy Company	NTEC's diversified energy portfolio includes coal mines on the Navajo Nation (Navajo Mine) and in Montana (Spring Creek Mine, Big Horn County) and Wyoming (Antelope Mine, Campbell and Converse Counties; and Cordero Rojo, Campbell County). As owners of the Antelope and Cordero Rojo mines, the Navajo Nation would be directly and adversely impacted by the proposed SEIS. **NTEC urges the BLM to adopt Alternative B, the No Action alternative, because the other alternatives will cause significant harm** without providing meaningful environmental benefits or reducing GHG emissions.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP. The BLM discusses potential impacts on environmental justice communities in Section 3.5.4 and Appendix E. The BLM is committed to fair treatment and meaningful involvement with all the people on the lands when making decisions on preservation, protection, and sustainable development of the natural resources on the public lands managed by the BLM. The coordination and consultation process with the public, cooperating agencies, and tribes is considered ongoing, and your feedback will be considered.
22.	Navajo Transitional Energy Company	Finally, the SEIS fundamentally misstates both total and incremental GHG emissions, misrepresenting the tradeoffs between the proposed alternatives. **BLM should adopt Alternative B, the No Action alternative, because the other alternatives will cause significant harm without providing meaningful environmental benefits or reducing GHG emissions.**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.

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23.	Campbell County Board of Commissioners	Federal Coal Leasing Alternatives - As you are aware, in 2019 and in compliance with the United States District Court for the District of Montana court order (Western Organization of Resource Councils et al. v. BLM), the BLM amended the Buffalo RMP. Campbell County participated in that plan amendment process and still believes that BLM sufficiently complied with the court order and therefore, adequately addressed the courts concerns. However, in August of 2022 the Court invalidated the Buffalo RMP based upon an inadequate environmental analysis violating NEPA and is once again requiring additional analysis to be completed. The court order specifically requires: "1) The BLM must complete new coal screening and NEPA analysis that considers a no leasing and limited coal leasing alternatives, 2) The BLM must disclose the public health impacts, both climate and non-climate of burning fossil fuels (coal, and oil and gas) from the planning area." While Campbell County believes the BLM has satisfied the court order in the development of its alternatives in this SEIS, the court did not mandate a particular outcome only that additional analysis be completed. Therefore, **the County strongly opposes BLMs identified preferred alternatives A (no leasing) and C (limited leasing). We believe that Alternative B (No Action) is still the appropriate management decision.**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
24.	Campbell County Board of Commissioners	Finally, BLM is scheduled to initiate a Resource Management Plan Revision in 2035 and this timeframe would be more appropriate to look at land allocations and leasing. The market should be at a place where we can better determine actual coal needs for both thermal and non-thermal uses. Until then, the Coal Development Potential Area should remain intact, and coal should be made available for lease. Therefore, **Campbell County contends that the only responsible and practical option is to support Alternative B (No Action).**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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25.	Campbell County Board of Commissioners	In conclusion, Campbell County is committed to ensuring that we are part of the energy solution both domestically and abroad. Limited or no leasing of our fossil fuels is not the answer - **advanced technology and innovation should be our focus.** For all the reasons outlined above and more, **we believe the only reasonable and responsible path forward is to support Alternative B (No Action)**, which maintains stringent government regulatory oversight while allowing demand and use to drive necessary exploration advanced technologies for coal in the future, utilize and enhance CCUS methods and maintain a reliable, affordable and abundant energy source for grid stability in this country.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. A discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
26.	Wyoming Mining Association	WMA membership is deeply concerned with continued efforts to place the federal coal resource off limits as outlined in the Buffalo RMP SEIS preferred no leasing (Alternative 2) or limited leasing (Alternative 3) options. BLM is charged with ensuring the resource is managed responsibly, and we hope that it would do the right thing and avoid a decision to further burden industry and restrict coal use. **WMA strongly supports the no change option offered in Alternative 1.**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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27.	Wyoming Department of Environmental Quality	In the event the BLM elects to move forward without addressing the required mineral withdrawal process, Alternative A should be removed, and Alternative C should be revised. The state recognizes the need and value in having a diverse energy production portfolio. The compliance coal (low in SO2) produced in Wyoming is available to power the nation's need for baseload thermal energy production. Even under the most aggressive energy transition predictions, the need for thermal coal baseload power will continue well into the 2040 to 2050 timeframe. Therefore, **Alternative C is deficient in only evaluating and providing 10 years of projected coal development.** Alternative C effectively "kicks the can down the road" to the next RMP required review and does not address the need to provide the nation with a reliable and affordable fuel for required dispatchable baseload thermal power production.	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present. The Alternatives Eliminated from Further Study (Section 2.6) in the Draft SEIS identified that the Limited Leasing Alternative provides sufficient coal for production through 2048; this meets the recommendation.

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28.	Wyoming Department of Environmental Quality	The BLM analysis relies on only one source of data to support Alternative C. The BLM used the Energy Information Administration (EIA) data to forecast a 10 year limited projected demand for coal. **The BLM should have relied on multiple sources and based Alternative C on a 20 year minimum leasing alternative** that included historical leasing volumes in the CDPA.	Text was added to Section 2.2.4, Reasonably Foreseeable Development, that in addition to using the EIA coal production forecast, the BLM also reviewed production forecasts from the 12 individual coal mines within the BFO planning area. Individual mine forecasts were lower than the EIA forecast over the planning period (2022–2038). The EIA develops projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions/. The Alternatives Eliminated from Further Study (Section 2.6) in the Draft SEIS identified that the Limited Leasing Alternative provides sufficient coal for production through 2048; this meets the 20-year recommendation. The use of historical leasing volumes is not appropriate, as demand has significantly decreased from the past and similar demand is unlikely in the foreseeable future, as demonstrated by the EIA and coal mine forecasts.
29.	State of Wyoming, Office of the Governor	In addition, the volume given by the BLM for its limited-leasing alternative is based on the estimated minimum amount of coal that the Energy Information Administration (EIA) forecasts would be needed by the next planning period ending in 2038. Taking the minimum extent of this range seems arbitrary, and not based on any additional analysis, environmental, economic, social, or otherwise. Many local cooperating agencies on this SEIS, my office included, raised these concerns during the review process and ask it be addressed before the final Record of Decision. No matter the alternative chosen, the **BLM must still review any lease application and permit additional mining activities**. Artificially constraining the total volume allowed to be leased during this time period ties the hands of the BLM and industry alike into the future.	The Limited Leasing Alternative is estimated to provide sufficient coal through 2048. The EIA forecast is higher than that of the coal mines themselves. The EIA develops projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions/. Coal leasing is a discretionary action. The BLM would review any Lease by Applications received. Under the No Leasing Alternative, the BLM would return the application or would need to amend the approved RMP in order to allocate and lease additional coal.

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30.	Wyoming Mining Association	**The alternative to allow for leasing of only 1.24 billion tons out of 48 billion tons is only slightly less odious. Wyoming coal is still in demand and will continue to be in the near future.** Operators and utilities need certainty that all the coal they will need to provide for American energy needs will indeed be available and not artificially limited by the agency. One need only look to Europe to realize how unpredictable events can be, and limiting tons available for leasing would hamstring this nation in the future.	The Limited Leasing Alternative is estimated to provide sufficient coal through 2048. The EIA forecast is higher than that of the coal mines themselves. The EIA develops projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions/. Coal leasing is a discretionary action. The BLM would review any Lease by Applications received. Under the No Leasing Alternative, the BLM would return the application or would need to amend the approved RMP in order to allocate and lease additional coal. Discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
31.	Center For Biological Diversity	The Buffalo RMP's **"limited leasing" alternative C does not, in fact, limit coal leasing**. It allows 1.24 billion short tons of coal mining, allowing mining on public lands to continue "uninterrupted" beyond 2038. Buffalo SDEIS at 2-2 to 2-3. In matching the RFD scenario, the alternative is merely a business-as-usual approach allowing existing mines to continue leasing as much as they decide to on public lands.	The Limited Leasing Alternative provides a maximum volume of coal (1.24 billion short tons) available for leasing based on the 2022 EIA forecast. Another RMP amendment would be necessary for the BLM to lease additional coal, if the demand were to increase.

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32.	Center For Biological Diversity	Moreover, **BLM rejected an alternative that ensured federal coal leasing is compatible with 1.5C of warming on the inaccurate basis that both no leasing and limited leasing alternatives meet that goal.** Id. at 2-6. BLM offers no support for that conclusion, beyond the fact that the planning period stops short of 2050. The limited leasing alternative would not foreclose additional leasing on public lands in the planning area at that time, it merely defers making a decision on whether, if ever, to limit coal production from these public lands. BLM has not demonstrated that allowing uninterrupted coal mining on public lands is consistent with a 1.5C future. If we are to remain within 1.5C, the vast majority of fossil fuels must remain in the ground, and BLM must acknowledge that fact in discussing climate alternatives in both plans.	The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5, Rationale for Identifying a Proposed Plan Amendment. The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. The BFO Final SEIS, Tables 3-33, 3-35,3-36 and 3-37 show that fossil fuel production emissions total 6.75 MMT CO2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.29 MMT CO2e emissions. Thus, the BLM administratively has some level of control over only the 1.5 percent of CO2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.
33.	State of Wyoming, Office of the Governor	While the BLM was ordered to analyze downstream climate and non-climate impacts, it was given a rushed timeframe that leaves the door open to include any and every negative climate and environmental justice analyses, while not allowing a great many other impacts to be a part of the larger discussion and final decision. The "Issues Considered but Not Analyzed Further" described emission control technologies and substitution analysis as being outside of the scope of this SEIS. Analysis is allowed based on market and environmental forecast models, only when it serves the purpose of diminishing the amount of coal approved to be leased. The significance of **grid reliability, substitution of PRB product, emission control technologies, non-thermal coal uses, and the socioeconomic analysis area, all matters within the scope of the court order,** are all bypassed in favor of findings bent towards lower amounts of potentially leasable coal.	Additional discussion of emission control technologies, substitution analysis, grid reliability, alternative coal uses, and local social and economic effects have been added to the Final SEIS (Sections 1.3.2, 3.5.3, and 3.5.5).

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34.	Board of Commissioners Converse County, Wyoming	Funding derived from mineral development constitutes a significant portion of State and County revenue used to pay for essential services, including roads, fire protection, courthouses and judicial systems, libraries, landfills, hospitals, law enforcement, airports, recreation, public health, and senior citizen centers. Any curtailment of leasing and development activity significantly impacts the socio-economics of the communities and eliminates a critical funding stream for not just Converse County but all counties, the State of Wyoming and its residents. Our ability to fund organizations would be negatively affected, which includes but is not limited to, the following: WY Child and Family Development, Children's Advocacy Project (forensic interviewing of sexually assaulted and abused children), Human Resource Council, 'Youth Development Services (Youth Crisis and Intervention Center)', Humane Society, Boys and Girls Clubs of Douglas and Glenrock, WY State Fair, Converse County Fair Board, Hope Center (Domestic Violence and Sexual Assault Survivors Crisis Center and Shelter), Douglas and Glenrock Libraries, High County Behavioral (Mental Health Crisis and Intervention Center), Douglas and Glenrock Economic Development organizations and various youth and community recreation organizations . Without County support these organizations will offer fewer public services and could fail and there would be insufficient funds to provide basic services at a level needed for the protection of the county resident's health, safety, and security. **BLM must include and expand its analysis in Appendix D of the effects funding and revenue decreases would have on local services and programs should the no leasing or limited leasing alternative be adopted. Moreover, the BLM should include an in-depth analysis on where those funding streams will be recovered if mineral leasing and development is significantly reduced or eliminated long-term.**	Impacts on funding derived from mineral development and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4, as well as Section D.3 in Appendix D. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as federal mineral royalties (FMRs), severance taxes, and ad valorem taxes, discussed and presented in tables throughout.

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35.	Campbell County Board of Commissioners	Funding derived from mineral development constitutes a significant portion of revenue used to pay for essential services, including roads, fire protection, courthouses and judicial systems, libraries, landfills, hospitals, law enforcement, airports, recreation, public health, and senior citizen centers. Any curtailment of leasing and development activity significantly impacts the socio-economics of the communities and eliminates a critical funding stream for not just Campbell County, but all counties, the State of Wyoming and its residents, which will cause reductions to budgets for human services, education, infrastructure and law enforcement. Without that tax revenue derived from this industry, there would be insufficient funds to provide basic services at a level needed for the protection of the county residents' health, safety and security. **BLM must include and expand its analysis in Appendix D of the effects funding and revenue decreases would have on local services and programs should the no leasing or limited leasing alternative be adopted. Moreover, the BLM should include an in-depth analysis on where those funding streams will be recovered if mineral leasing and development is significantly reduced or eliminated long-term.**	Impacts on funding derived from mineral development and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4, as well as Section D.3 in Appendix D. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
36.	N/A	I, and most of the surface owners I know in the area, object to the sterilization and "unacceptable for coal mining" characterization of coal reserves underlying their surface lands. Coal operators addressed the concerns with the viability of surface reclamation years ago and most landowners who have seen these reclamation efforts agree that the operators are and have been acting responsibly in returning the mined ranch land to its former productive uses. **By placing the entire unleased Coal Development Potential Area in the category of "Unacceptable for coal leasing", the BLM has essentially taken the value of the surface use of those lands for mining activities. How are these surface owners to be compensated for this mass taking of valuable rights?**	While FLPMA establishes guidelines for the management, protection, development, and enhancement of the public lands, it does not prioritize between uses, and does not mandate that every use be available on every acre. Adverse impacts, such as economic loss to some, will occur in certain situations for the overall health of the public lands and resources.

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37.	Amphibian Refuge	Wildlife populations will be affected by coal development in northeastern Wyoming. Amphibian species, such as the northern leopard frog and Great Plains toad, occur in this area. Amphibian populations are declining worldwide, and amphibians are experiencing high extinction rates due to habitat loss, chytrid fungus, pollutants, pesticides, and climate change. **In Chapter 1, the following issue should be added: How does coal development affect wildlife, including amphibians, in the coal development potential area? In Chapter 3, a wildlife section should be added that discusses the existing wildlife environment, including amphibians, and environmental consequences to wildlife from habitat loss, pollutants (such as mercury), and climate change related to coal development.**	Table 1-3 in the Draft SEIS identified that there would be no changes to the impacts disclosed for biological resources, including amphibians, in the 2015 Proposed RMP/Final EIS (BLM 2015b); therefore, biological resources were not carried forward for additional analysis in this SEIS. The unsuitability coal screen 19 (Appendix A) excluded 1,700 acres of declared alluvial valley floors from coal leasing consideration without exceptions, which directly benefits amphibian species.
38.	Wyoming Department of Environmental Quality	**Further evaluation of CCUS and non-thermal coal uses needs to be developed and included in the DEIS.** The public should have the opportunity for full disclosure and review of all relevant facts related to the Alternatives proposed in the DSEIS.	A discussion of carbon capture, utilization, and storage (CCUS) has been added to the GHG affected environment section, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
39.	Board of Commissioners Converse County, Wyoming	Given the strong support for coal that exists in these communities, local and state **leaders are optimistic about the potential for carbon capture, utilization, and storage (CCUS) technologies** to aid in the decarbonization of the U.S. coal industry, with demands for coal from the Powder River Basin expected to persist for many years. As noted above, the University of Wyoming School of Energy Resources is also exploring new applications for the region's abundant coal resources to carry the economy into the future. Alternative applications for Wyoming's abundant remaining coal reserves, including the production of coal-based construction products and materials including CM and REE. **By limiting the availability of coal for these applications, BLM could undermine the proactive efforts of potentially soon-to-be hard-hit communities** to diversify and bolster their economies by finding low-carbon applications for the resources available to them.	A discussion of CCUS has been added to the GHG affected environment section, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

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40.	Board of Commissioners Converse County, Wyoming	It is evident that the Biden Administration has unleashed a barrage of anti-fossil fuel directives, which appears to support a "no coal leasing" policy. On several fronts, the Administration is working to suffocate the fossil fuel industry and any future it may have by issuing policies and regulations that stifle coal and oil and gas leasing and production. Examples of recent rules, policies and NEPA documents include, but are not limited to, the following: 1. Reducing or eliminating federal coal leasing through this Buffalo SEIS and the identification of the two preferred alternatives A (No Action) and C (Limited Leasing); 2. The NOI to prepare an EIS regarding Maintaining Secretary Jewell's Coal Leasing Moratorium; 3. BLM Conservation and Landscape Health Proposed Rule, which would create another layer of leasing for conservation areas that will compete directly with fossil fuel and mineral leasing; 4. The EPA Proposed Rule on New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; 5. BLM Proposed Rule on Fluid Mineral Leases and the Leasing Process; and 6. Numerous Climate Change Executive Orders that are targeted at limiting or eliminating fossil fuel leasing and development now and in the future. While this is not an exhaustive list, it does support the premise that the Biden Administration is actively and aggressively moving toward elimination of fossil fuel use. **These misguided directives will not support increased needs in energy consumption when fossil fuels still support a significant percentage of the nation's electricity nor do they allow for advanced technologies to move forward if the feedstock is eliminated from access.**	All alternatives provide for the forecasted energy needs and allow alternative technologies to advance while their allotted coal persists. For the No Leasing Alternative (A), coal is produced through 2041; for the No Action Alternative (B), coal is produced through 2338; and for the Limited Leasing Alternative (C), coal is produced through 2048. A new RMP revision or amendment could extend coal leasing further. A discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP. The EIA develops coal production projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions/.

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41.	Board of Commissioners Converse County, Wyoming	Wyoming embraces an all-of-the-above energy strategy. We are an energy state that exports approximately ninety-three percent (93%) of the energy we produce. We recognize the need and value in having a diverse energy production portfolio; however, **continued coal produced from Wyoming mines is essential to meet not only baseload electric generation needs in this country but to explore non-thermal uses of coal for the future**.	All alternatives provide for the forecasted energy needs and allow alternative technologies to advance while their allotted coal persists. For the No Leasing Alternative (A), coal is produced through 2041; for the No Action Alternative (B), coal is produced through 2338; and for the Limited Leasing Alternative (C), coal is produced through 2048. A new RMP revision or amendment could extend coal leasing further. A discussion of alternative coal uses has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP. The EIA develops coal production projections by using a market-based approach. The EIA balances energy supply and demand, accounting for economic competition across the various energy fuels and sources. The modules function at the regional level to represent regional differences in energy markets. Detailed information on the underlying assumptions of EIA forecasts are available at https://www.eia.gov/outlooks/aeo/assumptions/.

Row #	Organization Name	Comment Text	Comment Response
42.	Board of Commissioners Converse County, Wyoming	Coal Export Opportunities - According to the Prager University Foundation website, oil, gas and coal, produce approximately eighty-four percent (84%) of the world's energy needs. Furthermore, China and India are the world's largest coal consumers as per the World Meter website. Instead of looking for ways to reduce or eliminate coal leasing and production, the federal government, and in particular the Biden Administration, must support and **promote all opportunities to export our coal products overseas** to meet these global demands for energy. It is also important to note that the Department of Energy researchers at the National Energy Technology Laboratory assessed various types of coal in the United States. Subbituminous Powder River Basin coal, largely produced in Wyoming, is among the lowest in terms of global warming impacts and provides other environmental benefits over countries that that do not have that grade of coal. The United States must pursue all options for marketing our energy products overseas should the market show a demand, and the federal government must work with all impacted states to secure production, transportation and infrastructure opportunities domestically. This would in turn provide long-term socioeconomic benefits to not only Wyoming but the country. We must look for opportunities to promote and allow the exportation of coal, oil and gas, to where there is a substantial need for energy. This measure alone would assist in the reduction of Green House Gas (GHG) emissions internationally, provide good paying jobs and support vibrant communities.	The export of Wyoming Powder River Basin coal out of the United States is highly unlikely. The predominant international consumers, China and India, also have their own large coal reserves. China is the world's leading producer of subbituminous coal. A new coal export terminal on the US West Coast is unlikely, as illustrated by the 2021 denial of the U.S. Supreme Court's acceptance to hear Montana and Wyoming's complaint that Washington State interfered with their lawful interstate commerce by failing to permit a proposed coal export terminal (Gruver 2021). While a small amount of Montana Powder River Basin coal has been exported, between the uncertain international market, lack of US export terminals, and the transportation costs, the exportation of Wyoming coal is not foreseeable.

