U.S. Department of the Interior
Bureau of Land Management

Carlsbad Field Office
Environmental Assessment
Eddy County, New Mexico
October 2024

DOI-BLM-NM-P020-2025-0007-EA

Bill Wilshushen Fed Com Multiwell

Lease Number: NMNM140712

Applications for Permit to Drill (APDs)

Applicant: Matador Production Company

US Department of the Interior
Bureau of Land Management:
Carlsbad Field Office
620 East Greene Street
Carlsbad, New Mexico 88220
575-234-5972

The BLM's multiple-use mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

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CHAPTER 1. INTRODUCTION

1.1 BACKGROUND

This environmental assessment (EA) documents the Bureau of Land Management (BLM) review of the Applications for Permit to Drill (APDs) from Matador Production Company. The project would access federal minerals and produce from the following lease(s): NMNM140712. The proponent has applied to drill 4 wells approximately 4.75 miles Northeast from Carlsbad, NM. The following associated infrastructure is proposed: 1 wellpad, 1 central tank battery, and 1 access road.

Surface Location Legal Description: Section 22, Township 21 South, Range 27 East.

1.2 PURPOSE AND NEED

The purpose for the action is to respond to the proponent's request to access and extract fluid minerals from a valid existing federal oil and gas lease within the administrative boundary of the BLM Carlsbad Field Office (CFO). The need for the action is to meet the BLM's mandate under the Mineral Leasing Act of 1920, as amended, to make mineral resources such as oil and gas available for development, in accordance with the Federal Onshore Oil and Gas Leasing Reform Act of 1987 to allow reasonable access to develop a federal oil and gas lease (Public Law 100–203), and the BLM's mandate under the Federal Land Policy and Management Act of 1976 (FLPMA) to manage for multiple use and sustained yield.

1.3 DECISION TO BE MADE

The BLM authorized officer will decide whether to approve or reject the proposal with or without constraints, in the form of design features, conditions of approval (COAs), and/or other mitigation measures, as provided for in the approved land use plans and based on the information provided in this EA.

1.4 CONFORMANCE WITH APPLICABLE LAND USE PLAN(S)

1.4.1. BLM Land Use Plan Conformance

The BLM, under the Mineral Leasing Act of 1920, as amended, must make mineral resources, such as oil and gas, available for development. Under FLPMA, the BLM must manage public lands, resources, and resource values according to its multiple-use, sustained-yield mandate in a manner that will best meet the present and future needs of the public and in accordance with an approved land use plan or resource management plan (RMP). For split-estate lands where the mineral estate is an interest owned by the United States, the BLM has no authority over the use of the surface estate; however, the BLM is responsible for the protection of the surface if accessing a federal mineral estate. As identified in 43 Code of Federal Regulations (CFR) 3170 and subpart 43 CFR 3171.8 (11), an operator is to supply the surface use plan of operations to any private surface owner when accessing private surface with federal minerals. The surface use plan outlines specifically how the surface will be managed while accessing the valid existing federal lease. The BLM is required to declare how the federal mineral estate will be managed, including identification of all appropriate lease stipulations and site-specific COAs (43 CFR 3101.1 and 43 CFR 1601.0-7(b); BLM Handbook H-1601-1 and H-1624-1 [BLM 2005, 2018a]).

The Proposed Action is in conformance with the 1988 Carlsbad RMP (BLM 1988), as amended by the 1997 Carlsbad Approved RMP Amendment (BLM 1997).

1.4.2. Relationship to Statutes, Regulations, or Other Plans

The proponent would comply with all applicable federal, state, and local laws and regulations; obtain the necessary permits for drilling, construction, completion, and operation; and certify that surface use agreements have been reached with the private landowners, where required. Table 1.1, below, is not a comprehensive list of all the statutes, regulations, or other plans that will need to be complied with; however, it does represent the major laws applied on BLM-administered lands. Additional discussion of relevant laws that apply to the protection of specific resources are presented in the individual resource sections of this EA.

Table 1.1. Relationship to Statutes, Regulations, Policies, and Other Plans

Relevant Statute, Regulation, or Plan	Relationship to the Proposed Action
Mining and Mineral Policy Act of 1970, as amended (30 United States Code [USC] 21)	This act fosters and encourages private enterprise in the development of economically sound and stable industries and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs.
Onshore Oil and Gas Operations (43 CFR 3160)	These regulations govern operations associated with the exploration, permitting, development and production of onshore oil and gas deposits on Federal leases.
New Mexico Surface Owner Protection Act	This act requires operators to provide the surface owner at least 5 business days' notice prior to initial entry upon the land for activities that do not disturb the surface; operators must provide at least 30 days' notice prior to conducting actual oil and gas operations. Included in this policy is the implementation of a notice to lessees; this is a requirement of lessees and operators of onshore federal oil and gas leases within New Mexico to provide the BLM with the names and addresses of the surface owners of those lands where the federal government is not the surface owner, not including lands where another federal agency manages the surface.
Endangered Species Act (ESA)	The ESA requires all federal departments and agencies to conserve threatened, endangered, critical, and sensitive species and the habitats on which they depend, as well as to consult with the US Fish and Wildlife Service (USFWS) on all actions authorized, funded, or carried out by the agency to ensure the action will not likely jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat.
National Historic Preservation Act of 1966, as amended (NHPA; 36 CFR 800)	The NHPA created the framework for federal agencies to manage and protect historic and archaeological sites in the United States. The NHPA created the National Register of Historic Places (NRHP), National Historic Landmarks, Advisory Council on Historic Preservation, State Historic Preservation Offices (SHPOs), and Section 106 reviews. Section 106 is always enacted during review of all federally funded and permitted projects that could impact sites listed, or eligible for listing, on the NRHP. Section 106 requires federal agencies to consider the effects a project may have on historic properties and minimize potential damage to historic properties. The Section 106 process is, as further explained in 36 CFR 800, "to seek ways to avoid, minimize, or mitigate any adverse effects on historic properties from proposed projects."
Archaeological and Historic Preservation Act of 1974 (16 USC 469)	This act provides for the preservation of historical and archaeological data (including relics and specimens) that might otherwise be irreparably lost or destroyed as the result of (1) flooding, the building of access roads, the erection of workmen's communities, the relocation of railroads and highways, and other alterations of the terrain caused by the construction of a dam by any agency of the United States, or by any private person or corporation holding a license issued by any such agency, or (2) any alteration of the terrain caused as a result of any federal construction project or federally licensed activity or program.
Archaeological Resources Protection Act of 1979, as amended (16 USC 470 et seq.)	This act secures, for the present and future benefit of the American people, the protection of archaeological resources and sites that are on public lands and Indian lands and fosters increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals.
Federal Cave Resource Protection Act	This act secures and protects significant caves on federal land for the benefit and enjoyment of all people and directs the Secretary of the Interior to inventory and list significant caves on federal lands. Details regarding general cave management; the significant cave nomination, evaluation, and designation process; and cave and karst resource confidentiality noted within the Federal Cave Resource Protection Act are located in 43 CFR 37 (Cave Management).

Relevant Statute, Regulation, or Plan	Relationship to the Proposed Action
New Mexico's Endangered Plant Rule	Prior to development, the applicant must apply for an Incidental Take Permit under New Mexico Administrative Code (NMAC) 19.21.2.11 if the development is anticipated to "remove, harm, kill, or destroy" plants on New Mexico's endangered list at NMAC 19.21.2.9.

1.5 SCOPING, PUBLIC INVOLVEMENT, AND ISSUES

1.5.1. Scoping

The CFO interdisciplinary team conducted internal scoping to identify issues, potential alternatives, and data needs by reviewing the Proposed Action within the context of the applicable RMP. Internal scoping was facilitated using geographic information system (GIS) data to identify resources that the Proposed Action may affect. A map of the project area was prepared to display the resources in the area and to identify potential issues. The Proposed Action was circulated among CFO resource specialists to identify any issues associated with the project. These issues are analyzed below.

1.5.2. Public Involvement

The CEQ regulations require agencies to make diligent efforts to involve the public in preparing and implementing their NEPA procedures (40 CFR 1506.6(a)). The draft EA (DOI-BLM-NM-P020-2025-0007-EA) will be available for public comment from October 16, 2024 to November 15, 2024.

1.5.3. Issues

The Council on Environmental Quality (CEQ) regulations state that National Environmental Policy Act (NEPA) documents should focus on issues that are potentially significant and identify and eliminate from detailed study issues that are not significant (40 CFR 1501.9(f)(1)) and only discuss these other issues in brief (40 CFR 1500.4(e)). Although many issues may arise during scoping, not all issues raised warrant analysis in an EA. An issue will be analyzed if (1) an analysis of the issue is necessary to make a reasoned choice between alternatives, or (2) the issue is associated with a direct, indirect, or cumulative impact where analysis is necessary to determine the significance of the impact. Table 1.2 provides the issues carried forward for detailed analysis.

This EA does not discuss resources and land uses that are not present or that would not be affected to a potentially significant level. Appendix A details other issues that were identified, considered, and analyzed in brief (AIB) by members of the interdisciplinary team in reviewing the Proposed Action.

Table 1.2. Issues Analyzed in Detail

Issue Shortname	Issue Statement	Indicator
Issue #1. Air Quality	How would construction, operation, and maintenance activities in the Proposed Action affect air quality (particularly National Ambient Air Quality Standards, hazardous air pollutants, and volatile organic compounds)?	Air pollutant emissions (tons per year)
Issue #2. Greenhouse Gases	How would construction, operation, and maintenance activities in the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change?	GHG emissions (metric tons per year)
Issue #3. Hydrology: Water Quantity	How would construction and operations activities in the Proposed Action impact surface and groundwater quantity?	Acre-feet of water removed from hydrological system
Issue #4. Environmental Justice	What are the potential effects from construction, operation, and maintenance of the Proposed Action on environmental justice (EJ) communities?	Disproportionately high and adverse environmental impacts on populations of concern

CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

Under the Proposed Action, the BLM would approve the APD, which includes the elements described below.

Wells and Well Pads

Matador Production Company is proposing to construct, drill, operate, and plug four horizontal oil and gas wells. To drill and maintain the proposed wells with a closed-loop system, one well pad would be needed. Matador Production Company would take about 30 days to drill a proposed well. The proposed wells would be drilled within 3 years. All well pad areas not needed for production would be reclaimed by removing the mineral material layer, recontouring the area, spreading the stockpiled topsoil, and seeding the area with BLM-approved seed mix. Figure 2.1, below, shows the location of the proposed wells and well pads.

Bill Wilshushen pad would be a 420- x 530-foot well pad. Matador Production Company would strip the available topsoil from the well pad area and stockpile the topsoil adjacent to the well pad edge. The topsoil stockpile would be 420 x 30 feet on the north side of the pad. The well site would then be leveled and surfaced with mineral materials. After drilling and completion, the proposed well pad would be downsized by 0.22 acres.

The legal land description is in Eddy County, New Mexico, and is described as follows:

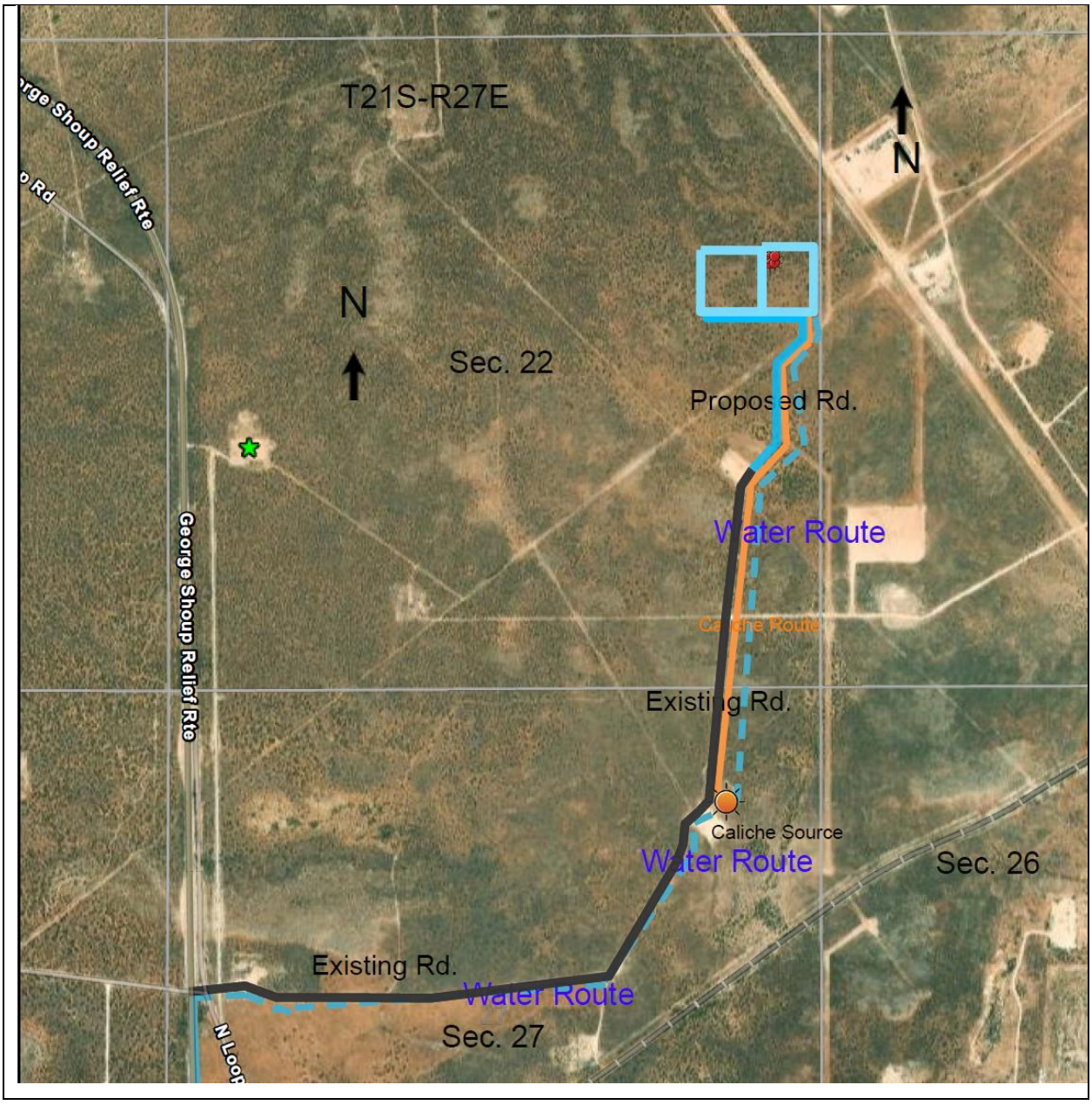
Bill Wilshushen Fed Com 122H
Surface Hole Location: 1842 feet FNL and 338 feet FEL, Section 22, T. 21 S., R. 27 E.
Bottom Hole Location: 1980 feet FNL and 110 feet FWL, Section 21, T. 21 S, R 27 E.

Bill Wilshushen Fed Com 202H
Surface Hole Location: 1842 feet FNL and 308 feet FEL, Section 22, T. 21 S., R. 27 E.
Bottom Hole Location: 1980 feet FNL and 110 feet FWL, Section 21, T. 21 S, R 27 E.

Bill Wilshushen Fed Com 121H
Surface Hole Location: 1812 feet FNL and 338 feet FEL, Section 22, T. 21 S., R. 27 E.
Bottom Hole Location: 652 feet FNL and 110 feet FWL, Section 21, T. 21 S, R 27 E.

Bill Wilshushen Fed Com 201H
Surface Hole Location: 1812 feet FNL and 308 feet FEL, Section 22, T. 21 S., R. 27 E.
Bottom Hole Location: 652 feet FNL and 110 feet FWL, Section 21, T. 21 S, R 27 E.

The location of the proposed wells and well pad are shown in Figure 2.1.


T21S-R27E
N
N
Sec. 22
Proposed Rd.
Water Route
Caliche Route
Existing Rd.
Caliche Source
Water Route
Sec. 26
Existing Rd.
Water Route
Sec. 27
George Shoup Relief Rte
N Loop

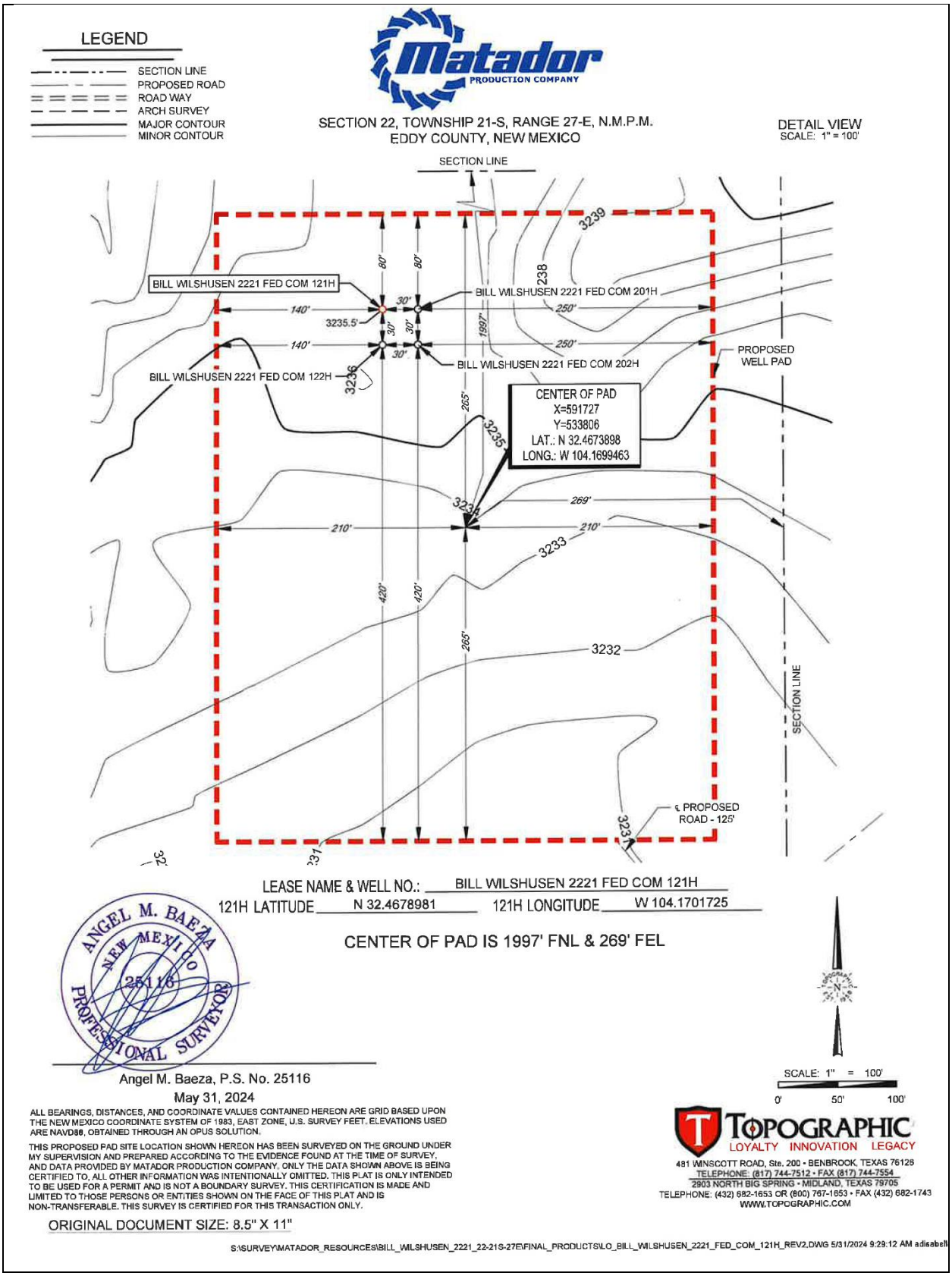


Figure 2.1. Location of Proposed Wells and Well Pads

Matador Production Company has applied to utilize a closed loop system, which means that all drill cuttings, drilling muds, and flowback from the well bore would be contained in tanks (with a secondary containment capacity of 150 percent of the largest tank volume) on location. After drilling is complete, the contents of the tanks would be hauled to R360. This method exempts the operator from constructing a pit on the proposed location as defined in Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases; Codification of Onshore Orders 1, 2, 6, and 7 (43 CFR 3170).

Proposed Access Road

Matador Production Company would need to construct approximately 2333.97 feet of road to access the well(s) and ancillary facilities. The disturbance width for all of the proposed access roads would not exceed 30 feet, and the maximum travel width for the access roads would not exceed 24 feet per BLM Gold Book standards. All access roads would be crowned, ditched, and surfaced with mineral materials.

After construction is complete, the proposed access road would encompass **1.6** acres of surface disturbance. Any unused portions would undergo final reclamation practices.

The location of the proposed access road is shown in Figure 2.2.

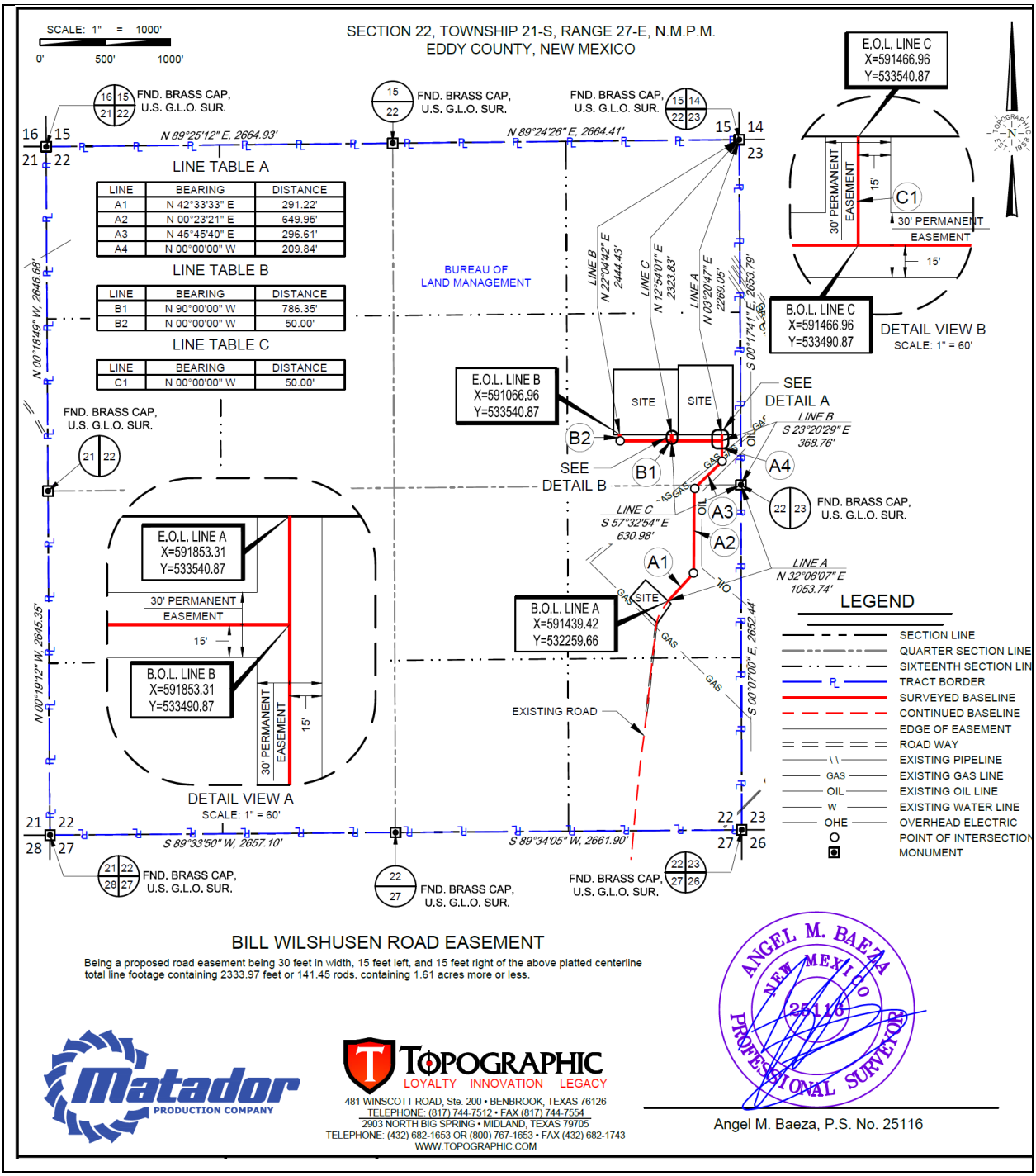


Figure 2.2. Location of Proposed Access Roads

Proposed Central Tank Battery

Matador Production Company plans to construct a 500- x 500-foot central tank battery (CTB). The CTB would be located 2008 feet FNL and 729 feet FEL Section 22, T. 21S. R. 27E. Topsoil during the construction of the CTB would be stored on the north side of the location and be used for reclamation purposes only.