Row #	Organization Name	Comment Text	Comment Response
43.	State of Wyoming, Office of the Governor	The coal from the PRB itself is not the negative issue this SEIS paints it to be. The State of **Wyoming is a leader in the advancement of Carbon Capture, Utilization, and Storage (CCUS) development. Emission mitigation technology is completely ignored in this analysis**, which is unjustifiable when models and projections are used for coal production out to 2048. Even though the time-frames in their proposed rule are impossible, the Biden Administration has recognized that CCUS is a commercially available technology and could capture 90 percent of the CO2 from coal-fired power plants while reducing other criteria pollutants. One does not need to look further than the Integrated Test Center located in the PRB to see the work being done locally, in this very arena. The Western Governors Association, of which I serve as Chair, began an initiative which, "will examine how CCUS technologies, including Direct Air Capture, can position western states at the forefront of emerging carbon markets and reduce the effects of carbon emissions on the environment." This bipartisan initiative encompasses nineteen states and three territories, many of which are downstream recipients of PRB coal scrutinized in this SEIS. Since the entire volume of coal in the PRB can be analyzed into perpetuity in this document, **there must be consideration of the regional and national support to advance these capabilities**.	A discussion of CCUS has been added to the GHG affected environment section, and an alternative uses of coal discussion has been added to the coal affected environment section. When CCUS or other alternative technologies mature enough to need federal coal, the BLM has the ability to amend the RMP.
44.	N/A	With coal on the decline, B**LM should consider how it can help with a just transition to the coming future** not further more Wyoming in the past. An end to coal leasing is low hanging fruit.	BLM assistance with transition from coal is outside the scope of the SEIS. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition.

Row #	Organization Name	Comment Text	Comment Response
45.	Campbell County Board of Commissioners	Coal Export Opportunities - According to the Prager University Foundation website, oil, gas and coal produce approximately eighty-four percent (84%) of the world's energy needs. Furthermore, China and India are the world's largest coal consumers as per the World Meter website. Instead of looking for ways to reduce or eliminate coal leasing and production, the federal government, and in particular the Biden Administration, must support and **promote all opportunities to export our coal products overseas** to meet these global demands for energy. It is also important to note that the Department of Energy researchers at the National Energy Technology Laboratory assessed various types of coal in the United States. Subbituminous Powder River Basin coal, largely produced in Wyoming, is among the lowest in terms of global warming impacts and provides other environmental benefits over countries that that do not have that grade of coal. The United States must pursue all options for marketing our energy products overseas should the market show a demand and the federal government must work with all impacted states to secure production, transportation and infrastructure opportunities domestically. This would in turn provide long-term socioeconomic benefits to not only Wyoming but the country. We must look for opportunities to promote and allow the exportation of coal to where there is a substantial need for energy. This measure alone would assist in the reduction of Green House Gas (GHG) emissions internationally, provide good paying jobs and support vibrant communities.	The export of Wyoming Powder River Basin coal out of the United States is highly unlikely. The predominant international consumers, China and India, also have their own large coal reserves. China is the world's leading producer of subbituminous coal. A new coal export terminal on the US West Coast is unlikely, as illustrated by the 2021 denial of the U.S. Supreme Court's acceptance to hear Montana and Wyoming's complaint that Washington State interfered with their lawful interstate commerce by failing to permit a proposed coal export terminal (Gruver 2021). While a small amount of Montana Powder River Basin coal has been exported, between the uncertain international market, lack of US export terminals, and the transportation costs, the exportation of Wyoming coal is not foreseeable.

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46.	Campbell County Board of Commissioners	Furthermore, Wyoming remains a national leader in coal technology development and research and in May of 2018, the Integrated Test Center (ITC) officially opened in Gillette, Wyoming. The center provides space for researchers to test Carbon Capture, Utilization and Sequestration (CCUS) technologies using actual coal-based flue gas. Research at the facility will help support jobs, local and state economies and keep electricity prices low for millions of people around the country. Other innovative projects are being pursued in Wyoming that include CCUS, carbon fiber, coal-to-products and extracting Critical Minerals (CM) and Rare Earth Elements (REE) from coal. We remain confident that diversification and advanced technology will provide longevity for the coal industry for years to come. Wyoming embraces an all-of-the-above energy strategy. We are an energy state that exports approximately ninety-three percent (93%) of the energy we produce. We recognize the need and value in having a diverse energy production portfolio; however, **continued coal produced from Wyoming mines is essential to meet not only baseload electric generation needs in this country but to explore non-thermal uses of coal for the future.**	A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
47.	Campbell County Board of Commissioners	Given the strong support for coal that exists in these communities, local and state **leaders are optimistic about the potential for carbon capture, utilization, and storage (CCUS) technologies** to aid in the decarbonization of the U.S. coal industry, with demands for coal from the Powder River Basin expected to persist for many years. In fact, community leaders in Campbell County envision that CCS/CCUS will be a leading regional industry in the near future. As noted above, the University of Wyoming School of Energy Resources is also exploring new applications for the region's abundant coal resources to carry the economy into the future. Alternative applications for Wyoming's abundant remaining coal reserves, including the production of coal-based construction products and materials including CM and REE. By limiting the availability of coal for these applications, BLM could undermine the proactive efforts of potentially soon-to-be hard-hit communities to diversify and bolster their economies by finding low-carbon applications for the resources available to them.	A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When CCUS or other alternative technologies mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
48.	Campbell County Board of Commissioners	It is evident that the Biden Administration has unleashed a barrage of anti-fossil fuel directives, with a goal to create a no coal leasing policy. These directives lack supporting evidence showing the benefit of limiting or eliminating vital energy resources from coal. On several fronts, the Administration is working to suffocate the fossil fuel industry and any future it may have by issuing policies and regulations that stifle coal, oil and gas leasing and production. Examples of recent rules, policies and NEPA documents include, but are not limited to, the following: 1. Reducing or eliminating federal coal leasing through this Buffalo SEIS and the identification of the two preferred alternatives A (No Action) and C (Limited Leasing); 2. The NOI to prepare an EIS regarding Maintaining Secretary Jewell's Coal Leasing Moratorium; 3. BLM Conservation and Landscape Health Proposed Rule, which would create another layer of leasing for conservation areas that will compete directly with fossil fuel and mineral leasing; 4. The EPA Proposed Rule on New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; 5. BLM Proposed Rule on Fluid Mineral Leases and the Leasing Process; and 6. Numerous Climate Change Executive Orders that are targeted at limiting or eliminating fossil fuel leasing and development now and in the future. While this is not an exhaustive list, it does support the premise that the Biden Administration is actively and aggressively moving toward elimination of fossil fuel use. These misguided directives will not support increased needs in energy consumption when fossil fuels still support a significant percentage of the nation's electricity **nor do they allow for advanced technologies to move forward if the feedstock is eliminated from access**.	All alternatives provide for the forecasted energy needs and allow alternative technologies to advance while their allotted coal persists. For the No Leasing Alternative (A), coal is produced through 2041; for the No Action Alternative (B), coal is produced through 2338; and for the Limited Leasing Alternative (C), coal is produced through 2048. A new RMP revision or amendment could extend coal leasing further. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
49.	Center For Biological Diversity	VI. **BLM Must Address New Information About the Impacts of Fossil Fuel Development and Climate Change on Pallid Sturgeon**. The Court in WORC has made clear that BLM must address the direct, indirect, and cumulative effects of its land management in the Buffalo and Miles City Field Office. The direct, indirect, and cumulative effects of BLM's land management-particularly fossil fuel development in-the planning areas, as well as cumulative impacts from oil and gas development in the Bakken in North Dakota, have the potential to impact pallid sturgeon in the Powder River and the Yellowstone River.47 47 Exhibit 29, Marcus Griswold, Pallid Sturgeon Synthesis Report 8 (2021) [hereinafter Synthesis Report] (citation omitted); Exhibit 30, FISH AND	The BLM and USFWS collected water quality samples on the Powder River at the Montana state line and downstream, during fall 2021 and spring 2022, which were analyzed for a variety of contaminants, including selenium. All water samples taken at the state line met water quality standards. Coalbed natural gas-produced water discharge was a large contributor of water discharge to the Powder River in the 2000s. However, any produced waters were required to meet Wyoming Department of Environmental Quality standards prior to release into the environment (https://deq.wyoming.gov/water-quality/water-wastewater/permitting/produced-water-disposal-treatment/).

Row #	Organization Name	Comment Text	Comment Response
49. *(cont.)*	Center For Biological Diversity *(continued)*	WILDLIFE SERV., PALLID STURGEON BASIN-WIDE CONTAMINANTS ASSESSMENT 3-4 (2019), available at https://pubs.er.usgs.gov/publication/70211832 [hereinafter CONTAMINANTS ASSESSMENT]. Pallid sturgeon are migrating up the Powder River. The Powder River stretches from its source in Wyoming to its confluence with the Yellowstone River in Montana. Both the Miles City and Buffalo Field Office regions encompass sections of the Powder River Basin.48 The Yellowstone River is itself a tributary of the Missouri River. The remaining endangered pallid sturgeon inhabits these three waterways, among others in the central United States. 48 Bureau of Land Management Resource Management Plans, BUREAU OF LAND MGMT. (March 2016), https://www.blm.gov/sites/blm.gov/files/LUP_In_Progress_March_2016.pdf. Pallid sturgeon are among the rarest surviving fish species in North America and are a federally endangered species in the Missouri River Watershed which includes the Yellowstone River and [Powder River Basin]. Once estimated to support over 1,000 adults, now, fewer than 125 naturally produced pallid sturgeon are estimated to live in the Upper Missouri Basin above Lake Sakakawea in North Dakota. Surviving wild sturgeon in the Upper Missouri River Basin are estimated to be at least 44 years old.49 49 Marcus Griswold, Pallid Sturgeon Synthesis Report 8 (2021) [hereinafter Synthesis Report] (citation omitted) (attached as Exhibit 1). The Fish and Wildlife Service (FWS) listed the pallid sturgeon as endangered under the ESA in 1990. 55 Fed. Reg. 36,641, 36,641 (Sept. 6, 1990). Despite three decades of recovery efforts, they remain endangered today. In its 2014 Revised Recovery Plan, FWS described the population as "neither self-sustaining nor viable."50 The existing population is aging and no recruitment has been documented.51 50 FISH AND WILDLIFE SERV., REVISED RECOVERY PLAN FOR THE PALLID STURGEON at 4 (2014). 51 Id. at 15. The Yellowstone River and its tributaries are critical to the survival and recovery of this unique species because-unlike the upper Missouri River-the Yellowstone River provides vital spawning habitat for a small group of pallid sturgeon that has not hybridized with other sturgeon species, making it likely a distinct population.52 Since 2014, pallid sturgeon have repeatedly migrated up the Powder River in Montana, traveling as far as 96 miles beyond the confluence with the Yellowstone River.53 Approximately 125 unhybridized pallid sturgeon remain today, and they depend on the ecological health of this region's waters. 52 Synthesis Report at 9. 53 Id. at 1. But today, coal and gas activities in the region, including	Coalbed natural gas has been in decline for more than a decade, many wells have been reclaimed, and today there are no Wyoming Department of Environmental Quality (WDEQ) permits for produced water discharge to the Powder River.

Row #	Organization Name	Comment Text	Comment Response
49. *(cont.)*	Center For Biological Diversity *(continued)*	extensive mineral development on federal lands, threaten the pallid sturgeon and its habitat. These activities contaminate waterways, alter hydrology, and contribute to climate change, all significant threats to the pallid sturgeon's survival and recovery. First, water contaminants linked to mineral extraction pose an especially grave risk to pallid sturgeon. Because of their long lives, large fat reserves, and role as both a bottom dweller and top predator, pallid sturgeon are exposed to and retain more contaminants over their life cycle than other fish.54 Coal and oil and gas development have released a variety of harmful contaminants into waterways in the Powder River Basin, many of which now exceed acceptable standards. For example, selenium levels are seven times the Aquatic Chronic Criteria-the baseline level of contaminants exposure a fish community can tolerate without harmful effect-while copper exceeds the standard by threefold.55 Both of these toxins lead to decreased spawning and growth.56 Other contaminants linked to energy extraction also harm the pallid sturgeon, with chronic exposure leading to behavioral disorders, abnormal hormone responses, suppressed immune function, reduced reproductive success, and other negative impacts.57 54 FISH AND WILDLIFE SERV., PALLID STURGEON BASIN-WIDE CONTAMINANTS ASSESSMENT 3-4 (2019), available at https://pubs.er.usgs.gov/publication/70211832 [hereinafter CONTAMINANTS ASSESSMENT] (attached as Exhibit 2). 55 Synthesis Report, supra, at 4. 56 See id. 57 Id. at 36-37 Second, water extraction and consumption, produced water disposal, and other hydrologic changes resulting from coal and oil and gas production also alter the hydrology of the Powder River Basin, posing other challenges for pallid sturgeon. Reduced stream flow due to water consumption increases the concentration of harmful contaminants released by mining operations.58 Altered river pathways also increase floodplain isolation and change the timing and duration of flows, disrupting fish movements and reproduction.59 58 Id. at 12. 59 Id. Finally, the indirect and cumulative effects of climate change-to which coal and oil and gas production in the Powder River Basin contributes significantly-also threaten the pallid sturgeon. Climate change is expected to decrease water flows in the Powder River Basin and, in turn, increase concentration of contaminants.60 Additionally, rising global temperatures could elevate water temperature in the sturgeon's habitat by as much as six degrees Fahrenheit. This could put the river above the critical threshold for sturgeon habitability, leading to impaired growth, reduced spawning activity, and ultimately	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
49. *(cont.)*	Center For Biological Diversity *(continued)*	extinction.61 60 Id. at 3. 61 Id. Moreover, transportation of fossil fuels, whether in pipelines or rail may impact sturgeon. The U.S. Army Corps of Engineers recognized that "crude oil pipeline breaks" threaten fisheries.62 Pipelines under the Yellowstone River ruptured in 2011 near Laurel and in 2016 near Glendive, together releasing nearly 100,000 gallons of crude oil into the Yellowstone.63 Dozens of pipelines intersect or cross the Yellowstone River.64 Many more certainly also cross the Powder River. BLM must disclose all pipeline crossings and identify the risks they pose to sturgeon. 62 Exhibit 31, U.S. Army Corp of Engineers, Yellowstone River Cumulative Effects Analysis (Apr. 2016). 63 Id. at 192, 206. 64 Id. In addition to analyzing the indirect, direct, and cumulative impacts of its land management on pallid sturgeon, BLM must also complete consultation under the section 7 of the ESA for both field offices. BLM must issue biological opinions for both field offices prior to making any irreversible or irrevocable commitment of resources. BLM's consultation should also include a comprehensive analysis of threatened and endangered species that are impacted by fossil fuel development, including transportation (for example grizzly bears struck by fossil fuel trains), in the Powder River Basin. In order to avoid impacts to these species, BLM should significantly constrain fossil fuel development in the planning areas. Despite this evidence, however, BLM fails to address impacts to pallid sturgeon in either DSEIS. BFO refuses to address sturgeon on the basis that there is no sturgeon critical habitat in the planning area and that selenium levels are higher downstream (in Montana) than in Wyoming. This does not however permit BLM to ignore impacts to sturgeon. As the Griswold Report and the Contaminants Report make clear, pollution moves downstream. Furthermore, whether Montana contributes more selenium to the Powder River than Wyoming is not the point. Numerous reaches of the Powder River in Wyoming are impaired and fail to meet water quality standards for warm water fish due to excessive selenium, and the South Fork of the Powder River in Wyoming is impaired and fails to meet water quality standards for warm water fish due to excessive selenium.65 MCFO in turn refuses to address sturgeon on the basis that it removes sturgeon habitat from consideration of coal leasing and that BLM is engaged in consultation on sturgeon. These arguments also fail. First, the removal of sturgeon habitat from potential coal leasing may address the direct impacts of coal mining on sturgeon habitat, but it does not address indirect and cumulative impacts from transportation and combustion, nor does it address impacts from oil and gas development. These additional impacts are	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
49. *(cont.)*	Center For Biological Diversity *(continued)*	likely impacting sturgeon habitat as explained in the Griswold Report and the Contaminants Report. Second, that BLM is consulting with the Fish and Wildlife Service with respect to impacts to sturgeon clearly indicates that fossil fuel development in the planning areas may adversely impact sturgeon, warranting further analysis in the DSEIS. Furthermore, during the consultation process, BLM is prohibited from making any irretrievable commitments of resources, and consequently, BLM must complete consultation before it issues final decisions on the RMPAs. 16 U.S.C. § 1536(d). 65 Exhibit 32, https://gis.deq.wyo.gov/MAPS/WQD_ACTIVE_PROJECTS/IR/FS/Factsheet_WYPR100902020600_01.pdf; Exhibit 32(a), https://gis.deq.wyo.gov/MAPS/WQD_ACTIVE_PROJECTS/IR/FS/Factsheet_WYPR100902030400_01.pdf; Exhibit 33, https://gis.deq.wyo.gov/MAPS/WQD_ACTIVE_PROJECTS/IR/FS/Factsheet_WYPR100902020102_00.pdf; Exhibit 34, https://gis.deq.wyo.gov/MAPS/WQD_ACTIVE_PROJECTS/IR/FS/Factsheet_WYPR100902020103_01.pdf.	*(see above)*
50.	Center For Biological Diversity	Similarly, the Intergovernmental Panel on Climate Change (IPCC) recently released the entirety of its sixth assessment report (AR6), including a synthesis of its findings.11 The IPCC Sixth Assessment provided the remaining carbon budget from the beginning of 2020 as 400 GtCO2 for a 67% probability of meeting the 1.5°C limit and 500 GtCO2 for a 50% probability of 1.5°C.12 At current emissions levels, the world will exceed the global carbon budget for a 50% chance of limiting warming to 1.5°C in just 10 years. The Sixth Assessment Report found that net anthropogenic greenhouse gas emissions during 2010 to 2019 were higher than at any previous time in human history.13 Nationally determined contributions (NDCs) make it likely that we will exceed 1.5°C this century, and the most recent projections have set that exceedance much sooner-there is a 98% chance it will occur before 2027, and a high likelihood of it occurring much sooner.14 Policies implemented at the end of 2020 are projected to result in higher global GHG emissions than even those implied by NDCs. Projected CO2 emissions over the lifetime of existing and planned fossil fuel infrastructure exceed the CO2 emissions in pathways that limit warming to 1.5°C.15 In pathways that limit warming to 1.5°C with no or limited overshoot, global GHG emissions peak between 2020 and 2025, and then fall to 48% below 2019 level by 2030, reaching net-zero by early 2050s. Without strengthening policies beyond those at present, GHG emissions are projected to rise beyond 2025, leading to global warming of 3.2°C by 2100.16 Reducing GHG	The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5, Rationale for Identifying a Proposed Plan Amendment. The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. The BFO Final SEIS, Tables 3-33, 3-35,3-36 and 3-37 show that fossil fuel production emissions total 6.75 MMT CO2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.29 MMT CO2e emissions. Thus, the BLM administratively has some level of control over only the 1.5 percent of CO2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.

Row #	Organization Name	Comment Text	Comment Response
50. *(cont.)*	Center For Biological Diversity *(continued)*	emissions across the energy sector requires substantial reduction in overall fossil fuel use and the deployment of low-emission energy sources. The continued installation of fossil fuel infrastructure will 'lock-in' GHG emissions that will continue atmospheric warming for years to come.17 11 Exhibits 9 and 10, IPCC, 2021: Summary for Policymakers and Technical Summary. Exhibit 11, In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson Delmotte et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3-32, doi:10.1017/9781009157896.001; Exhibit 12, IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926; Exhibit 13, IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner et al.]. Cambridge University Press. In Press; Exhibit 14, IPCC 2023: Synthesis Report of the IPCC Sixth Assessment Report [Paola Arias et al. (eds.)], Cambridge University Press. 12 Exhibit 9, Intergovernmental Panel on Climate Change, Summary for Policymakers In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021), https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/ at SPM-38. 13 Exhibit 12, IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. 14 Exhibit 15, World Meteorological Organization (October 26, 2022), Greenhouse Gas Bulletin: The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2021. https://library.wmo.int/doc_num.php?explnum_id=11352. See also Exhibit 15a, WORLD METEOROLOGICAL ORGANIZATION, Global Annual to Decadal Climate Update Target years: 2023 and 2023-2027, Publication Date, 2023. 15 Id. at SPM-15, 16. 16 Id. at SPM-21. 17 Id. at SPM-36 As UN Secretary-General António Guterres stated upon the release of the Intergovernmental Panel on Climate Change's (IPCC) latest 2022 report: Climate scientists warn that we are already perilously close to tipping points that could lead to cascading and irreversible climate impacts. But, high-emitting Governments and corporations are not just turning a blind	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
50. *(cont.)*	Center For Biological Diversity *(continued)*	eye, they are adding fuel to the flames. They are choking our planet, based on their vested interests and historic investments in fossil fuels, when cheaper, renewable solutions provide green jobs, energy security and greater price stability.... Climate activists are sometimes depicted as dangerous radicals. But, the truly dangerous radicals are the countries that are increasing the production of fossil fuels. Investing in new fossil fuels infrastructure is moral and economic madness...18 18 United Nations Secretary-General, António Guterres (UN Secretary-General) to the press conference launch of IPCC Report (February 28, 2022) (emphasis added), https://media.un.org/en/asset/k1x/k1xcijxjhp. BLM has yet to complete a programmatic EIS that factors in these scientific conclusions and with an eye to developing alternatives that respond to them. A programmatic NEPA review is the ideal vehicle for such an analysis. NEPA requires analysis before making decisions with potentially irreversible effects: "the appropriate time for preparing an EIS is prior to a decision, when the decisionmaker retains a maximum range of options." Sierra Club v. Peterson, 717 F.2d 1409, 1414 (D.C. Cir. 1983). While this is of course true at the project level, it is no less true at the programmatic level when each project comprises an incremental part of the overall impact. Conservation Groups have and continue to urge BLM to conduct this analysis in its projected EIS associated with the coal program review, and to seriously consider issues of environmental justice, frontline communities, and transition costs in the context of a critically necessary phase-out of all development as well as a continuation of the moratorium on new leasing.	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
51.	Center For Biological Diversity	The Interior Department has acknowledged the need to address climate change when making management decisions on federal lands. Interior Secretarial Order 3289, Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources (Sept. 14, 2009), stated that "the realities of climate change require us to change how we manage the land, water, fish and wildlife, and cultural heritage and tribal lands and resources we oversee"; and acknowledged that the Department of the Interior is "responsible for helping protect the nation from the impacts of climate change." And in 2021, the Secretary recognized that the "Nation faces a profound climate crisis," ordering the Interior Department to "prioritize[] action on climate change." Interior Secretarial Order 3399, Department-Wide Approach to the Climate Crisis and Restoring Transparency and Integrity to the Decision-Making Process (April 16, 2021). A fundamental disconnect exists, however, between the federal government's commitment to address climate change, and how public lands are managed for energy production. A recent paper calculated that lifecycle emissions from federal fossil fuel development resulted in an average of 1,408 million metric tons (MMT) of Carbon Dioxide-equivalent (CO2e) per year since 2005-the equivalent of 377 coal-fired power plants, or the emissions from 303 million cars-and are projected to be around 1,130 MMT CO2e by 2030.4 These emissions will amount to around 20% of total U.S. greenhouse gas emissions each year.5 4 Exhibit 3, N. Ratledge et al., Emissions from Fossil Fuels Produced on US Federal Lands and Waters Present Opportunities for Climate Mitigation, 171 Climatic Change, no. 11, Mar. 14, 2022, at 2-5, https://link.springer.com/content/pdf/10.1007/s10584-021-03302-x.pdf. 5 Id. at 6 fig.2.	The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5, Rationale for Identifying a Proposed Plan Amendment. The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. The BFO Final SEIS, Tables 3-33, 3-35,3-36 and 3-37 show that fossil fuel production emissions total 6.75 MMT CO2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.29 MMT CO2e emissions. Thus, the BLM administratively has some level of control over only the 1.5 percent of CO2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.

Row #	Organization Name	Comment Text	Comment Response
52.	Center For Biological Diversity	**BLM must address the impacts of fossil fuel development on pallid sturgeon in the Powder River and Yellowstone River**	The BLM and USFWS collected water quality samples on the Powder River at the Montana state line and downstream, during fall 2021 and spring 2022, which were analyzed for a variety of contaminants, including selenium. All water samples taken at the state line met water quality standards. Coalbed natural gas-produced water discharge was a large contributor of water discharge to the Powder River in the 2000s. However, any produced waters were required to meet Wyoming Department of Environmental Quality standards prior to release into the environment (https://deq.wyoming.gov/water-quality/water-wastewater/permitting/produced-water-disposal-treatment/). Coalbed natural gas has been in decline for more than a decade, many wells have been reclaimed, and today there are no WDEQ permits for produced water discharge to the Powder River.
53.	U.S. Environmental Protection Agency	With consideration of the ongoing and worsening climate crisis, and the inevitable contribution to climate change emissions that would occur with BLM-authorized coal leasing and development, **we also recommend that the RMP identify lease stipulations to mitigate the climate-related impacts of coal development and combustion**. These stipulations could include requirements for GHG emissions offsets (including offsets of downstream emissions from coal combustion) or climate change impacts fees. Such requirements would be consistent with BLM's mandates to manage land for sustained yield, prevent unnecessary and undue degradation, and safeguard the public welfare.	The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. For the BFO Draft SEIS, Tables 3-46, 3-48, and 3-49 show that fossil fuel production emissions total 5.98 MMT CO_2e, whereas total life cycle emissions attributable to fossil fuel extracted from the BFO planning area are 454.38 MMT CO_2e emissions. Thus, the BLM administratively has some level of control over only the 1.3 percent of CO_2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area. The White House net-zero 2050 goal is not a legal requirement, but an expressed national goal. It is not within the BLM's legal purview to impose lease stipulations solely on the basis of national goals. As stated previously, only 1.3 percent of the total CO_2e projected by this SEIS is within the BLM's administrative jurisdiction.

Row #	Organization Name	Comment Text	Comment Response
54.	Wyoming Mining Association	Additionally, **restricting access to the federal coal resource negatively impacts ongoing efforts of the University of Wyoming and numerous Wyoming companies working in the emerging coal-to-products field.**	A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.
55.	Wyoming Mining Association	And closer to home **it will have very real impacts on families in Wyoming**. The coal industry employs over 5,100 individuals directly with a payroll of nearly $500 million, and over 2,000 contractors. The average coal mining job pays over $83 thousand per year, well above the state average. And every coal mining job supports another 2-3 jobs in the service and supply industry. Access to federal coal allows Wyoming families to pay the bills, put supper on the table, take a summer vacation, and buy the kids some toys at Christmas. Quite simply, **the loss of coal leasing means Wyoming people lose their jobs and livelihoods.** This is unacceptable.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
56.	National Mining Association	Similarly, **alternatives A and C conflict with the statutory mandates that govern the Federal Coal Management Program.** Congress' purpose in enacting the Mineral Leasing Act is '[t]o promote the mining of coal . . . on the public domain."6 The express Congressional policy is that it is "in the national interest to foster and encourage private enterprise in," among other endeavors, "the orderly and economic development of domestic mineral resources, reserves . . .to help assure satisfaction of industrial . . . needs."7 Congress has instructed that "[i]t shall be the responsibility of the Secretary of the Interior to carry out this policy when exercising authority under such programs as may be authorized by law."8 6 Law of Feb. 25, 1920, c. 85, § 32, 41 Stat. 43758. 7 Mining & Minerals Policy Act of 1970, 30 U.S.C. § 21a. 8 Id.	The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. While these policies may encourage coal mining, just as with Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

Row #	Organization Name	Comment Text	Comment Response
57.	Center For Biological Diversity	BLM must not only consider, but **must also address the utter inconsistency of any future coal leasing in the planning areas, not only with meeting U.S. climate commitments (including the nationally determined contribution under the Paris Agreement), but with minimizing worsening national and global humanitarian crises.** As many of these groups noted in their comments on Interior's projected EIS for the federal coal program,2 we have surpassed the point at which simply halting new coal leasing will effect meaningful reductions in GHG emissions. BLM and Interior must also consider how these RMPs fit into a bigger picture in which the federal coal program is brought to a swift and equitable close. 2 Exhibit 1, Comments of Conservation groups Center for Biological Diversity, Earthjustice, Grand Canyon Trust, Montana Environmental Information Center, and Sierra Club, submitted in response to the Department of Interior's Notice of Intent to Prepare an Environmental Impact Statement to Analyze the Potential Environmental Effects from Maintaining Secretary Jewell's Coal Leasing Moratorium, submitted via eplanning June 15, 2023.	The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5, Rationale for Identifying a Proposed Plan Amendment. The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. The BFO Final SEIS, Tables 3-33, 3-35,3-36 and 3-37 show that fossil fuel production emissions total 6.75 MMT CO2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.29 MMT CO2e emissions. Thus, the BLM administratively has some level of control over only the 1.5 percent of CO2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.

Row #	Organization Name	Comment Text	Comment Response
58.	Center For Biological Diversity	II. **BLM Must Ensure Consistency with the Ongoing Federal Coal Program Review**. Through its review of the Buffalo and Miles City RMPs, BLM should ensure consistency with the ongoing review of the federal coal program, including the currently in-place moratorium on new coal leasing. Since the Powder River Basin encompasses the vast majority of federal coal leasing and mining operations, there is significant opportunity present in these RMP revisions to positively impact the scope of the federal coal program. By adopting the no new leasing alternative for federal coal resources in these field office areas, as discussed above, BLM will be setting a positive precedent for other field offices with federal coal, and the federal coal program as a whole. The no new leasing alternative is the only alternative consistent with the legally required coal leasing moratorium currently in place. Additionally, it is the only alternative consistent with future policy and direction of the federal coal program that recognizes the various needs to indefinitely continue the leasing moratorium, as well as to implement federal policy that implements decisions related to leasing and mining of federal coal resources taking into account climate protection objectives. Our organizations recently submitted comments to the agency about the future of the federal coal program generally and the need to indefinitely continue the federal coal leasing moratorium.19 We have attached those comments for your review and consideration, and please consider them incorporated by reference into this set of comments. 19 Exhibit 16, comments of Powder River Basin Resource Council et al. (Oct. 5, 2021), attached as Exhibit; Exhibit 17, Comments of Sierra Club, et al. (Oct. 5, 2021); Exhibit 18, Comments of Powder River Basin Resource Council et al. (June 15, 2023); Exhibit 1, Comments of Sierra Club, et al. (June 15, 2023).	BLM Montana and Wyoming regularly brief the BLM Director and DOI senior staff to ensure consistency with BLM and DOI policies and direction, and will continue to do so. The *Federal Register* Notice of Intent initiating the EIS to analyze the potential environmental effects from maintaining or revoking former Secretary Jewell's coal leasing moratorium was published on May 1, 2023, with the scoping period running through June 15 (https://eplanning.blm.gov/eplanning-ui/project/2024545/510). A scoping summary report has not yet been published.

Row #	Organization Name	Comment Text	Comment Response
59.	Board of Commissioners Converse County, Wyoming	On behalf of the Converse County Board of Commissioners (County), we appreciate the opportunity to submit comments regarding the above referenced NOA. Converse County's economic viability is highly dependent on the ability to produce, market, and deliver mineral and energy products to consumers not only in the County but within the State and across the country. In addition, our ability to continue with a viable federal coal, oil and gas leasing program is essential to our long-term socioeconomic health. While Converse County supports the continued multiple use of federal lands, federal agencies must respect the custom, culture and socioeconomics of local communities and acknowledge those local values through the approval and implementation of their rules, regulations and policies. Converse County is rich in federal resources as our lands are comprised of approximately 76% private surface and an estimated 60% federal minerals. The Antelope Mine is partially located in Converse County and is the major coal mine that accounts for our coal production. Up until 2021, coal has been one of the largest and most stable sources for Converse County revenues for the past twenty years. Today, the influence of coal is through good paying jobs, both on the mine site, and secondarily with services and transportation of employees. We are, however, an energy rich area with a significant percentage of oil and natural gas located in the area. Mineral production is not only critical to our county, state and school systems but also for the entire nation in meeting energy demands.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment. A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
60.	Navajo Transitional Energy Company	Domestic **coal production is of paramount importance to national security, particularly because of its critical role in the production of steel, concrete, sugar, and stable energy**. Steel is a major component of national defense, both through the direct construction of military equipment, and indirectly, as an essential component in the construction, automotive and energy sectors. Without domestic coal production, the United States would have to rely on foreign sources for its coal needs, creating a potential vulnerability due to supply chain disruptions, political instability, or price volatility in other regions. **Coal is also integral to the production of concrete**. In the case of concrete production, coal combustion products, particularly fly ash, are often used as a replacement for a portion of the Portland cement used in concrete. This substitution not only reduces greenhouse gas emissions, but it also enhances the strength and durability of the final product. Coal is used in the steel production process as a reducing agent for iron ore-this process, known as coking, yields coke, which is a high-carbon content derivative of coal and an essential ingredient for making steel. Moreover, steel is a vital material in various sectors, including defense, infrastructure, and manufacturing, underscoring the strategic imperative of securing domestic coal production to ensure a steady supply of steel for national security requirements. Beyond its strategic role in concrete and steel production, coal also plays a critical role in electricity generation, a cornerstone of the nation's infrastructure. Coal-powered electricity makes up nearly 20% of total electricity generation. A key source of baseload power, **coal-fired power plants can operate continuously and provide a stable and reliable supply of electricity, irrespective of weather conditions or time of day.** This continuous power generation capability is essential for national security, as it supports the uninterrupted functioning of critical infrastructure, including military installations, communication networks, and emergency services. Therefore, prematurely phasing out domestic coal production, especially the entire Wyoming Powder River Basin undermines national security and energy resilience.	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
61.	State of Wyoming, Office of the Governor	Over my numerous comments to the BLM regarding federal coal in Wyoming's Powder River Basin (PRB), I have stated that **it is not in the public interest to decrease the amount available for leasing** whether it be by acreage, or in this case, volume. Wyoming produced 244.3 million tons of coal in 2022, of which 80 percent of our federal coal is produced in the PRB. We are the top low-sulfur compliance coal producing state in the nation.	The SEIS is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. The BLM analyzed two alternatives that continue coal leasing and it should be noted that production from existing leases would continue under all alternatives. The public interest may be judged using various metrics and qualities, and the variety of alternatives considered allows the BLM to examine the facets of public interest as well as other considerations that go into making resource management decisions.
62.	Campbell County Board of Commissioners	Campbell County is unique as our lands are comprised of approximately 83% private surface and an estimated 87.5% federal minerals. We are also an energy rich area with an estimated forty percent (40%) of the nation's BTU's being produced from the surface coal mines located in the area. **Coal production is not only critical to our county, state and school systems but also for the nation in meeting energy demands.**	Additional discussions of grid reliability and local social and economic effects have been added to the Final SEIS (Sections 1.3.2, 3.5.3, and 3.5.5).
63.	Campbell County Board of Commissioners	According to BLM, federal coal produced from the Powder River Basin in Wyoming and Montana accounts for over 85 percent of all federal coal production. Moreover, the BLM Buffalo Field Office administers approximately 4.7-million acres of subsurface federal mineral estate in Campbell, Johnson, and Sheridan Counties in north-central Wyoming of which the federal coal estate is significant. Therefore, it is safe to say that Wyoming effectively dominates BLM's federal coal leasing program and Campbell County is the largest producer within that space.	Comment noted.

Row #	Organization Name	Comment Text	Comment Response
64.	Wyoming Mining Association	The BLM Federal Coal Lease Program creates a great return not only for those who directly benefit from mining taxes, royalties, fees, and bonus bids, like we do in Wyoming. It also provides value for those across America who want and rely on affordable, reliable electricity. **Coal fired generation remains the most reliable, low-cost source of electricity** in the United States. Coal generation is reliable and resilient where renewables such as wind and solar (by their very nature) are not. The socio-economic benefits cannot be understated. Coal fired generation is readily available and dispatchable 24 hours a day, 7 days a week, 365 days of the year. It is reliable where heavily subsidized renewables are subject to weather and daylight. Its cost is consistently low and not subject to the price swings of natural gas. Reliable, low-cost electricity is necessary to power homes, businesses, schools, hospitals, and American life. **Recent winter weather events show dramatically the impacts of removing coal fired generation from the nation's power grid**. Had the ERCOT grid in Texas not retired much of its coal fleet once fed by federal coal and replaced it with unreliable renewables, the catastrophic grid failure during the winter storm of 2020, resulting in deaths and billions in economic damage could have been largely avoided. Conversely, other power grids in more recent storms have been able to avoid ERCOT scenarios largely due to significantly increased coal fired generation from online coal generation assets, largely powered by federal coal from Wyoming. Coal remains the only abundant, consistently low-cost, and reliable source of electricity generation in the United States at a time when grid reliability is rapidly deteriorating due to the hasty build-out of heavily subsidized, highly unreliable wind and solar. And coal fired base load generation remains critical as the nation moves ever further down the path of over-reliance on unreliable alternative energy sources such as wind and solar, and volatile natural gas subject to price swings. Efforts to restrict the federal coal resource will have a negative effect on Americans not only in terms of reliability, but significantly higher energy prices as well.	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. All types of electrical generation technologies failed, including coal power plants, during the widespread grid failure during the winter storm of February 2021. See the University of Texas Austin 2021 report The Timeline and Events of the February 2021 Texas Electric Grid Blackouts (https://energy.utexas.edu/sites/default/files/UTAustin%20%282021%29%20EventsFebruary2021TexasBlackout%2020210714.pdf). Additional discussions of substitution analysis, grid reliability, alternative coal uses, and local social and economic effects have been added to the Final SEIS (Sections 1.3.2, 3.5.3, and 3.5.5).

Row #	Organization Name	Comment Text	Comment Response
65.	Wyoming Mining Association	Wyoming coal operators produced 244.3 million ton in 2022, the vast majority from federally owned Powder River Basin coal. Remarkably, this was not enough to meet contracted demand as producers lost an estimated 60 million tons of production because of the inability to move coal to customers due to poor rail service. The state lost between $90-100 million in revenue. **The point is that federal coal from Wyoming is still very much in demand for American energy generation.**	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is discussed in the executive summary. A discussion of CCUS has been added to the GHG affected environment section.

Row #	Organization Name	Comment Text	Comment Response
66.	Arkansas State House	I'm writing these comments to provide an Arkansas perspective concerning the leasing of federal lands for coal production in Wyoming. I am told that 95% of the coal used by Arkansas cold fire generating facilities comes from the state of Wyoming. It goes without saying that **without a steady reliable supply of coal many if not all of our coal-fired generation facilities would be shut down**. Arkansas is the home of some of the newest and cleanest burning coal-fired facilities in the nation.+172	Energy markets are complex, and the net effects of production changes in one location or one sector are affected by multiple factors in the broader energy market. In general, reductions in oil, natural gas, or coal produced from federal leases may be partially offset by nonfederal production (state and private) in the United States or by overseas production (i.e., geographic substitution). The effect of this substitution on indirect GHG emissions depends on the fuel produced and transportation costs. For example, overseas production often faces more relaxed regulatory requirements for production, and the produced fuels would need to be physically transported into the United States. There may also be substitution of other energy types to meet energy demand. These substitution patterns will be different for different fuel types. Further, the effect of substitution between different fuel sources on indirect GHG emissions depends on the replacement energy source. For example, coal is a relatively more carbon intense fuel than natural gas, and hydroelectricity is the least carbon intense fuel. In the transportation sector, alternatives to oil are likely to be less carbon intensive. Additionally, substitution across energy sources or locations may not fully meet the energy needs that would otherwise have been realized through production from the federal mineral estate. Price effects may lower the market equilibrium quantity demanded for some fuel sources. This would lead to a reduction in indirect GHG emissions. These three effects are likely to occur in some combination when considering substitution away from federal fossil fuels, but the relative contribution of each clearly depends on many interrelated and complex factors. While the BLM does not currently have a model suitable to perform such an analysis, sections described above have been edited to more clearly discuss such energy substitution considerations.

Row #	Organization Name	Comment Text	Comment Response
67.	Missouri State Senate	I am emailing opposing both options. **We need to continue to use the coal from federal lands to power our country**. As the majority leader of the State Senate in Missouri, it is imperative that we have access to low-cost energy sources to keep energy affordable for the people of this state and the nation we serve. Energy security is imperative to our national security and our food production. We cannot become reliant on foreign adversaries like China and Russia to produce critical minerals. China is building new coal-fired power plants. We must take more action to keep up with adversaries and become energy dominant. This proposal takes us in the opposite direction.	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. All alternatives would continue to provide Powder River Basin coal until at least 2041. Eleven Missouri power plants received coal from Wyoming's Powder River Basin in 2021; four of these plants do not have published retirement dates (see Appendix F).
68.	Nebraska State Legislature	**A moratorium on extraction from public land would be extremely detrimental** to Nebraska. Coal utilization supports over 20% of the nation's electrical grid, with over 250 million tons mined on leased federal land by private companies with roughly 40% of all of the nation's coal coming from the Powder River Basin. Nebraska utilizes coal mined on such lands leased and operated in Wyoming's Powder River Basin for a significant part of Nebraska's energy production. Gerald Gentleman Station is Nebraska's largest electric generating facility, supplying enough electricity to serve 600,000 Nebraskans and operates with clean low-sulfur coal from Wyoming's Powder River Basin to generate steam to turn the turbines.	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. All alternatives would continue to provide Powder River Basin coal until at least 2041. Five Nebraska power plants received coal from Wyoming's Powder River Basin in 2021; three of these plants, including Gerald Gentleman, do not have published retirement dates (see Appendix F).