The location of the proposed CTB is shown in figure 2.3.

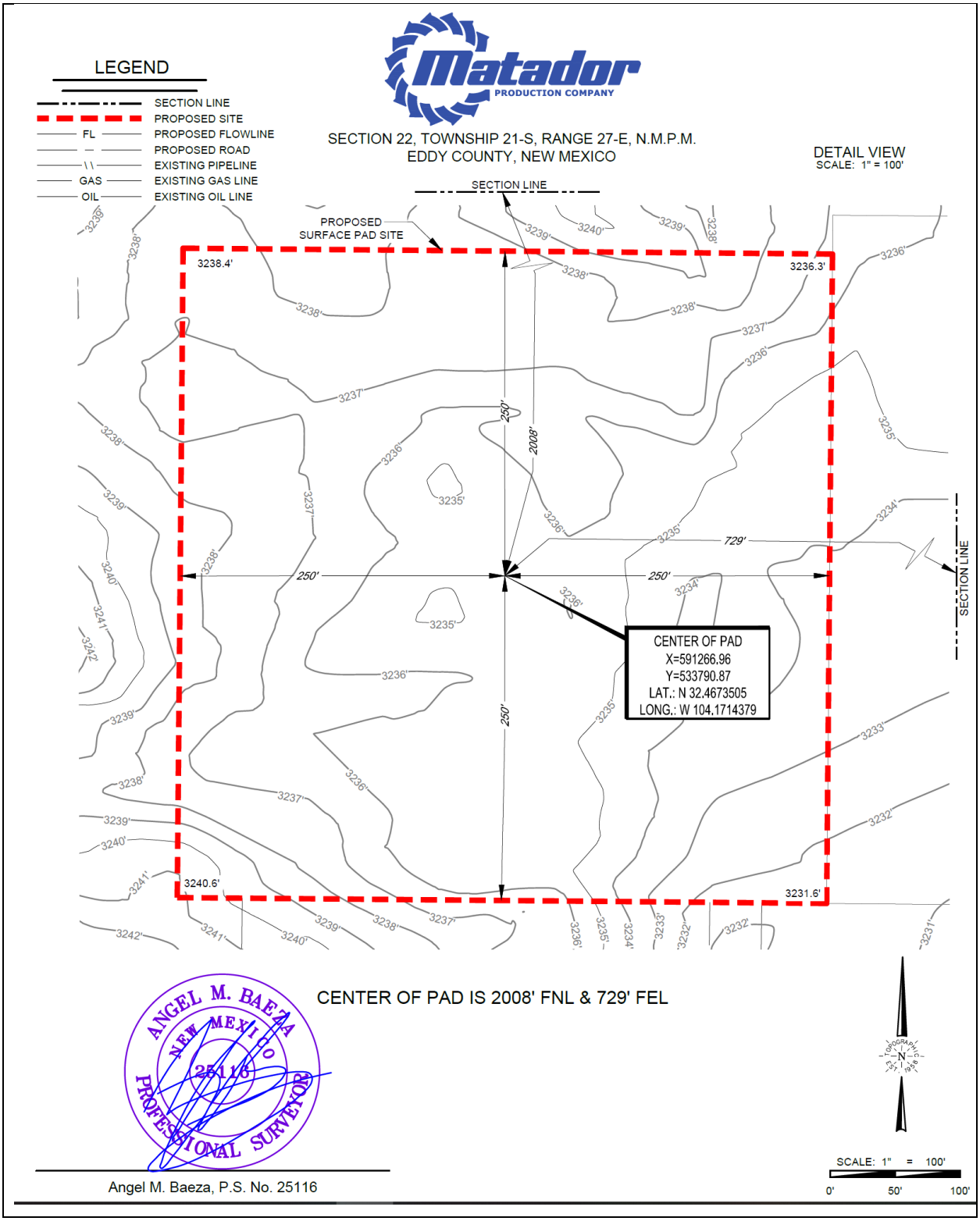


Figure 2.3. Location of Proposed Central Tank Battery

Table 2.1. Proposed Action Total Surface Disturbance

Action	Length (feet)	Width (feet)	Acres
Well pad	420	530	5.11
Well pad topsoil stockpile	420	30	0.28
Road	2333.97	30	1.6
Facility Pad	500	500	5.73
Total	—	—	12.75

2.1.1. Lease Stipulations and Conditions of Approval

There are no specific lease stipulations associated with this parcel that provide moderate to major constraints on development. Standard lease terms and conditions can be found in Form 3100-00 Section 6.

Attachment 1 of the EA details surface COAs that would be applied to the APD should the Proposed Action be selected. Any additional COAs or design features identified to minimize or avoid impacts of the specific project are detailed by issue statement in Chapter 3 and Attachment 1.

2.2 NO ACTION

The BLM NEPA Handbook (H-1790-1) states that for EAs on externally initiated Proposed Actions, the No Action Alternative generally means that the proposed activity would not take place. This option is provided in 43 CFR 3162.3-1(h)(2). This alternative would deny the approval of the proposed application(s), and the current land and resource uses would continue to occur in the proposed project area. No mitigation measures would be required. If the BLM selects the No Action Alternative, this does not prevent any future proposed actions to access the valid existing lease with an additional APD or alteration of the existing application.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Based on scoping, GIS resource data, and field investigations for cultural and natural resources within the analyzed Proposed Action area, no additional alternatives were identified for detailed study.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter contains the effects analysis related to the issues listed in Section 1.5.3. Section 3.2 describes the methodology and assumptions and provides an overview of reasonably foreseeable cumulative actions considered in the effects analysis. Section 3.2 describes the No Action Alternative. Sections 3.3 on present the issues that are analyzed in detail in this EA. As described in Section 1.5.3, this EA does not discuss resources and land uses that are not present or that would not be affected to a

potentially significant level. Appendix A details other issues that were identified, considered, and analyzed in brief or dismissed by members of the interdisciplinary team in reviewing the Proposed Action.

The analysis in Chapter 3 includes the following assumptions:

- The project life is estimated to be 20 years.
- The development is assumed to result in 347,292 barrels of oil per welll and 1,189,482 thousand cubic feet (Mcf) of natural gas per well over a 20-year well life, based on estimates from past oil and gas development and available information from existing development within the Carlsbad Field Office.

The BLM New Mexico State Office prepares an annual Water Support Document for Oil and Gas Development in New Mexico (BLM 2023a) and an annual Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas, and Kansas (BLM 2023b). These reports, which serve as the basis of the air quality, climate change and greenhouse gases, and water resources analyses, are incorporated by reference in this EA.

The BLM's Assessment, Inventory, and Monitoring (AIM) strategy provides a standardized monitoring strategy for assessing natural resource conditions and trends on BLM-administered lands. The AIM strategy allows for the collection of quantitative data and information about ecosystem health and trends to guide policy, land uses, and adaptive management decisions. BLM Instruction Memorandum 2023-043, Assessment, Inventory, and Monitoring Data Application to Land Use Plan Effectiveness and NEPA Analysis, notes that BLM offices should incorporate AIM data, where available and appropriate, into NEPA analysis to inform the status and trends of ecological resources as well as potential effects from the Proposed Action and alternatives.

There are approximately 300 AIM plots on BLM-administered lands in the CFO planning area. AIM data collection started in 2019. AIM protocol is to revisit each plot every 5 years; as of 2023, no plot has been visited more than once. This data can be used where available and appropriate to inform the affected environment and potential environmental consequences of the Proposed Action for relevant issues. Due to lack of plot revisitation, there is often not sufficient AIM data to analyze ecosystem health and trends or meaningfully incorporate into an analysis at the APD level.

3.2 CUMULATIVE IMPACTS SCENARIO

The CFO administrative boundary (also known as the planning area) encompasses approximately 6.2 million surface acres, including over 2 million acres of BLM-administered surface estate and 3 million acres of BLM-administered mineral estate. The following section outline the reasonably foreseeable environmental trends and planned actions within the CFO's administrative boundary and help frame the cumulative effects of the Proposed Action. As defined in 40 CFR 1508.7, a cumulative impact is an impact on the environment that results from the incremental impact of the action when combined with the effects of past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such other actions. Table 3.1 describes the cumulative actions within the CFO planning area. The BLM can identify and analyze reasonably foreseeable cumulative actions expected to occur over the next 20 years, as this time period is aligned with available RMP and RFD scenario information available (Engler 2023).

Table 3.1. Cumulative Actions within the CFO Planning Area

Cumulative Actions within CFO Planning Area (Total Acres: 6,200,000)	**Number of Wells**	**Acreage of Surface Disturbance**	**Percent of CFO Planning Area Acreage** (%)
Existing development in the CFO planning area (oil and gas well pads, construction of gas plants, potash mines, access roads, transmission lines, and other linear features) *	42,650	317,000	5.11

Cumulative Actions within CFO Planning Area (Total Acres: 6,200,000)	**Number of Wells**	**Acreage of Surface Disturbance**	**Percent of CFO Planning Area Acreage** (%)
Oil and gas reasonably foreseeable development (RFD) scenario ‡	19,600	33,367	0.54
Mining reasonably foreseeable actions (RFAs) ¶	N/A	2,400	0.04
Other linear infrastructure RFAs ¶	N/A	4,200	0.07
Seismic RFAs ¶	N/A	32,000	0.52
Agriculture RFAs ¶	N/A	140	0.00
Contribution from the Proposed Action	4	12.75	0.00020
Total	**62,250**	**389,107**	**6.28**

*Source: BLM (2018b) and US Geological Survey (USGS 2023a). Value includes estimates of existing disturbance from past construction of gas plants, potash mines, oil and gas well pads, access roads, transmission lines, and other linear features. Of this total, at least 109,000 acres of existing surface disturbance is attributed to oil and gas development in the planning area (USGS 2023a). There is no reliable estimate for past wells that are no longer in use and were either plugged, reclaimed, and abandoned or, in some cases, abandoned without full reclamation.

‡ Source: Engler (2023). Based on the 20-year RFD scenario (2023–2043), new surface disturbance from potential wells is estimated at 1.6 acres per horizontal well and 2.8 acres per vertical well.

¶ Sources: BLM (2014a, 2018b). This estimate includes approximately 2,400 acres of surface disturbance predicted from the proposed Ochoa Mine (BLM 2014a), 4,200 acres of surface disturbance from development of transmission lines and pipelines/associated infrastructure (BLM 2018b), 140 acres of surface disturbance from agriculture (BLM 2018b), and 32,000 acres of short-term disturbance from seismic exploration, with reclamation occurring within 3 years (BLM 2018b).

The existing surface disturbance resulting from past and present oil and gas development is estimated to be approximately 109,000 acres (1.8 percent of the planning area) as of the end of 2020. This approximation is provided by a USGS vegetation geodatabase of oil and gas well pads and access roads within the analysis area (USGS 2023a). Pad polygons for each of the New Mexico Oil and Gas Conservation Division well points were derived from classified 1-meter National Agriculture Imagery Program imagery from 2020. The data approximates the true size of the pad and represents the disturbed area dominated by bright soil that is visible from aerial imagery, not the disturbed areas that have been reclaimed or vegetated. In cases where areas around the pad were reclaimed/revegetated, the true disturbance area may be underestimated.

The Reasonably Foreseeable Development Scenario (RFD scenario) for Oil and Gas Activities in the Carlsbad Field Office (Engler 2023) provides an estimate of projected oil and gas development in Eddy and Lea Counties. The RFD scenario estimated future annual oil and gas production using decline curves from historical production data, which were then extrapolated into future years to determine remaining production for existing wells and future production from new well development. New surface disturbance from potential wells in the RFD scenario is estimated at 1.6 acres per horizontal well and 2.8 acres per vertical well (Engler 2023), though the predicted numbers may not represent actual development. Between 2023 and 2043, the RFD estimates that 19,600 federal and nonfederal wells would be drilled and completed within Eddy and Lea Counties. In total, 33,367 acres (0.54 percent of the planning area) would be required for oil and gas development projected in the RFD scenario (Engler 2023).

The existing surface disturbance resulting from past and present non-oil and gas development is estimated to be approximately 208,000 acres (3.35 percent of the planning area, BLM 2018b). Surface disturbance for other reasonably foreseeable actions include 2,400 acres for the Ochoa Mine Project (0.04 percent of the planning area), 4,200 acres from development of transmission lines and pipelines/associated infrastructure (0.07 percent of the planning area), 140 acres of surface disturbance from land farms (less than 0.01 percent of the planning area), and 32,000 acres from seismic exploration (0.52 percent of the planning area). In total, past, present, and reasonably foreseeable future actions would comprise approximately 389,107 acres, or 6.28 percent of the planning area.

The Proposed Action would comprise 0.020 percent of the projected wells in the oil and gas RFD scenario (19,600 wells), and 0.006 percent of the total past, present, and reasonably foreseeable oil and gas development (62,250 wells). The estimated acreage of surface disturbance under the Proposed

Action would represent 0.037 percent of the total projected surface disturbance in the oil and gas RFD scenario (33,367 acres), and 0.0032 percent of the past, present, and reasonably foreseeable landscape disturbance (389,107 acres).

When these past, present, and reasonably foreseeable actions are considered in conjunction with the Proposed Action, there is the potential for impacts on issues considered in this EA.

3.2.1. Land Restoration and Conservation Activities

As required by Onshore Oil and Gas Order Number 1 and codified in 43 CFR 3171.8(e)(10), oil and gas operators are required to conduct both interim reclamation and final reclamation of all surface disturbance associated with a federal well. Additionally, buried pipeline corridors undergo reclamation immediately after installation. Any reclamation that is conducted by the oil and gas operator is monitored by BLM surface inspectors for efficacy. Enforcement actions are taken when additional work such as removal of soil contaminants, noxious weed treatments, or erosion control is needed to re-vegetate and restore ecosystem functions to a site. An operator's bonds are not released until a BLM certified surface inspector, or an Authorized Officer (AO) determines that all previously disturbed areas associated with a well meet reclamation standards for site stability and ecosystem functions. For the CFO these standards are specified in the 1997 Resource Management Plan Amendment (RMPA; BLM 1997).

CFO Rehabilitation efforts act as countervailing effects to present and future landscape-level surface disturbance. The BLM CFO via the New Mexico State Office (NMSO) has partnered with the State of New Mexico, ranchers, industry, and other local partners on a restoration initiative called Restore New Mexico. Since 2005, the initiative has restored over 3 million acres of grasslands, woodlands, and riparian areas across the state that had been degraded by invasive species and woodland encroachment in New Mexico (U.S. Geological Survey [USGS] 2019). This program has also resulted in the reclamation of some oil and gas legacy well pads, roads, and caliche pits within the CFO analysis area (USGS 2019). Restore New Mexico's efforts and continued work are considered an ongoing countervailing effect as legacy oil and gas development and ecosystems are gradually restored.

Additionally, BLM management decisions have a continued focus on conserving lands (habitat) for special status species, including federally endangered Lesser prairie chicken (LPC) (*Tympanuchus pallidicinctus*) and Dunes sagebrush lizard (DSL) (*Sceloporus arenicolus*), as identified and analyzed in the 2008 BLM PDO *Special Status Species Record of Decision and Approved Resource Management Plan Amendment* (BLM 2008a) and those managed by Candidate Conservation Agreements (CCA) including the afore mentioned LPC and DSL as well as the federally endangered Texas Hornshell (*Popenaias popeii*) (BLM 2007a, 2008a; USFWS et al. 2008; USFWS and Texas Comptroller of Public Accounts [CPA] 2019; USFWS et al. 2014). Oil and gas operators are granted access to develop certain areas by paying into the CCA and following a standard set of mitigation measures. Funds from the CCA are then used to restore and improve habitat in areas where oil and gas is not expected to occur. It is anticipated that the BLM and other agencies would also continue to improve habitat by treating lands within the CFO with prescribed fire, mechanical treatments, and herbicide according to the Carlsbad RMP (BLM 1988), as amended (BLM 1997, 2008a).

3.3 IMPACTS FROM THE NO ACTION ALTERNATIVE (ALL ISSUES)

The No Action Alternative reflects the current conditions within the project area and serves as the baseline for comparing the environmental impacts of the Proposed Action. Under the No Action Alternative, the BLM would not authorize the Proposed Action, as detailed in Section 2.1. The proposed project would not be constructed, and there would be no new direct, indirect, or cumulative impacts on natural or cultural resources from oil and gas development or production. The CFO would continue to manage natural and cultural resources in the project area under the current land and resource uses as detailed in the CFO RMP and amendments (see Section 1.4). Under the No Action Alternative, the proponent may alter their existing application or prepare a new one to access the minerals in another manner via an existing or new location. Existing oil and gas development may continue on lands adjacent

to the proposed project area; with it, potential direct, indirect, and cumulative impacts may also continue. The cumulative impacts from oil and gas and other development in the CFO are described in Section 3.2, above. For most issues, implementing the No Action Alternative would result in no new impacts on the resource. Where implementing the No Action Alternative would have an impact on an issue analyzed in detail, analysis is included in the environmental consequences for that issue.

3.4 ISSUES ANALYZED IN DETAIL

3.4.1. Issue #1. Air Quality

How would construction, operation, and maintenance activities in the Proposed Action affect air quality (particularly National Ambient Air Quality Standards [NAAQS], hazardous air pollutants [HAPs], and volatile organic compounds [VOCs])?

3.4.1.1 *Affected Environment*

Air quality is determined by the quantity and chemistry of atmospheric pollutants in consideration of meteorological factors (e.g., weather patterns) and topography, both of which influence the dispersion and concentration of those pollutants. The presence of air pollutants is generally due to a number of different and widespread sources of emissions.

The analysis area for effects on air quality includes the CFO, specifically Eddy and Lea Counties because they overlap the Permian Basin, which is well-known for being a highly productive oil and gas region. The majority of new well completions on federally managed lands (including minerals) in this area are horizontal, and the main targets are expected to be the unconventional Bone Spring and Wolfcamp plays (Engler 2023). This spatial scope of analysis was identified to accommodate the regional nature of air pollution and to facilitate analysis using the best available air quality data, which is generally provided at the county level. Much of the information referenced in this section is incorporated by reference from the BLM 2022 Air Resources Technical Report for Oil and Gas Development: New Mexico, Oklahoma, Texas and Kansas (hereafter referred to as the Air Resources Technical Report; BLM 2023b).

National Ambient Air Quality Standards for Criteria Pollutants

The Clean Air Act (CAA) requires the US Environmental Protection Agency (EPA) to set NAAQS for six criteria air pollutants considered harmful to public health and the environment: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (particulate matter smaller than 10 microns in diameter [PM_{10}] and particulate matter smaller than 2.5 microns in diameter [$PM_{2.5}$]), sulfur dioxide (SO_2), and lead (Pb). Oxides of nitrogen (NO_x) and VOC emissions contribute to secondarily formed pollutants of O_3 and $PM_{2.5}$ through a complex series of atmospheric chemical interactions. The CAA categorizes NAAQS as “primary” or “secondary.” Primary standards provide public health protection, including the health of at-risk populations, with an adequate margin of safety (EPA 2023c), while secondary standards provide for public welfare, including protection against degraded visibility and damage to animals, crops, vegetation, and buildings (EPA 2023c). A detailed description of these pollutants, along with their health effects and their sources, can be found in Chapter 3 of the Air Resources Technical Report (BLM 2023b), which has been incorporated by reference.

Compliance with the NAAQS is typically demonstrated through monitoring of ground-level concentrations of atmospheric air pollutants. Areas where pollutant concentrations are below the NAAQS are designated as attainment or unclassifiable. Locations where monitored pollutant concentrations are higher than the NAAQS are designated as nonattainment, and air quality is considered unhealthy. All of the planning area is in attainment/unclassified status for each of the NAAQS; however, air monitoring data shows that O_3 design value concentrations in the planning area are within 95 percent of the 8-hour O_3 NAAQS, and in

some cases, above the NAAQS. Pursuant to New Mexico Statute 74-2-5.3, if the New Mexico Environment Department (NMED) determines that emissions from sources within its jurisdiction cause or contribute to O_3 concentrations in excess of 95 percent of the NAAQS for O_3, it shall adopt a plan, including regulations, to control emissions of NO_x and VOCs to provide for attainment and maintenance of the standard. The NMED initiated an Ozone Attainment Initiative to address O_3 levels in the area, including recent new rulemaking (waste prevention rule [NMAC 19.15.27.9] and ozone precursor rule [NMAC 20.2.50.1]; NMED 2023a, 2023b).

The EPA has delegated the responsibility for regulating and enforcing the NAAQS to the NMED and has approved the New Mexico State Implementation Plan, which allows the State of New Mexico to enforce both the New Mexico Ambient Air Quality Standards (NMAAQS) and the NAAQS on all federal and private lands with the exception of tribal lands and lands within Bernalillo County (NMED 2023d). Tribal lands under EPA jurisdiction follow the Federal Implementation Plan for the Indian Country Minor New Source Review Program for the Oil and Gas Industry (80 Federal Register 51991). Air pollutant concentrations are reported using design values. Design values are statistics that describe the air quality in any given area relative to the NAAQS levels. Design values are used to designate and classify nonattainment areas, as well as to assess progress toward meeting the NAAQS. The EPA's Air Quality Design Values webpage lists the Design Value Reports used for making NAAQS and NMAAQS compliance determinations (EPA 2023a). Design values that are representative of the impact analysis area are provided in Table 3.2. It is assumed that counties without reported design values have good air quality and that pollutant concentrations are below the NAAQS. The main pollutants of concern are O_3 and $PM_{2.5}$, as these are the pollutants with reported design values nearest or above the NAAQS.