Row #	Organization Name	Comment Text	Comment Response
69.	Nebraska State Legislature	As you may be aware, **in February 2021, the Midwest experienced an extreme weather event** that stretched from North Dakota to Texas causing the congestion of transmission lines which resulted in rolling blackouts in Nebraska. This led the Natural Resources Committee of the Nebraska Legislature to conduct a study, LR136, and authorize a report which found that **electric generation from coal played a significant role in keeping the grid from collapsing.** The study found that one of the major factors contributing to the congestion of transmission lines during the winter storm was the increased cost and decreased availability of natural gas. SPP reported that natural gas generated only 12,000 MW of the 30,000 MW expected. Other forms of generation such as wind, nuclear and coal met their accredited capacity with coal contributing the largest amount of energy with 17,000 MW, which was roughly one half of the electricity demand. Nebraska is a largely agricultural state, providing food around the globe each year. To produce this food, we are the largest irrigated state relying heavily on reliable/resilient energy supply. Livestock operations rely on the energy grid for the survival of livestock during inclement weather. In short, without the grid capability, Nebraska farmers and ranchers would lose the ability to irrigate crops and protect livestock. This, of course, would directly threaten Nebraska's economy, as well as food security throughout the nation. We encourage the BLM to not move forward with any moratorium or prohibitions on coal mining on federal lands	Legislative Resolution (LR) 136 findings can be found at the following website: https://nebraskalegislature.gov/pdf/reports/committee/natural/lr136_2021.pdf. The recommendations also include better communication, a feasibility study to ensure needs are being met, and improvement of electric line distribution limitations. The no-action alternative continues to provide coal until 2041, thus giving Nebraska time to implement the recommendations in the report. Additional discussions of grid reliability and local social and economic effects have been added to the Final SEIS (Sections 1.3.2, 3.5.3, and 3.5.5).
70.	Texas House of Representatives	**Grid reliability is something that agencies should take account of,** and courts have done so in regulatory regimes with analogous situations as those here.12 Here both the plain text of National Environmental Policy Act13 and the Federal Land Policy and Management Act. 14 The former requires any plan to be economically and technically feasible.15 And the latter "established a policy in favor of retaining public lands for multiple use management."16 "Multiple use management" is a deceptively simple term that describes the enormously complicated task of striking a balance among the many competing uses to which land can be put, "including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and [uses serving] natural scenic, scientific and historical values."17 Any amendment cannot only focus on the preferred policy goals, such as mitigating downstream effects. 12 See, e.g., Texas v. United States Env't Prot. Agency, 829 F.3d 405, 431-33 (5th Cir. 2016) (taking in account grid reliability in the context of the EPA implementing a Clean Air Act plan that needed to "take[] into consideration . . . the energy . . .	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. Additional discussions of grid reliability and local social and economic effects have been added to the Final SEIS (Sections 1.3.2, 3.5.3, and 3.5.5).

Row #	Organization Name	Comment Text	Comment Response
70 *(cont.)*	Texas House of Representatives *(continued)*	impacts of compliance") (quoting 42 U.S.C. § 7491(g)(1)). 13 See, e.g., 42 U.S.C. § 4332. 14 See, e.g., 43 U.S.C. § 1701. 15 See, e.g., 42 U.S.C. § 4332. 16 Lujan v. National Wildlife Federation, 497 U.S. 871, 877 (1990). 17 Norton v. S. Utah Wilderness All., 542 U.S. 55, 58 (2004). And any alleged attenuated downstream climate effects pale in comparison to immediate, real-word grid reliability impacts that taking BFO Coal off the table would effect. Emissions from mining and burning BFO Coal are a tiny drop in the bucket of the U.S.'s CO2 emissions-let alone the globe's.18 By contrast, as noted above, BFO's rule in U.S. Grid reliability, is significant. MISO and SPP alone show how devastating it would be to eliminate BFO coal from the resource mix.19 18 There's several orders of magnitude between BFO Coal and U.S. CO2 emissions. Compare BFO Report at 3-71 with Environmental Protective Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks#:~:text=Key%20findings%20from%20the%201990,sequestration%20from%20the%20land%20s ector. (April 29, 2023). 19 SPP Forecast, at 7 (showing 35% of capacity in 2022 was from coal); MISO Forecast, at 4-6 (May 23, 2023) (showing 30% of capacity is powered through coal and losing accredited capacity because of coal retirements). Any agency action on the amendments to the Buffalo Resource Management Plan is statutorily required to take account of BFO coal's important contributions to the grid. And it makes good sense for the benefit of the people of the United States-not only within but also beyond the borders of Montana and Wyoming- for BLM to do so.	*(see above)*
71.	Texas House of Representatives	The United States District Court for the District of Montana's August 3, 2022 Order1 has spurred the Bureau of Land Management to begin the administrative process for amending the Buffalo Resource Management Plan. I write to draw attention to the forgotten statutory requirements so far in the analysis of the amendments. There has not been enough consideration of the statutory text requiring the agency to take account of "economic and technical considerations" and thoroughly consider the "technically and economically feasib[ility]" of the proposed agency action.2 Or the declaration of policy that "public lands be managed in a manner which recognizes the Nation's need for domestic sources of minerals . . . from the public lands . "3 . . . 1 W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt., No. 4:20-CV-00076-GF-BMM, 2022 WL 3082475, at *1 (D. Mont. Aug. 3, 2022). 2 42 U.S.C. § 4332 (cited by W. Org., 2022 WL 3082475, at *8). 3 43	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source.

Row #	Organization Name	Comment Text	Comment Response
71 *(cont.)*	Texas House of Representatives *(continued)*	U.S.C. § 1701 (cited by W. Org., 2022 WL 3082475, at *6 The Buffalo Field Office (BFO) assumes that "low prices for natural gas" will continue to "reduce the demand for coal production for energy generation" leading to widespread retirements of coal plans.4 This is how the office justifies the "direct, indirect, and induced economic effects that [will] ripple throughout the state and local economies" when their plan leads to the mines no longer being "economically viable" and "likely to close."5 But for better or for worse, **the United States' electrical grid-and therefore the economy-still need coal to keep the lights on**. 4 U.S. Dep't of Interior, Buffalo Filed Office, Draft Supplemental Impact Statement and Potential Resource Management Plan Amendment at ES-12 (May 2023). 5 Id Over one hundred plants receive BFO coal.6 That coal fuels the integrated patchwork of regional transmission organizations- such as MISO and SPP7-as well as Texas's independent grid in ERCOT.8 Each of these electrical grids are on the brink with around a third of their generation needs coming from coal.9 Coal's importance comes from its high accreditation in capacity analysis-its ability to produce rain, shine, or still air.10 While the BFO report takes in account the jobs that will be lost, never does it realistically grapple with the widespread economic effects and technical feasibility of stopping coal from reaching these grids.11 6 Id. at 3-103. 7 Federal Energy Regulatory Commission (FERC), Electric Power Markets, https://www.ferc.gov/electric-power-markets. MISO "operates the transmission system and centrally dispatched market" in fifteen states ranging from Canada down to the Gulf Coast. Across those states, it serves more than 42 million customers. FERC, MISO, https://www.ferc.gov/industries-data/electric/electric-power-markets/miso. SPP "ensur[es] reliable power supplies, adequate transmission infrastructure, and competitive wholesale electric prices for its members." FERC, SPP, https://www.ferc.gov/industries-data/electric/electric-power-markets/spp. There are 112 members across fourteen states with over 70,000 miles of transmission lines covering a 552,885 square mile territory, serving 19 million people. Id. 8Electric Reliability Council of Texas, About ERCOT, https://www.ercot.com/about. ERCOT serves more than 26 million customers over 52,700 miles of transmission line and 1,1000 generation units. 9 See, e.g., MISO Forecast of Resource Adequacy, at 4-6 (May 23, 2023) (showing 30% of capacity is powered through coal and losing accredited capacity because of coal retirements); id. at 26 (chart showing MISO dipping into reserve margin as part of the status quo); see also SPP Forecast of Resource Adequacy, at 29 (May 15, 2023) (chart	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
71 *(cont.)*	Texas House of Representatives *(continued)*	showing SPP dipping into reserve margin as part of the status quo); id. at 7 (showing 35% of capacity in 2022 was from coal). 10 See, e.g., SPP Forecast, at 8; MISO Forecast, at 25-26. 11 See, e.g., BFO Report, at 3-103-04 (analyzing job loss); but see generally id. (no grid reliability analysis).	*(see above)*
72.	Board of Commissioners Converse County, Wyoming	Socioeconomic Impacts, Appendix D - As stated multiple times, coal, oil, and gas production is a critical component of the State and County's economic base and also has a direct impact on schools, colleges, highways and the overall socioeconomics of the community. The coal, oil, and gas industries generate high paying jobs to hundreds of people throughout the region, and while coal production from the Antelope Mine and the North Antelope/Rochelle Mine are decreasing, **many mine workers continue to reside in Converse County. Coal production is an important component of the State and county's economic base and also has a direct impact on schools, colleges, highways, and the overall socioeconomics of the community. The coal industry generates high paying jobs to hundreds of people throughout the region.** In 2020 and 2021, coal production generated $3.2 million and $8.7 million respectively in Converse County alone.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
73.	Campbell County Board of Commissioners	Socioeconomic Impacts, Appendix D - As stated multiple times, **coal production is an important component of the State and County's economic base and also has a direct impact on schools, colleges, highways and the overall socioeconomics of the community.** The coal industry generates high paying jobs to hundreds of people throughout the region. To further illustrate its importance, the assessed valuation for coal in Campbell County for the current Fiscal Year 2022 is approximately $1.9 billion while the most recent production accounted for $231 million tons in 2022. To further illustrate the importance of fossil fuel development in the County, the assessed valuation for coal/oil/gas for the current Fiscal Year 2022 is over $4.1 billion.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.

Row #	Organization Name	Comment Text	Comment Response
74.	State of Wyoming, Office of the Governor	There will be a significant socioeconomic impact to counties outside the CDPA. However, this is also regarded as beyond the scope of this SEIS. Johnson County's scoping comments show concern for the economic well-being of their residents due to the closing or limiting of fossil fuel development. In the BLM's response, they note that the county is not within the physical CDPA area, so only the oil and gas production being analyzed would pertain to them, and they are not changing its RMP allocation. This raises two important issues. First, if the BLM deems the court is not requiring them to change RMP allocations for oil and gas, then why are they also choosing to change the RMP allocations for coal? The court order was to consider additional alternatives, and disclose additional analysis. According to the BLM, this can be accomplished without the need for allocation changes and coal leasing should be given the same treatment. Second, Johnson County, as well as Sheridan, Natrona, Weston, Crook, and others, are left out of the Buffalo Field Office's Local Socioeconomic Analysis Area. Miners rarely live within the CDPA boundary and commute from many of the surrounding communities. **There are more counties, towns, and jobs impacted than are analyzed here which will suffer from the direct, indirect and induced effects that are listed** in Chapter 3. Revenues listed for Wyoming, Campbell, and Converse Counties frequently compared 2015 and 2021 numbers as proof that the coal industry in the PRB is in decline. While coal production hit an all-time high in 2008, 2015 was one of the best years among the last 50 in the state. On the other hand, 2021 was amidst COVID-19 and reeling economies across the globe. **Selecting these dates while omitting other regions is disingenuous** and only exacerbates concerns that the BLM is cherry picking its data to further curtail the coal industry.	Social and economic considerations (Section 3.5.3) describe within the *Affected Environment* that the local socioeconomic analysis area was limited to Campbell and Converse Counties due to the declining employment contributions from neighboring counties prior to initiation of the SEIS. Regional economic impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, and associated benefactors discussed and presented in tables throughout. However, further discussion on mineral production revenue reliance across Wyoming, not just the CDPA, has also been added to these sections. Trend-wise data presented in the aforementioned supplementary tables are broken out by fiscal year. This and other trend-wise data presented are reflective of the cumulative timeline of past BFO RMPA SEIS efforts.

Row #	Organization Name	Comment Text	Comment Response
75.	Board of Commissioners Converse County, Wyoming	**As energy markets have shifted away from coal, in part due to federal policy and market trends, coal communities in Wyoming are increasingly vulnerable to socioeconomic harm.** All of Northeast Wyoming is designated a "Priority Energy Community" by the U.S. Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. This designation signals a high dependence on coal jobs and the potential for severe economic harm should coal decline. Not only does coal support the economic vitality of Wyoming communities, but it also provides much-needed community support. Historically, mining companies in the Powder River Basin have partnered with and provided the majority of support for community service programs, including programs associated with substance abuse recovery and mental health. Although Converse County is not currently designated a "disadvantaged community" pursuant to BLM screening metrics for income and race, policies that limit the region's use of its abundant remaining coal reserves would result in severe socioeconomic harm to the region, potentially rendering Converse County a "disadvantaged community" in the near future. This is partly the reason we disagree with the BLM determination that there are several census tract blocks that identify parts of Converse County as meeting the eligibility for Environmental Justice with coal production. We contend that without coal leasing and production along with continued oil and gas development, we would see much more detrimental impacts to our County and its citizens; therefore, the inverse to your determination is true.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
76.	Board of Commissioners Converse County, Wyoming	Input from Wyoming communities should be meaningfully integrated in the decision-making process. **The coal mining, oil, and gas sectors enjoy strong, vocal public support in Converse County and Wyoming** in part due to the high-paying jobs and significant tax revenue associated with energy development.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.

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77.	Board of Commissioners Converse County, Wyoming	Chapter 3, Affected Environment 3.4.5, Page 3-108 and Appendix E (Environmental Justice Support Document) - **The County challenges BLMs premise for determining block census tracks identified in Converse County under both the Affected Environment and Appendix E (Environmental Justice Support Document) as meeting the criteria for Environmental Justice communities of concern.** BLM uses the metrics to determine this designation by looking at total population, minority percentage per geographic area, Native American populations per geographic area, and low-income population per geographic areas. It is therefore determined that several block census tracks meet the criteria for Environmental Justice areas due to coal, oil and gas, leasing and production throughout the County. We would argue the opposite affect is true for the County and its citizens for leasing and production of coal.	Table E-1 in Appendix E provides an overview of the screening criteria for block groups within the local analysis area. A total of 21 block groups (72 percent of block groups) in Campbell County and 7 block groups (64 percent of block groups) in Converse County meet one or more criteria for consideration as environmental justice communities of concern. Environmental justice screening criteria evaluated for baseline analyses are expected, at a minimum, to be minority percentage per geographic area, Indigenous populations per geographic area, and low-income populations per geographic area per the EPA's EJScreen and BLM Instruction Memorandum 2022-059, among others. Such data and associated baseline findings do not incorporate considerations of energy-related policy or production; in other words, census block groups involved with coal, oil, and gas leasing and production are not potential environmental justice communities of concern unless they are also minority, low-income, and/or Indigenous block groups.

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78.	Board of Commissioners Converse County, Wyoming	In its SEIS, BLM defines "environmental justice" as "the fair treatment and meaningful involvement of all potentially affected people-regardless of race, color, national origin, or income." (BLM IM2022-059) (adopting EPA's definition). Pursuant to this definition, "fair treatment" means that "no group should bear a disproportionate share of the adverse consequences that could result from federal environmental programs or policies." (Id.). On the other hand, "meaningful involvement" involves "allowing all portions of the population a meaningful opportunity to participate in the development of, compliance with, and enforcement of Federal laws, regulations, and policies affecting human health or the environment regardless of race, color, national origin, or income." (Environmental Justice Guidance Under the National Environmental Policy Act 23 (Appendix A) https://www.doi.govisitesidoi.gov/filesiuploads/EJ-under-NEPA.pdf). This definition requires BLM to consider 1) whether groups and communities affected by BLM decision-making will bear a disproportionate share of the adverse consequences resulting from BLM programs and policies; and 2) whether those communities have been meaningfully involved in the decision-making process. **Wyoming communities will be disproportionately harmed by a BLM decision that limits or restricts or eliminates coal, oil, or gas leasing in the Powder River Basin. Wyoming's Powder River Basin (PRB) is home to some of the world's largest surface coal mines along with an abundance of oil and gas resources and with many rural communities in Northeast Wyoming highly dependent on the energy industries for jobs, tax revenue, and social safety nets**. A reduction or the elimination of mineral leasing would significantly impact many communities in our area of the State.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
79.	Navajo Transitional Energy Company	**The SEIS fails to adequately account for environmental justice concerns stemming from the significant harms the co-preferred alternatives would inflict on identified environmental justice communities. In fact, although the SEIS identifies many communities in Campbell and Converse counties as environmental justice communities, it fails to make any meaningful and specific consideration of how job losses from the mine's closures would impact community health.**	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.

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80.	Navajo Transitional Energy Company	The value provided by the Wyoming Powder River Basin mines goes beyond the hundreds of millions of dollars paid to the county, state, and federal government through taxes and royalty fees. **Coal mining, which provides high-paying jobs within a region where 70% of the census blocks were identified as environmental justice communities, is the central economic pillar of Wyoming's Powder River Basin.** SEIS at 3-92 and Appx. D-3. These positions are not seasonal or transitional jobs, but enduring careers where workers earn enough to support their families. The economic impact of coal mining extends beyond the thousands of mine employees, permeating throughout the community and significantly contributing to overall economic self-sufficiency. As the SEIS notes, coal mining and support activities provide over 15% of all jobs locally. SEIS at Appx. D-2 and D-3. The immense value of coal mining, which (not counting indirect and induced activities) is projected to average about two billion dollars per year, is the essential nucleus for a robust economic system. Mined coal is the ultimate source of an estimated $500,000,000 per year of wages paid for direct, indirect, and induced work, fostering financial security and improving the standard of living for thousands of families.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.
81.	Navajo Transitional Energy Company	As the SEIS noted, **the cessation of mining would precipitate a myriad of health impacts within the local community.** The loss of stable, high-paying employment is associated with heightened stress levels and related mental health issues such as anxiety and depression. Economic hardship can also directly impact physical health by decreasing access to healthcare services, nutritious food, and even basic necessities. Unemployment can lead to social isolation and feelings of helplessness, exacerbating mental health concerns. While the SEIS makes passing mention of these social impacts, the environmental justice analysis does not specifically or meaningfully consider how these health and social consequences will disproportionately fall on identified environmental justice communities.	Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Additional discussion on these opportunities has been added to the Social and Economic Considerations section (3.5.3) and Environmental Justice section (3.5.4). The BLM discusses potential impacts on environmental justice communities in Section 3.5.4 and Appendix E. The BLM is committed to fair treatment and meaningful involvement with all the people on the lands when making decisions on preservation, protection, and sustainable development of the natural resources on the public lands managed by the BLM. The coordination and consultation process with the public, cooperating agencies, and tribes is considered ongoing, and your feedback will be considered.

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82.	State of Wyoming, Office of the Governor	**No consideration is given to the importance of reliable 24-hour dispatchable power**, especially to communities that may find themselves under the BLM's definition of "environmental justice." Recent winter storms and summer heat waves have drawn considerable attention to the importance of dependable electric grids. Table 3-33 in the SEIS uses "Air-Pollution-Related Health Effects of Electricity Generation in Europe by Primary Energy Source" and claims 6.12-98 deaths per terawatt/hour. However, the Nature Medicine journal estimated that 61,672 people died of heat-related causes across thirty-five European nations during the summer of 2022.1 These impacts are felt more heavily by the elderly and the impoverished. Dismissing the fact that both of these models are based in Europe, without the availability of affordable, reliable energy, these already economically and health challenged communities, even in the United States, will continue to be left behind and suffer higher risks. 1 Ballester, J., Quijal-Zamorano, M., Mendez Turrubiates, R.F. et al. Heat-related mortality in Europe during the summer of 2022. Nat Med 29, 1857-1866 (2023). https://doi.org/10.1038/s41591-023-02419-z	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. During the widespread grid failure in Texas during the winter storm of February 2021, all types of electrical generation technologies failed, including coal power plants. See the University of Texas Austin 2021 report The Timeline and Events of the February 2021 Texas Electric Grid Blackouts (https://energy.utexas.edu/sites/default/files/UTAustin%20%282021%29%20EventsFebruary2021TexasBlackout%2020210714.pdf). The BLM discusses potential impacts on environmental justice communities in Section 3.5.4 and Appendix E. The BLM is committed to fair treatment and meaningful involvement with all the people on the lands when making decisions on preservation, protection, and sustainable development of the natural resources on the public lands managed by the BLM. The coordination and consultation process with the public, cooperating agencies, and tribes is considered ongoing, and your feedback will be considered.