Table 3.2. Design Values Compared with NAAQS and NMAAQS for Counties within/near the Analysis Area

Pollutant	2023 Design Concentrations	Averaging Time	NAAQS	NMAAQS
CO	El Paso County, TX – El Paso Chamizal: 2.0 ppm El Paso County, TX – Ojo De Agua: 0.7 ppm	8-hour	9 ppm	–
CO	El Paso County, TX – El Paso Chamizal: 4.1 ppm El Paso County, TX – Ojo De Agua: 1.0 ppm	1-hour	35 ppm	–
O_3	Eddy County – Holland St.: 0.078 ppm Eddy County – Carlsbad NP: 0.078 ppm Lea County – Hobbs: 0.071 ppm	8-hour [a]	0.070 ppm	–
NO_2	Eddy County – Holland St.: 5 ppb Lea County – Hobbs: 5 ppb	Annual [b]	53 ppb	50 ppb
NO_2	Eddy County – Holland St.: 31 ppb Lea County – Hobbs: 31 ppb	1-hour [c]	100 ppb	–
SO_2	El Paso County, TX – El Paso Chamizal: 5 ppb	1-hour [d]	75 ppb	–
$PM_{2.5}$ [#]	Lea County – Hobbs: 6.3 µg/m^3	Annual [b, e]	9 µg/m^3	–
$PM_{2.5}$ [#]	Lea County – Hobbs: 19 µg/m^3	24-hour [c,e]	35 µg/m^3	
PM_{10}	Dona Ana County – Holman Rd.: 2.7 Dona Ana County – West Mesa: 1.7 Luna County – Deming Airport.: 4.7	24-hour [b,e]	150 ug/m^3, Not to be exceeded more than once per year on average over 3 years	–

Source: EPA 2023a

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[a] Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years

[b] Not to be exceeded during the year

[c] 98th percentile, averaged over 3 years

[d] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

[e] Annual mean averaged over 3 years

[#] 2023 $PM_{2.5}$ design values have not been released by EPA. As a result, 2022 design values for $PM_{2.5}$ are populated in this table.

Specifically, the 2811 Holland Street and 727 Carlsbad Caverns Highway monitoring station in Eddy County are analyzed in depth below (EPA 2023i). Table 3.17 and Table 3.18 provide the 8-hour O3 values from the two Eddy County monitoring stations, including the number of days per year any exceedances of the NAAQS occurred. Compliance with the NAAQS is typically demonstrated through monitoring of ground-level concentrations of atmospheric air pollutants. Current design values in Eddy County and Lea County are above the 70 ppb 2015 ozone NAAQS; however, the area is still designated as attainment. While the EPA is currently considering a designation, it has not made public any action to designate the area as nonattainment for ozone. Design value data and trends for the proposed action are found in the Air Resources Technical Report and incorporated into this EA by reference (BLM 2023a).

Table 3.3 O3 Exceedances at the Eddy County Holland Site

Year	O3 8-hour ppm				
	Days with Exceedances	Highest	2nd Highest	3rd Highest	4th Highest
2016	0	0.065	0.064	0.064	0.063
2017	10	0.082	0.078	0.077	0.076
2018	18	0.096	0.095	0.091	0.083
2019	19	0.095	0.092	0.084	0.08
2020	5	0.075	0.075	0.075	0.073
2021	23	0.092	0.082	0.08	0.08
2022	23	0.084	0.083	0.08	0.079
2023	18	0.081	0.079	0.079	0.076

Note: Values are from the Eddy County Holland Site: 2811 Holland Street, Carlsbad, New Mexico (ID 350151005).
Source: EPA (2023i).

Table 3.4 O3 Exceedances at the Eddy County Carlsbad Site

Year	O3 8-hour ppm				
	Days with Exceedances	Highest	2nd Highest	3rd Highest	4th Highest
2016	0	0.07	0.069	0.069	0.069
2017	0	0.069	0.065	0.065	0.065
2018	10	0.099	0.081	0.08	0.08
2019	6	0.082	0.08	0.078	0.074
2020	9	0.074	0.074	0.073	0.072
2021	15	0.085	0.08	0.079	0.077
2022	21	0.086	0.085	0.084	0.083
2023	11	0.083	0.077	0.076	0.076

Note: Values are from the Eddy County Carlsbad Site: 727 Carlsbad Caverns Highway, Carlsbad, New Mexico (ID 350150010 and 350153001).
Source: EPA (2023i).

Air Quality Related Values

Prevention of Significant Deterioration (PSD) is a CAA permitting program for new or modified major sources of air pollution located in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (EPA 2023b). Under PSD regulations, the EPA classifies airsheds as Class I, Class II, or Class III. The CAA PSD requirements give more stringent air quality and visibility protection to national parks and wilderness areas that are designated as Class I areas, but a PSD designation does not prevent emission increases. Federal land managers are responsible for defining specific air quality related values, including visual air quality (haze) and acid (nitrogen and sulfur) deposition, for an area and for establishing the criteria to determine an

adverse impact on the air quality related values. There is one Class I area within the analysis area: Carlsbad Caverns National Park in Eddy County. There are two additional Class I airsheds near the analysis area: Guadalupe Mountains National Park, which is located just south of Eddy County in Hudspeth and Culbertson Counties in Texas, and Salt Creek Wilderness in Chaves County. White Sands National Park, which is located northwest of the analysis area in Otero and Doña Ana Counties, New Mexico is a Class II area with air monitoring equipment necessary to determine nitrogen and sulfur deposition trends (see Table 3.5). The analysis area is in attainment for the NAAQS and the NMAAQS and is categorized as a Class II area (NMED 2023c). This project is not subject to PSD analysis or permitting because PSD requirements apply to major stationary sources and the majority of emissions related to the Proposed Action would come from mobile, non-stationary sources during the construction and well development stages.

As required by the Regional Haze Rule, reasonable progress goals must provide for an improvement in visibility for the 20 percent most anthropogenically impaired days relative to baseline visibility conditions and ensure no degradation in visibility for the 20 percent clearest days relative to baseline visibility conditions (EPA 2019). Model simulations were used to project visibility by using the baseline for each Class I area as the average visibility (in deciviews [dv]) for the years 2014 through 2017. The visibility conditions in these years are the benchmark for the “provide for an improvement” and “no degradation” requirements. A line drawn between the end of the 2014-2017 baseline period and 2064 (dv/year) shows a uniform rate of progress or “glidepath” between these two points. The glidepath represents a linear or uniform rate of progress and is the amount of visibility improvement needed in each implementation period to stay on the glidepath; there is no rule requirement to be on or below the glidepath. Results for the nearest Class I areas to the analysis area show improving visibility trends for both the base (2014-2017) and future year (2028) deciview values on the 20% clearest and most impaired days, although some locations show 2028 projections above the linear uniform rate of progress value of the glidepath. More information can be found in the Technical Support Document for EPA’s Updated 2028 Regional Haze Modeling (EPA 2019), incorporated by reference. Visibility extinction trends based on air monitoring data from the IMPROVE monitors in the BLM New Mexico State Office area of responsibility show that visibility trends have been flat or improving (Figures 9-18 of the Air Resources Technical Report [BLM 2023b]). Specifically, visibility trends shown for Salt Creek, White Mountain, and Carlsbad Caverns/Guadalupe Mountains indicate that visibility on the best days has been flat to improving and that visibility on the worst days has shown a relatively flat to slight improvement over the period of record, although a lot of annual variability makes determining a trend difficult over the period of record. Implementation of best available retrofit technology strategies, as required under the federal Regional Haze Rule over the next few years, should result in further improvements (BLM 2023b).

The National Park Service (NPS) monitors and evaluates deposition to determine which parks are most at risk from air pollution and where conditions are declining or improving. Nitrogen deposition conditions in NPS-managed areas near the project area are generally poor to fair with no trend available, while sulfur deposition conditions are poor to good with no trend or a relatively unchanging trend (where trend data is available). Conditions by national park are provided in Table 3.3. (NPS 2023).

Table 3.5. Nitrogen and Sulfur Deposition Conditions at NPS-Managed Areas Near Eddy and Lea Counties

Class I Area	**Nitrogen (Conditions / Trend)**	**Sulfur (Conditions / Trend)**
Carlsbad Caverns National Park	Poor / Trend not available	Poor/ Trend not available
Guadalupe Mountains National Park	Poor / Trend not available	Fair / Relatively unchanging
Class II Area	**Nitrogen (Conditions / Trend)**	**Sulfur (Conditions / Trend)**
White Sands National Park	Fair / Trend not available	Good / Trend not available

Source: NPS 2023

Only areas with air monitoring equipment have been reported in this table.

Criteria Pollutant Emissions within the Analysis Area

Along with criteria pollutant concentrations as measured by air monitors, the EPA provides data on criteria pollutant emissions, expressed in tons per year or total volume of pollutant released into the atmosphere. Emissions data point to which industries and/or practices are contributing the most to the general level of pollution (BLM 2023b). Emissions associated with industry and other anthropogenic practices within the CFO's administrative boundary are primarily the result of oil and gas development, miscellaneous sources, and highway vehicles (EPA 2023d).

The NMED compiles statewide emission inventories to assess the level of pollutants released into the air from various sources. The 2020 National Emissions Inventory (NEI) data for the state of New Mexico, the New Mexico portion of the Permian Basin (Pecos District), and Eddy and Lea Counties (the two counties that fall within the New Mexico portion of the Permian Basin and the CFO planning area) are listed in Table 3.4 (EPA 2023d). Notable sources of criteria air pollutants in the analysis area include three natural gas-powered electrical generation units: the Hobbs Generating Station in the city of Hobbs in Lea County, the Maddox Power Station located 8 miles north of Hobbs, and the Cunningham Power Station located 13 miles west of Hobbs (EPA 2023e). Other notable sources of criteria air pollutants are numerous natural gas processing plants scattered across Eddy and Lea Counties, including in the Pecos District (NMED 2023e).

Table 3.6. 2020 NEI Air Pollutant Emissions for New Mexico and Eddy and Lea Counties

Source	Emissions (tons per year)						
	NO_X	VOCs	PM_{10}	$PM_{2.5}$	SO_2	CO	HAPs
2020 NEI – Lea and Eddy Counties *	59,510	227,325	13,570	4,600	82,081	91,287	21,685
2020 NEI – New Mexico Portion of the Permian Basin (Pecos District)	66,098	252,387	20,585	6,270	83,521	109,477	30,508
2020 NEI – State of New Mexico	199,462	712,639	129,132	42,623	87,828	615,513	105,528

Source: EPA 2023d

NH_3 = ammonia; HAPs = hazardous air pollutants

* 2020 data include the point, nonpoint, onroad mobile, and nonroad mobile data. Values may not always sum correctly if queried on demand as the NEI database updates its emissions periodically with newer emission information.

The largest 2020 NEI anthropogenic sources of criteria air pollutants in the Permian Basin (Eddy, Chaves, Lea, and Roosevelt Counties) is oil and gas sources for CO, NO_X, SO_2, and VOCs. In the Permian Basin, the largest sources of criteria air pollutants emitted by human activities are area sources for PM_{10} and $PM_{2.5}$ (BLM 2023b). The largest 2020 NEI anthropogenic sources of criteria air pollutants in Lea and Eddy Counties are oil and gas sources for CO, NO_x, SO_x, and VOCs (Table 3.5). The Area Sources category includes all area sources except biogenic (natural) sources, forest wildfires, and prescribed fires. From the period of 2008 to 2020, criteria air pollutant emissions have increased. CO emissions increased from 61,944 tons in 2008 to 91,287 tons in 2020; NO_x increased from 23,225 tons to 59,510 tons; SO_x went from 9,695 tons to 82,081 tons; and VOCs increased from 89,149 tons to 227,325 tons. However, PM_{10} decreased from 56,337 tons to 13,570 tons and $PM_{2.5}$ decreased from 6,602 tons to 4,600 tons. Emissions from biogenic sources decreased from 105,015 tons in 2008 to 19,056 tons in 2020, while criteria air pollutant emissions from oil and gas production increased from 9,931 to 337,269 tons. (EPA 2008, 2023d).

Table 3.7. 2020 NEI Lea and Eddy Counties Air Pollutant Emissions Tons per Year by Source

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	NH_3	Total
Area sources	1,330	449	10,275	1,615	154	3,130	8,453	25,406
Oil and gas sources	60,281	40,675	1,786	1,637	81,518	192,365	3	378,265

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOCs	NH_3	Total
Non-road mobile	3,123	482	40	36	1	300	1	3,982
On-road mobile	10,058	2,327	150	69	6	626	62	13,298
Point sources	12,210	14,611	1,241	1,177	394	14,789	137	44,559
VOC refueling	–	–	–	–	–	1,432	–	1,432
Natural sources (biogenic)	3,591	948	–	–	–	14,517	–	19,056
Forest wildfires	478	12	54	45	5	114	7	715
Prescribed fires	216	6	24	21	3	52	3	325
Lea and Eddy Counties Total	**91,287**	**59,510**	**13,570**	**4,600**	**82,081**	**227,325**	**8,666**	**487,038**

Source: EPA 2023d

While other emissions data exist (2014 Western States Air Resources Council–Western Regional Air Partnership, 2017 NEI data), the 2020 NEI contains the newest and best available emissions information. The 2020 NEI data include emissions from agricultural practices in Eddy and Lea Counties, which make up 11,052 tons of the total criteria air pollutant emissions, as well as industrial mining, which contributed 820 tons of emissions. There are two major potash mines approximately 25 miles east of Carlsbad, with potash leases located in eastern Eddy County and western Lea County. Petroleum refineries contributed 2,208 tons of total emissions in 2020 (EPA 2023d). Two oil refineries exist within Eddy and Lea Counties: HF Sinclair Navajo Refining LLC (Artesia) in Eddy County and HF Sinclair Navajo Refining LLC (Lovington), located 5 miles southeast of Lovington in Lea County. The Artesia refinery is a PSD major source subject to best available control technology limits and control methods (NMED 2023f).

Hazardous Air Pollutants

HAPs A pollutant is classified as a HAP if it has been identified by the EPA as a compound that is known or suspected to cause cancer or other serious health effects, such as compromises to immune and reproductive systems, birth defects, developmental disorders, and/or adverse environmental effects (BLM 2023b). There are currently 188 compounds listed as HAPs by the EPA. HAPs emitted by the oil and gas industry include benzene, toluene, ethyl benzene, mixed xylenes, formaldehyde, and normal-hexane. National Emissions Standards for HAPs (NESHAPs), established by the EPA, limit the release of specified HAPs from specific industries (40 C.F.R. §§ 61, 63). NESHAPs for oil and gas development include control of benzene, toluene, ethyl benzene, mixed xylenes, and n-hexane from major sources, and benzene emissions from triethylene glycol dehydration units as area sources (BLM 2023b).

The Air Resources Technical Report discusses the relevance of HAPs to oil and gas development and the particular HAPs that are regulated in relation to these activities (BLM 2023b) and has been incorporated by reference. Potential health risks associated with HAPs released into the air from oil and gas operations have been evaluated by review of existing emissions data, air quality monitoring, and modeling studies. The Air Resources Technical Report discusses in detail a 2019 health assessment study for which scientists from Colorado State University conducted on-site air monitoring for 47 VOCs (including HAPs) during various stages of well development and production at oil and gas extraction facilities in Colorado. In summary, simulated cancer risks to average individuals were below one in one million at distances of 1,400 feet from the well pads, four in one million at 500 feet from the well pads, and ten in one million at 300 feet from the well pads. Fewer than one in one million people at distances of 2,000 feet from the well pads experienced the worst potential long-term combination of individual risk factors, oil and gas emissions, and local meteorological conditions (maximum exposed individual). This figure rises to seven in one million at 500 feet from the well pads, and 10 in 1 million at 400 feet from the well pads (BLM 2023b).

The Air Toxics Screening Assessment (AirToxScreen), published by the EPA, provides a screening tool for state, local, and tribal air agencies (EPA 2022a). The EPA Air Toxics Screening Assessment is used to evaluate impacts from existing HAP emissions in New Mexico. AirToxScreen is the successor to the

previous National Air Toxics Assessment. In December 2022, EPA released the results of its 2019 AirToxScreen (EPA 2022a). AirToxScreen calculates concentration and risk estimates from a single year's emissions data using meteorological data for that same year. The risk estimates assume a person breathes these emissions each year over a lifetime (or approximately 70 years). AirToxScreen provides quantitative estimates of potential cancer risk and five classes of non-cancer hazards (grouped by organ/system: immunological, kidney, liver, neurological, and respiratory) associated with chronic inhalation exposure to real-world toxics for each county and census tract (BLM 2023b). AirToxScreen is a cumulative HAP assessment based on total HAP emissions from all sources contained in the NEI. Per the AirToxScreen Technical Support Document, this national-scale assessment (AirToxScreen) is consistent with EPA's definition of a cumulative risk assessment, as stated in EPA's *Framework for Cumulative Risk Assessment*, as "an analysis, characterization, and possible quantification of the combined risks to health or the environment from multiple agents or stressors" (EPA 2022b).

The 2019 AirToxScreen analysis reveals that the total cancer risk (defined as the probability of contracting cancer over the course of a 70-year lifetime, assuming continuous exposure) in Chaves, Eddy, and Lea Counties is 19.16, 22.25, and 20.16 in 1 million, respectively, which is lower than the nationwide level (25.5 in 1 million) and in the same range as the state of New Mexico (19.1 in 1 million). The contribution of the oil and gas industry to the cancer risk in Chaves, Eddy, and Lea Counties is 0.15, 3.91, and 3.05 in 1 million, respectively (EPA 2022a).[1] Bright lines[2] could not be used in the analysis of the HAP results to determine if a particular risk level is acceptable or not, as no such construct for risk exists within the CAA framework akin to the NAAQS (that is, there are no NAAQS against which to compare modeled HAP concentrations). Rather, values or ranges of values published by EPA (e.g., AirToxScreen [National Air Toxics Assessment] or 40 C.F.R. Part 300.430 [Remedial Investigation/Feasibility Study]) were used to provide useful context to risk estimates. While no explicit risk thresholds are available, EPA uses 1 in 1 million and 100 in 1 million risk for context (EPA 2022b). As a result, the values for Lea and Eddy Counties are within the contextual range published by the EPA. The respiratory hazard index (HI) in the analysis area (Chaves, Eddy, and Lea Counties) ranges from 0.24, 0.23 and 0.21, respectively, which is lower than the national HI (0.31) and within a similar range as the New Mexico HI (0.22) (BLM 2023b). A review of the results of the 2019 AirToxScreen shows that cancer, neurological risks, and respiratory risks in the analysis area are all lower than national levels and are generally the same as the state of New Mexico (EPA 2022b).

This HAPs analysis was prepared in response to an adverse decision of the Tenth Circuit. While the U.S. Court of Appeals for the Tenth Circuit directed the BLM to analyze cumulative HAPs emissions for the San Juan Basin in its oil and gas leasing NEPA (Diné Citizens Against Ruining Our Env't v. Haaland, 59 F.4th 1016, 1047 (10th Cir. 2023) ("Diné CARE II"))[3], the BLM has also created the same analysis for the Carlsbad Field Office. The BLM Cumulative Hazardous Air Pollutants Modeling – Final Report (Ramboll and BLM 2023) and the BLM Summary of Cumulative Oil and Gas Hazardous Air Pollutant Analysis for the Pecos District Office (PDO) (BLM 2024c), incorporated by reference and summarized below, detail the modeling methods used and the results of the modeling. Note, while the report shows the analysis for all of PDO, only the counties in the Carlsbad Field Office were discussed in this EA.

The BLM's Western United States HAP photochemical modeling assessment was prepared to support BLM's analysis of cumulative oil and gas impacts from HAPs originating from oil and gas production in Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming (states where the BLM commonly authorizes federal activities for fossil energy development) on public health. In regards to which HAPs to consider in the analysis, the Diné CARE II Court specifically mentioned five HAPs—

[1] A one in 1 million lifetime cancer risk is defined as for every 1 million people who are continuously exposed over 70 years to a certain level of a pollutant, one person may develop cancer (EPA 2022a).

[2] "A "bright line" in risk characterization refers to a threshold value that separates acceptable and unacceptable levels of risk. It is regarded as a clear and unambiguous limit used to determine whether a particular level of exposure to a hazardous substance is safe or not." (BLM 2024a:6).

[3] The federal Clean Air Act defines a Hazardous Air Pollutant (HAP) as "any air pollutant" of which "emissions, ambient concentrations, bioaccumulation or deposition of the substance are known to cause or may reasonably be anticipated to cause adverse effects to human health or adverse environmental effect." 42 U.S.C. § 7412.

benzene, toluene, ethylbenzene, mixed xylenes, and n-hexane—as applying to oil and gas development activities based on the National Emission Standards for HAPs (NESHAPs; see 43 C.F.R. Part 63). The modeling assessment evaluated emissions from existing federal, new federal, and non-federal oil and gas sources and includes six key HAPs—benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde—because these compounds are common in the oil and gas sector and consistent with regulatory requirements described in the Environmental Protection Agency's New Source Performance Standards, see 43 C.F.R. Part 60, and NESHAPs. HAP emissions in this study include emission sources associated with wellsite exploration, wellsite production, and midstream sources (Ramboll and BLM 2023). The modeling analysis evaluated air quality out to a future year of 2032[4] utilizing data from the 2028 Western Regional Air Partnership (WRAP)/Western Air Quality Study (WAQS) modeling platform, the Environmental Protection Agency SPECIATE 5.14 speciation profiles, the EPA's 2016v2 emissions modeling platform (EPA 2022d), and the BLM oil and gas development projections to quantify and apportion federal and non-federal oil and gas emissions (Ramboll and BLM 2023). The model output allows the BLM to compare concentrations of HAPs to calculated risk-based thresholds in order to provide the hard look at the effects on public health required by NEPA.

Carcinogenic and noncarcinogenic chronic risks from modeled oil and gas concentrations were calculated for the 2032 future year. The emissions inventory for the Carlsbad Field Office was based on Annual Energy Outlook oil and gas projections for the Permian Basin. These projections describe the reasonably foreseeable oil and gas development anticipated to occur within the Permian Basin projected out to 2032, providing the temporal component of the cumulative oil and gas analysis as described by the CEQ regulations. These projections reflect the best currently available information for projected oil and gas development in the Permian Basin. Health-based inhalation thresholds and cancer unit risk estimate threshold values were obtained from the weight of evidence for carcinogenicity under the 2005 EPA cancer guidelines (without revisions) (EPA 2021). A residency exposure adjustment factor was applied to the cancer inhalation risk by multiplying the annual modeled concentration by the cancer unit risk factor and multiplying this product by an applicable exposure adjustment factor. The residency exposure adjustment factor[5] is computed by taking the average residency of the county where development is proposed (Table 2.3) and dividing that by length of exposure over an assumed 70-year life span. For example, for Eddy County, the residency exposure adjustment factor would be 15.0/70. All other values in the following tables are raw model output with no adjustment applied.

Table 2.3. County specific residency information

Area	Chaves County, New Mexico	Eddy County, New Mexico	Lea County, New Mexico	New Mexico	United States
Years	14.9	15.0	14.0	13.1	12.4

Source: Estimate based on data from U.S. Census Bureau (USCB), 2022, 2017-2021 American Community Survey 5-Year Estimates, Table S2502 Demographic Characteristics for Occupied Housing Units, https://data.census.gov/table/ACSST5Y2021.S2502, accessed on October 5, 2023.

Table 2.4 shows the oil and gas cancer risk from federal sources (existing and new) and from all mineral designations together from the combination of benzene, ethylbenzene, and formaldehyde. The risk analysis was performed only for the three HAPs (benzene, ethylbenzene, and formaldehyde) because these pollutants had EPA-provided non-zero unit risk estimate (URE) values based on the weight of evidence approach (EPA 2021). The non-adjusted (70-year) cancer risk from all oil and gas sources for Chaves, Eddy, and Lea Counties is less than 20 in a million (maximum of 15.10 in Eddy County). The maximum total oil and gas residency exposure-adjusted cancer risk for Chaves, Eddy, and Lea Counties, as described above, is 1.59, 3.24, and 2.62, respectively.

[4] EPA's 2016v2 modeling platform (EPA 2022d), the most advanced dataset at the time of model development, includes emissions for the years 2016, 2023, 2026, and 2032. Future year 2032 was used in this modeling assessment.

[5] EPA. Exposure Assessment Tools by Routes – Inhalation, https://www.epa.gov/expobox/exposure-assessment-tools-routes-inhalation.

Table 2.4. Estimated Cancer Risk from 2032 Oil and Gas Production in the Carlsbad Field Office by Mineral Designation

County	Cancer Risk* from Existing Federal Wells (per million)	Cancer Risk* from New Federal Wells (per million)	Cancer Risk* from Total Federal Wells (per million)	Cancer Risk* from Nonfederal Wells (per million)	Cancer Risk* from Cumulative Oil and Gas Production (per million)	Adjusted Cancer Risk** From Cumulative Oil and Gas Production (per million)
Chaves	0.20 to 2.51	0.07 to 1.54	0.26 to 3.95	0.20 to 3.53	0.46 to 7.48	0.10 to 1.59
Eddy	0.20 to 6.91	0.08 to 2.95	0.28 to 7.57	0.22 to 8.95	0.51 to 15.10	0.11 to 3.24
Lea	0.45 to 4.65	0.25 to 4.86	0.72 to 7.10	0.79 to 6.46	1.61 to 13.11	0.32 to 2.62

*Cancer risk from emissions of benzene, ethylbenzene, and formaldehyde
**Adjusted residency risk based on residency factors by county (14.9 years for Chaves, 15.0 years for Eddy, and 14.0 years for Lea Counties)

Risk characterization is a description of the nature and, often, magnitude of human risk, including resulting uncertainties. Risk characterization is accomplished by integrating information from the components of the risk assessment and synthesizing an overall conclusion about risk that is complete, informative, and useful for decision makers (EPA 2000[6]). A “bright line” in risk characterization refers to a threshold value that separates acceptable and unacceptable levels of risk. It is regarded as a clear and unambiguous limit used to determine whether a particular level of exposure to a hazardous substance is safe or not. Bright lines were not used in the analysis of the cumulative oil and gas HAPs results to determine if a particular risk level is acceptable or not, as no such construct for risk exists within the Clean Air Act framework akin to the national ambient air quality standards (that is, there are no national ambient air quality standards against which to compare modeled HAP concentrations). Rather, values or ranges of values published by EPA (e.g., AirToxScreen [National Air Toxics Assessment] or 40 C.F.R. Part 300.430 [Remedial Investigation/Feasibility Study]) were used to provide useful context to risk estimates associated with the cumulative oil and gas HAPs study. As described in the BLM Cumulative Hazardous Air Pollutants Modeling Final Report (Ramboll and BLM 2023), while no explicit risk thresholds are available, EPA uses 1 in 1 million and 100 in 1 million risk for context (EPA 2022b). As a result, both the 70-year cancer risk and the adjusted cancer risk in Table 2.4 are within the contextual range published by the EPA. It is important to note that the cancer risks estimated by this assessment only consider cumulative oil and gas sources and six common oil and gas HAP pollutants. While the cumulative oil and gas contribution is within the contextual range published by EPA (1 in 1 million and 100 in 1 million), additional HAPs from non-oil and gas sources could increase the overall risk in the project area. This modeling assessment looked at cumulative oil and gas sources to address the court’s holding in regards to analysis of cumulative HAP emissions. It was beyond the scope of this modeling assessment to determine cumulative HAP values from non-oil and gas sources.

AirToxSreen is consistent with EPA’s definition of a cumulative risk assessment. The contribution, based on EPA's most recent AirToxScreen results (2019), of the oil and gas industry to the cancer risk in Chaves, Eddy, and Lea Counties ranged from 0.15 to 3.91 in a million (BLM 2023b). While not paired in time, the BLM’s cumulative oil and gas study showed the contribution of the oil and gas industry to cancer risk (circa 2032) in Chaves, Eddy, and Lea Counties ranged from 1.59 to 3.24 in a million (BLM 2024c). While different methods were used by EPA and the BLM to determine cumulative oil and gas contributions and this could result in inconsistencies when comparing the data, the overall trend projects cumulative oil and gas contribution to be steady to slightly decrease between 2019 and circa 2032. The overall HAPs trend could be further affected by projected declines in other sectors based on increased electrification, equipment efficiency, and renewable technologies for electricity generation (EIA 2023a). To have an entirely consistent analysis between BLM and EPA would have required BLM to project the entire national emission inventory forward to a common future year (2032 in the BLM study) and use the

[6] EPA. 2000. Science Policy Council Handbook “Risk Characterization”, EPA 100-B-00-002, December 2000, https://www.epa.gov/sites/default/files/2015- 10/documents/osp_risk_characterization_handbook_2000.pdf.

CMAQ model with the unique chemical mechanism within CMAQ used in AirToxScreen. To BLM's knowledge, in the near 30-year history of EPA's National Air Toxics Assessment (NATA), of which AirToxScreen is part of, a future year projection for NATA has never been attempted and such an exercise would be outside the scope of this EA and would not contribute to informed decision-making for the proposed action. Therefore, using the AirToxScreen results described above, if one were to simply add the risk values for respective counties between EPA's and BLM's modeling (would not be scientifically valid given the varying methodologies), the addition of the other source categories places the total risk from other sources in addition to future projections of HAPs impacts from oil and gas development still well within the 1 in 1 million and 100 in 1 million risk range.

Table 2.5 shows the Hazard Quotients (HQs) for each compound and the Hazard Index (HI). EPA estimates chronic noncancer HQs by dividing a chemical's estimated long-term exposure concentration by the reference concentration for that chemical. Chronic noncancer hazards from multiple air toxics were assessed by calculating a HI through the summation of individual HAP HQs that share similar adverse health effects, resulting in a target organ-specific HI representing the risk to a specific organ or organ system. An HQ or HI value less than 1 indicates that the exposure is not likely to result in adverse noncancer effects. (Ramboll and BLM 2023, EPA 2022b). Chaves, Eddy, and Lea Counties show HQ and HI values below 1 for all mineral designations, indicating that cumulative oil and gas source exposure is not likely to result in adverse noncancer effects. The maximum HI from total oil and gas production is also below 1, at 0.0564, 0.1145, and 0.1007, for Chaves, Eddy, and Lea Counties, respectively. It is important to note that the noncancer risks estimated by this assessment only consider cumulative oil and gas sources and the six common oil and gas pollutants. While the cumulative oil and gas contribution are below 1, additional HAPs from non-oil and gas sources could increase the overall risks in the project area. This modeling assessment looked at cumulative oil and gas sources to address the court's holding in regards to analysis of cumulative HAP emissions. It was beyond the scope of this modeling assessment to determine cumulative HAP values from non-oil and gas sources.

Table 2.5. Estimated Hazard Quotients and Hazard Index from Circa 2032 Oil and Gas Production in the Carlsbad Field Office by Mineral Designation

	Hazard Quotient (HQ)						Hazard Index (HI)
Source	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**	**n-Hexane**	**Formaldehyde**	
Chaves County							
Existing Federal	<0.0001 to 0.0008	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0001	Range is <0.0001	0.0015 to 0.0181	0.0015 to 0.0191
New Federal	<0.0001 to 0.0019	Range is <0.0001	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0004	0.0005 to 0.0085	0.0005 to 0.0109
Total Federal	<0.0001 to 0.0026	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0002	<0.0001 to 0.0004	0.0019 to 0.0263	0.002 to 0.0294
Non-Federal	<0.0001 to 0.0017	Range is <0.0001	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0004	0.0015 to 0.0259	0.0015 to 0.027
Total Oil and Gas	0.0001 to 0.0034	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0003	<0.0001 to 0.0005	0.0034 to 0.0522	0.0035 to 0.0564
Eddy County							
Existing Federal	<0.0001 to 0.0039	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0004	<0.0001 to 0.0006	0.0015 to 0.047	0.0016 to 0.0516
New Federal	<0.0001 to 0.0037	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0001	<0.0001 to 0.0008	0.0005 to 0.0162	0.0006 to 0.0208
Total Federal	<0.0001 to 0.0052	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0005	<0.0001 to 0.0008	0.0021 to 0.0528	0.0021 to 0.0563
Non-Federal	<0.0001 to 0.0043	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0004	<0.0001 to 0.0008	0.0017 to 0.0632	0.0017 to 0.0679

	Hazard Quotient (HQ)						Hazard Index (HI)
Source	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**	**n-Hexane**	**Formaldehyde**	
Total Oil and Gas	0.0001 to 0.0069	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0007	<0.0001 to 0.0009	0.0037 to 0.1066	0.0039 to 0.1145
Lea County							
Existing Federal	0.0001 to 0.0014	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0002	<0.0001 to 0.0002	0.0033 to 0.0353	0.0034 to 0.0361
New Federal	0.0002 to 0.012	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0002	<0.0001 to 0.0029	0.0015 to 0.0156	0.0018 to 0.0309
Total Federal	0.0004 to 0.0127	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0003	<0.0001 to 0.003	0.0049 to 0.0491	0.0054 to 0.0511
Non-Federal	0.0003 to 0.0016	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0002	<0.0001 to 0.0003	0.0057 to 0.0477	0.006 to 0.0496
Total Oil and Gas	0.0008 to 0.0133	Range is <0.0001	Range is <0.0001	<0.0001 to 0.0003	<0.0001 to 0.003	0.0111 to 0.0968	0.0121 to 0.1007

3.4.1.2 *Environmental Consequences*

IMPACTS FROM THE PROPOSED ACTION

The Proposed Action would result in different emission sources associated with well development and well production. Annual estimated emissions from the Proposed Action, summarized in Table 3.7, are estimated from the BLM Single Oil and Gas Well Emissions Tool. Emissions related to construction were averaged over all wells in the single well construction/development phase in Table 3.7. After construction and development, only operation emissions would occur on an annual basis. Operation annual emissions were based upon the maximum emission year. Future-year operational annual emissions would be lower, based on production decline of the wells.

Table 3.9. Proposed Action Emissions (tons/year)

	Total Emissions (tons per year)						
	PM_{10}	**$PM_{2.5}$**	**NO_x**	**SO_2**	**CO**	**VOCs**	**Total HAPs**
Single well construction/development phase	2.73	0.75	8.75	0.0114	2.96	2.21	0.02
Single well operation phase	1.40	0.51	1.11	0.0046	1.34	10.54	0.93
Single well total	4.13	1.26	9.86	0.016	4.3	12.75	0.95
4-well construction/development phase	10.92	3.00	52.84	0.04	12.64	2.76	0.08
4-well operation phase	5.60	2.04	3.88	0.02	4.84	42.12	3.72
4-well project total	**16.52**	**5.04**	**56.72**	**0.06**	**17.48**	**44.88**	**3.80**
Current emissions (Eddy and Lea Counties)[1]	13,570	4,600	59,510	82,081	91,287	227,325	25,271
Project (4 wells) percent increase compared to Eddy and Lea Counties	**0.12**	**0.11**	**0.10**	**0.000**	**0.019**	**0.02**	**0.015**

[1] EPA 2023d

Well development would include NO_x, SO_2, and CO tailpipe emissions from construction equipment, vehicle traffic, drilling, and completion activities. Fugitive dust concentrations would occur from vehicle traffic on unpaved roads, construction equipment, and wind erosion where soils are disturbed. Drill rig and

fracturing engine operations would result mainly in NO_x and CO emissions, with lesser amounts of SO_2. VOC and HAP emissions during completions (flowback) would also occur. These emissions would be short term, approximately 1–2 weeks for the construction of the well pad and 24 days for the development and completion of each well. During well production, NO_x, CO, VOC, and HAP emissions would originate from well pad separators, storage tank vents, compressor engines, generators, equipment tailpipes, and flares (if applicable). Fugitive road dust (PM_{10} and $PM_{2.5}$) would be produced by operational vehicles visiting and servicing the wells. HAP emissions would occur from storage tanks, pneumatic devices, and other production equipment. The wells associated with the Proposed Action are assumed to be included within the RFD scenario. Emissions would be minimized through design features and COAs such as limiting surface disturbance, requiring interim reclamation, and requiring dust control on dirt roads. Additionally, emissions would be minimized by following applicable NMED rules and regulations.

Levels of HAPs would also temporarily increase during construction and completion activities under the Proposed Action, particularly in the form of diesel particulate matter from the on- and off-road construction equipment. However, concentrations of mobile source emissions of diesel particulate matter are typically reduced by 60 percent at a distance of approximately 300 feet (Zhu et al. 2002). According to Zhu et al. (2002), the ultrafine particle (diameter <100 nanometers) concentration measured at 300 m downwind from source of emissions was indistinguishable from the upwind background concentration. Additionally, a 2019 health assessment study completed by Colorado State University (ICF and Colorado State University 2019) during various stages of well development and production at oil and gas extraction facilities in Colorado found that chemical air concentrations for VOCs (including HAPs) and associated exposure levels decreased rapidly with distance. Simulated chronic cancer risks over a lifetime of exposure during production operations to average individuals were below 1 in 1 million at distances of 1,400 feet from the well pads, 4 in 1 million at 500 feet from the well pads, and 10 in 1 million at 300 feet from the well pads. Maximum exposed individuals were below 1 in 1 million at distances of 2,000 feet from the well pads, 7 in one million at 500 feet from the well pads, and 10 in 1 million at 400 feet from the well pads (ICF and Colorado State University 2019).

VOCs and NO_X contribute to the formation of O_3, which is the pollutant of most concern in southeastern New Mexico, and because O_3 is not a direct emission, emissions of NO_X and VOCs are used as proxies for estimating O_3 levels. Under the Proposed Action, the additional NO_X and VOC emissions (quantified in Table 3.7) from the potential development would incrementally add to O_3 levels within the analysis area. Regarding ozone values in Eddy and Lea Counties, current design values in Eddy and Lea County are above the 70 ppb 2015 ozone NAAQS; however, the area is still designated as attainment. While the EPA is currently considering a designation, it has not made public any action to designate the area as nonattainment for ozone. The New Mexico Ozone Attainment Initiative showed 2028 projected future ozone design values in southern New Mexico to be below the 70 ppb 2015 ozone NAAQS when following EPA guidance, using the 2012–2016 current design value and the Oil and Gas (O&G) Control Strategy scenario. A sensitivity study using a current design value of 2015–2019 resulted in 2028 projected future ozone design values below the 70 ppb 2015 ozone NAAQS when using the O&G Control Strategy scenario. An additional sensitivity study using a current design value of 2017–2019 resulted in 2028 projected future ozone design values above the 70 ppb 2015 ozone NAAQS when using the O&G Control Strategy scenario. However, it should be noted that these sensitivity studies likely result in uncertainties and likely overstate the 2028 ozone future design values in the Permian Basin emissions, as the scaling factor (Relative Response Factor [RRF] = Σ Model2028 / Σ Model2014) does not account for emission increases in oil and gas sources between 2014 and the end of the 2010 decade. It should also be noted that the sensitivity studies did not follow EPA guidance, for which the current design value is the average of 3 years of ozone design values centered on the base modeling year (NMED 2021). Additionally, the modeling results for the future year (2032) simulations for New Mexico from the BLM Regional Criteria Air Pollutant Model showed that ozone cumulative concentrations ranged between 50 and 65 ppb in New Mexico, with the higher concentrations in the San Juan Basin and isolated regions on the western side of the state. The modeled values did not lead to any ozone NAAQS exceedances in the state (BLM and EMPSi 2023). Further discussion of air quality modeling is found in the cumulative impacts section below.

Emissions of criteria air pollutants would also occur outside the planning area from transport, processing, distribution, and end-use. Generally, crude oil from the well fields in the Permian Basin of southeastern

New Mexico is transported to the crude oil refinery in Artesia, also located in southeastern New Mexico. The refinery processes both heavy sour and light sweet crude oils and serves markets in the southwestern United States and northern Mexico and primarily produces gasoline, diesel, and asphalt (US Energy Information Administration [US EIA] 2023c, NMED 2023f). Natural gas is produced from conventional oil and gas wells and shale gas wells in the Permian Basin. Interstate pipelines bring natural gas into New Mexico from Texas and Colorado, but because New Mexico produces more natural gas than it uses, about three times more natural gas leaves the state, with most of the natural gas that leaves the state transported to Arizona or Texas. Some of New Mexico's natural gas is placed in the state's two underground storage fields (US EIA 2023c). Since combustion of all petroleum products emits criteria and HAP emissions, local ambient concentrations of these pollutants could increase in areas where oil and gas products from the Permian Basin are combusted. This could contribute to an area exceeding either national or local air quality standards. 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. If any pollutant concentration is near or above its standard in a particular area, the combustion of oil and gas products could 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. Downstream combustion and end uses are regulated by the EPA or delegated to state agencies.

IMPACTS FROM THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not authorize the APDs, and the new wells and associated infrastructure described in the Proposed Action would not be implemented. Potential impacts on air quality would not occur because the proposed wells would not be developed, and no new emissions of pollutants would occur. Although no new criteria pollutant emissions would occur under the No Action Alternative, federal production levels are expected to remain static or even increase in the short term, and nonfederal oil and gas supply would likely increase if the wells were not developed, potentially resulting in similar increases in emissions as described for the Proposed Action. Oil and gas development of nonfederal minerals would be subject to federal and state regulations governing oil and gas activities.

CUMULATIVE IMPACTS

Cumulative impacts for air quality are the result of the incremental impacts from the Proposed Action when added to other past, present, and reasonably foreseeable future actions. The sections below describe trends in air quality and how they relate to past and present oil and gas activities, as well as projected emissions through modeling for the CFO. More information regarding cumulative effects can be found in Chapter 9 of the Air Resources Technical Report (BLM 2023b).

Emission Trends

Past and present actions that have affected and would likely continue to affect air quality in the analysis area include surface disturbance resulting from ongoing oil and gas development and associated infrastructure, geophysical exploration, ranching, and livestock grazing, range improvements, recreation (including OHV use), authorization of rights of ways (ROWs) for utilities and other uses, and road development. Past and present actions that have affected and would likely continue to affect air quality are too numerous to list here but would include the development or conversion of power plants; the development of energy sources such as oil and gas; the development of highways and railways; and the development of various industries that emit pollutants. These types of actions and activities can reduce air quality through emissions of criteria pollutants including fugitive dust, VOCs, and HAPs, as well as contribute to deposition impacts and to a reduction in visibility.

Emissions in the oil and gas sector roughly parallel oil and gas production. Future trends in oil and gas production growth for the Mountain Region (Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizonia, and New Mexico) are used from the U.S. Energy Information Administration (EIA) 2023 Annual Energy Outlook (AEO) (EIA 2023a) to provide an estimate of the change in emissions from oil and gas sources in New Mexico. U.S. production of natural gas and petroleum and liquids is projected to rise amid

growing demand for exports and industrial uses. U.S. natural gas production is expected to increase by 15% from 2022 to 2050, while crude oil is expected to increase by 11 percent during the same period. Similarly, oil and gas related CAP and HAP emissions from existing and foreseeable wells, plus development of lease parcel, are anticipated to rise due to increasing production.

Design value trends for pollutants in the Permian Basin can be found in Section 3 of the Air Resource Technical Report (BLM 2023b), incorporated by reference. O_3 (8-hour) design value trends from the 2011-2013 design value to the 2021-2023 design value indicate an increasing to a steady/flat trend, depending on the county in the Permian Basin. Nationally, O_3 concentrations at urban and rural sites have decreased 29 percent from 1980 to 2022. Since the late 1990s, concentrations of O_3-depleting substances have been declining due to the successful implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer (United Nations Environment Programme [UNEP] 1987). The long-term decrease is likely also driven by reductions in global emissions of O_3 precursors such as VOCs and NO_x. In correlation over the same period, emissions of VOCs and NO_x have decreased by 61 percent and 72 percent, respectively (BLM 2023b).

In Carlsbad-Artesia, New Mexico, O_3 concentrations increased 9.9 percent from 2011 to 2023 (BLM 2023a; EPA 2024). Design values in Lea County for O_3 have shown a relatively flat/slightly increasing curve within the last 10 years, while design values in Eddy County showed an increasing curve in the mid to late 2010s and a relatively flat curve for the last 4 years (BLM 2023b; EPA 2023a; EPA 2024). Ozone reductions are anticipated as per the Statewide Natural Gas Capture Requirements (NMAC 19.15.27.9), which regulate the oil and gas sector to reduce natural gas waste by a fixed amount each year to achieve a gas capture rate of 98 percent by December 31, 2026. Key provisions include prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to route the gas to pipelines or to use this gas for some other beneficial purpose (such as onsite fuel consumption). In all cases, operators must flare rather than vent natural gas except where this is technically infeasible or would pose a safety risk. These provisions will reduce VOC emissions due to stringent limitations on natural gas venting, which results in uncombusted VOC emissions. Additionally, the Statewide Natural Gas Capture Requirements propose that natural gas be recovered and reused rather than flared, which would result in reductions of VOCs, NO_x, CO, SO_2, and particulate matter emissions. Additionally, the NMED Ozone Attainment Initiative (20.2.50.1 NMAC) rule is estimated to reduce VOC emissions by 106,420 tons and NO_x emissions by 23,148 tons, along with a co-benefit of reducing methane (CH_4) emissions by over 851 million pounds annually (NMED 2023a, 2023b).

Additionally, monitored CO concentrations have decreased nationally 88% from 1980 to 2022 due to improvements in motor vehicle emissions control and monitoring. CO concentrations in the southwest region of the United States have decreased 70% between 2000 and 2022. While outside the project area, the closest CO monitors are located in El Paso County, Texas, and show the CO 8-hour emission design values at a declining to flat curve from 2016 to 2023 (EPA 2023g). Nationally, SO_2 concentrations have decreased 85% from 2000 to 2022, but substantial decreases (94% reduction) have occurred since 1980 due to implementation of federal rules requiring reduction in SO_2 emissions from power plants and other larger sources of SO_2. SO_2 concentrations in the southwest region of the United States have decreased 94% between 2000 and 2022 (BLM 2023a). Design values for SO_2 emissions in El Paso County, Texas (closest to the project area) show a decreasing curve, although there are only two recent data points (2022 and 2023).

Design values for annual NO_2 emissions in Eddy and Lea Counties showed a relatively flat curve from 2018 to 2023. For 1-hr NO_2 emissions, Eddy County showed an increasing trend over the last 5 years, while Lea County showed a decreasing trend over the last 5 years. Design values for particulate matter equal to or less than 2.5 microns in the analysis area show concentrations with a decreasing trend from 2017 to 2022 (for annual values) and a slight increasing trend from 2017 to 2022 (for 24-hour values) (BLM 2023b; EPA 2023a). 2023 design values for PM2.5 are not available at this time.