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83.	Campbell County Board of Commissioners	**As energy markets have shifted away from coal**, in part due to federal policy and market trends, **coal communities in Wyoming are increasingly vulnerable to socioeconomic harm**. All of Northeast Wyoming is designated a "Priority Energy Community" by the U.S. Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. This designation signals a high dependence on coal jobs and the potential for severe economic harm should coal decline. Wyoming is already feeling the effects of federal policies and market trends that disfavor coal. Analysis by the University of Wyoming shows that since peaking in 2008 (at approximately 467 million tons), Wyoming coal production has declined drastically, nearly halving in 2019 to 277 million tons. Employment has followed this trend. Employment in coal mines peaked in 2009 with 7,054 employees. In 2019, 5,399 employees worked in coal mines in the state, a 23.5 percent decrease from the 2009 employment level. Not only does coal support the economic vitality of Wyoming communities, but it also provides much-needed community support. Historically, mining companies in the Powder River Basin have partnered with and provided the majority of support for community service programs, including programs associated with substance abuse recovery and mental health. Although Campbell County is not currently designated a "disadvantaged community" pursuant to BLM screening metrics for income and race, policies that limit the region's use of its abundant remaining coal reserves would result in severe socioeconomic harm to the region, potentially rendering Campbell County a "disadvantaged community" in the near future. This is partly the reason we disagree with the BLM determination that there are several census tract blocks that identify parts of Campbell County as meeting the eligibility for Environmental Justice with coal production. We contend that without coal leasing and production, we would see much more detrimental impacts on our County and its citizens; therefore, the inverse to your determination is true.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Additional discussion on these opportunities has been added to the Social and Economic Considerations section (3.5.3) and Environmental Justice section (3.5.4).

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84.	Campbell County Board of Commissioners	**Input from Wyoming communities should be meaningfully integrated in the decision-making process.** The coal mining, oil, and gas sectors enjoy strong, vocal public support in Campbell County and Wyoming in part due to the high-paying jobs and significant tax revenue associated with energy development.	Opportunities for local involvement were included during development of the SEIS. See Section 4.3, Public Scoping, and 4.4, Public Comments on the Draft SEIS. The state of Wyoming, and Campbell and Johnson Counties are cooperating agencies in the preparation of this SEIS. Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout.

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85.	Campbell County Board of Commissioners	In its SEIS, BLM defines "environmental justice" as "the fair treatment and meaningful involvement of all potentially affected people-regardless of race, color, national origin, or income." (BLM IM2022-059) (adopting EPA's definition). Pursuant to this definition, "fair treatment" means that "no group should bear a disproportionate share of the adverse consequences that could result from federal environmental programs or policies." (Id.). On the other hand, "meaningful involvement" involves "allowing all portions of the population a meaningful opportunity to participate in the development of, compliance with, and enforcement of Federal laws, regulations, and policies affecting human health or the environment regardless of race, color, national origin, or income." (Environmental Justice Guidance Under the National Environmental Policy Act 23 (Appendix A) https://www.doi.qovisites/doi.gov/filesiuploads/EJ-under-NEPA.pdf). This definition requires BLM to consider 1) whether groups and communities affected by BLM decision-making will bear a disproportionate share of the adverse consequences resulting from BLM programs and policies; and 2) whether those communities have been meaningfully involved in the decision-making process. **Wyoming communities will be disproportionately harmed by a BLM decision that limits or eliminates coal leasing in the Powder River Basin**. Wyoming's Powder River Basin (PRB) is home to some of the world's largest surface coal mines, with many rural communities in Northeast Wyoming highly dependent on the coal industry for jobs, tax revenue, and social safety nets. Since its founding as a railroad town in 1891, Campbell County, Wyoming has continued to evolve as a rural hub for industry, emerging as a state and even national leader in coal and oil and gas production. With a total county population of only 47,000 working together to supply about 40% of the nation's coal for electrical generation, Campbell County and Gillette have proudly earned their reputation as the "epicenter of American coal."	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Additional discussion on these opportunities has been added to the Social and Economic Considerations section (3.5.3) and Environmental Justice section (3.5.4).

Row #	Organization Name	Comment Text	Comment Response
86.	Campbell County Board of Commissioners	1. Chapter 3, Affected Environment 3.4.5, Page 3-108 and Appendix E (Environmental Justice Support Document) - **The County challenges BLMs premise for determining block census tracks identified in Campbell County under both the Affected Environment and Appendix E (Environmental Justice Support Document) as meeting the criteria for Environmental Justice communities of concern.** BLM uses the metrics to determine this designation by looking at total population, minority percentage per geographic area, Native American populations per geographic area, and low-income population per geographic areas. It is therefore determined that several block census tracks meet the criteria for Environmental Justice areas due to coal leasing and production throughout the County. We would argue the opposite affect is true for the County and its citizens for leasing and production of coal.	Table E-1 in Appendix E provides an overview of the screening criteria for block groups within the local analysis area. A total of 21 block groups (72 percent of block groups) in Campbell County and 7 block groups (64 percent of block groups) in Converse County meet one or more criteria for consideration as environmental justice communities of concern. Environmental justice screening criteria evaluated for baseline analyses are expected, at a minimum, to be minority percentage per geographic area, Indigenous populations per geographic area, and low-income populations per geographic area, per the EPA's EJScreen and BLM Instruction Memorandum 2022-059, among others. Such data and associated baseline findings do not incorporate considerations of energy-related policy or production; in other words, census block groups involved with coal leasing and production are not potential environmental justice communities of concern unless they are also minority, low-income, and/or Indigenous block groups.

Row #	Organization Name	Comment Text	Comment Response
87.	Wyoming Department of Environmental Quality	**The BLM's decision to change the preferred No Action (Alternative B) to a new co-preferred alternative(s) Alternatives A and C, effectively act as an arbitrary mineral and land withdrawal.** In proposing to withdraw lands through the RMP DSEIS, BLM has effectively sidestep the required mineral withdrawal process. The DSEIS Alternatives should have included an evaluation and process for the mineral withdrawal of the coal and surface estate within the CDPA first, and then an evaluation and alternative for No or Limited leasing actions within the RMP. **BLM has chosen to ignore the required formal mineral withdrawal process**. BLM has effectively proposed through the DSEIS Alternatives A and C a defacto mineral withdrawal without conducting the formal mineral withdrawal process and notification of this action to the public.	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

Row #	Organization Name	Comment Text	Comment Response
88.	Wyoming Department of Environmental Quality	Thermal Coal, Leasing, and Use: According to BLM, federal coal produced from the Powder River Basin in Wyoming and Montana accounts for over 85 percent of all federal coal production. The BLM Buffalo and Casper Field Office(s) administer approximately 4.7-million acres of subsurface federal mineral estate in Campbell, Converse, Johnson, and Sheridan Counties in north-central Wyoming. The coal is produced from within the Coal Development Potential Area (CDPA). The CDPA is a defined mineral resource boundary in which coal has been established as the primary resource for development. The coal sale and recovery within the CDPA is governed under the Federal Mineral Leasing Act of 1920 (FMLA) as amended for the benefit of the public. **The DSEIS proposed coal screening process and analysis as drafted within the DSEIS is fatally flawed. The DSEIS proposed process fails to take into account the requirements as set forth in the Federal Mineral Leasing Act of 1920 (FMLA) as amended, the Federal Land Management Policy Act of 1976 (FLPMA) as amended, the Mining and Mineral Policy of 1970, and the Fair Market Value Policy for Leasing Federal Coal of 1984. As written, the DSEIS fails to detail a separate Alternative Action to remove the CDPA boundary, coal acreage, and surface acreage through a formal mineral withdrawal** prior to initiating a No Leasing (Alternative A) or Limited Leasing (Alternative C) alternative.	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

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89.	Wyoming Department of Environmental Quality	As proposed the No leasing (Alternative A) and Limited Leasing (Alternative C) allow the BLM to prioritize the non-use or limited use of public lands and minerals within a defined mineral resource boundary without conducting the required mineral withdrawal. **The FMLA and FLPMA as amended, obligate the BLM to recognize, facilitate, and prioritize mineral development on BLM-managed lands** and minerals within the CDPA for the purpose of generating revenue for the public interest. This is of particular importance when considering mineral withdrawals within a BLM defined mineral resource boundary, such as the Powder River Basin CDPA. As the state agency with primary regulatory authority over mining activities in the State of Wyoming, DEQ is concerned that Alternatives A and C as proposed exceed BLM's statutory authority under other controlling federal law.	The term “withdrawal” means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

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90.	Wyoming Department of Environmental Quality	**The DEIS fails to meet the requirements for a formal mineral withdrawal** of a CDPA, which should have been addressed first. Therefore, the only alternative that can move forward is Alternative B, "No Action". The BLM does not have the authority to sidestep the formal mineral withdrawal process through the RMP DSEIS process within the CDPA.	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

Row #	Organization Name	Comment Text	Comment Response
91.	Board of Commissioners Converse County, Wyoming	Regarding the BLM SEIS and Plan Amendment, **Converse County questions the agencies path to amend the RMP without considering in further detail the removal of the Coal Development Potential Area (CDPA) as part of a formal withdrawal under FLMPA,** which requires congressional approval and not just a Plan Amendment to the Buffalo RMP. We contend that the proposed revised coal screening process and analysis within the SEIS did not follow the appropriate process for modification. On page ES 6 within the draft SEIS, BLM states "...The CDPA is the decision area which includes approximately 481,000 acres of subsurface federal mineral coal estate. Under Screen 3, 48.12 billion short tons of coal were removed from consideration from leasing in order to reduce greenhouse gas (GHG) emissions as a proxy for climate change in response to the court order..." The SEIS proposed process fails to consider the requirements as set forth in the Federal Mineral Leasing Act of 1920 (FMLA) as amended, the Federal Land Management Policy Act of 1976 (FLPMA) as amended, the Mining and Mineral Policy of 1970, and the Fair Market Value Policy for Leasing Federal Coal of 1984. Certainly, this withdrawal of lands currently identified as the CDPA far exceeds the acreage limitations as outlined in FLPMA. If BLM moves forward with identifying either Alternative A or C as the preferred alternative in the Record of Decision, the SEIS fails to analyze that the removal of the CDPA boundary, coal acreage, and surface acreage should be required to go through a formal mineral withdrawal process including congressional approval so as not to set aside a "defacto" mineral withdrawal area which circumvents the process	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

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92.	National Mining Association	**NMA objects to Alternatives A and C as severely limiting or completely foreclosing further coal leasing** of nearly all lands within the planning area based on the coal screening analysis detailed in Appendix F. **That approach is short-sighted, not only because it ignores the nation's continued need for federal coal to provide affordable and reliable electricity, but it fails to acknowledge the agency's multiple use mandate under the Federal Land Policy and Management Act** (FLPMA). Section 302 of FLPMA provides that "[t]he Secretary shall manage the public lands under principles of multiple use and sustained yield."2 Furthermore, FLPMA requires management of the public lands "in a manner which recognizes the Nation's need for domestic sources of minerals."3 2 42 U.S.C. § 1732(a). 3 43 U.S.C. § 1701(11)-(12). The definition of multiple use in FLPMA was essentially borrowed from the Multiple-Use Sustained-Yield Act of 1960 (MYUSA) and is intended to have the same meaning.4 Therefore, by analogy, the legislative history of MUSYA regarding multiple use principles applies with equal weight to FLPMA. In explaining MUSYA's multiple-use directive, the House Report discusses the "relative values" analysis as follows: 4 See Senate Report No. 95-583 ("this [multiple use] definition is very similar to that . . . which presently appears at section 4 of the Multiple-Use Sustained-Yield Act of 1960 . . . ." and House Report No. 94-1163 ("the definition of multiple use preserves essentially its same meaning as used in the Forest Service Multiple Use Act of 1960 [as MUSYA is also known].)" One of the basic concepts of multiple use is that all of these resources in general are entitled to equal consideration, but in particular or localized areas relative values of the various resources will be recognized.... no resource would be given a statutory priority over the others. The bill would neither upgrade nor downgrade any resource.5 5 See H.R. Rep. No. 1551, 86th Cong., 2d Sess. --- (1960), reprinted in 1960 U.S.C.C.A.N. 2377, 2379. See 43 U.S.C. §§ 1701(a)(3) and National Wildlife Federation v. Buford, 835 F.2d 305, 308-09 (9th Cir. 1987) (finding that classifications must be reviewed consistent with the principles of multiple use and sustained yield).	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in Western Organization of Resource Councils, et al. v. Bureau of Land Management, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

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93.	National Mining Association	**Not only are alternatives A and C inconsistent with FLPMA**, but they fail to achieve the hoped for environmental benefits. Placing this federal coal off limits will not reduce the overall tonnage of coal that is extracted in Wyoming. Rather, it **encourages the development of non-federal coal in a way that is both inefficient and functionally sterilizes federal coal resources**. Such an approach would ultimately result in greater impacts on environmental resources while having a negative long-term impact on revenues to federal, state, and local governments. BLM must reject alternatives A and C.	The BLM's decision area is limited to federal lands and federal mineral estate managed by the BLM. The BLM's decisions do not affect the availability of nonfederal coal. However, realistically, with over 90 percent of the coal being federal coal, it is unlikely that much additional nonfederal coal would be mined without additional federal coal.

Row #	Organization Name	Comment Text	Comment Response
94.	Campbell County Board of Commissioners	Regarding the BLM SEIS and Plan Amendment, **Campbell County questions the agencies path to amend the RMP without considering in further detail the removal of the Coal Development Potential Area (CDPA) as part of a formal withdrawal under FLMPA**, which requires congressional approval and not just a Plan Amendment to the Buffalo RMP. We contend that the proposed revised coal screening process and analysis within the SEIS did not follow the appropriate process for modification. On page ES 6 within the draft SEIS, BLM states "...The CDPA is the decision area which includes approximately 481,000 acres of subsurface federal mineral coal estate. Under Screen 3, 48.12 billion short tons of coal were removed from consideration from leasing in order to reduce greenhouse gas (GHG) emissions as a proxy for climate change in response to the court order..." The SEIS proposed process fails to take into account the requirements as set forth in the Federal Mineral Leasing Act of 1920 (FMLA) as amended, the Federal Land Management Policy Act of 1976 (FLPMA) as amended, the Mining and Mineral Policy of 1970, and the Fair Market Value Policy for Leasing Federal Coal of 1984. Certainly, this withdrawal of lands currently identified as the CDPA far exceeds the acreage limitations as outlined in FLPMA. If BLM moves forward with identifying either Alternative A or C as the preferred alternative in the Record of Decision, the SEIS fails to analyze that the removal of the CDPA boundary, coal acreage, and surface acreage should be required to go through a formal mineral withdrawal process including congressional approval so as not to set aside a "defacto" mineral withdrawal area which circumvents the process.	The term "withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry for the purpose of limiting activities in order to maintain other public values (FLPMA Section 103(j)). Leasing is not settlement, sale, location, or entry. FLPMA Section 204 provides the Secretary of the Interior with withdrawal authority. A FLPMA Section 204 withdrawal contemplates the transfer of title to the lands in question, particularly the patenting or potential patenting, of lands out of Federal ownership into the hands of private parties based on the provisions of the General Mining Law of 1872, as amended, the various Homestead Acts, and other general land law. Mineral leasing occurring under the Mineral Leasing Act of 1920 (MLA) is a discretionary action and not subject to the requirements of FLPMA Section 204. The Mineral Leasing Act of 1920 Section 2 provides the Secretary of the Interior with the authority to lease coal. Federal coal resources have specific planning requirements. These regulations are found in 43 CFR 3420.1. This process results in a determination of areas acceptable for further consideration for coal leasing. Neither the Mineral Leasing Act or FLPMA require that leases within the allocation area be granted or that coal leasing is excluded from the remainder of the planning area (that is, a non-allocated area can be nominated, and the BLM could amend its land use plan if determined warranted). The Mining and Mineral Policy Act of 1970 ordered the Secretary of the Interior to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. The Fair Market Value Policy of Federal Coal Leasing (1984) established that taxpayers are to receive fair market value in the leasing of federal coal reserves. While these policies may encourage coal mining, just as with the Mineral Leasing Act and FLPMA, they do not mandate that coal mining be authorized wherever coal reserves may be present.

Row #	Organization Name	Comment Text	Comment Response
95.	N/A	Figure A-2, Alternative C appears to show all 48.01 billion tons of unleased federal coal reserves as "Acceptable for coal leasing" but the Coal Screening Results Table ES-3 limits the tons available for leasing to 1.24 billion tons which is only five years of reserves at current production rates. **This 1.24 billion tons is not delineated on the map Figure A-2. Who will determine where this acceptable coal will be located?** Is it determined on a first-come, first-served basis? A lease by application process? And who will decide which tracts are offered for lease if coal operators nominate more than 1.24 billion tons?	Section 2.2.6, Alternatives Considered but Eliminated from Further Study, identified that a geographically limited leasing alternative was considered, but that it was not possible to define a geographic area for leasing without interfering with the competitive free-market environment. The BLM would evaluate Lease by Applications as they are received in determining where the available coal would be leased.
96.	N/A	I also hold interests and investments in two State of Wyoming Coal Leases in Township 51 North, Range 73 West and Township 53 North, Range 73 West that are surrounded by or adjacent to Federal coal lands in the Coal Development Potential Area. **Alternative A of the RMPA would isolate these state leases rendering my investments worthless since it is not technically feasible to develop a mine plan for the state leases without including the leasing and mining of some of the adjacent Federal coal reserves** which are deemed "Unacceptable for coal leasing" under Alternative A and likely under Alternative C. How am Ito be compensated for this taking?	As described in the planning criteria (Section 1.4.1), the BLM's decision area is limited to federal lands and federal mineral estate managed by the BLM. No decisions will be made relative to non-BLM-administered lands. The BLM's decisions do not affect the availability of nonfederal coal; the state controls the development of nonfederal coal. The Surface Mining Control and Reclamation Act (SMCRA) of 1977 (Public Law 95-87) established the Office of Surface Mining, Reclamation and Enforcement (OSMRE), which has the statutory role to promote and assist its partner states and tribes in establishing and maintaining a stable regulatory environment for coal mining consistent with SMCRA and administered primarily through state programs, or by OSMRE. Under SMCRA, the State of Wyoming has primary responsibility, known as "primacy," to administer its regulatory programs for mining and reclamation. The proposed plan amendment does not alter the State's regulatory authority under SMCRA.