RFD Scenario

While there are other sources of emissions in the CFO, the oil and gas industry is one of the most prominent sources of emissions. Approximately 45,579 active oil and gas wells are in the New Mexico portion of the Permian Basin. Of these, roughly 24,990 wells are federal, with the remainder falling in other jurisdictions (BLM 2023a). Over the past 8 years, there have been a total of 6,796 federal wells have been drilled within the Pecos District (Table 3.10).

Table 3.10 Past and Present Federal Well Spuds

Number of Federal Well Spuds	2016	2017	2018	2019	2020	2021	2022	2023
Pecos District	198	525	650	791	824	1,153	1,202	1,444
Carlsbad Field Office (including Hobbs Field Station)	196	522	659	785	823	1,150	1,195	1,431
Roswell Field Office	2	3	9	6	1	3	7	13

BLM (2024a, 2024b)
Note: Data Obtained by running the canned Oracle report for Drilling Engineering Priority Report. After initial analysis, it was determined that AFMSS 2's report was skewed for data prior to 01/01/2021 (likely due to migration issues from A1 to A2). Reports were pulled for the Roswell Field Office (RFO) and Carlsbad Field Office (CFO) for 01/01/2021 - 12/31/2023 using the A2 Dashboard and filtering for the Roswell Field Office and Carlsbad Field Office separately. Duplicate values were assessed and removed from this report. For the data gathered for 01/01/2016 - 12/31/2020, the A1 Dashboard was utilized. Carlsbad Field Office was split into Hobbs and Carlsbad in A1, so both offices were selected for that sum. For Roswell Field Office, Roswell was selected for the date range. A pivot table was created to summarize the data set

* PDO number of BLM federal and non-federal wells in PDO RFD (2016–2037) is 16,000. PDO BLM wells includes completions from Carlsbad Field Office, Hobbs Field Station, and Roswell Field Office.

The RFD scenario for oil and gas in the CFO (Engler 2023) projects that on average, 980 oil and gas wells would be completed within the CFO planning area each year over the 20-year scenario (2023–2043), for approximately 19,600 new wells (federal and non-federal), most of which are expected to be horizontally drilled. Of this, at least 12,500 wells in CFO planning area alone would be federal (Engler 2023). CFO well spud projections by year vary from 1,208 new federal and non-federal well spuds (770 federal) in 2023 to 769 new federal and non-federal well spuds (490 federal) in 2043. The CFO planning area encompasses Lea and Eddy Counties and portions of Chaves County. The CFO RFD does not account for future well development in the Roswell Field Office (RFO) portion of the PDO planning area (which encompasses portions of Chaves and Roosevelt Counties); therefore, well projections for the RFO planning area were extracted from the PDO RFD (Engler et al. 2012; Engler and Cather 2014). The PDO RFD projects that 800 oil and gas wells would be completed within the PDO each year for the 20-year scenario (2015–2035), for a total of approximately 16,000 new wells (federal and non-federal), most of which are expected to be horizontally drilled. Based on the review of cumulative production volumes through 2010 (see Summary Table 1 [page 49] in Engler et al. [2012]), most of the production has occurred in Eddy and Lea Counties, and development in Chaves and Roosevelt Counties represents approximately 4% of the cumulative production volumes for the PDO planning area. Assuming that this proportion of development in Chaves and Roosevelt Counties relative to the larger PDO planning area would remain relatively stable into the future, the number of projected wells from the PDO RFD that are likely to occur within Chaves and Roosevelt Counties would be approximately 640. When combined, the total number of projected wells for the PDO planning area is 20,240 (including 19,600 wells in CFO and 640 wells in RFO). PDO RFD projections over a 20-year time period show well development with an average of 1,012 wells per year (of which at least 625 would be federal). The Air Resources Technical Report (BLM 2023a) provides information related to the RFD for the PDO planning area. Annual well averages are multiplied by the one oil-well pollutant emission factor (Table 3.11) to calculate reasonably foreseeable future action annual emissions for both federal well development and federal and non-federal well development associated with the RFD scenarios (see Table 3.11). PFO RFD emissions are also compared with the 2020 NEI data for the Permian Basin (Eddy, Lea, Chaves, and Roosevelt Counties) in Table 3.11.

Table 3.11. Total and Federal PDO Emissions per Year Based on the RFD

PDO RFD	RFD Emissions (tons per year)						
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Single well construction/development phase	2.73	0.75	13.21	1.11e-02	3.16	0.69	0.02
Single well operation phase	1.40	0.51	0.97	4.5E-03	1.21	10.53	0.93
Single well total	4.13	1.26	14.18	1.56e-02	4.37	11.21	0.95
Total emissions from PDO RFD (1,012 wells)	4,179.56	1,275.12	14,350.16	15.79	4,422.44	11,344.52	961.40
Federal emissions from PDO RFD (625 wells)	2,581.25	787.50	8,862.50	9.75	2,731.25	7,006.25	593.75
2020 NEI Permian Basin (Eddy, Lea, Chaves, and Roosevelt Counties) emissions	20,585	6,270	66,098	83,521	109,477	252,387	30,508
Total RFD percent of PDO emissions (1,012 wells)	20.3%	20.3%	21.7%	0.02%	4.0%	4.5%	3.2%
Federal RFD percent of PDO emissions (625 wells)	12.5%	12.6%	13.4%	0.01%	2.5%	2.8%	1.9%

Note: The analysis contained in this table provides percentage contribution rounded to two decimal points. The representative well used to calculate emissions is a horizontal well.

Air Quality and Air Quality Related Values Modeling

New Mexico Ozone Attainment Initiative Photochemical Modeling Study

The State of New Mexico initiated the New Mexico Ozone Attainment Initiative Photochemical Modeling Study in the spring of 2018 to address the high ozone concentrations, protect the ozone attainment status, and ensure the health and welfare of the residents of the state for future generations (NMED 2021). Based on the Western Regional Air Partnership, Western Air Quality Study CAMx 2014 36/12-kilometer modeling platform, a CAMx 2014 36/12/4-kilometer ozone modeling platform was developed with the 4-kilometer domain focused on New Mexico and adjacent states. The study also looked at a 2028 Base Case future year modeling and an O&G Control Strategy scenario that implemented proposed controls on 2028 New Mexico oil and gas sources. The 2028 O&G Control Strategy reduced oil and gas combustion-related NO_x emissions by approximately 21,000 tons per year (or by 64 percent compared to the 2028 Base Case) and VOC emissions from oil and gas by approximately 53,000 tons per year (or by 46 percent compared to the 2028 base case; NMED 2021). This study has been incorporated by reference.

The 2028 Base Case and 2028 O&G Control Strategy modeling results followed EPA guidance (EPA 2018), which recommended using a current year design value based on an average of three ozone design values centered on the base modeling year (in this study, 2014). As a result, this part of the study utilized a current year design value from 2012 to 2016. To develop the 2028 ozone future year design values for the specific scenarios, the current year design value (2012–2016, average of three design values over 5 years) was scaled by RRF, which are model-derived scaling factors. In this study, the RRF are the ratio of the 2028 future scenario (Base Case or O&G Control Strategy) over the 2014v2 Base Case CAMx ozone results (RRF = Σ Model2028 / Σ Model2014). This method allowed for the development of a projected 2028 ozone future year design value for the respective scenarios (Base Case or O&G Control Strategy). The current 2012–2016 ozone design values at southern New Mexico sites range from 62.0 to 72.0 ppb. The 2028 Base Case saw future ozone design value reductions of -2.0 ppb

to -6.3 ppb in this area, including reductions of -2.3 ppb at Carlsbad and -2.0 ppb at Hobbs in Eddy and Lea Counties. The 2028 Base Case future ozone design values in southern New Mexico ranged from 59.0 to 67.0 ppb. The 2028 O&G Control Strategy saw future ozone design value reductions of -0.1 to -0.7 ppb, including reductions of -0.3 ppb at Carlsbad and -0.7 ppb at Hobbs in Eddy and Lea Counties, from the 2028 Base Case. The 2028 projected O&G Control Strategy ozone design values in southern New Mexico ranged from 58.9 ppb to 66.8 ppb. Utilizing this method and following EPA guidance, all 2028 projected ozone future design values at monitoring sites in New Mexico were below the 70 ppb 2015 ozone NAAQS using the 2012–2016 design value (NMED 2021).
With the recent upward trend in ozone values in southeast New Mexico, the New Mexico Ozone Attainment Initiative study also looked at more recent design values (2015–2019 and 2017–2019). A similar method to determine the future 2015–2019 and 2017–2019 design values was used as described above. However, it should be noted that because the study is using the CAMx 2014v2 Base Case results as the denominator in the RRF equation (RRF = Σ Model2028 / Σ Model2014) to develop 2028 ozone future design value projections, any emission changes (increases or decreases) between 2014 and the end of the 2010 decade will not be accounted for (for example, increases in oil and gas source emissions and decreases in mobile source emissions). This will result in uncertainties and will likely overstate the 2028 ozone future design values in the Permian Basin emissions, as emissions from oil and gas sources were higher at the end of the 2010 decade than in 2014 (NMED 2021).

The current 2015–2019 ozone design values at all New Mexico sites selected for this sensitivity test ranged from 65.0 to 74.3 ppb and included both Carlsbad (73.7 ppb) and Hobbs (69.3 ppb) in Eddy and Lea Counties. The 2028 Base Case saw future ozone design value reductions of -1.7 ppb to -6.6 ppb, including reductions of -2.5 ppb at Carlsbad and -2.1 ppb at Hobbs in Eddy and Lea Counties. The 2028 projected Base Case ozone design values at all New Mexico sites selected for this sensitivity test ranged from 61.0 ppb to 71.2 ppb. Note that the 2015–2019 future ozone design value had one monitoring site (Carlsbad) that exceeded the 2015 ozone NAAQS at 71.2 ppb. The 2028 O&G Control Strategy saw future ozone design value reductions of 0.0 to -1.5 ppb, including reductions of -0.3 ppb at Carlsbad and -0.7 ppb at Hobbs in Eddy and Lea Counties, from the 2028 Base Case. The 2028 projected O&G Control Strategy ozone design values at all New Mexico sites selected for this sensitivity test ranged from 60.5 ppb to 70.9 ppb. Emission controls in the 2028 O&G Control Strategy were sufficient to reduce the 2028 future ozone value at Carlsbad (70.9 ppb) to below the ozone NAAQS (NMED 2021).

The current 2017–2019 ozone design values at all New Mexico sites selected for this sensitivity test ranged from 66.0 to 79.0 ppb and included both Carlsbad (79.0 ppb) and Hobbs (71.0 ppb) in Eddy and Lea Counties (both above the 2015 ozone NAAQS). The 2028 Base Case saw future ozone design value reductions of -2.1 ppb to –6.7 ppb, including reductions of -2.6 ppb at Carlsbad and -2.1 ppb at Hobbs in Eddy and Lea Counties. 2028 projected Base Case ozone design values at all New Mexico sites selected for this sensitivity test ranged from 61.9 ppb to 76.4 ppb. Note that the 2015–2019 future ozone design value had two monitoring sites (Carlsbad, with 76.4 ppb, and Desert View, Dona Ana County, with 71.6 ppb) that exceeded the 2015 ozone NAAQS. The 2028 O&G Control Strategy saw future ozone design value reductions of 0.0 to -1.5 ppb, including reductions of -0.3 ppb at Carlsbad and -0.7 ppb at Hobbs in Eddy and Lea Counties, from the 2028 Base Case. The 2028 projected O&G Control Strategy ozone design values at all New Mexico sites selected for this sensitivity test ranged from 61.4 ppb to 76.0 ppb. The 76.0 ppb 2028 future design value at Carlsbad, with the O&G Control Strategy, exceeds the 2008 and 2015 ozone NAAQS. However, as mentioned above, the design of this sensitivity study will result in uncertainties and will likely overstate the 2028 ozone future design values in the Permian Basin, as emissions from O&G sources are higher at the end of the 2010 decade than in 2014 (NMED 2021).

The final part of the New Mexico Ozone Attainment Initiative study investigated source apportionment and was conducted to determine the contributions of source sectors to 2028 future year ozone design values under the O&G control strategy scenario. One investigation involved international emissions. The Speciated Modeled Attainment Test ozone projection tool was run without the contributions of international anthropogenic emissions for current design values 2012–2016, 2015–2019, and 2017–2019.

In New Mexico, international anthropogenic emissions contributed 11 to 26 ppb to the projected 2028 future design values. The Carlsbad site had reductions of 20.3 ppb, 21.7 ppb, and 23.2 ppb, respectively. Carlsbad, which had produced a projected 2028 ozone exceedance for both the 2008 and 2015 ozone NAAQS under the current design value 2017–2019 scenario, was below 55 ppb for a future design value under all three design value scenarios (2012–2016, 2015–2019, and 2017–2019) (NMED 2021).

2032 BLM Regional Criteria Air Pollutant Photochemical Modeling Study

The BLM developed a 12km grid spacing, Comprehensive Air quality Model with extensions (CAMx) photochemical modeling platform to assess the impacts of oil and gas development and coal production and other cumulative sources on air quality in the western U.S. (Utah, Colorado, New Mexico, Wyoming, Montana, North Dakota and South Dakota). The modeling analysis evaluated air quality and air quality related values out to a future year of circa 2032 utilizing data from the Western Regional Air Partnership (WRAP)/Western Air Quality Study (WAQS) modeling platform, the EPA's 2016v2 emissions modeling platform (EPA 2022d), and the BLM oil and gas development projections to quantify and apportion federal and non-federal oil and gas emissions (BLM and EMPSi 2023). Additional methodology can be found in the BLM Regional Criteria Air Pollutant Photochemical Modeling study, incorporated by reference.

The BLM regional criteria air pollutant modeling study results show that the cumulative concentrations over New Mexico range between 50 and 65 ppb in New Mexico, with the higher concentrations in the San Juan Basin and isolated regions on the western side of the state. The modeled values did not lead to any ozone NAAQS exceedances in the state, including the Pecos District. The largest contributions to ozone are due to the modeled boundary conditions, followed by other anthropogenic sources (i.e., those not including oil, gas, or coal source groups) and natural sources.

1-hour NO_2 modeled cumulative concentrations showed the highest concentrations over the San Juan Basin (highest value of 60.0 ppb), the El Paso, TX area, and over the Permian Basin. The modeled values did not lead to any 1-hour NO_2 NAAQS exceedances in the state, including the Pecos District. The largest contributions to 1-hour NO_2 are due to federal, non-federal, and tribal oil and gas development. 24-hour $PM_{2.5}$ modeling showed a northwest to southeast gradient, with larger $PM_{2.5}$ concentrations on the southeastern side of New Mexico.

The largest 24-hour $PM_{2.5}$ concentration in the state is 47.2 ug/m^3 in Socorro County (primarily due to wildfires). As a result, the modeled values did exceed the 24-hour PM2.5 NAAQS in Socorro County, New Mexico, but nowhere else in the state, including the Pecos District, was the NAAQS exceeded. The largest contributors to 24-hour $PM_{2.5}$ are wildfires and non-coal, oil, or gas anthropogenic sources. Annual $PM_{2.5}$ modeled values showed cumulative concentrations over New Mexico did lead to an annual $PM_{2.5}$ NAAQS exceedance over the Albuquerque area based of the new $PM_{2.5}$ NAAQS standard of 9.0 ug/m^3, but nowhere else in the state, including the Pecos District, was the NAAQS exceeded. Cumulative annual $PM_{2.5}$ concentrations were highest near Albuquerque (9.2 ug/m^3), which were due to other anthropogenic sources (i.e., those not including oil, gas, or coal source groups) and generally less than 4 ug/m^3 within the rest of New Mexico. The largest contributors to annual $PM_{2.5}$ are the anthropogenic and wildfire sources.

24-hour PM_{10} cumulative concentrations showed PM_{10} NAAQS exceedances in a few grid cells in southwestern New Mexico (primarily due to wildfires), but nowhere else in the state, including the Pecos District, was the NAAQS exceeded. PM_{10} cumulative concentrations over most of New Mexico ranged between 2 and 30 mg/m^3, with smaller areas of concentrations between 30 and 150 mg/m^3. The largest contributors to annual PM_{10} are wildfires and other anthropogenic sources (i.e., those not including oil, gas, or coal source groups).

1-hour SO_2 modeled cumulative concentrations over New Mexico did not lead to any 1-hour SO_2 NAAQS exceedances, including the Pecos District. Most of the state had concentrations that did not exceed 10 ppb, except for a few southeastern counties (e.g., Eddy, Lea and Roosevelt) where concentrations ranged from 5 to 69 ppb. The largest contributors to 1-hour SO_2 in New Mexico are oil and gas activities

and wildfires. 3-hour SO_2 modeled cumulative concentrations showed no exceedances of the 3-hour SO_2 NAAQS, including the Pecos District. The largest contributors to 3-hour SO_2 in New Mexico were oil and gas activities, other anthropogenic sources (i.e., those not including oil, gas, or coal source groups), and wildfires.

1-hour CO modeled cumulative concentrations over New Mexico did not lead to any 1-hour CO NAAQS exceedances, including the Pecos District. Most of the state had concentrations less than 5 ppm, although Socorro County had concentrations to up 10 ppm. 8-hour CO modeled cumulative concentrations over New Mexico did not lead to any 8-hour CO NAAQS exceedances, including the Pecos District. Most of the state had concentrations less than 5 ppm, although Socorro County had concentrations to up 6.9 ppm. The location of the higher 1-hour and 8-hour CO concentrations is the same location as the PM_{10} peak, indicating that natural sources (likely fires) are responsible for the higher 1-hour and 8-hour CO in this area (BLM and EMPSi 2023).

Cumulative annual nitrogen deposition over most of New Mexico varies between around 1 and 6 kilograms of nitrogen per hectare (kg N/ha-year) with an east-to-west gradient. The eastern part of the state shows nitrogen deposition generally between 2 and 6 kg N/ha-year, whereas the west side of the state is generally lower, with nitrogen deposition ranging from 1 to 4 kg N/ha-year (although higher deposition is present in a few grid cells in San Juan County). Nitrogen critical loads for the Class I areas in the New Mexico analysis area range from 3.0 to 7.54 kg N/ha. The cumulative average nitrogen deposition ranges from 1.2 at Petrified Forest National Park to 2.7 kg N/ha-year at Carlsbad Caverns National Park. None of the areas exceed the critical load thresholds for cumulative average nitrogen deposition. The largest contributors to the cumulative average nitrogen deposition are other anthropogenic sources (i.e., those not including oil, gas, or coal source groups), ranging from 40% to 60% depending on the area of interest. The cumulative maximum nitrogen deposition values in all Class I areas of interest are below their critical loads for atmospheric nitrogen deposition, except for Carlsbad Caverns National Park.

Cumulative annual sulfur deposition over most of New Mexico ranges between 0.1 and 2.0 kilograms of sulfur per hectare (kg S/ha-year), with higher concentrations in the southeastern part of the state. In the southeastern part of the state, concentrations generally range between 1 and 4 kg S/ha-year (although a few grid cells show concentrations between 4 and 9 kg S/ha-year in Roosevelt, Eddy, and Lea Counties.) For total sulfur deposition, the 5 kg/ha-yr threshold published by Fox et al. is used as critical load for each area of interest. The cumulative average sulfur deposition ranges from 0.1 at Petrified Forest National Park/Great Sand Dunes National Park to 1.8 kg S/ha-year at Carlsbad Caverns National Park. None of the areas exceed for the critical load thresholds for cumulative average and maximum sulfur deposition. The largest contributors to sulfur deposition in New Mexico are oil and gas non-federal and existing federal sources and other anthropogenic sources (BLM and EMPSi 2023). Additional modeling results can be found in the BLM Regional Criteria Air Pollutant Photochemical Modeling Study (BLM and EMPSi 2023), incorporated by reference.

Cumulative Impacts Summary

In summary, atmospheric concentrations for criteria air pollutants in the project area are projected to be below the NAAQS based on future year modeling. Ozone, which is currently above the NAAQS in Eddy county, is projected to be below the NAAQS in future year (circa 2032) modeling. NMED modeling following EPA guidance showed 2028 future year design values below the NAAQS (utilizing the 2012-2016 design value). Sensitivity analyses by NMED showed 2028 future design values at Carlsbad (utilizing the 2017-2019 design value), with the O&G Control Strategy, exceeding the 2008 and 2015 ozone NAAQS. However, the design of this sensitivity study would result in uncertainties and would likely overstate the 2028 ozone future design values in the Permian Basin, as emissions from O&G sources are higher at the end of the 2010 decade than in 2014. PM2.5, another pollutant of concern showed both annual and 24-hour circa 2032 values below the NAAQS in the project area. Visibility is generally projected to be steady or improving at IMPROVE monitors near the project area (BLM 2023b). Results for the nearest Class I areas to the analysis area show improving visibility trends for both the base (2014-

2017) and future year (2028) deciview values on the 20% clearest and most impaired days, although some locations show 2028 projections above the linear uniform rate of progress value of the glidepath. Nitrogen deposition at National Park Service monitors near the project area show generally poor to fair conditions with no trends available, while sulfur deposition conditions are generally poor to good with no trend or a relatively unchanging trend (where trend data is available). The cumulative average nitrogen deposition ranges from 1.2 at Petrified Forest National Park to 2.7 kg N/ha at Carlsbad Caverns National Park in future year (circa 2032) modeling. None of areas exceed the critical loads for cumulative average nitrogen deposition. The cumulative maximum nitrogen deposition values in all areas of interest are below their critical loads for atmospheric nitrogen deposition, except for Carlsbad Caverns National Park. The cumulative average sulfur deposition ranges from 0.1 at Petrified Forest National Park/Great Sand Dunes National Park to 1.8 kg S/ha-year at Carlsbad Caverns National Park in future year (circa 2032) modeling. None of the areas exceed for the critical load thresholds for cumulative average and maximum sulfur deposition.

Using the best science and data available (EPA's AirToxScreen), the current Chaves, Eddy, and Counties cancer risk is 19.16, 22.25, and 20.16 in 1 million, respectively, and is within the contextual range published by the EPA. Additionally, the oil and gas activity in the Permian Basin contribute a max of 18% to the total cancer risk in Eddy County (the county percentages for Chaves and Lea are lower). The BLM's Western United States HAP photochemical modeling study showed adjusted cancer risk from cumulative oil and gas production for 2032 ranged from 0.10 to 3.24 per million in the Permian Basin, which is well within the contextual range published by the EPA. While new production from the foreseeable development of the Proposed Action and from approved and pending APDs could outweigh the production decline from currently producing wells (EIA 2023a) and result in slightly higher HAPs emissions, an increase in oil and gas related HAPs emissions should not make a substantial change to cumulative HAPs impacts since the cancer risk is well within the contextual range published by the EPA and oil and gas contributes a small percentage to the cancer risk.