Row #	Organization Name	Comment Text	Comment Response
97.	N/A	I, and the surviving members of the Hall Ranch Family, have been engaged in a 13-year-long fee coal exchange process and bureaucratic quagmire to obtain a Federally mandated and BLM agreed-to exchange of coal minerals for 138 million tons of mineable coal under the Wildcat Creek Alluvial Valley Floor which was sterilized by the terms of the Surface Mining Control and Reclamation Act in 1978. **The BLM preferred alternatives, described in the SEIS and RMPA, which delineate lands "Unacceptable for coal leasing" (Figure A-1 and Figure A-2), would appear likely to preclude or severely restrict the completion of a meaningful fee coal exchange.** If the lands identified as unacceptable for coal leasing are also deemed unacceptable for exchange, how are we going to complete the exchange? How will I and the Hall Family be compensated for the taking of these coal minerals under this RMPA?	The SMCRA of 1977 requirements ensure that coal mining operations are conducted in an environmentally responsible manner and that the land is adequately reclaimed during and following the mining process. SMCRA Section 510(b)(5) prohibits surface mining within qualifying alluvial valley floors. Title 43 CFR 3436 establishes criteria and procedures for the equal value exchange of fee held coal for unleased federally owned coal in cases where surface coal mining operations on the lands that are fee held would interrupt, discontinue, or preclude farming on alluvial valley floors or materially damage the quantity or quality of water in surface or underground systems that supply those alluvial valley floors. The merits of a specific alluvial valley floor are outside the scope of the potential RMPA/SEIS. Mining of the private coal within the Wildcat Creek alluvial valley floor is not within sufficient proximity to an existing coal mine for mining to be likely. It is beyond the scope of the potential RMPA/SEIS to opine on the whether the federal coal tract requested by the Hall Ranch Family (North Antelope South Tract), which is some distance from the Hall Ranch and immediately adjacent to mineable reserves and competitively valued (DME 2017) would be appropriate. BLM's delineation of federal lands unacceptable for future coal leasing do not dictate how fee coal might be used and would not restrict completion of an exchange.
98.	Wyoming Department of Environmental Quality	Carbon Capture: The DSEIS ignores the fact that coal is not the issue at hand, the release of CO2 is the issue to be resolved. **The Draft SEIS fails to incorporate an adequate discussion and analysis on Carbon Capture Utilization and Storage (CCUS).** Advances in carbon capture and storage technologies make PRB coal even more environmentally protective and beneficial. The Administration has recognized in its proposed greenhouse gas emission standards for fossil-fuel fired electric generating units that CCUS is a commercially available technology for the mitigation of carbon dioxide emissions from coal-fired power plants and could capture up to 90 percent of the CO2 from these facilities while reducing other criteria pollutants (see 88 Fed Reg 33240 (May 23, 2023)). The DSEIS also fails to include in its analysis a discussion of the 45Q and Carbon-Safe programs. The DSEIS is deficient and inadequately address the complete and critical role of CCUS.	A discussion of CCUS has been added to the GHG affected environment, and an alternative uses of coal discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
99.	Wyoming Department of Environmental Quality	Non-Thermal Coal Uses: BLM assumes coal for this DSEIS will only be used for thermal power production. **The DSEIS fails to adequately address the use of coal as a feedstock to produce many materials and other products** needed and of national-security value. For example, PRB federal coal seams are currently being evaluated as a source for rare earth elements and critical minerals needed for energy technologies such as wind turbines and batteries. Materials in or associated with coal can also be used for advanced technology industries such as battery production, solar panel production, and aerospace technologies (among other advanced manufacturing sectors). BLM does discuss these alternative uses within the DSEIS, however, the analysis conducted is brief and incomplete.	An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.
100.	Board of Commissioners Converse County, Wyoming	Non-thermal Coal Uses - B**LM should also consider in greater detail advancements in coal development, technology improvements, and new products derived from coal, which include but are not limited to, CCUS, carbon capture and storage (CCS), carbon fiber, coal-to-products and extracting Critical Minerals (CM) and Rare Earth Elements (REE) from coal.** This will strengthen the need for coal products in the future and enforce the need to continue with a coal leasing program long-term. New technology is being discovered every day and while many innovative ideas are either in the Research and Development or demonstration phases, some are advancing to commercialization faster than we realize. Products under development include, but are not limited to: components for asphalt for roads and roofing materials, building materials (bricks, foam, drywall, pavers, aggregate for roads and other products), graphene oxide, soil amendments that can be used in reclamation, and polymer products (decking material) and carbon membranes for water purification. Graphite, a major component of batteries of electric vehicles, is also being studied as a by-product of coal. Without the future leasing of coal in sufficient quantities, these potential advances for the use of coal will never come to fruition. This would be a significant loss not only for the coal industry but the greater public as well.	An emissions control and carbon capture discussion has been added to the GHG affected environment section. An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
101.	Board of Commissioners Converse County, Wyoming	Thermal Coal Use -- The coal produced in Wyoming is available to power the nation's baseload thermal energy production for decades to come. Even under the most aggressive energy transition predictions, the need for thermal coal baseload power will continue well beyond the 2040 timeframe. Statistics show that the US and the world are going to require more energy in the future and without a broad-based strategy for energy sources, the demand may very well outpace the supply. The need for the nation's security and a strong economy will demand that electricity remain reliable and affordable, requiring the use of coal-fired power. Converse County understands that the market is demanding reliable, affordable energy along with emission reductions. We are home to the Dave Johnson Coal-Fired Power Plant that is scheduled be decommissioned in the near future. We embrace technologies like Carbon Capture, Utilization and Storage (CCUS). Some of Wyoming, and the nation's coal-fired power plants are ideal for CO2 capture. We contend that burning coal is not the issue, but rather the release of CO2 is the issue. If the true goal is to reduce or eliminate CO2 emissions into the atmosphere, then CO2 should be the focus. The reduction of CO2 can be achieved and coal can continue to provide reliable, low-cost energy through the deployment of CCUS. If coal leasing is discontinued and specifically for thermal energy purposes, **BLM must analyze where sufficient energy resources will come from to meet energy grid demands** in the United States. Coal continues to be an abundant, affordable and reliable energy source. Without future leasing and thermal coal production our domestic energy security would be at risk. It is irresponsible to limit or eliminate leasing of coal until we better understand the needs for coal in both thermal and non-thermal uses now and in the future.	An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP. Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source.
102.	State of Wyoming, Office of the Governor	Following the last iteration of the Buffalo Coal RMP which withdrew acreage from the Federal Mineral leasing Area, **any alternative with additional limitations based on volume is inappropriate and not a part of the most recent court order.**	The court order required a limited leasing alternative; there was no constraint that the alternative could not be based on volume. The coal market is based on volume (tons) not area (acres).

Row #	Organization Name	Comment Text	Comment Response
103.	Campbell County Board of Commissioners	Non-thermal Coal Uses - **BLM should also consider in greater detail advancements in coal development, technology improvements, and new products derived from coal, which include but are not limited to, CCUS, carbon capture and storage (CCS), carbon fiber, coal-to-products and extracting Critical Minerals (CM) and Rare Earth Elements (REE) from coal.** This will strengthen the need for coal products in the future and enforce the need to continue with a coal leasing program long-term. New technology is being discovered every day and while many innovative ideas are either in the Research and Development or demonstration phases, some are advancing to commercialization faster than we realize. Products under development include, but are not limited to, components for asphalt for roads and roofing materials, building materials (bricks, foam, drywall, pavers, aggregate for roads and other products), graphene oxide, soil amendments that can be used in reclamation, and polymer products (decking material) and carbon membranes for water purification. Graphite, a major component of batteries of electric vehicles, is also being studied as a by-product of coal. Without the future leasing of coal in sufficient quantities, these potential advances for the use of coal will never come to fruition. This would be a significant loss not only for the coal industry but the greater public as well.	An emissions control and carbon capture discussion has been added to the GHG affected environment section. An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) become mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
104.	Campbell County Board of Commissioners	Thermal Coal Use -- The coal produced in Wyoming is available to power the nation's baseload thermal energy production for decades to come. Even under the most aggressive energy transition predictions, the need for thermal coal baseload power will continue well beyond the 2040 timeframe. Statistics show that the US and the world are going to require more energy in the future and without a broad-based strategy for energy sources, the demand may very well outpace the supply. The need for the nation's security and a strong economy will demand that electricity remain reliable and affordable, requiring the use of coal-fired power. Campbell County understands that the market is demanding reliable, affordable energy along with emission reductions. **We embrace technologies like Carbon Capture, Utilization and Storage (CCUS).** Some of Wyoming, and the nation's coal-fired power plants are ideal for CO2 capture. However, CO2 is one of the hundreds of factors that influence climate change and to believe the climate can be influenced on the margins by one of these factors is misguided. To demonstrate Wyoming's leadership in this arena, the University of Wyoming (UW) School of Energy Resources (SER) website describes that researchers at the UW are currently funded by the U.S. Department of Energy (DOE) to advance a potential large-scale integrated CO2 storage project near Gillette, Wyoming, known as the Wyoming CarbonSAFE project. The Wyoming CarbonSAFE Project, which stands for Carbon Storage Assurance Facility Enterprise, is one of thirteen original carbon capture, utilization, and storage (CCUS) project sites in the U.S. with the ultimate goal of ensuring carbon storage complexes will be ready for integrated CCUS system deployment. In addition, the ITC provides space for researchers to test carbon capture, utilization and storage technologies using actual coal-based flue gas from a coal-fired power plant and is also located in Gillette. Campbell County in partnership with Wyoming remains committed to continue to find ways to move towards a net zero or a net neutral emissions goal. If coal leasing is discontinued and specifically for thermal energy purposes, BLM must analyze where sufficient energy resources will come from to meet energy grid demands in the United States. Coal continues to be an abundant, affordable and reliable energy source and without future leasing and thermal coal production our domestic energy security would be at risk. It is irresponsible to limit or eliminate leasing of coal until we better understand the needs for coal in both thermal and non-thermal uses now and in the future.	An emissions control and carbon capture discussion has been added to the GHG affected environment. When CCUS or other technologies mature enough to need federal coal, the BLM has the ability to amend the RMP. Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source.

Row #	Organization Name	Comment Text	Comment Response
105.	Center For Biological Diversity	Commenters (collectively, "Conservation Groups") not only appreciate the opportunity to provide input to inform these planning processes, they also wish to express appreciation that BLM has agreed to consider, for the first time in these planning processes, a "no leasing" alternative, and for inclusion of that alternative as one of the "co-preferred alternatives" provisionally selected by BLM. As Conservation Groups pointed out in their scoping comments, BLM is under no legal imperative to lease public lands for coal development. We are pleased that BLM has acknowledged this reality in the selection of its co-preferred alternatives. This approach represents a significant step in the right direction, as does BLM's qualitative analysis of climate and non-climate environmental and public health impacts. Conservation Groups nonetheless feel it imperative to once again **urge BLM to select the only legally, economically, and scientifically justifiable alternative (no future leasing),** and to highlight selected areas where BLM's analyses can and should be improved.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. The selection of the preferred alternative/proposed plan is identified in the executive summary and discussed in Section 2.2.5 Rationale for Identifying a Proposed Plan Amendment.
106.	Center For Biological Diversity	If BLM persists in its current approach of selecting co-preferred alternatives, including one allowing for limited future leasing (or if BLM ultimately selects the limited leasing alternative as its sole preferred alternative), its analyses for the planning areas **must address the social and economic costs resulting from development of any future lease**s, and explain what benefits warrant incurring those costs. For example, the SEIS estimate of social costs for the Alternative C limited leasing alternative for the Buffalo Field Office planning area estimates astronomical social costs from GHG emissions alone: ranging from more than $19 billion to nearly $252 billion (depending on the discount rate used) between 2040 and 2048. Buffalo Field office Draft SEIS and Potential RMPA at 3-86. **Under no circumstance could these impacts be considered anything other than unnecessary and undue degradation.** 43 U.S.C § 1732(b).	Social cost was estimated for all alternatives, including the Limited Leasing Alternative (C) in Section 3.5.2 Greenhouse Gas Emissions and Climate Change.. Unnecessary or undue degradation is avoided by (a) complying with the lease terms and conditions; approved mine plan of operations and other federal and state laws related to environmental protection and protection of cultural resources; and (b) assuring that operations are "reasonably incident" to mining or processing operations.

Row #	Organization Name	Comment Text	Comment Response
107.	Center For Biological Diversity	Further, **BLM has failed to identify any countervailing economic benefits that come remotely close-within an order of magnitude-of the economic harms caused by any additional leasing**. As such, any option other than the no leasing alternative would be arbitrary and capricious. This comparison is even starker given that **BLM omits the significant benefits of the IRA,** which would be available throughout the region in the no lease alternative	Funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic benefactors are discussed in Sections 3.5.3 and 3.5.4, including detail on funding magnitude and how funds for mineral development are allocated for state and local operations. Revenues from mineral development and more specifically, coal, are also identified, with impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, discussed and presented in tables throughout. A discussion of the Inflation Reduction Act was added to the Social and Economic Considerations Affected Environment section (Section 3.5.3).
108.	U.S. Environmental Protection Agency	Rather than relying only on subsequent NEPA analyses at the coal leasing phase to disclose and consider potential climate change impacts, **we recommend that a climate vulnerability analysis be included in the Final SEIS.** Climate-related risks and associated impacts can be considered in decision making at the current RMP stage, such as to address any climate change resiliency needs or concerns that may exist if specific federal lands remain open to leasing under the RMP amendment. This analysis should consider the climate change impacts identified in Section 3.5.2 and connect them to the local public infrastructure and resources in the planning area. These potential risks include increased temperatures and extreme heat, the increased frequency of heavy precipitation events and flooding, increased wildfire frequency, and more severe summer droughts which may all impact local communities. These potential risks include failure of mine operational containment infrastructure (e.g., spill over events) and excess erosion, which could lead to adverse impacts to community infrastructure, drinking water resources, and aquatic habitat. We recommend that the SEIS acknowledge and consider these types of potential risks and consider making commitments in the RMP to require specific actions to reduce such risks, and consider community feedback about their impacts, at the federal coal leasing stage.	An evaluation of "local public infrastructure and resources" would require information on the locations and specific characteristics of those infrastructure and resources, which would require direct consultation with local governments within the planning area. This would likely necessitate a significant time extension to the 16-month SEIS deadline the Great Falls Division of the US District Court for Montana granted the BLM to obtain detailed information from local governments. Additionally, the level of detail for climate projection information would require information regarding temperatures and precipitation that are scientifically downscaled to the local environment of the planning area. The climate information would then need to be analyzed to project impacts on local hydrologic and biologic resources within the planning area to assess potential climate change impacts on the local public infrastructure and resources.

Row #	Organization Name	Comment Text	Comment Response
109.	U.S. Environmental Protection Agency	EPA appreciates the comprehensive discussion on state and global climate trends included in Section 3.5.2 of the Draft SEIS. To further support this analysis, **we recommend that the Draft EIS connect the GHG impacts analysis for each alternative in Section 3.5.2, Direct and Indirect Analysis, to the GHG emission reduction goals referenced on page 3-66**. These goals include the Whitehouse long-term strategy to achieve net-zero GHG emissions by 2050.[1] **We also recommend the SEIS identify mineral lease stipulations** that would apply to mitigate any adverse impacts to these federal climate change goals, such as requirements for GHG emissions offsets or climate change impact fees. 1 National Climate Task Force: https://www.whitehouse.gov/climate/	The US national long-term strategy of limiting global temperature rise and net-zero emissions are not a legal requirement, but an expressed national goal. The BLM has no legal authority to impose mitigation measures (including emission offsets or climate change impact fees) of GHG emissions resulting from either transportation/processing activities or end point combustion of fossil fuel products extracted on BLM-administered lands. Only GHG emissions directly resulting from fossil fuel extraction are within the BLM's jurisdiction. The BFO Final SEIS, Tables 3-33, 3-35, 3-36 and 3-37 show that fossil fuel production emissions total 6.75 MMT CO_2e, whereas total life cycle emissions attributable to federal fossil fuels extracted from the BFO planning area are 465.54 MMT CO_2e emissions. Thus, the BLM administratively has some level of control over only the 1.5 percent of CO_2e attributable to the full life cycle of fossil fuel extracted from the federal mineral estate within the BFO planning area.

Row #	Organization Name	Comment Text	Comment Response
110.	Navajo Transitional Energy Company	**BLM improperly calculates and understates the total emissions** for Alternatives A and C. As noted in the SEIS, the Council on Environmental Quality has released interim guidance to assist agencies with estimating greenhouse gas (GHG) emissions and climate change effects. 88 FR 1196 (Jan. 9, 2023) (the "Interim Guidance"). In short, under the Interim Guidance, agencies should quantify proposed actions' GHG emissions and place GHG emissions in appropriate context. Federal agencies must disclose and consider the reasonably foreseeable effects of their proposed actions, including the reasonably foreseeable GHG emissions. 88 FR 1196, 1200. And the National Environmental Policy Act requires agencies to consider the worldwide and long-range character of environmental problems, such as climate change. 42 U.S.C. § 4332(2)(F). Climate change is caused by GHG emitted anywhere around the world and GHG emissions from coal combustion are, overwhelmingly, a product of the demand1 for coal by downstream users. See, e.g., SEIS at 3-88 (finding 6,163 of 6,321 MMT CO2e are from downstream combustion). Therefore, **proposed alternatives will reduce GHG emissions and climate impacts only to the extent they reduce the worldwide demand for coal**. The Ninth Circuit has endorsed the need to consider how an alternative changes worldwide demand and production related emissions. 1 Demand means the quantity consumers are willing and able to purchase. O'Sullivan; Sheffrin, Economics: Principles in Action 79 (2003). "The direct downstream emissions of the no-action alternative are zero, but-as BOEM recognized-its indirect downstream emissions may be much higher. Not drilling at the proposed site may cause global oil supply to fall, demand to rise, and, as a result, require drilling and oil extraction elsewhere. **To capture these indirect downstream emissions, BOEM used a market-simulation model** to predict the greenhouse gas emissions for energy sources that would substitute for the oil not produced...." Ctr. for Biological Diversity v. Bernhardt, 982 F.3d 723, 736 (9th Cir. 2020).	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal is not exported; global coal effects are outside the scope of the SEIS. Coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3).

Row #	Organization Name	Comment Text	Comment Response
111.	Navajo Transitional Energy Company	Coal production, like GHG emissions, is driven primarily by demand. SEIS at 3-101 ("Since mines already have recoverable reserves on hand, annual production decisions are driven by market demand and mine mouth prices for low-sulfur sub-bituminous coal from Wyoming's Powder River Basin.") (Footnote omitted). **The SEIS assumes that there will be no substitution whatsoever of Wyoming's Powder River Basin coal**, which is a clearly unrealistic assumption provided without evidence or discussion. The Ninth Circuit explicitly rejected an agency decision to omit foreign emissions from its GHG calculations, even when the exact emitter and quantities are unknown. 982 F.3d at 740. It is enough to know that there will be some increase in foreign emissions to warrant discussion and environmental analyses. Scientists' Inst. For Pub. Info., Inc. v. Atomic Energy Comm'n, 481 F.2d 1079, 1092 (D.C. Cir. 1973). Based on information provided in the SEIS, **it is reasonably foreseeable that Alternative A will result in increased emissions from other sources, and BLM must account for those other emissions in its SEIS**. In fact, it is likely that the total GHG emissions for Alternative A approximates GHG emissions of the other alternatives, at least for the analysis period, because all of the downstream sources (which account for 97% of GHG emissions attributed to coal mining) will be able to source coal from elsewhere.	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal is not exported; global coal effects are outside the scope of the SEIS. Coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3).

Row #	Organization Name	Comment Text	Comment Response
112.	Navajo Transitional Energy Company	Following Bernhardt, **the SEIS must consider how the alternatives that end mining in Wyoming's Powder River Basin may cause mining and extraction-and accompanying GHG emissions-elsewhere**. BLM cannot simply ignore these downstream emissions, it must account for sources that would substitute for the coal not produced. As discussed in Bernhardt, many factors influence which power plants operate and, thus, the demand for coal from energy generation units. Those factors include the relative price of coal and its substitution elasticity, generators' nonfuel variable operating costs, startup/shut down costs, emission rates and allowance costs, electricity grid flow constraints, and reliability constraints.2 The SEIS does not discuss how any of the proposed alternatives will impact any of these factors, so it is not clear how limiting future coal mining in Wyoming's Powder River Basin would reduce worldwide coal demand- and worldwide emissions. 2 U.S. Energy Information Administration, Fuel Competition in Power Generation and Elasticities of Substitution, 1 (June, 2012) ("The elasticity of substitution concept measures how the use of these fuels varies as their relative prices change.") (https://www.eia.gov/analysis/studies/fuelelasticities/pdf/eia-fuelelasticities.pdf) (last accessed Jul. 25, 2023).	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal is not exported; global coal effects are outside the scope of the SEIS. Coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3).

Row #	Organization Name	Comment Text	Comment Response
113.	Navajo Transitional Energy Company	Under both the Interim Guidance and judicial precedent, BLM must consider all reasonably foreseeable emissions caused by selecting an alternative. However, **the SEIS misrepresents the total emissions of Alternative A by failing to account for the foreseeable increase in emissions from other sources.** If production in Wyoming's Powder River Basin is prohibited after 2040, the downstream sources of GHG emissions will readily find additional coal from other regions. To the extent that coal comes from less efficient sources (as it likely will), the overall emissions may even increase, even if there is less than perfect substitution. In sum, the emissions from coal produced at sites other than Wyoming's Powder River Basin are foreseeable emissions that must be accounted for when evaluating Alternative A. See 982 F.3d at 736.	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal is not exported; global coal effects are outside the scope of the SEIS. Coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3). Energy markets are complex, and the net effects of production changes in one location or one sector are affected by multiple factors in the broader energy market. In general, reductions in oil, natural gas, or coal produced from federal leases may be partially offset by nonfederal production (state and private) in the United States or by overseas production (i.e., geographic substitution). The effect of this substitution on indirect GHG emissions depends on the fuel produced and transportation costs. For example, overseas production often faces more relaxed regulatory requirements for production, and the produced fuels would need to be physically transported into the United States. There may also be substitution of other energy types to meet energy demand. These substitution patterns will be different for different fuel types. Further, the effect of substitution between different fuel sources on indirect GHG emissions depends on the replacement energy source. For example, coal is a relatively more carbon intense fuel than natural gas, and hydroelectricity is the least carbon intense fuel. In the transportation sector, alternatives to oil are likely to be less carbon intensive. Additionally, substitution across energy sources or locations may not fully meet the energy needs that would otherwise have been realized through production from the federal mineral estate. Price effects may lower the market equilibrium quantity demanded for some fuel sources. This would lead to a reduction in indirect GHG emissions. These three effects are likely to occur in some combination when considering substitution away from federal fossil fuels, but the relative contribution of each clearly depends on many interrelated and complex factors.

Row #	Organization Name	Comment Text	Comment Response
114.	Board of Commissioners Converse County, Wyoming	Furthermore, the Biden Administration has identified Wyoming as a "Priority Energy Community" by the U.S. Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. Through the Infrastructure and Investment Jobs Act (IIJA) and the Inflation Reduction Act (IRA) the Administration has appropriated DOE at unprecedented funding levels to promote the timely evolution of advanced technologies for coal (i.e. carbon management projects, REE/CM extraction from coal, etc.) to reduce carbon emissions. **These demonstration projects are currently underway and they need a chance to ascertain whether or not commercialization is possible.** It would be premature to make a determination of no leasing or limited leasing until these projects reveal a clear path forward.	An emissions control and carbon capture discussion has been added to the GHG affected environment section. An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
115.	Campbell County Board of Commissioners	Furthermore, the Biden Administration has identified Wyoming as a "Priority Energy Community" by the U.S. Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization. Through the Infrastructure and Investment Jobs Act (IIJA) and the Inflation Reduction Act (IRA) the Administration has appropriated DOE at unprecedented funding levels to promote the timely evolution of advanced technologies for coal (i.e. carbon management projects, REE/CM extraction from coal, etc.) to reduce carbon emissions. **These demonstration projects are currently underway, and they need a chance to ascertain whether or not commercialization is possible.** It would be premature to make a determination of no leasing or limited leasing until these projects reveal a clear path forward.	An emissions control and carbon capture discussion has been added to the GHG affected environment section. An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.
116.	Center For Biological Diversity	Importantly and contrary to the narrative of the DSEISs that reduction in coal mining will result in economic losses in the Powder River Basin, the IRA provides significant funding for energy communities, low income communities, and disadvantaged communities, which are over represented in the PRB, as the DSEISs note.42 The IRA provides billions of dollars in dedicated funding for clean energy development in low income and disadvantaged communities, as well as climate block grants for environmental remediation and clean energy work force development.43 This significant influx of federal funding is intended to leverage additional private financing, making tens of billions of dollars available to finance a just transition for rural communities burdened by and dependent on fossil fuels. Significant tax incentives directly target rural, low income, disadvantaged, and energy communities, like those in the PRB: 42 See Greg Dotson & Dustin Maghamfar, The Clean Air Act Amendments of 2022: Clean Air, Climate Change, and the Inflation Reduction Act, 53 Env't L. Rep. 10017 (2023). 43	BLM assistance with transition from coal is outside the scope of the SEIS. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Additional discussion on these opportunities has been added to the Social and Economic Considerations section (3.5.3) and Environmental Justice section (3.5.4).

Row #	Organization Name	Comment Text	Comment Response
116 *(cont.)*	Center For Biological Diversity *(continued)*	Id. For too long, Tribal nations, rural areas, low-income communities, and communities of color have been left behind as the rest of America prospers. Through the Inflation Reduction Act, we will invest billions of dollars to expedite and expand deployment of new clean energy projects so that these communities will benefit in the form of new economic development, good-paying jobs, and less pollution. The Inflation Reduction Act structures the clean energy Production Tax Credit (PTC) and Investment Tax Credit (ITC) provisions to incentivize investment in communities most in need of new economic development. The PTC, as extended, and the new Clean Electricity PTC offer a 10 percent credit increase for facilities located in an energy community. The ITC, as extended, and the new Clean Electricity ITC offer up to a 10-percentage point bonus credit for projects located in an energy community. The ITCs also offer another 10-percentage point bonus allocated investment credit for qualified solar and wind facilities located in a low-income community or on Tribal land and a 20-percentage point bonus for projects that are part of a qualified low-income residential building project or a qualified low-income economic benefit project. This bonus amount will require an application by the taxpayer, with a cumulative total of 1.8 GW of direct current capacity per year available for allocation. Additional information about this allocated bonus credit will be issued by the Department of the Treasury. The Inflation Reduction Act also structures the tax provisions to ensure that new clean energy projects create good-paying jobs. The PTC and ITC offer bonus credit to projects that pay the prevailing wage or use registered apprentices. They also offer bonus credit for projects that meet certain domestic content requirements for steel, iron, and manufactured products, a provision designed to strengthen America's manufacturing base and the good-paying jobs needed to support it. The Zero-Emission Nuclear Power Production Credit also offers bonus credit for facilities meeting prevailing wage requirements. The Environmental Protection Agency's Greenhouse Gas Reduction Fund, by statute, must dedicate at least $15 billion of the Fund's $27 billion appropriation to help low-income and disadvantaged communities deploy or benefit from projects that reduce greenhouse gas emissions and other air pollution. This requirement aligns with the President's Justice40 Initiative, which commits to delivering 40 percent of the benefits of certain federal investments to disadvantaged communities. As noted above, the ITC offers bonus credit for solar and wind investments on Tribal land. In addition, the Inflation Reduction Act increases the Department of Energy's loan authority	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
116 *(cont.)*	Center For Biological Diversity *(continued)*	from $2 billion to $20 billion for the Tribal Energy Loan Guarantee Program, allowing the agency to offer more support to Tribal Energy Development Organizations and federally recognized Tribes, including Alaska Native villages or regional or village corporations, for energy-related Projects.44 44 Exhibit 27, Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action (2023), available at https://www.whitehouse.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Gu idebook. pdf. Stacking the available tax credits can provide up to or more than a 40% tax credit for clean energy projects in communities in the PRB. The US Department of Energy has even made a mapping tool to identify qualifying communities.45 Renewable energy can provide substantial economic benefits to rural communities, in the form of reliable tax revenue, long term jobs, and local business development.46 BLM must consider these benefits to ensure an accurate comparison of alternatives. By omitting these benefits, BLM unfairly and unlawfully advantages continued leasing alternatives. The communities throughout the PRB must not be portrayed unfairly to rely on fossil fuels and BLM must not unfairly force these communities to rely on fossil fuels. The evidence noted above and in the DSEISs shows that the climate impacts of continued fossil fuel development are economically inefficient and produce net harm to the public in general. **A fair accounting of economic alternatives available in the absence of fossil fuel development shows that local communities throughout the PRB can also benefit from a just transition. BLM must provide this evenhanded analysis to the public.** 45 https://arcgis.netl.doe.gov/portal/apps/experiencebuilder/experience/?id=a2ce47d4721a477a8701bd0e08495e 1d. 46 Exhibit 28, Kevin Brehm et al., Rocky Mountain Institute, Seeds of Opportunity (2021).	*(see above)*

Row #	Organization Name	Comment Text	Comment Response
117.	Center For Biological Diversity	**BLM must address the pressing need to support a just and equitable transition away from continued coal production** on existing leases, including an analysis of the significant funding available through the Inflation Reduction Act	BLM assistance with transition from coal is outside the scope of the SEIS. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Additional discussion on these opportunities has been added to the Social and Economic Considerations section (3.5.3) and Environmental Justice section (3.5.4).
118.	N/A	BLM's organic law, FLPMA, requires BLM to manage renewable resources like soil, vegetation, and wildlife habitat for their "sustained yield" to benefit current and future generations. Even back in 1976 with FLPMA, Congress recognized the importance of sustainable resource management. The climate crisis and continued burning of fossil fuels pose a direct threat to the "sustained yield" of renewable resources on BLM lands because of dramatic weather events and erratic changes in weather patterns. Extreme heat events and prolonged drought are examples. Natural ecological systems are already being altered and under greater stress. For those paying attention, it is easy to connect these dots. As such, **any further BLM coal leasing would be an obvious threat to the future health, productivity, and diversity of renewable resources and therefore would violate this basic BLM FLPMA requirement.**	All of the issues identified have been addressed in the Final SEIS and are consistent with FLPMA guidance.
119.	State of Wyoming, Office of the Governor	The BLM's approach also neglects to account for any coal that may be extracted for purposes other than thermal. Earlier this year, this Administration's Department of Energy's Office of Fossil Energy and Carbon Management announced $6 million to develop useful products from coal and coal wastes. Their February 16, 2023 press release noted, "Coal's unique structure and composition make it well-suited for use as a raw material for producing various high-value carbon products like carbon nano-materials, activated carbons, and graphite, which may be used for computer memory devices, LED lighting, solar photovoltaic cells, batteries, capacitors, sorbents, catalysts, membranes, and medical imaging."2 Again, artificially **limiting the volume of coal allowed to be leased will prevent any additional uses of coal to be explored** beyond what is deemed by the EIA to be minimum demand. 2 https://www.energy.gov/fecm/articles/doe-invests-6-million-develop-useful-products-coal-and-coal-wastes-support-clean	A discussion on alternative coal uses was added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
120.	Center For Biological Diversity	V.**BLM Must Address the Need for a Just Transition to Accompany a Managed Decline of Federal Coal Production including Analysis of the Impacts** of the Inflation Reduction Act. While as noted, BLM's determination that a no leasing alternative is a preferred alternative is a much needed and much appreciated step forward, the agency must discuss a just transition for the currently coal dependent communities. As the draft analyses demonstrate, the majority of the coal mined in the Powder River Basin is public, federal coal and federal policy has dictated development of these coal reserves. It is wrong for BLM to refuse to consider means of diversifying local economies through renewable energy or the impact of the Inflation Reduction Act (IRA). BLM makes a point to discuss the economic impacts that would result from winding down coal mining in the basin over the next two decades. Not only will the IRA contribute to the continued decline in coal generation in the US, but it will also result in increased renewable generation. According to the Energy Information Administration's most recent energy outlook, "The IRA provides additional incentives to wind and solar power generation, which accelerates the near-term decline of electric power sector coal-fired generating capacity and hastens the timeline for retirement in the U.S. coal fleet."41 This is critical because BLM relies on the Energy Information Administration's projections throughout its analyses. 41 Exhibit 26, EIA, Annual Energy Outlook (2023).	An analysis of the impacts of the Inflation Reduction Act are outside the scope of the SEIS. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. A discussion of the Inflation Reduction Act was added to the Social and Economic Considerations Affected Environment section (3.5.3) and the Environmental Justice section (3.5.4). Additional analysis to the local economy was added to the Final SEIS.
121.	Board of Commissioners Converse County, Wyoming	Additionally, the Federal Land Policy and Management Act (FLPMA) provides a framework for managing public lands that requires a systematic, interdisciplinary approach and requires coordination in land-use planning with other state and federal agencies. Under FLPMA (43 USC 1712 [1976]), **the BLM is required to stay apprised of local land use plans, assure consideration is given to local land use plans, assist in resolving inconsistencies with state and local land use plans, and provide meaningful opportunities for local government officials to participate in the development of land use programs, regulations, and decisions for public lands** that may have a significant impact on non-federal lands. Converse County consistency review should be included in the SEIS.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).

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122.	Board of Commissioners Converse County, Wyoming	Furthermore, NEPA establishes a national policy and goals for the protection, maintenance, and enhancement of the environment. Two key requirements of NEPA are that agencies consider alternatives and that the public officials and citizens are involved in the decision-making process. NEPA established a Council on Environmental Quality (42 US Code [USC] 4321 (19701), which issued regulations for implementing provisions of the law (40 Code of Federal Regulations [CFR] 1500-1508 [1970]). In these regulations is the **requirement that federal agencies to consider and use local planning documents during their decision making and planning efforts** (40 CFR 1506.2 [1978] and 43 CFR 1610.3-2(a) [1983]).	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).
123.	Board of Commissioners Converse County, Wyoming	Consistency with Campbell County Natural Resource Plan (CCNRP) - **Converse County encourages both state and federal agencies to be as consistent as allowed by law with the Converse County Natural Resource Management Plan** adopted in July of 2022. The County Plan specifically recognizes that the private sector is the best engine for economic growth; and regulatory policies should respect the role of state and local governments. In adopting this land use plan, the Board of Converse County Commissioners intends that: The basis for management of all public lands is multiple-use management that considers Converse County's custom and culture and economic wellbeing in coordination with the County. Private property and interests in private property are protected and the continuation of private economic pursuits is promoted within Converse County. Federal and state agencies should support traditional multiple land uses within Converse County to maintain continuity in the local economy and assure the sustainability of existing agricultural, recreational, and industrial interests while maintaining or improving the present environmental quality of life.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).

Row #	Organization Name	Comment Text	Comment Response
124.	State of Wyoming, Office of the Governor	As I mentioned, the PRB's Coal Development Potential Area (CDPA) continues to be whittled away by antagonistic administrations and incessant lawsuits. First, the BLM looked to reduce the CDPA acreage. Now, it has changed the screening process to limit the volume of leasable coal. The federal government persists in forcing state and local governments, counties, communities, industries, and the businesses that support them all to accept their unpopular mandates. This fact is even recognized in the SEIS "Relationship to State and Local Plans" by the BLM's statement that, **"The no-leasing and limited-leasing alternatives are not consistent with the 2022 Campbell County Natural Resource Land Use Plan."** The two alternatives listed here are identified as the BLM's co-preferred alternatives and both involve the further restriction of federal coal leasing. Dismissing local land use plans with one sentence shows an inadequate cooperative process that appears to be politically driven. This matter will be further explored during the Governor's Consistency Review.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).
125.	Campbell County Board of Commissioners	Furthermore, the Federal Land Policy and Management Act (FLPMA) provides a framework for managing public lands that requires a systematic, interdisciplinary approach and requires coordination in land-use planning with other state and federal agencies. Under FLPMA (43 USC 1712 [1976]), **the BLM is required to stay apprised of local land use plans, assure consideration is given to local land use plans,** assist in resolving inconsistencies with state and local land use plans, and provide meaningful opportunities for local government officials to participate in the development of land use programs, regulations, and decisions for public lands that may have a significant impact on non-federal lands.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).
126.	Campbell County Board of Commissioners	Furthermore, NEPA establishes a national policy and goals for the protection, maintenance, and enhancement of the environment. **Two key requirements of NEPA are that agencies consider alternatives and that the public officials and citizens are involved in the decision-making process. NEPA established a Council on Environmental Quality (42 US Code [USC] 4321 [1970]), which issued regulations for implementing provisions of the law (40 Code of Federal Regulations [CFR] 1500-1508 [1970]). In these regulations is the requirement that federal agencies to consider and use local planning documents during their decision making and planning efforts** (40 CFR 1506.2 [1978] and 43 CFR 1610.3-2(a) [1983]).	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).

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127.	Campbell County Board of Commissioners	Chapter 1, Purpose and Need 1.6, Page 1-13 "Relationship to state and Local Plans" -- "...**The no-leasing and limited-leasing alternatives are not consistent with the 2022 Campbell County Natural Resource Land Use Plan,** which states the county's policy as... federally managed lands shall remain open and available for mineral resource exploration, development and production, unless administrative withdrawal or other action is necessary to protect the national security and withdrawal procedures are fully followed..." While we appreciate BLMs acknowledgement of the consistency and inconsistency with the County Plan, we disagree with the preferred alternative choices. We believe that BLM is making a political decision to support Alternative A and C versus Alternative B, which will impact our ability to meet the energy demands of this country and stifle future uses of non-thermal coal both now and in the future.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).
128.	Campbell County Board of Commissioners	Consistency with Campbell County Natural Resource Plan (CCNRP) -- **Campbell County encourages both state and federal agencies to be as consistent as allowed by law with the Campbell County Natural Resource Land Use Plan** adopted in September of 2022. The County Plan specifically recognizes that the private sector is the best engine for economic growth; regulatory policies should respect the role of state and local governments; and state and federal land policies and regulations should be effective, consistent, sensible, and understandable. In adopting this land use plan, the Board of Campbell County Commissioners intends to take the following actions as noted on page 2-3 of the County Plan: a. Protect the integrity of environmental systems and natural resources. b. Preserve and promote resource-based industries. c. Promote a robust, diverse, and stable economy. d. Minimize conflicts between land uses. e. Protect public health, safety and welfare. f. Preserve culture, customs, heritage, and economic diversity. g. Recognize and protect private rights and interests in state and federal land resources, including rights-of-way, public access, grazing leases and permits, water rights, special use leases and permits, mineral leases, contracts, and recreational use permits and licenses.	RMPs must be consistent with officially approved or adopted resource-related plans of other Federal agencies, state and local governments, and Indian tribes to the extent the BLM finds those plans are also consistent with the purposes of FLPMA and other Federal law and regulations applicable to public lands (43 CFR 1610.3-2(a)).

Row #	Organization Name	Comment Text	Comment Response
129.	Board of Commissioners Converse County, Wyoming	Chapter 3, Affected Environment 3..5.2, Page 3-74 - Social Cost of Carbon - BLM states that "The social cost of carbon, social cost of N20, and social cost of methane-together, the social cost of greenhouse gases (SC-GHG)-are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year. It includes the estimated value of all climate change impacts, including but not limited to public health effects, changes in net agricultural productivity, property damage from increased flood risk, natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services (Interagency Working Group on the Social Cost of Greenhouse Gases [IWG] 2021)..." The use of the Biden Administrations' Interagency Working Group on the Social Cost of Greenhouse Gases' (IWG) latest estimates regarding the "Social Cost of Carbon" in this analysis illustrates yet another example of the federal government solely considering information which leads to its predetermined desired outcome. Its use in the context of this RMP amendment is premature, beyond the scope of the SEIS and lacks legal and scientific support. For example, the cost per ton of CO2 has ranged in recent years from $1 to $340. The estimates are politically driven and not based on any sort of scientific certainty. This arbitrary figure is difficult to rectify when compared to the very real budgets of Wyoming's miners, families struggling to pay their energy bills across the country, and state services dependent on mineral royalties. **Converse County does not support the use of metrics such as the SCC** to be applied to the production of coal. **The SCC assumes that all fossil fuels will be combusted with no carbon mitigation nor with the utilization of CCUS/CCS.** In most all instances, greenhouse gas emissions will be mitigated and that should be a significant consideration.	While SC-GHG numbers were monetized, they do not constitute a complete cost benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared.
130.	Navajo Transitional Energy Company	**BLM improperly calculated the social cost of carbon** for the all of the alternatives. Agencies should also provide context for GHG emissions and climate effects, which can include the social cost of GHG. 88 FR 1196, 1202. Calculating public health impacts from GHG emissions is inherently uncertain. See Del. Riverkeeper Network v. FERC, 45 F.4th 104, 111 (D.C. Cir. 2022) (upholding FERC finding that there was no scientifically-accepted methodology available to correlate specific amounts of GHG emissions to discrete changes in the human environment and FERC's rejection of the Social Cost of Carbon methodology for calculating climate change impacts). Nonetheless, the Interim Guidance provides guidance on how GHG emissions may be used to calculate the	While SC-GHG numbers were monetized, they do not constitute a complete cost benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality

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130 *(cont.)*	Navajo Transitional Energy Company *(continued)*	social cost of GHG and provide appropriate context for alternatives. Under the Interim Guidance, agencies should quantify proposed actions' "total net GHG emissions or reductions (both by pollutant and by total CO2-equivalent emissions) relative to baseline." 88 FR 1196, 1201. If the social cost of GHG will be presented, it is calculated from the net GHG emissions. 88 FR 1196, 1202. **Net GHG emissions account for the GHG impact of sources of GHG emissions that would be replaced by the proposal.** 88 FR 1196, n53. For example, in an August 2022 Environmental Assessment associated with a geothermal lease, BLM determined that it was "reasonably foreseeable" that a geothermal facility would result in a reduction of GHG emissions by displacing fossil-fuel fired power plants. BLM, Environmental Assessment for the August 2022 Competitive Geothermal Lease Sale, 31 (Doc. # DOI-BLM-NV-B000-2022-0001-EA). Here, the SEIS improperly calculates the social cost of GHG for Alternative A, because it does not use net GHG emissions. Instead, the SEIS calculates the social cost of GHG using each alternative's total emissions (which, as discussed above, were also incorrectly calculated). Net emissions are equal to the difference between the total emissions of a proposed alternative and the total emissions it would displace. 88 FR 1196, n53. As discussed above, the SEIS wrongfully treats total emissions from Alternative A as zero. When calculating the social cost of carbon for Alternative A, B**LM must account for the increase in emissions attributed to the substitution of Wyoming's Powder River Basin coal**. As discussed above, those emissions at least approach the baseline, No Action alternative (Alternative B).	updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared. Energy markets are complex, and the net effects of production changes in one location or one sector are affected by multiple factors in the broader energy market. In general, reductions in oil, natural gas, or coal produced from federal leases may be partially offset by nonfederal production (state and private) in the United States or by overseas production (i.e., geographic substitution). The effect of this substitution on indirect GHG emissions depends on the fuel produced and transportation costs. For example, overseas production often faces more relaxed regulatory requirements for production, and the produced fuels would need to be physically transported into the United States. There may also be substitution of other energy types to meet energy demand. These substitution patterns will be different for different fuel types. Further, the effect of substitution between different fuel sources on indirect GHG emissions depends on the replacement energy source. For example, coal is a relatively more carbon intense fuel than natural gas, and hydroelectricity is the least carbon intense fuel. In the transportation sector, alternatives to oil are likely to be less carbon intensive. Additionally, substitution across energy sources or locations may not fully meet the energy needs that would otherwise have been realized through production from the federal mineral estate. Price effects may lower the market equilibrium quantity demanded for some fuel sources. This would lead to a reduction in indirect GHG emissions. These three effects are likely to occur in some combination when considering substitution away from federal fossil fuels, but the relative contribution of each clearly depends on many interrelated and complex factors. While the BLM does not currently have a model suitable to perform such an analysis, Section 3.5.3 has been edited to more clearly discuss such energy substitution considerations.