3.4.1.3 *Emissions Control Measures and Residual Effects*

The following measures would reduce air pollutant emissions resulting from the Proposed Action:

- Areas not required for facilities would be revegetated during interim reclamation.
- Dirt roads would be watered during periods of high use (using fresh water, with 10,000 total dissolved solids or less).
- Best management practices (BMPs) provided in the Gold Book would be implemented for proposed and existing roads (US DOI and USDA 2007).
- Green completions would be used for all well completion activities where technically feasible, per the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, subpart OOOOa) or other regulations that replace or exceed OOOOa.
- The operator would obtain an air permit, if required by the regulatory agency, for equipment operating under this Proposed Action and would follow regulatory requirements.

Design features were established at the time of the onsite field inspection to minimize dust by reducing initial disturbance and maximizing interim reclamation as well as requiring dust control on dirt roads. Additional emission reductions would be achieved by following the new waste prevention rule [NMAC 19.15.27.9] and the ozone precursor rule [NMAC 20.2.50.1].

BMPs are designed to reduce emissions from field production and operations. They are applied to oil and natural gas drilling and production to help minimize impacts on air quality through reduction of emissions, surface disturbances, and dust. The BLM encourages oil and natural gas companies to adopt other proven, cost-effective technologies and practices that improve operational efficiency and reduce emissions. Toward this end, the BLM also encourages industry to participate in the Natural Gas STAR program, a flexible, voluntary partnership administered by the EPA (EPA 2022c).

The BLM CFO has an Inspection and Enforcement Department to perform inspections for potential fugitive emissions, such as CH_4 leaks, within the CFO planning area. The BLM currently has six certified inspectors and seven noncertified inspectors. At the beginning of each fiscal year, inspectors are assigned priority inspections that must be completed within that fiscal year. For fiscal year 2023, inspectors must complete at least 502 priority production inspections as well as inspections on any producing locations that have not been inspected within the last 2 fiscal years. Additionally, BLM notice NTL-3A requires that all gas releases of larger than 50 thousand cubic feet be reported to the BLM and that the leak or cause of the release be repaired immediately.

3.4.2. Issue #2. Greenhouse Gases

How would construction, operation, and maintenance activities in the Proposed Action contribute to greenhouse gas (GHG) emissions and climate change?

Any subsequent development of the APDs under consideration could lead to emissions of methane (CH4), carbon dioxide (CO2), and nitrous oxide (N2O); the three most common GHGs associated with oil and gas development. These GHG emissions would be emitted from activities occurring on the project area, and from the consumption of any fluid minerals produced. For the purposes of this analysis, the BLM has evaluated the potential climate change impacts of the Proposed Action by estimating and analyzing the projected potential GHG emissions from oil and gas development. Projected emissions estimates are based on previous actual oil and gas development analyses, and any available information from existing development within the state. Further discussion of climate change science and predicted impacts as well as the reasonably foreseeable and cumulative GHG emissions associated with BLM's oil and gas leasing actions and methodologies are included in the 2022 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2023b) (Annual GHG Report). This report presents the estimated emissions of GHGs attributable to development and consumption of fossil fuels produced on lands and mineral estate managed by the BLM. The Annual GHG Report is incorporated by reference as an integral part of this analysis.

3.4.2.1 *Affected Environment*

Climate change is a global process that is affected by the sum total of GHGs in the Earth's atmosphere. GHGs act to contain solar energy loss by trapping longer wave radiation emitted from the Earth's surface and act as a positive radiative forcing component. GHGs influence the global climate by increasing the amount of solar energy retained by land, water bodies, and the atmosphere. GHGs can have long atmospheric lifetimes, which allows them to become well mixed and uniformly distributed over the entirety of the Earth's surface no matter their point of origin. The buildup of these gases has contributed to the current changing state of the climate equilibrium towards warming. A discussion of past, current, and projected future climate change impacts is described in Chapters 4, 8, and 9 of the Annual GHG Report (BLM 2023b). These chapters describe currently observed climate impacts globally, nationally, and in each state, and present a range of projected impact scenarios depending on future GHG emission levels.

The incremental contribution to global GHGs from a single proposed land management action cannot be accurately translated into its potential effect on global climate change or any localized effects in the area specific to the action. Currently, global climate models are unable to forecast local or regional effects on resources resulting from a specific subset of emissions. However, there are general projections regarding potential impacts on natural resources and plant and animal species that may be attributed to climate change resulting from the accumulation of GHG emissions over time. In this EA, the BLM uses GHG emissions as a proxy for impacts and provides context with other proxies such as GHG equivalents and the social cost of GHGs.

For the purposes of this EA, the projected emissions from the Proposed Action can be compared to modeled emissions that have been shown to have definitive or quantifiable impacts on the climate in order to provide context of their potential contribution to climate change. Table 3.8 shows the total estimated GHG emissions from fossil fuels at the global, national, and state scales from 2016 to 2021 (6 years). Emissions are shown in megatonnes (Mt) per year of carbon dioxide (CO2). Chapter 3 of the

Annual GHG Report contains additional information on GHGs and an explanation of CO2e. State and national energy-related CO2 emissions include emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed.

Table 3.9 Global and U.S. Fossil Fuel GHG Emissions 2016 - 2021 (Mt CO_2e/yr)

Scale	2016	2017	2018	2019	2020	2021
Global (CO_2 Only)	36,465.6	36,935.6	37,716.2	37,911.4	35,962.9	37,500
U.S.	4,909.9	4,852.5	4,989.8	4,855.9	4,344.9	4,639.1
New Mexico	48.8	49.4	45.2	48.4	45.03	46.0

Source: Annual GHG Report (BLM 2023e), Chap. 5, Table 5-1 (U.S.) and Table 5-2 (State). Global emissions (CO_2 only) from the Emissions Database for Global Atmospheric Research (EDGAR) 2023 Report - https://edgar.jrc.ec.europa.eu/report_2023?vis=co2tot#emissions_table
Mt (megatonne) = 1 million metric tons

Additional information on current state, national, and global GHG emissions as well as the methodology and parameters for estimating emissions from BLM fossil fuel authorizations and cumulative GHG emissions is included in Chapters 5, 6, and 7 of the Annual GHG Report.

3.4.2.2 *Environmental Consequences*

IMPACTS FROM THE PROPOSED ACTION

Four general phases of development processes would generate GHG emissions: 1) well development (well site construction, well drilling, and well completion), 2) well production operations (extraction, separation, gathering), 3) mid-stream (refining, processing, storage, and transport/distribution), and 4) end use (combustion or other uses) of the fuels produced. While well development and production operation emissions (phases 1 and 2) occur on-site and the BLM has authority over these activities, mid-stream and end-use emissions (phases 3 and 4) typically occur off-site where the BLM has no authority.

The emission estimates calculated for this analysis were generated using the assumptions previously described above in the BLM Lease Sale Emissions Tool (BLM 2024b), using the APD option. Emissions are presented for each of the four phases described above.

- Well development emissions occur over a short period and may include emissions from heavy equipment and vehicle exhaust, drill rig engines, completion equipment, pipe venting, and well treatments such as hydraulic fracturing.
- Well production operations, mid-stream, and end-use emissions occur over the entire production life of a well, which is assumed to be 20 years for this analysis based on the productive life of a typical oil/gas field.
- Production operation emissions may result from storage tank breathing and flashing, truck loading, pump engines, heaters and dehydrators, pneumatic instruments or controls, flaring, fugitives, and vehicle exhaust.
- Mid-stream emissions occur from the transport, refining, processing, storage, transmission, and distribution of produced oil and gas. Mid-stream emissions are estimated by multiplying the EUR of produced oil and gas with emissions factors from NETL life cycle analysis of U.S. oil and natural gas. Additional information on emission factors can be found in the Annual GHG Report (BLM 2023b: Chapter 6, Tables 6-8 and 6-10).
- For the purposes of this analysis, end-use emissions are calculated assuming all produced oil and gas is combusted for energy use. End-use emissions are estimated by multiplying the EUR of produced oil and gas with emissions factors for combustion established by the EPA (Tables C-

1 and C-2 to Subpart C of 40 C.F.R. § 98). Additional information on emission factors and EUR factors can be found in the Annual GHG Report (BLM 2023b: Chapter 6).

For purposes of estimating end-use emissions, wells are assumed to produce oil and gas in amounts similar to existing nearby wells. While the BLM has no authority to direct or regulate the end use of the products, for this analysis the BLM assumes all produced oil or gas will be combusted (such as for domestic heating or energy production). Table 3.9 shows the estimated maximum year and average year GHG emissions over the life of the well for both 100-year and 20-year global warming potentials (GWPs). Section 3.4 of the Annual GHG Report provides a detailed explanation of GWP.

Table 3.9 Estimated Direct and Indirect Emissions from Wells on an Annual and Life of Well Basis (metric tonnes)

Timeframe	CO_2	CH_4	N_2O	CO_2e (100-year)	CO_2e (20-year)
Max Year	324,925	269	02	333,601	347,778
Average Year	50,875	47	00	52,381	54,863
Life of Well	1,017,498	942.04	7.479	1,047,612	1,097,258

Source: BLM Lease Sale Emissions Tool (BLM 2024b)

Table 3.10 lists the estimated direct (well development and production operations) and indirect (mid-stream and end-use) GHG emissions in metric tonnes for the subject Proposed Action over the average 20-year production life of the well. In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 1,047,612 metric tonnes of CO_2e over the life of the well.

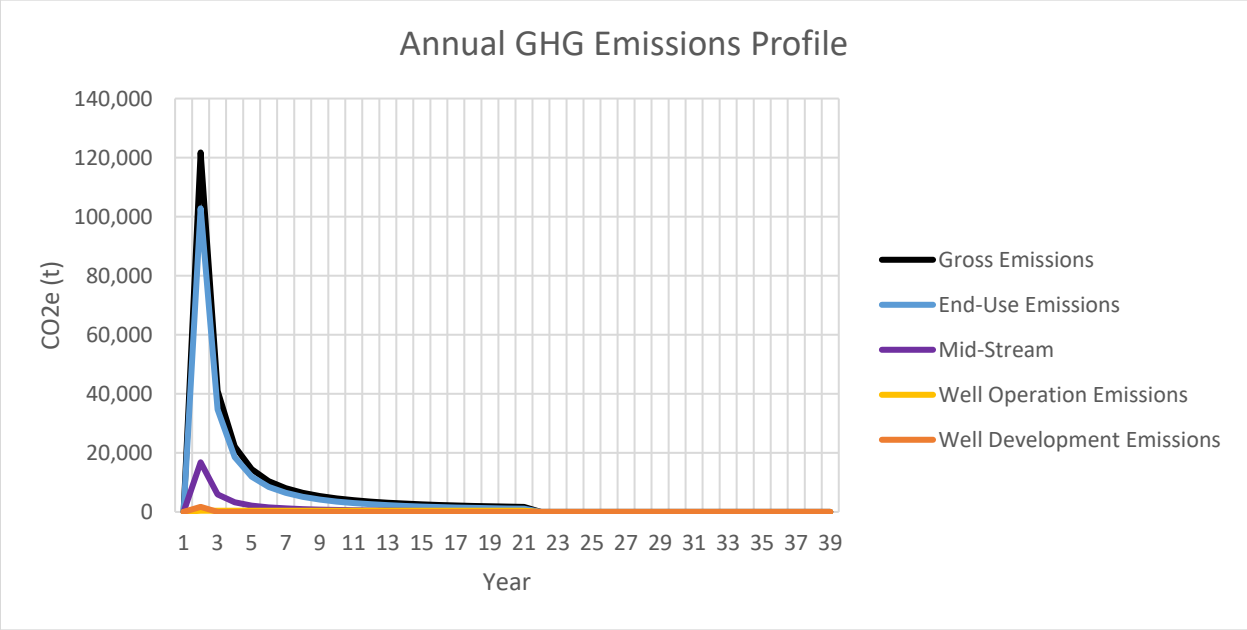
Table 3.10 Estimated Life of Wells Emissions from Well Development, Well Production Operations, Mid-stream, and End-use (tonnes) (4 wells)

Activity	CO_2	CH_4	N_2O	CO_2e (100-yr)	CO_2e (20-yr)
Well Development	6,747	1.81	0.054	6,816	6,911
Well Production Operations	28,681	112.80	0.174	32,090	38,034
Mid-Stream	122,883	798.39	1.932	147,202	189,277
End-Use	859,187	29.04	5.319	861,505	863,035
Total	1,017,498	942.04	7.479	1,047,612	1,097,258

Source: BLM Lease Sale Emissions Tool, modified to show emissions associated with the APDs for a 20-year life.
IPCC Sixth Assessment Report Global Warming Potentials (GWP) - 100-year GWP: CO_2=1, CH_4=29.8, N_2O=273; 20-year GWP: CO_2=1, CH_4=82.5, N_2O=273 (IPCC 2021).

GHG emissions vary annually over the production life of a well due to declining production rates over time. Figure 3-1 shows the estimated GHG emissions profile over the production life of a single well, including well development, well production operations, mid-stream, end-use, and gross (total of well development, well production, mid-stream, and end-use) emissions.

Figure 3-1. Estimated GHG Emissions Profile over the Life of a Single Well



Source: BLM Lease Sale Emissions Tool, modified to show emissions associated with the APDs for a 20-year life.

To put the estimated GHG emissions for this proposed action in a relatable context, potential emissions that could result from development of the wells for this action can be compared to other common activities that generate GHG emissions. The EPA GHG equivalency calculator (EPA 2023e) can be used to express the potential average year GHG emissions on a scale relatable to everyday life (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator). For instance, the projected average annual GHG emissions from potential development of the subject proposed action are equivalent to 11,289 gasoline-fueled passenger vehicles driven for one year, or the emissions that could be avoided by operating 62358 wind turbines as an alternative energy source, or offset by the carbon sequestration of 14 acres of forest land for one year.

Table 3.11 compares emission estimates over the 20-year life of the wells compared to the 30-year projected emissions from developing BLM federal mineral estate in the state and nation from existing wells, the development of approved APDs, and emissions related to reasonably foreseeable federal oil and gas development.

Table 3.11. Comparison of the Life of Wells (4) Emissions to Other Federal Oil and Gas Emissions

Reference	Mt CO_2e (100-year)	Life of Well Percentage of Reference
Proposed Action emissions (life of well)	1.048	-
New Mexico reasonably foreseeable short-term federal (oil and gas)*	3,183.2	0.033%
New Mexico EIA projected long-term federal (oil and gas)†	9,961.8	0.011%
U.S. reasonably foreseeable short-term federal (oil and gas)*	6,033.0	0.017%
U.S. EIA projected long-term federal (oil and gas) †	16,523.0	0.006%

Source: U.S. and federal emissions from BLM Lease Sale Emissions Tool Data and Tables 7-18, 7-19, and Section 7 of the 2022 Annual GHG Report (BLM 2023e).

* Short-term foreseeable is estimated federal emissions from existing producing wells, approved APDs, and one year of leasing.

† Long-term foreseeable are estimated federal emissions to meet EIA projected energy demand.

Compared to emissions from other existing and foreseeable federal oil and gas development, the life of project emissions for the Proposed Action is between 0.033 percent and 0.011 percent of emissions associated with developing federal mineral estate in the state and between 0.017 percent and 0.006 percent of emissions associated with developing federal mineral estate in the nation. In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 1.048 Mt CO_2e over the life of the wells.

Table 3.12 compares the estimated annual Proposed Action emissions to existing federal fossil fuel (oil, gas, and coal) emissions, state, and U.S. total GHG emissions.

Table 3.12. Comparison of Proposed Action Emissions to Other Sources (megatonnes)

Reference	Mt CO_2e (100-year)	Life of Well Percentage of Reference
Proposed Action emissions (maximum year)	1.048	-
New Mexico onshore federal (oil and gas) †	326.00	0.102%
U.S. onshore federal (oil and gas) †	331.85	0.062%
U.S. federal-all (oil and gas) †‡	542.06	0.036%
U.S. federal onshore (oil, gas, and coal) †	933.87	0.032%
New Mexico total (all sectors) †	1,033.21	0.101%
U.S. total	**6,899.49**	0.005**%**

Source: BLM Lease Sale Emissions Tool (BLM 2024b)

* Mt (megatonne) = 1 million metric tonnes. Estimates are based on 100-GWP values.

† Federal values come from Tables ES-1 and ES-2 of the Annual GHG Report.

‡ Includes offshore and onshore oil and gas production.

Social Cost of Greenhouse Gases

The “social cost of carbon,” “social cost of nitrous oxide,” and “social cost of methane” – together, the “social cost of greenhouse gases” (SC-GHGs) are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year. 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. The SC-GHGs measure is provided only to inform agency decision-making. For federal agencies, the best currently available estimates of the SC-GHGs are the interim estimates of the social cost of carbon dioxide, methane, and nitrous oxide developed by the Interagency Working Group (IWG) on the SC-GHG.

Table 3.13 presents the SC-GHGs associated with estimated emissions from the proposed development of the wells. 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 (i.e., 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%, 3%, and 5% (IWG 2021).

To address uncertainty in the estimates, the IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average costs 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 impacts estimated, applying a 3% annual

discount rate for future economic effects. This is a low probability, but high impact scenario, and represents an upper bound of impacts within the 3% discount rate model.

The estimates below follow the IWG recommendations and represent the present value (from the perspective of 2021) of future market and nonmarket costs associated with CO_2, CH_4, and N_2O emissions from potential well development and operations and potential end-use. 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, rounded to the nearest $1,000.

Table 3.13 SC-GHGs Associated with Future Potential Development of 4 Wells

	Social Cost of GHGs ($)			
	Average Value, 5% discount rate	**Average Value, 3% discount rate**	**Average Value, 2.5% discount rate**	**95th Percentile Value, 3% discount rate**
Development and Operations	$575,000	$1,986,000	$2,939,000	$5,944,000
Mid-Stream and End-Use	$16,141,000	$54,662,000	$80,673,000	$163,619,000
Total	**$16,716,000**	**$56,648,000**	**$83,612,000**	**$169,563,000**

Source: BLM SC-GHG Emissions Tool

IMPACTS FROM THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not authorize the APDs, and the new wells described in the proposed action would not be drilled. Although no new GHG emissions resulting from new Federal oil and gas development would occur under the No Action Alternative, the national and global demand for energy is not expected to differ regardless of BLM decision-making.

The BLM does not have a model to estimate energy market substitutions at a spatial resolution needed for this onshore production scenario. Reductions in oil and natural gas produced from Federal leases may be partially offset by non-Federal production (state and private) in the United States (in which case the indirect GHG emissions would be similar), or overseas, in which case the GHG emissions would likely be higher, to the extent environmental protection requirements for production are less vigorous, and the produced energy would need to be physically transported into the United States. There may also be substitution of other energy resources to meet energy demand. These substitution patterns will be different for oil and gas because oil is primarily used for transportation, while natural gas is primarily used for electricity production and manufacturing, and to a lesser degree by residential and commercial users (EIA 2023a). Coal and renewable energy sources are stronger substitutes for natural gas in electricity generation. 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 energy source (see Table 10-3 of the Annual GHG Report (BLM 2023e). In the transportation sector, alternatives to oil are likely to be less carbon intensive.

Finally, substitution across energy sources or oil and gas production from other locations may not fully meet the energy needs that would otherwise have been realized through production from leases. 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 under the no action alternative, but the relative contribution of each is unknown. Regardless, GHG emissions under the no action alternative are not expected to be zero.

CUMULATIVE IMPACTS

The analysis of GHGs contained in this EA includes estimated emissions from the proposed action as described above. An assessment of GHG emissions from other BLM federal mineral estate authorizations, including coal leasing and oil and gas leasing and development, is included in Chapter 7 of Annual GHG Report. The Annual GHG Report includes estimates of reasonably foreseeable GHG emissions related to coal, oil, and gas development that is occurring, and is projected to occur, on the federal onshore mineral estate. It is, therefore, an estimate of cumulative GHG emissions from the BLM federal mineral estate based on actual production and statistical trends.

The Annual GHG Report provides an estimate of short-term and long-term GHG emissions from activities across the BLM's oil and gas program. The short-term methodology presented in the Annual GHG Report includes a trends analysis of (1) leased federal lands that are held-by-production [7](2) approved applications for permit to drill (APDs), and (3) leased lands from competitive lease sales occurring over the next annual reporting cycle (12 months), to provide a 30-year projection of potential emissions from all Federal oil and gas actions over the next 12 months. The long-term methodology uses oil and gas production forecasts from the Energy Information Administration (EIA) to estimate GHG emissions out to 2050 that could occur from past, present, and future development of Federal fluid minerals. For both methodologies, the emissions are calculated using life-cycle-assessment data and emission factors. These analyses are the basis for projecting GHG emissions from new Federal oil and gas that are likely to go into production during the analysis period of the Annual GHG Report and represent both a hard look at GHG emissions from oil and gas development and the best available estimate of reasonably foreseeable cumulative emissions related to any one APD or set of APDs.

Table 3.14 shows the aggregate GHG emissions estimate that would occur from Federal oil and gas development and operations within the region, existing and foreseeable, between the years 2022 and 2050, using the methodology described above. A detailed explanation of the short-term and long-term emissions estimate methodologies are provided in sections 6.6 and 6.7 of the Annual GHG Report.

Table 3.14 GHG Emissions from Regional Past, Present, and Reasonably Foreseeable Federal Onshore Development (Mt CO_2e)

State	Existing Wells (Report Year)	Existing Wells (Projected)	Approved APDs	New Leasing	Short-Term Totals	Long-Term Totals
CO	46.16	399.35	30.80	23.95	454.10	1,395.90
MT	2.52	25.68	0.42	12.63	38.73	77.12
NV	0.13	1.01	0.01	0.19	1.22	4.07
NM	326.00	2,318.83	745.21	119.12	3,183.17	9,961.81
TX	3.31	36.52	19.00	1.97	57.49	99.95
UT	13.90	175.34	16.33	36.75	228.41	421.63
WY	103.34	920.76	178.16	317.98	1,416.91	3,134.55
Total Onshore Federal	**542**	**4,334**	**1,123**	**576**	**6,033**	**16,523**

Source: BLM Annual GHG Report, Section 7

As detailed in the 2022 Annual GHG Report, which is incorporated by reference, the BLM also looked at other tools to inform its analysis, including the Model for the Assessment of Greenhouse Gas Induced

[7] held-by-production - A provision in an oil or natural gas property lease that allows the lessee to continue drilling activities on the property as long as it is economically producing a minimum amount of oil or gas. The held-by-production provision thereby extends the lessee's right to operate the property beyond the initial lease term.

Climate Change (MAGICC)[8] (see Section 9.0 of the Annual GHG Report [BLM 2023d]). BLM conducted MAGICC runs evaluating potential contributions to global climate change and related values for two climate change projection scenarios. These two scenarios were chosen because they most closely approximate or frame the desired outcomes of the Paris Climate Accord and would also reflect the greatest contribution as a percent of BLM's authorized cumulative emissions relative to the global emissions levels contained in the scenarios. IPCC's most optimistic scenario evaluates global CO_2 emissions cut to net zero around 2050. This is the only scenario that meets the Paris Agreement's goal of keeping global warming to around 1.5 degrees Celsius (°C) above pre-industrial temperatures. The second "middle of the road" scenario leaves global CO2 emissions around current levels before starting to fall by 2050 but does not reach NetZero by 2100. In this scenario, temperatures rise 2.7°C by the end of the century. The maximum BLM fossil fuel (oil, gas, and coal) contribution to global temperature increases under these two scenarios is 0.015°C and 0.013°C, respectively.

As this is an assessment of what BLM has projected could come from the entire federal mineral estate, including the projected emissions from the Proposed Action, over the next 30 years, the reasonably foreseeable APD emissions contemplated in this EA are not expected to substantially affect the rate of change in climate effects, bring forth impacts that are not already identified in existing literature, or cause a change in the magnitude of impacts from climate change at the state, national, or global scale.

Recent short-term energy outlook (STEO) reports published by the EIA (EIA 2024) predict that the world's oil and gas supply and consumption will increase over the next 18 to 24 months. The STEO projections are useful for providing context for the cumulative discussion as the global forecast models used for the STEO are not dependent on whether the BLM issues onshore leases or authorizes new oil and gas, but are based on foreseeable short-term global supply and demand and include oil and gas development/operations on existing U.S. onshore leases. Recent STEOs include the following projections for the next 2 years:

- U.S. liquid fuels consumption is projected to increase to 20.40 million barrels per day (b/d) in 2024, up from 20.25 million b/d in 2023.
- U.S. crude oil production is expected to average 13.19 million b/d in 2024 and rise to 13.65 million b/d in 2025.
- U.S natural gas consumption is expected to average 89.68 billion cubic feet/day (Bcf/d) in 2024, decreasing slightly to 89.21 Bcf/d in 2025.
- U.S. liquid natural gas exports are expected to increase from 11.9 Bcf/d in 2023 to 12.34 Bcf/d in 2024 and 14.43 Bcf/d in 2025.
- U.S. coal production is expected to total 496.6 million short tons (MMst) in 2024 and 465.8 MMst in 2025 and decrease to 15% of total U.S. electricity generation in 2024 compared to 17% in 2023, driven by the ongoing retirement of coal-fired generating plants.

Generation from renewable sources will make up an increasing share of total U.S. electricity generation, rising from 21% in 2023 to 24% in 2024. Recent events, both domestically and internationally, have resulted in abrupt changes to the global oil and gas supply. EIA studies and recent U.S. analyses (associated with weather impacts) regarding short-term domestic supply disruptions and shortages or sudden increases in demand demonstrate that reducing domestic supply (in the near-term under the current supply and demand scenario) will likely lead to the import of more oil and natural gas from other countries, including countries with lower environmental and emission control standards than the United States (EIA 2024). Recent global supply disruptions have also led to multiple releases from the U.S. Strategic Petroleum Reserve in order to meet consumer demand and curb price surges.

The EIA 2023 Annual Energy Outlook (EIA 2023a) projects energy consumption increases through 2050 as population and economic growth outweighs efficiency gains. As a result, U.S. production of natural gas

[8] https://magicc.org.

and petroleum and liquids will rise amid growing demand for exports and industrial uses. U.S. natural gas production increases by 15% from 2022 to 2050. However, renewable energy will be the fastest growing U.S. energy source through 2050. As electricity generation shifts to using more renewable sources, domestic natural gas consumption for electricity generation is expected to decrease by 2050 relative to 2022. As a result, energy-related CO_2 emissions are expected to fall 25% to 38% below the 2005 level, depending on economic growth factors. Further discussion of past, present, and projected global and state GHG emissions can be found in Chapter 5 of the Annual GHG Report (BLM 2023d).

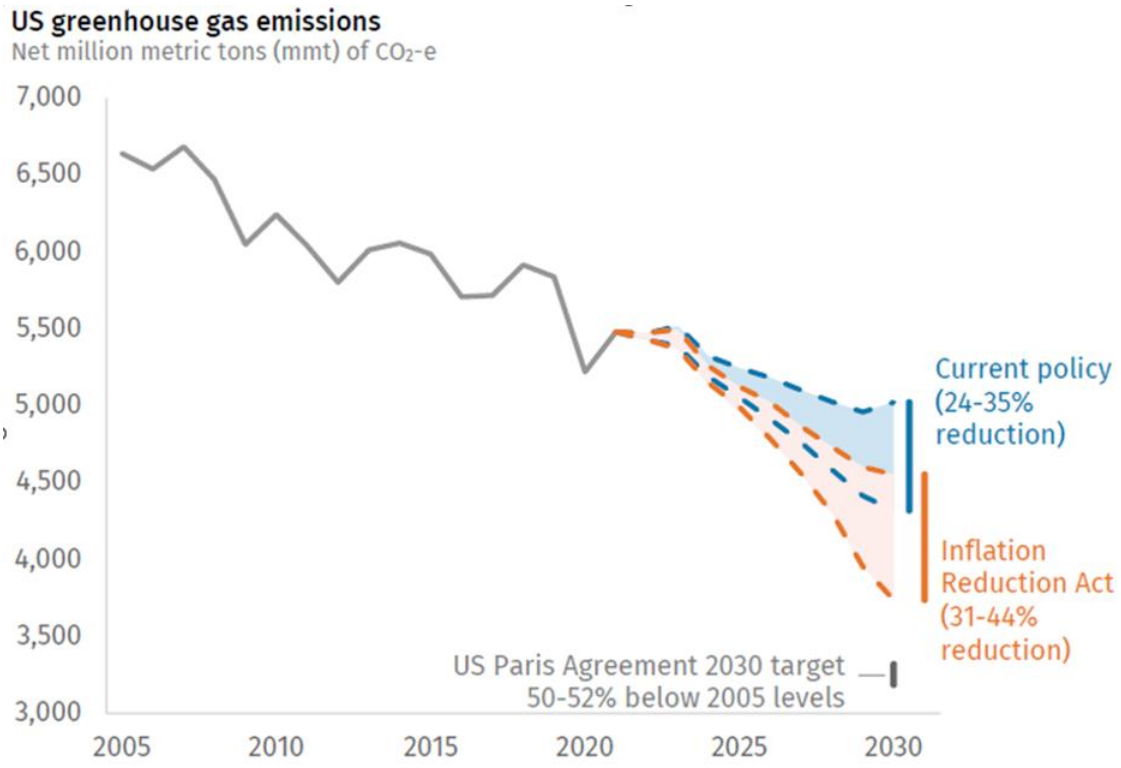
Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad" (January 27, 2021), directs the executive branch to establish policies or rules that put the United States on a path to achieve carbon neutrality, economy-wide, by no later than 2050. This goal is consistent with IPCC's recommendation to reduce net annual global CO emissions between 2020 and 2030 in order to reach carbon neutrality by mid-century. Federal agencies are still in the process of developing policies that align with a goal of carbon neutrality by 2050. In the short-term, the order has a stated goal of reducing economy-wide GHG emissions by 50% to 52% relative to 2005 emissions levels no later than 2030 (see Figure A.1).

Carbon budgets estimate the amount of additional GHGs that could be emitted into the atmosphere over time to reach carbon neutrality while still limiting global temperatures to no more than 1.5°C or 2°C above preindustrial levels (see Section 9.1 of the Annual GHG Report [BLM 2023f]). The IPCC Special Report on Global Warming of 1.5ºC is the most widely accepted authority on the development of a carbon budget to meet the goals of the Paris Agreement (IPCC 2020). None of the global carbon budgets or pledges that countries have committed to stay within as part of the Paris Agreement are binding. At present, no national or federal agency carbon budgets have been established, 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 or 2.0°C are not useful for BLM decision making, as it is unclear what portion of the budget applies to emissions occurring in the United States.

The CEQ discourages federal agencies from comparing emissions from an action to global or domestic levels as "such comparisons and fractions also are not an appropriate method for characterizing the extent of a proposed actions and its alternatives' contributions to climate change because this approach does not reveal anything beyond the nature of the climate change challenge itself" (CEQ 2023:18). However, stakeholders and members of the public have requested that the BLM consider comparing the estimated federal oil and gas emissions in the context of global carbon budgets. In the interest of public disclosure, Table 9-1 in the Annual GHG Report (BLM 2023d) provides an estimate of the potential emissions associated with federal fossil fuel authorizations in relation to IPCC carbon budgets. Total federal fossil fuel authorizations, including coal, natural gas, and oil, represents approximately 1.37% of the remaining global carbon budget of 380 gigatonnes of CO_2 needed to limit global warming to 1.5°C.

While continued fossil fuel authorizations will occur over the next decade to support energy demand and remain in compliance with the leasing mandates in the Inflation Reduction Act of 2022 (IRA), the EIA International Energy Outlook expects renewable energy consumption to double between 2020 and 2050 and nearly equal liquid fuels consumption by 2050 (EIA 2023a). The United States has committed to the expansion of renewable energy through infrastructure investments in clean energy transmission and grid upgrades included in the Bipartisan Infrastructure Investment and Jobs Act (Public Law No: 117-58) as well as clean energy investments and incentives included in the IRA.

Figure 2. Projected Short-Term Emissions Reductions Associated with the IRA



Source: Rhodium Group. The range reflects uncertainty around future fossil fuel prices, economic growth, and clean technology costs. It corresponds with high, central, and low emissions scenarios detailed in Taking Stock 2022 (https://rhg.com/research/taking-stock-2022/). Under the central scenario (not shown), the IRA accelerates emissions reductions to a 40% cut from 2005 levels (BLM 2023e).

3.4.2.3 *Conditions of Approval and Design Features*

EMISSION CONTROL MEASURES CONSIDERED IN THE ANALYSIS

The relationship between GHG emissions and climate impacts is complex, but a project's potential to contribute to climate change is reduced as its net emissions are reduced. When net emissions approach zero, the project has little or no contribution to climate change. Net-zero emissions can be achieved through a combination of controlling and offsetting emissions. Emission controls (e.g., vapor recovery devices, no-bleed pneumatics, leak detection and repair, etc.) can substantially limit the amount of GHGs emitted to the atmosphere, while offsets (e.g., sequestration, low carbon energy substitution, plugging abandoned or uneconomical wells) can remove GHGs from the atmosphere or reduce emissions in other areas. Chapter 10 of the Annual GHG Report (BLM 2023b) provides a more detailed discussion of GHG mitigation strategies.

Several federal agencies work in concert to implement climate change strategies and meet U.S. emissions reduction goals all while supporting U.S. oil and gas development and operations. The EPA is the federal agency charged with regulation of air pollutants and establishing standards for protection of human health and the environment. The EPA has issued regulations that will reduce GHG emissions from any development related to the Proposed Action. These regulations include the NSPS for Crude Oil and Natural Gas Facilities (40 C.F.R. § 60, Subpart OOOOa), Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After November 15, 2021 (40 C.F.R. § 60, Subpart OOOOb) and Waste Emissions Charge for Petroleum and Natural Gas Systems (40 C.F.R. § 99). These regulations impose emission limits, equipment design standards, and monitoring requirements on oil and gas facilities and a waste emissions charge on CH4 emissions that exceed 25,000 metric tonnes of CO_2e for applicable petroleum and natural gas facilities currently required to report under the GHG Reporting Rule. A detailed discussion of existing regulations

and Executive Orders that apply to BLM management of federal lands as well as current federal and state regulations that apply to oil and gas development and production can be found in Chapter 2 of the Annual GHG Report (BLM 2023b).

At the state level, New Mexico's EMNRD published the New Mexico Oil Conservation Division Statewide Natural Gas Capture Requirements (Waste Prevention Rule), NMAC 19.15.27, on May 25, 2001, as part of the New Mexico statewide enforceable regulatory framework to secure reductions in oil and gas sector emissions and to prevent natural gas waste from new and existing sources. Key provisions include prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to route the gas to pipeline or to use this gas for some other beneficial purpose (such as on-site fuel consumption). In all cases, operators must flare rather than vent natural gas except where this is technically infeasible or would pose a safety risk. These provisions will reduce VOC emissions due to stringent limitations on natural gas venting (which results in uncombusted VOC emissions). Additionally, it proposes that natural gas be recovered and reused rather than flared, which would result in reductions of VOCs, NO_X, CO, SO_2, GHGs, and particulate matter emissions. The NMED developed the "*Oil and Natural Gas Regulation for Ozone Precursors*," NMAC 20.2.50, published on July 26, 2022, with an effective date of August 5, 2022. Approximately 50,000 wells and associated equipment will be subject to this regulation. It is anticipated that the regulation will annually reduce VOC emissions by 106,420 tons, NO_X emissions by 23,148 tons, and CH_4 emissions by 200,000 to 425,000 tons. The regulation includes emissions reduction requirements for compressors, engines and turbines, liquids unloading, dehydrators, heaters, pneumatics, storage tanks, and pipeline inspection gauge launching and receiving. A description of federal and state rules and regulations can be found in Section 2 of the Air Resources Technical Report (BLM 2023a), incorporated by reference.

The majority of GHG emissions resulting from federal fossil fuel authorizations occur outside of the BLM's authority and control. These emissions are referred to as indirect emissions and generally occur off-site during the transport, distribution, refining, and end use of the produced federal minerals. The BLM's regulatory authority is limited to those activities authorized under the APD, which primarily occur in the "upstream" portions of natural gas and petroleum systems (i.e., the well development and well-production phases). This decision authority is applicable when development is proposed on public lands and the BLM assesses the specific location, design, and plan of development. In carrying out its responsibilities under NEPA, the BLM has developed BMPs designed to reduce emissions from field production and operations. BMPs may include limiting emissions from stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions that may occur during development of the wells. Analysis and approval of future development may include the application of BMPs within BLM's authority, included as COAs, to reduce or mitigate GHG emissions. Additional measures proposed at the project development stage may be incorporated as applicant committed measures by the project proponent or added to necessary air quality permits. Additional information on mitigation strategies, including emissions controls and offset options, are provided in Chapter 10 of the Annual GHG Report (BLM 2023b).

3.4.3. Issue #3. Hydrology: Water Quantity

How would the construction and operation activities in the Proposed Action impact water quantity?

3.4.3.1 *Affected Environment*

The analysis area for this issue is Chaves, Eddy, and Lea Counties (the tri-county analysis area), which collectively make up the New Mexico portion of the Permian Basin. This analysis area is used because water sources used to support future potential development would likely be sourced from these three counties and their associated aquifers.

Water uses common with development of the Proposed Action (such as hydraulic fracturing) would occur during the 30- to 60-day well construction and completion period. Additional water uses (such as use

associated with dust control) would occur during the 20-year production operations period. While much of the water use associated with oil and gas development is expected to occur within a 30- to 60-day construction period when the wells would be drilled, the effect of this use on groundwater aquifers extends until seasonal recharge occurs. Due to uncertainty about water sources and recharge rates, and due to slow recharge rates associated with droughts from climate change factors, it is assumed that all water use associated with oil and gas development is likely to have a long-term effect (Smerdon 2017). The ability of an aquifer to replenish pumped groundwater is dependent on adequate precipitation infiltrating into recharge zones which may be impacted by extended droughts resulting from climate change.

The following analysis summarizes information contained in the 2023 BLM Water Support Document for Oil and Gas Development in New Mexico (hereafter, Water Support Document [WSD]; BLM 2023a); this information is incorporated by reference. Water use for development of the Proposed Action is assumed to primarily come from groundwater sources based on previous oil and gas development in the targeted area.

CURRENT TOTAL WATER USE IN THE ANALYSIS AREA

The USGS report, *Estimated Use of Water in the United States in 2015* (Dieter et al. 2018), lists total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power. Table 3.17 summarizes water use for 2015 for the eight water use categories in each of the three counties within the analysis area. Irrigation is the largest category of water use in all counties, accounting for an average of 75 percent (466,784 acre-feet [AF]) of the total water withdrawal for the analysis area (619,375 AF). Approximately 88 percent (525,154 AF) of the total water use is from groundwater. Mining (which includes oil and gas development) comprises approximately 15 percent of water withdrawals. All mining-related water use (94,758 AF) is from groundwater. Of that total, 99 percent of withdrawals are from nonpotable saline sources (that is, water containing dissolved solids of 1,000 milligrams per liter or more).

Table 3.3. Tri-County Analysis Area 2015 Water Use by Category

Category	Surface Water			Groundwater			Total Withdrawals			
	Fresh (AF)	Saline (AF)	Total (AF)	Fresh (AF)	Saline (AF)	Total (AF)	Fresh (AF)	Saline (AF)	Total (AF)	Total Use (%)
Aquaculture	0	0	0	1,782	0	1,782	1,782	0	1,782	<1
Domestic	0	–	0	2,780	–	2,780	2,780	–	2,780	<1
Industrial	0	0	0	1,121	0	1,121	1,121	0	1,121	<1
Irrigation	73,908	–	73,908	392,877	–	392,877	466,784	–	466,784	75
Livestock	314	–	313.88	10,537	–	10,537	10,851	–	10,851	2
Mining		0	0	1,379	93,379	94,758	1,379	93,379	94,758	15
Public water supply	0	0	0	39,470	0	39,470	39,470	0	39,470	6
Thermoelectric power	0	0	0	1,827	0	1,827	1,827	0	1,827	<1
Total	**74,221**	**0**	**74,221**	**451,774**	**93,379**	**525,154**	**525,996**	**93,379**	**619,375**	**100**

Source: BLM 2023a

Notes: The Mining category represents the category into which the Proposed Action falls.

See the Water Support Document (BLM 2023a) for a graphical representation of these data, as well as comparisons with water use across New Mexico.

CURRENT WATER USE ASSOCIATED WITH OIL AND GAS DEVELOPMENT

As part of oil and gas development, water is used for drilling fluid preparation and makeup water for completion fluids, in well stimulation (of which the most common method is hydraulic fracturing), as rig wash water, as coolant for internal combustion engines, for dust suppression on roads or well pads, and for equipment testing. Water uses for oil and gas development in the Pecos District tri-county area are typically sourced from groundwater. Of these uses, hydraulic fracturing activities use the most water. The amount of water used for hydraulic fracturing is dependent on many factors, including the geologic formation. In the CFO, all wells use water for completion, and some include nitrogen gel or slickwater additives to the completion technologies (Herrell 2020).

The State of New Mexico requires oil and gas operators to disclose water use to FracFocus (per NMAC 19.15.16), a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission, to provide objective information on hydraulic fracturing. The BLM examined FracFocus data reported for the calendar years 2014 to 2022 to ascertain actual water use in the analysis area (Table 3.18).

Table 3.4. Actual Water Use in the Tri-County Analysis Area for Calendar Years 2014 to 2022

Year	Federal Water Use (AF)	Nonfederal Water Use (AF)	Total Water Use (AF)	Federal Water Use (%)	Federal Cumulative Water Use (AF)	Total Cumulative Water Use (AF)	Average Water Use per Well (AF)	Total Number of Wells Reported to FracFocus	Produced Water (AF)
2014	872	635	1,507	58	872	1,507	7.6	199	107,301
2015	4,041	4,357	8,399	48	4,913	9,906	14.5	578	109,495
2016	874	5,978	6,852	13	5,787	16,759	20.3	337	103,951
2017	3,368	11,047	14,416	23	9,156	31,174	24.7	584	108,911
2018	9,171	22,623	31,794	29	18,327	62,968	28.9	1,099	130,771
2019	10,385	31,979	42,364	25	28,712	105,332	38.4	1,103	152,731
2020	15,539	24,822	40,361	38	44,251	145,693	50.9	793	165,191
2021	34,426	31,342	65,768	52	78,677	211,461	51.7	1,272	199,615
2022	36,044	50,703	86,747	42	114,721	298,208	52.9	1,639	260,816
Total	**114,721**	**183,487**	**298,208**	**36**	-	-	-	**7,604**	**1,338,782**

Source: BLM 2023a

Notes: Produced water is naturally occurring water that exists in a formation that is being targeted for mineral extraction and is produced as a byproduct. * Includes both federal and nonfederal wells.

Total water use has increased from 1,507 AF in 2014 to 86,747 AF in 2022, with a corresponding basin wide average water use increase from 7.6 AF per well to 52.9 AF per well (BLM 2023a). Although the average water use per well for hydraulic fracturing increased to 52.9 AF in 2022, the 3-year average is 51.8 AF per well. This increase in water use per well is likely due to the higher volume of wells, the likelihood that horizontal wells are being drilled to longer lengths, and the continued use of hydraulic fracturing technologies in well drilling and completion (BLM 2023a).

While much of the water use associated with oil and gas development is expected to occur within a 30- to 60-day construction and completion period, the effect of this use on groundwater aquifers is expected to last until proper recharge occurs. The WSD indicates there are four potential sources of groundwater in the tri-county analysis area: the Pecos Valley alluvium aquifer, the Dockum Formation aquifer (which includes Dewey Lake and Santa Rosa), the Rustler Formation aquifer, and the Capitan Reef aquifer (BLM 2023a). A recent study within the analysis area to identify sources of waters indicated most water wells

contained a mix of source waters; however, in general, the main water sources for water wells are the Dockum Formation aquifer and the Rustler Formation aquifer. Some wells near the community of Carlsbad access the Capitan Reef aquifer for various uses (BLM 2023a).

Recharge for the Dockum Formation aquifer and the Rustler Formation aquifer is driven by precipitation (BLM 2023a). Minimal research has been conducted on recharge rates in the area. In light of this uncertainty about water sources and recharge rates, impacts from water use associated with oil and gas development is typically long term since the ability for the area to recharge is limited by climate factors such as seasonal precipitation and snowpack. Variability of the amount of water coming into the system will affect the amount of water being stored and being used for the various uses across the tri-county area of the Pecos District.

No additional information is available about recharge rates. In addition, estimating overall aquifer volumes and water availability is difficult due to the size and complexity of water sources within the analysis area. Although some water budgets exist for individual watersheds and recent studies have measured and modeled water resource use within parts of the Permian Basin (Lowry et al. 2018; Reardon et al. 2021; USGS 2021b), data regarding overall aquifer volumes for the tri-county analysis area are not available.

3.4.3.2 *Environmental Consequences*

IMPACTS FROM THE PROPOSED ACTION

Drilling and completion of 4 horizontal wells in the project area would use approximately 240 AF of groundwater. This calculation is based on a factor of 60 AF per horizontal well; the BLM considers this a reasonable current estimate of water use associated with drilling and completion of both horizontal and vertical wells within the analysis area (BLM 2023a). If more water-intensive stimulation methods (such as slick-water fracturing) are implemented or if laterals become longer, water use could increase from estimates provided in the WSD (BLM 2023a). Alternatively, water use estimates could be lower if produced water is reused or recycled, or if less water-intensive stimulation methods are used (such as nitrogen) in hydraulic fracturing. Generally, impacts on water quantity associated with the Proposed Action are primarily short-term and occur with water use during the drilling of the well(s).

Assuming all wells are developed in the same year, groundwater use associated with potential development would result in a 0.04 percent increase of the tri-county analysis area's 2015 total water use (619,375 AF), 0.05 percent of the tri-county area's 2015 total groundwater use (525,154 AF), and an 0.25 percent increase over 2015's water use in the mining category for the tri-county analysis area (94,758 AF). The total estimated water use for drilling and completion of the 4 horizontal wells proposed under the Proposed Action (240 AF) represents approximately 0.28 percent of the 2022 single-year oil and gas water use reported to FracFocus (86,747 AF; BLM 2023a).

Water use associated with Proposed Action comprise 0.41 percent of the annual RFD water use and 0.02 percent of total water use associated with the RFD (BLM 2023a). Long-term water requirements during operation could include coolant for internal combustion engines and dust suppression on roads and well pads.

Water used for the purpose of oil and gas drilling, completion, and operations would be transported to the proposed drilling location via trucking from a fracking pond located at NE4 of Sec 26 T21S R27E. The potential sources of groundwater in the analysis area were described above and in Table 3-8 of the WSD (BLM 2023a).