Row #	Organization Name	Comment Text	Comment Response
131.	Navajo Transitional Energy Company	Similarly, the **SEIS fails to properly calculate the social cost of GHG** for Alternatives B and C, because it does not subtract the emissions displaced by the use of Wyoming's Powder River Basin coal. Put another way, the SEIS assumes that there will be zero substitution. Once again, that is an erroneous and unsupported assumption. The SEIS properly recognizes that demand is driving production, but then it flips that relationship and assumes any reduction in production will create a 100% decrease in demand. In fact, those downstream sources are likely to emit as much GHG whether coal from Wyoming's Powder River Basin is available, and they must be accounted for to accurately calculate net GHG emissions and the social cost of GHG.	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3). While SC-GHG numbers were monetized, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared. Energy markets are complex, and the net effects of production changes in one location or one sector are affected by multiple factors in the broader energy market. In general, reductions in oil, natural gas, or coal produced from federal leases may be partially offset by nonfederal production (state and private) in the United States or by overseas production (i.e., geographic substitution). The effect of this substitution on indirect GHG emissions depends on the fuel produced and transportation costs. For example, overseas production often faces more relaxed regulatory requirements for production and the

Row #	Organization Name	Comment Text	Comment Response
131 *(cont.)*	Navajo Transitional Energy Company *(continued)*	*(see above)*	produced fuels would need to be physically transported into the United States. There may also be substitution of other energy types to meet energy demand. These substitution patterns will be different for different fuel types. Further, the effect of substitution between different fuel sources on indirect GHG emissions depends on the replacement energy source. For example, coal is a relatively more carbon intense fuel than natural gas and hydroelectricity is the least carbon intense fuel. In the transportation sector, alternatives to oil are likely to be less carbon intensive. Additionally, substitution across energy sources or locations may not fully meet the energy needs that would otherwise have been realized through production from the federal mineral estate. Price effects may lower the market equilibrium quantity demanded for some fuel sources. This would lead to a reduction in indirect GHG emissions. These three effects are likely to occur in some combination when considering substitution away from federal fossil fuels, but the relative contribution of each clearly depends on many interrelated and complex factors. While the BLM does not currently have a model suitable to perform such an analysis, Sections 3.5.3 has been edited to more clearly discuss such energy substitution considerations.
132.	Navajo Transitional Energy Company	If BLM selects Alternative A, no more coal would be produced in Wyoming's Powder River Basin after mid-2041, with the foreseeable consequence that **demand for coal would be met by other sources**, potentially including producers of dirtier coal. Accordingly, coal demand fulfilled by coal from Wyoming's Powder River Basin displaces coal from other sources. Therefore, **each of the alternatives should have approximately the same social cost of GHG.**	The BLM is responsible for analyzing effects derived from federal coal produced in the BFO only. Wyoming Powder River Basin coal's share of the electricity generation fuel mix changes is driven by outside market and societal forces. Substitution away from federal coal depends on many interrelated and complex factors. The BLM does not currently have a model suitable to perform such an analysis. Additional discussion on substitution has been added to the Social and Economic Considerations (Section 3.5.3). While SC-GHG numbers were monetized, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM

Row #	Organization Name	Comment Text	Comment Response
132 *(cont.)*	Navajo Transitional Energy Company *(continued)*	*(see above)*	exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared. Energy markets are complex, and the net effects of production changes in one location or one sector are affected by multiple factors in the broader energy market. In general, reductions in oil, natural gas, or coal produced from federal leases may be partially offset by nonfederal production (state and private) in the United States or by overseas production (i.e., geographic substitution). The effect of this substitution on indirect GHG emissions depends on the fuel produced and transportation costs. For example, overseas production often faces more relaxed regulatory requirements for production, and the produced fuels would need to be physically transported into the United States. There may also be substitution of other energy types to meet energy demand. These substitution patterns will be different for different fuel types. Further, the effect of substitution between different fuel sources on indirect GHG emissions depends on the replacement energy source. For example, coal is a relatively more carbon intense fuel than natural gas, and hydroelectricity is the least carbon intense fuel. In the transportation sector, alternatives to oil are likely to be less carbon intensive. Additionally, substitution across energy sources or locations may not fully meet the energy needs that would otherwise have been realized through production from the federal mineral estate. Price effects may lower the market equilibrium quantity demanded for some fuel sources. This would lead to a reduction in indirect GHG emissions. These three effects are likely to occur in some combination when

Row #	Organization Name	Comment Text	Comment Response
132 *(cont.)*	Navajo Transitional Energy Company *(continued)*	*(see above)*	considering substitution away from federal fossil fuels, but the relative contribution of each clearly depends on many interrelated and complex factors. While the BLM does not currently have a model suitable to perform such an analysis, Sections 3.5.3 has been edited to more clearly discuss such energy substitution considerations.
133.	State of Wyoming, Office of the Governor	The use of the Biden Administration's Interagency Working Group on the Social Cost of Greenhouse Gases' (IWG) latest estimates regarding the "**Social Cost of Carbon**" in this analysis illustrates yet another example of the federal government solely considering information which leads to its predetermined desired outcome. Its use in the context of this RMP amendment **is premature, beyond the scope of the EIS and lacks legal and scientific support.** For example, the cost per ton of CO2 has ranged in recent years from $1 to $340. The estimates are politically driven and not based on any sort of scientific certainty. This arbitrary figure is difficult to rectify when compared to the very real budgets of the families of Wyoming's miners struggling to pay their bills and the State's ability to provide services that are currently paid for by mineral royalties. This also affects families across America struggling to pay ever increasing energy costs.	While SC-GHG numbers were monetized, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared.

Row #	Organization Name	Comment Text	Comment Response
134.	Campbell County Board of Commissioners	The use of the Biden Administrations' Interagency Working Group on the Social Cost of Greenhouse Gases' (IWG) latest estimates regarding the "**Social Cost of Carbon**" in this analysis illustrates yet another example of the federal government solely considering information which leads to its predetermined desired outcome. Its use in the context of this RMP amendment **is premature, beyond the scope of the SEIS and lacks legal and scientific support.** For example, the cost per ton of CO2 has ranged in recent years from $1 to $340. The estimates are politically driven and not based on any sort of scientific certainty. This arbitrary figure is difficult to rectify when compared to the very real budgets of Wyoming's miners, families struggling to pay their energy bills across the country, and state services dependent on mineral royalties. Campbell County does not support the use of metrics such as the SCC to be applied to the production of coal. The SCC assumes that all fossil fuels will be combusted with no carbon mitigation nor with the utilization of CCUS/CCS. In most all instances, greenhouse gas emissions will be mitigated and that should be taken into account.	While SC-GHG numbers were monetized, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document; rather, SC-GHG is an estimate of impacts on the human environment based on best currently available science that the BLM is obligated to consider pursuant to NEPA and CEQ guidance, regardless of whether the BLM conducts a complete or partial cost-benefit analysis of alternatives considered. The BLM exercised its discretion to evaluate the social costs of the GHG emissions issue being analyzed in this SEIS. These context comparisons are consistent with the White House Council on Environmental Quality updated 2016 Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (CEQ GHG Guidance) posted on the *Federal Register* on January 9, 2023, for a 60-day comment period. Section VI(F) Monetizing Costs and Benefits and IV(B) Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects in the 2023 CEQ GHG Guidance states that NEPA does not require a cost-benefit analysis in which all monetized benefits and costs are directly compared.
135.	Board of Commissioners Converse County, Wyoming	In addition to the socioeconomic information provided above, according to the Wyoming Mining Association 2022 Revenue Report, coal's estimated contribution to state and local revenue in Wyoming was about $562.7 million (an increase of $82.8 million or 17.3 percent from 2021). Wyoming coal mines continue to employ over 5,100 workers directly in the industry with more than 15,000 workers supported directly or indirectly. These facts are significant in the State and reinforces the importance of a continued fair and efficient federal coal leasing program. **BLM should also consider advancements in coal development, technology improvements, and new products derived from coal when analyzing for future uses.**	Discussion of impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on potential cumulative impact considerations over time, such as advancements in research and development, among others, has been added to the Draft SEIS. An emissions control and carbon capture discussion has been added to the GHG affected environment section. An alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
136.	State of Wyoming, Office of the Governor	In 2021, the financial contribution of this coal to both state and local governments was nearly $480 million, paid in the form of taxes, royalties, and fees. Since 2003, approximately $4.5 billion has been paid in bonus bids to the federal and state governments. Wyoming's share is used to fund K-12 schools, community colleges, highways and roads, mental health programs, law enforcement, and the University of Wyoming. Due to Wyoming's small population and rural nature, this funding is essential to maintaining these public services. **These alternatives inherently and disproportionately impact Wyoming, especially the counties and communities physically and economically intertwined with PRB coal production.**	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified. Impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, and associated benefactors and coffers are discussed and presented in tables throughout.
137.	Campbell County Board of Commissioners	On a statewide level, the **most up-to-date information obtain from the Wyoming Mining Association highlights the following for coal production in all of Wyoming**: In 2022, it is estimated that state and local revenue from Wyoming Coal is approximately $562.7 million (an increase of $82.8 million or 17.3 percent from 2021). Additional benefits from coal leasing and production include: 1. Ad Valorem (Property) - $13,717,859 2. AML Distributions - $25,900,397 3. State Rents and Royalties - $25,053,038 4. Sales and Use Taxes - $19,541,264 5. Ad Valorem (Production) - $141,513,372 6. Severance Tax - $153,070,627 7. Federal Mineral Royalties (State Share) - $183,942,784 (Federal Share - $229,718,453)	The SEIS reports 2022 economic data from the following Wyoming sources: Office of Natural Resources Revenue 2022, Wyoming Consensus Revenue Estimating Group 2022, Wyoming Department of Revenue 2016–2022 annual reports. Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified. Impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, and associated benefactors and coffers are discussed and presented in tables throughout.

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138.	Wyoming Mining Association	For decades, the BLM Federal Coal Leasing program has been working as intended and has been a remarkable success. Wyoming is the top coal producing state in the nation, and the American taxpayer receives an excellent return from the program. In 2022, the financial contribution from coal to state and local governments in the form of taxes, royalties and fees was over $562.7 million. Wyoming's share of federal mineral royalties - royalties paid on mining the leased federal coal - was over $184 million (with a $229.7 million share paid to the federal government). Revenues generated from the federal coal resource fund federal, state and local governments, highways and roads, schools and community colleges, and the University of Wyoming. Billions of dollars in revenues from Coal Lease Bonus Bids have built new schools and facilities in every county in Wyoming over the last 3 decades. Considering that Wyoming accounts for and estimated 85% of all federal coal production, it couldn't be clearer that **taxpayers in Wyoming are receiving a fair return and excellent value from the BLM Federal Coal Leasing Program**.	Impacts on funding, employment, income, and overall economic output derived from the coal industry and associated socioeconomic consequences are discussed in Sections 3.5.3 and 3.5.4. Further detail on funding magnitude and how funds for mineral development are allocated has also been added to these sections. Revenues from mineral development and more specifically, coal, are also identified. Impacts on funding sources, such as FMRs, severance taxes, and ad valorem taxes, and associated benefactors and coffers are discussed and presented in tables throughout. The SEIS reports 2022 economic data from the following Wyoming sources: Office of Natural Resources Revenue 2022, Wyoming Consensus Revenue Estimating Group 2022, Wyoming Department of Revenue 2016–2022 annual reports.
139.	N/A	I would like to express my concern on the Montana Judge Court Order to place moratoriums on coal mining leases in the Powder River Basin…. I know the coal mining world. I know the benefits of coal energy. I know the economic gains to the towns, counties, and states who work in the coal industry, or work in a town or a state with a thriving coal industry, or use coal powered electricity. When **our country and our world are not ready to be powered by renewable energy yet**, we need to ensure our energy needs are being filled in the most efficient, effective, and clean way. **Technology and industry standards have made coal a very reasonable energy source** until we have the means to go completely green. The boom/bust cycles I have lived through and continue to see my family live through seem whimsical, dependent on who is residing on Pennsylvania avenue. It needs to stop. Until we can rely on our current standard of living, energy use wise, STOP placing any restrictions on coal mining.	Electricity generation from coal has been declining since the late 2000s as natural gas and renewable energy costs have decreased. Free-market economics drive the demand for coal. Federal policies and coal management are a factor, but they are not a driver of coal's predicted future demands. Renewable energy options are the most cost-effective new sources of electricity generation in most markets (https://www.iea.org/reports/coal-in-net-zero-transitions). Federal policies and coal management are a factor but not a driver of coal's market share decline. Utility companies are responsible for providing continuous electricity to customers and typically do not retire coal-fired power plants without a reliable replacement energy source. An emissions control and carbon capture discussion has been added to the GHG affected environment section, and an alternative uses discussion has been added to the coal affected environment section. When those potential uses identified (or other uses not yet conceptualized) mature enough to need federal coal, the BLM has the ability to amend the RMP.

Row #	Organization Name	Comment Text	Comment Response
140.	N/A	**BLM management has traditionally placed extractive commercial uses (like logging, grazing, and mining) well above the FLPMA required conservation** of precious natural and cultural resources on BLM lands. For example, BLM continues to approve harmful logging of old-growth and mature forest stands and livestock grazing on millions of acres of degraded BLM rangelands. This pattern of biased BLM decisions contributes to making the increasingly serious climate and extinction crises even worse. BLM management needs to be substantially reformed to truly uphold relevant laws, apply the best available science, and serve the public interest. The status quo BLM management of the past is no longer appropriate or sustainable. Rapidly changing public values and environmental conditions require commensurate management changes. **Please review the BLM management reform recommendations at the web link below**. I fully support and urge BLM to implement these recommendations. Thanks for your consideration.https://www.counterpunch.org/2021/08/20/the-blm-is-broken-heres-how-to-fix-it/	Section 1.3.1 in the Draft SEIS identified the issues for detailed consideration, and Section 1.3.2 identified the resources eliminated from further analysis. The attached article is outside the scope and unrelated to this SEIS.
141.	N/A	I am concerned that **BLM may be improperly biased toward extractive or other human land uses that may cause otherwise avoidable adverse environmental impacts** or reduce the ability to maintain the FLPMA required "sustained yield" of renewable resources on BLM lands. **Please carefully review the open letter to Interior Secretary Haaland** at the web link below and attached. https://www.counterpunch.org/2021/08/20/the-blm-is-broken-heres-how-to-fix-it/ This open letter describes serious concerns with BLM's current dominant management culture. It proposes nine specific reforms to help make that culture more responsive to both increasing public support for conservation and increasingly challenging environmental stresses like climate change, prolonged drought, and expanding invasive weeds with more severe wildfires.	While FLPMA establishes guidelines for the management, protection, development, and enhancement of public lands, it does not prioritize between uses, and does not mandate that every use be available on every acre. Adverse impacts will occur in certain situations for the overall health of the public lands and resources. The attached article is outside the scope and unrelated to this SEIS.

Row #	Organization Name	Comment Text	Comment Response
142.	N/A	**BLM must adopt its proposed no new leasing alternative** to adhere to public interest mandates of federal law, including protection of land, water, air, wildlife, and global climate resources. **BLM must conduct policy options that help to plan and manage the decline of federal oil leasing** and development in an orderly, structured way that provides time, space, and opportunity for a just and equitable transition for workers, communities, and coal-dependent state economies. **BLM must end subsidies on federal coal production** by implementing new fiscal policies, such as increasing royalty and rental rates, as well as discontinuing royalty rate reductions. BLM must deny any pending royalty relief reduction applications for coal leases.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. Oil leasing and policy decisions are outside the purpose of and need for this SEIS. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition.
143.	N/A	**I support "NO NEW LEASING"** of fossil fuel minerals. It is a critical time to support public interests to protect and foster renewable resources of land, air, water and wildlife. For too long the mineral interests have been subsidized without thought of the renewable resources. Mineral extraction is a single use and once they are gone there is nothing left. This is not in the public interest. So, please, end subsidies and increase royalties and apply those funds to promote renewable resources.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. Subsidy and royalty management are outside the purpose of and need for this SEIS.

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144.	N/A	Please **make an honest choice to consider no new leases for minerals** on federal lands to protect what is left of clean water air & wildlife habitat in the Powder River Basin. With the proposed 5000(!) wells on federal land this area will become an industrial waste land without ferruginous hawks, sage grouse, burrowing owls & dwindled herds of antelope. How does this help anything or anyone except the fossil fuel companies? With coal on the decline, **BLM should consider how it can help with a just transition** to the coming future not further more Wyoming in the past. An end to coal leasing is low hanging fruit. I live here in Inez Wyo and depend on the BLM to manage our federal lands & minerals with an eye toward the future. We are all living climate change whether we believe in it or not. Coal is a dead end, even here in Wyoming. Let's move on and stop subsidies for this source of energy that really costs more in pollution than the alternatives. No to petitions to reduce royalties, no to new leases. Yes to a future for our grandchildren!	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Subsidy and royalty management are outside the purpose of and need for this SEIS.
145.	N/A	With the health of our planet at a critical juncture, it is critical that the **BLM's environmental analysis focus on ways to effectively and responsibly foster an orderly transition away from emphasis on the burning of fossil fuels**. Elements of this transition should include: * **Adoption of the "Proposed New Leasing" alternative** to adhere to public interest mandates of federal law, to include the protection of land, water, air, wildlife and global climate issues. * Consideration of policy options to **foster an orderly and structured way of managing the necessary decline in federal coal leasing and development**. * **Subsidies on federal coal production must end** and be replaced by increasing royalty and rental rates, and decreasing royalty rate reductions. Accordingly, BLM should deny any pending royalty relief reductions for coal leases.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. Eastern Wyoming is ranked eighth, of 25, on the prioritized list of energy communities in the Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization American Rescue Plan. The Bipartisan Infrastructure Law, CHIPS and Science Act, and the Inflation Reduction Act have greatly increased the amount of federal funding available to meet the needs of energy communities through this transition. Subsidy and royalty management are outside the purpose of and need for this SEIS.

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146.	N/A	**BLM should be doing everything possible to stop any further fossil fuel development on BLM lands, including coal leasing**. BLM should muster enough courage, compassion, and common sense to do what is necessary in the public interest. I therefore **strongly support and urge BLM to adopt and implement Alternative A, for no new coal leasing.** This is the only sane and proper choice. The purported benefits of any further coal leasing would be far outweighed by the much greater adverse impacts and increased dangers to public and environmental health. BLM's organic law, **FLPMA, requires BLM to manage renewable resources like soil, vegetation, and wildlife habitat for their "sustained yield"** to benefit current and future generations. Even back in 1976 with FLPMA, Congress recognized the importance of sustainable resource management. The climate crisis and continued burning of fossil fuels pose a direct threat to the "sustained yield" of renewable resources on BLM lands because of dramatic weather events and erratic changes in weather patterns.	This SEIS is a land use-level review specific to the BFO and is responsive to the federal district court's order in *Western Organization of Resource Councils, et al. v. Bureau of Land Management*, Civil Action No. CV-00076-GF-BMM (D. Mont. 2022). The court specifically ordered the BLM to consider no-leasing and limited leasing alternatives. In addition, the NEPA requires agencies to analyze a no-action alternative. See Section 2.2, Alternatives Development, for further details. Table 1-1 in Section 1.3.1 of the Draft SEIS identified the issues for detailed consideration, and Table 1-2 in Section 1.3.2 identified the resources eliminated from further analysis.
147.	Wyoming Game and Fish Department	Given we previously provided input for the development of these management documents and the limited scope of resources analyzed in the Draft Supplemental EIS and Potential RMPA, the Department has no terrestrial or aquatic habitat concerns.	Thank you for your comment; no response is required.

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