The BLM encourages the use of recycled water in hydraulic fracturing techniques, and in 2019 the State of New Mexico passed the Produced Water Act, which encourages oil and gas producers to reuse produced water for oil and gas extraction when possible rather than relying on freshwater sources (BLM 2023a). Produced water associated with Proposed Action is estimated at approximately 5,533,840 AF of water (1,383,460 barrels per well; S&P Global 2023). Produced water would be disposed of at regulated and permitted commercial facilities, such as saltwater disposal wells. Hydraulic fracturing water that is

sourced from outside the geological formation but remains in the geological formation after hydraulic fracturing is complete is likely lost to the hydrological water cycle (Kondash et al. 2018).

The volume of water that will be used from the RFD scenario is estimated at 58,800 AF of water annually. The volume of water used for the Proposed Action is 0.020 percent of the total RFD projected water use and would be minimal compared to the annual development projected; however, care should still be taken to ensure proper measures are followed to account for both the overall water usage and the health of the local watersheds.

CUMULATIVE IMPACTS

Typical cumulative impacts associated with the Proposed Action include the reduction in overall AF of water available in the tri-county area, reducing the water available for other uses. In the tri-county area, the total water usage reported in 2015 was 619,375 AF (see Table 3-17), which accounted for about 19 percent of the total withdrawals in the state (BLM 2023a). The total amount of water used to complete oil and gas activities within the state has increased from 8,399 AF in 2015 to around 86,747 AF in 2022, primarily due to an increase in the number of wells being drilled and other variables like well depth. This represents an 11,193 AF per year increase in last 7 years. Development of the RFD scenario is anticipated to require approximately 60 AF per well, which equates to 1,176,000 AF over the 20-year development period, or 58,800 AF per year (BLM 2023a). While the volume of water used for the Proposed Action is minimal compared to the overall use estimated annually, it would contribute to overall water use and potential cumulative reductions in available water over time. This impact would be exacerbated in the event of drought conditions associated with climate change. The use of recycled water in hydraulic fracturing techniques as well as advances in hydraulic fracturing technologies would minimize these impacts over time.

The demand from the Proposed Action negligible when contrasted with the estimated water demand of the RFD, the tri-county analysis area 2015 water use (619,374 AD), and the demands of other sectors in the tri-county analysis area, such as irrigation (466,785 AF) and mining (94,758 AF) in 2015.

3.4.3.3 *Conditions of Approval and Design Features*

Overall, there have been requests to increase the use of alternative water sources, such as brackish water or recycled produced water, which would minimize the strain on local freshwater resources (Kondash et al. 2018). The BLM encourages the use of recycled water in hydraulic fracturing techniques but does not have the ability to require this as a mitigation.

3.4.4. Issue #4. Environmental Justice

What are the potential effects from construction, operation, and maintenance in the Proposed Action on environmental justice (EJ) communities?

3.4.4.1 *Affected Environment*

EJ refers to the fair treatment and meaningful involvement of people of all races, tribal affiliations, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies (CEQ 1997). Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 16, 1994), requires federal agencies to determine whether Proposed Actions would have disproportionately high and adverse environmental impacts on minority, low-income, and American Indian populations of concern. BLM policy, as contained in BLM Land Use Planning Handbook H-1601-1 (BLM 2005, Appendix C), provides direction on how to fulfill the BLM's responsibilities for Executive Order 12898.

The CEQ has developed guidance to assist federal agencies with their NEPA procedures so that EJ concerns are effectively identified and addressed. The guidance focuses on identifying minority and low-income EJ populations using census data. The BLM's Instruction Memorandum 2022-059 builds upon the CEQ's guidance and provides further direction for considering EJ concerns in BLM-prepared NEPA documents. This includes a detailed framework for identifying EJ populations using census data as well as several other recommended data sources. The BLM uses five criteria to identify EJ populations (BLM 2022a):

- The low-income population of the analysis area is the same or greater than that of the reference area.
- The low-income population of the analysis area is 50 percent or greater of the total analysis area population.
- The minority population of the analysis area is meaningfully greater than that of the reference area (that is, the minority population is 110 percent or more than the reference area population).
- The minority population of the analysis area is 50 percent or greater of the total analysis area population.
- Tribal populations are present within the analysis area.

The BLM defines low-income populations as individuals or groups of people whose income is less than or equal to twice (200 percent of) the federal poverty threshold, as identified by the US Census Bureau (BLM 2022a). Minority populations include the following population groups: 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 (BLM 2022a; CEQ 1997). Except for white non-Hispanics, all other racial and ethnic groups are considered minorities; therefore, the total minority population of an area is calculated by subtracting the white non-Hispanic population from the total population (BLM 2022a).

Members of tribal populations include all persons who have origins in any of the original peoples of North America and South America (including Central America) and who maintain tribal affiliation or community attachment. Any American Indian or Alaska Native population qualifies as a tribal population, and membership in a federally recognized tribe is not required (BLM 2022a). All tribal populations qualify as EJ populations, regardless of the percentage of the analysis area population they constitute. In addition, dispersed tribal populations can also constitute EJ populations if they do not reside within the analysis area but depend on cultural resources or places located on BLM-administered land within the analysis area.

Census places are generally a statistical geography representing closely settled, unincorporated communities that are locally recognized and identified by name. A place either is legally incorporated under the laws of its respective State, or a statistical equivalent that the Census Bureau treats as a census designated place (CDP). Census tracts generally have a population size between 1,200 and 8,000 people and usually covers a contiguous area; however, the spatial size of census tracts varies widely depending on the density of settlement.

The analysis area for EJ based on the largest anticipated extent of potential impacts (for example, on air quality and water quality) associated with oil and gas development that may result in disproportionate effects on EJ populations (the distance is estimated to be up to 15 miles but could be less depending on project location).

Within the 15 mile analysis area, there are 5 places. Within a 15-mile analysis area, 3 of the places have the potential for an EJ population: Happy Valley CDP, Livingston Wheeler CDP, Loving village.

Within the 15 mile analysis area, there are 10 census tracts. 6 of the census tracts within the analysis area have the potential for an EJ population: Eddy County Census Tract 8, Eddy County Census Tract 6, Eddy County Census Tract 3, Eddy County Census Tract 5, Eddy County Census Tract 4.02, Eddy County Census Tract 1.

Table 3.5. Places - Environmental Justice Screening of the Analysis Area Communities 2024

Geography	Minority (%)	Meets or Exceeds the Minority Threshold	Low-Income (%)[1]	Meets or Exceeds the Low-Income Threshold	Tribal Census Tract	Potential for an EJ population
Carlsbad city	62.41%	YES	28.03%	NO	NO	YES
Happy Valley CDP	39.27%	NO	41.65%	YES	NO	YES
Livingston Wheeler CDP	27.38%	NO	34.86%	YES	NO	YES
La Huerta CDP	37.60%	NO	12.17%	NO	NO	NO
Loving village	84.22%	YES	47.28%	YES	NO	YES

Source: US Census Bureau, 2023 and U.S. Bureau of Labor Statistics, 2023.

[1] The low-income population shown is as a percentage of the total population for whom poverty status is determined.

Table 3.6. Census Tracts - Environmental Justice Screening of the Analysis Area Communities 2024

Geography	Minority (%)	Meets or Exceeds the Minority Threshold	Low-Income (%)[1]	Meets or Exceeds the Low-Income Threshold	Tribal Census Tract	Potential for an EJ population
Eddy County Census Tract 7	45.25%	NO	17.68%	NO	NO	NO
Eddy County Census Tract 9	41.77%	NO	25.21%	NO	NO	NO
Eddy County Census Tract 8	75.82%	YES	45.65%	YES	NO	YES
Eddy County Census Tract 4.01	41.47%	NO	31.33%	NO	NO	NO
Eddy County Census Tract 6	56.22%	YES	36.13%	YES	NO	YES
Eddy County, Census Tract 2	47.54%	NO	18.94%	NO	NO	NO
Eddy County Census Tract 3	52.98%	YES	25.44%	NO	NO	YES

Geography	Minority (%)	Meets or Exceeds the Minority Threshold	Low-Income (%)[1]	Meets or Exceeds the Low-Income Threshold	Tribal Census Tract	Potential for an EJ population
Eddy County Census Tract 5	71.96%	YES	40.96%	YES	NO	YES
Eddy County Census Tract 4.02	52.35%	YES	39.54%	YES	NO	YES
Eddy County Census Tract 1	70.59%	YES	28.70%	NO	NO	YES

Source: US Census Bureau, 2023 and U.S. Bureau of Labor Statistics, 2023.

[1] The low-income population shown is as a percentage of the total population for whom poverty status is determined.

3.4.4.2 *Environmental Consequences*

IMPACTS FROM THE PROPOSED ACTION

The CEQ guidance states that if EJ communities are identified in the analysis area, additional analysis is needed to determine if there are adverse and disproportionate impacts from the Proposed Action, and that the following factors should be considered when examining whether human health effects or environmental effects are disproportionately high and adverse (CEQ 1997):

- Are the health effects or environmental effects significant or above generally accepted normal rates or risks? Do they negatively harm EJ communities?
- Are the risks or rates of harm to EJ communities greater than the risk or rate of harm to the general population or comparison community?
- Are EJ communities impacted by cumulative effects?

The Proposed Action would result in localized air, noise, visual resources, and traffic impacts that could affect quality of life and human health and safety for local residences and EJ populations, particularly during construction. Continued expansion of the oil and gas industry may be perceived as having a negative effect on quality of life for people who value undeveloped landscapes. In general, quality of life and human health and safety impacts would be greater for the residents in close proximity to current and future potential development (AIB Issue 2. Quality of Life). These residents may be members of an EJ population who may be more likely to experience adverse health outcomes because of demographic or socioeconomic factors. When evaluating siting of wells, standard design features and project specific COAs are applied to reduce adverse effects on EJ populations, so it is not anticipated that the Proposed Action would result in disproportionate and adverse impacts on environmental justice communities from changes in quality of life or to human health and safety.

The EJ populations around the project area would experience impacts on access to clean water resources if surface or groundwater is contaminated, such as through spills. With consideration of design features and regulatory requirements, negligible impacts on groundwater or surface water quality are expected from well drilling and completion. The Proposed Action would increase the demand for surface and groundwater, and require 240 AF of water, or 0.039 percent of the tri-county analysis area's 2015 total water use (619,375 AF). While groundwater resources are regional in nature and water withdrawals are not anticipated to affect domestic water sources, any impacts on local water wells could force residents to find other means of supplying water for domestic use. These impacts could have a disproportionate effect on any downstream EJ communities who rely on water for business, recreation, or drinking water purposes and who may not have the economic means and resources to acquire sufficient clean water to use to the same degree as other groups. However, the BLM would minimize adverse impacts on EJ populations from changes in water quality or quantity by applying best practices, design features, and COAs.

The Proposed Action would result in adverse impacts on clean air, which could disproportionately impact EJ communities near the project area. As described in Issue #1. Air Quality, fugitive dust and diesel exhaust emissions from construction would result in criteria pollutant, VOC, and HAP emissions. These emissions would be short term (30–60 days) and would have the greatest impact at locations near the construction activities. Residents near the construction activities, who may be part of an EJ population, would experience greater levels of impacts due to project construction (AIB Issue 2. Quality of Life). Air quality impacts would have disproportionate effects on EJ communities because they can be more prone to experience adverse health effects due to a lack of economic resources or access to healthcare in such communities. However, the BLM would minimize adverse impacts on EJ populations from changes in air quality by applying best practices, design features, and COAs.

As described in Issue #2. Greenhouse Gases, the Proposed Action is estimated to result in 1.048 megatonnes of CO_2e from GHG emissions. All GHG emissions would contribute to global GHG emissions associated with documented ongoing and reasonably foreseeable climate-related effects. For the Upper Rio Grande Basin (southern Colorado to central southern New Mexico), these may include increased temperatures, decreases in overall water availability, and increases in frequency, intensity, and duration of both droughts and floods. Any climate change–related impacts would be regional in nature, so it is not anticipated that there would be disproportionate impacts on EJ populations.

Indirect emissions are those often associated with transportation of oil or natural gas across long distances. The level of impacts of indirect emissions and the potential for disproportionate impacts on the EJ communities would depend on quantity of indirect emissions and where the emissions occur. There is uncertainty regarding the time and location of indirect emissions because indirect emissions are more dispersed than direct emissions. Because of this dispersion of indirect emissions, it is not anticipated that there would be disproportionate adverse impacts on EJ communities from indirect emissions that result from the Proposed Action.

CUMULATIVE EFFECTS

Data compiled by the US Census at the block group level indicate the potential presence of minority and low-income communities in the vicinity of the Proposed Action. The Proposed Action is not expected to generate disproportionate adverse human health or environmental effects on nearby EJ communities. The Proposed Action would result in long-term visual impacts in some locations where the structures and overhead conductors would be visible from private residences, including parts of the census block groups that have potential minority and low-income communities, especially when looking at reasonably foreseeable future actions for the area as described in Section 3.1, which expects around 19,600 new wells to be developed over the next 20 years. The Proposed Action would incrementally contribute to impacts associated with reasonably foreseeable trends and future actions. While these potential impacts exist, overall, the Proposed Action does not appear to exhibit systematic bias toward placing the project in minority or low-income communities.

3.4.4.3 *Conditions of Approval and Design Features*

There are no COAs or design features specific to EJ communities, however, design features and COAs for hydrology, air quality, greenhouse gases, human health and safety, quality of life minimize impacts described above.

CHAPTER 4. CONSULTATION AND COORDINATION

The following consultation and coordination efforts would be conducted with tribes, individuals, organizations, and agencies, where applicable, for the proposed oil and gas development.

4.1 ENDANGERED SPECIES ACT CONSULTATION

BLM specialists reviewed the most recent IPaC list from USFWS; although this does not constitute proper consultation, it provides an assessment of the species of concern that exist within the project area. BLM Project Leads work with BLM specialists to initiate proper consultation efforts at a site-specific level. The process can vary depending on the complexity of the project or action and follows a specific format: Step 1 – Informal Consultation, Step 2 – Review, Step 3 – Determination, Step 4 – Formal Consultation (if applicable), and Step 5 – Conclusion of Biological Opinion. The USFWS has 45 days after completion of formal consultation to write the biological opinion. ESA consultation specific to the Proposed Action is detailed below.

4.1.1. ESA Consultation

BLM CFO biologists have determined the Proposed Action is consistent with threatened and endangered species management guidelines outlined in the 1988 CFO RMP, as amended in 1997 (Consultation #2-22-96-F-128). The BLM CFO maintains, in coordination with the USFWS, a current list of species and critical habitats protected by the ESA, as amended.

The CFO has determined the project would have no effect on any protected species or designated critical habitat and, thus, fulfills the requirements for Section 7 interagency consultation.

4.1.2. Climate Change and ESA Consultation

The BLM continues to review the available climate science for its statutory responsibilities, including under NEPA. The BLM has found that despite advances in climate science, “global climate models are unable to forecast local or regional effects on resources as a result of specific emissions.” Any contribution to global climate processes from the approval of an individual APD is simply too remote, speculative, and undetectable to trigger ESA Section 7 consultation, given accumulated and persisting GHGs already in the atmosphere, the annual volume of GHG emissions that will occur globally regardless of whether a particular APD is approved, and projected continued climate change.

For an example, see the BLM Specialist Report on Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2022b), which finds that “[u]nlike other common air pollutants, the ecological impacts that are attributable to the GHGs are not the result of localized or even regional emissions but are entirely dependent on the collective behavior and emissions of the world’s societies.” It notes “the lack of climate analysis tools and techniques that lend themselves to describing the physical climate or Earth system responses, such as changes to sea level, average surface temperatures, or regional precipitation rates, that could be attributable to emissions associated with any single [land management] action or decision.”

See also the USFWS’s Threatened Species Status for Emperor Penguin With Section 4(d) Rule (87 *Federal Register* 64,700 and 64,704, October 26, 2022; USFWS 2022b). This states that “based on the best scientific data available we are unable to draw a causal link between the effects of specific GHG emissions and take of the emperor penguin in order to promulgate more specific regulations under [ESA Section] 4(d).”

4.2 TRIBAL CONSULTATION

Tribal consultation is done on a government-to-government basis during land use planning and lease sale processes. The BLM CFO relies on existing ethnographic research and information gathered in consultation during the land use planning and lease sale stages to scope for potential tribal and religious concerns in an area of proposed development. Through consultations and extensive research, culturally significant areas have been identified and are protected from development within the entirety of BLM-

administered lands in the CFO planning area. Consultation is ongoing, and the CFO is available to engage with tribes and pueblos and respond to any consultation requests.

4.3 NHPA SECTION 106 CONSULTATION

Section 106 of the NHPA and its implementing regulations (36 CFR 800) require federal agencies to consider what effect authorizations, such as APDs, would have on the landscape. Specific definitions are given in 36 CFR 800.16 for key cultural resource management concepts, such as undertakings, effects, and areas of potential effects. The New Mexico BLM has a two-party agreement with the SHPO that implements an authorized alternative to 36 CFR 800 for most undertakings (BLM 2014b). This agreement, called the State Protocol, offers a streamlined process for reporting and review that expedites consultation with the SHPO. However, certain circumstances, including intense public controversy over an undertaking, may result in the SHPO or BLM requiring use of the standard Section 106 consultation procedures outlined in 36 CFR 800 rather than using the State Protocol.

The State Protocol details how the New Mexico BLM and SHPO consult and regulate their relationship. The State Protocol also outlines when case-by-case SHPO consultation is or is not required for specific undertakings and the procedures for evaluating the effects of common types of undertakings. It also details how to resolve adverse effects on historic properties. These common types of undertakings regularly include actions undertaken by the BLM.

Additionally, the CFO implements the PBPA, an optional method of compliance with Section 106 of the NHPA. The programmatic agreement is a form of off-site mitigation that allows industry to design projects to avoid known NRHP-eligible cultural resources and to contribute to a mitigation fund in lieu of paying for additional archaeological inventory in an area that has already been adequately surveyed. The PBPA may be applied to energy-related projects in a 39-quadrangle area of BLM-administered lands in the CFO planning area. Funds received from the PBPA will be used to conduct archaeological research and outreach in southeastern New Mexico.

CHAPTER 5. SUPPORTING INFORMATION

5.1 LIST OF PREPARERS

The following individuals contributed to the preparation of this EA.

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APPENDIX A. ISSUES ANALYZED IN BRIEF AND ISSUES DISMISSED FROM ANALYSIS

ISSUES ANALYZED IN BRIEF

AIB Issue 1. Human Health and Safety

What are the potential effects on human health and safety from construction, operation, and maintenance activities associated with the Proposed Action?

There are 42,650 existing well bores of all well types and approximately 109,000 acres of disturbance attributed to oil and gas development within the CFO's administrative boundary (Engler 2023). This level of development has resulted in the following potential public health and safety-related concerns: occasional fire starts; spills of hazardous materials, hydrocarbons, produced water, drilling fluid, and hydraulic fracturing fluid and the corresponding potential contamination of air, soil, or water; exposure to naturally occurring radioactive material in drill cuttings or produced water; traffic congestion and collisions from commercial vehicles and heavy use; the presence of hydrogen sulfide (H_2S); and increased levels of air pollutants.

Fires
Between 2001 and 2017, there were 409 human-caused fires on Bureau of Land Management (BLM)-administered lands within the CFO's administrative boundary, resulting in 91,788 acres burned (BLM 2018b, Appendix S, Table S.10). Most human-caused fires and acreage burned occurred between 2008 and 2011 (BLM 2018b). Human-caused fires are usually from equipment use, such as vehicles or machinery, power lines, or negligence. The BLM coordinates responses to fires with a number of local, state, and federal agencies to ensure timely response and to minimize fire-related impacts (see the CFO Draft Resource Management Plan/Environmental Impact Statement [RMP/EIS; BLM 2018b] for additional information on fires, causes, and BLM response). Additionally, the BLM implements guidance in the Gold Book relevant to safety and emergency situations, including notification, response, and appropriate procedures for minimizing the potential for vehicles or equipment to cause fires during construction and operational activities related to oil and gas development (US DOI and USDA 2007). Oil and gas industry fires must be reported to the BLM under BLM Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL 3-A), which initiates BLM Authorized Officer oversight of the event, impacts, and mitigation measures.

With these measures in place, the potential for effects on human health and safety from human-caused fire is low.

Well Blowouts
The production formations in the CFO administrative boundary include the presence of various gas bearing formations in both lesser and greater quantities. When drilling into gas bearing formations, gas may rise from production formations to the surface and result in a well blowout if not properly controlled during drilling and worker. Standards and requirements for well blowout prevention and blowout preventer equipment (BOPE) installation and testing are contained in 43 CFR 3172.6 (Well control). Well blowouts must be reported to the BLM under NTL 3-A. New Mexico state reporting and compliance measures are also applicable.

While well blowouts have the potential to occur, well blowouts are considered to be rare events in the region. Reporting measures and regulatory oversight of blowouts and their impacts are also in place.

Spills

Human health and safety concerns related to spills of hazardous materials, hydrocarbons, produced water, and hydraulic fracturing fluid are addressed under AIB Issue 8. Hydrology: Drilling and Water Quality. The rate of recovery varies by spill type, but generally most spills are not recovered.

Spills and undesirable events are reported to the BLM in accordance with NTL-3A. For spills and other undesirable events, the responsible party must comply with the instructions of the BLM Authorized Officer and also complete corrective actions under New Mexico Administrative Code (NMAC; Title 19, Chapter 15, Part 29 [Releases]) in accordance with an approved remediation plan or abatement plan, and remediate contaminants from unrecovered spills in accordance with federal and state standards. Because the potential for spills to affect surface or groundwater is low and regulatory measures are in place to address spills that do occur, the potential for impact on human health and safety from changes in water quality or from exposure to hazardous materials from spills is low.

Naturally Occurring Radioactive Materials (NORM)
In addition to potential exposure through spills, radionuclides, which are naturally occurring radioactive materials (NORM), can be brought to the surface during oil and gas drilling, potentially exposing personnel to these materials (EPA 2023f). New Mexico has regulations for transport, storage, and disposal of NORM materials to minimize the potential for impacts on people and the environment (NMED 2023g; see also 20 NMAC 3.1, Subpart 14 [**N**aturally Occurring Radioactive Materials (NORM) in the Oil and Gas Industry**]**).

Because the risks of oil and gas personnel and members of the public being exposed to hazardous materials, hydrocarbons, produced water, and hydrologic fracturing fluids are minimized through compliance with existing federal and state laws, regulations, and policy, the potential for impact on public health and safety from exposure to hazardous materials is low.

Traffic Safety
Traffic congestion and increases in traffic accidents are associated with oil and gas development, especially south and east of Carlsbad along New Mexico State Road 128 and US Route 285. Concurrent with oil and gas development, the region has a higher-than-normal incidence of “wide load” cargos (that take up more than one traffic lane in width), large and heavy debris that falls off service trucks, blown out tire treads, commercial transport rollovers, and potholes created by heavy weight transports using residential, county, and state roadways. While road-specific data is difficult to identify, New Mexico Department of Transportation (NMDOT) does publish annual traffic accident and crash data. In 2021, both Lea and Eddy Counties were in the top ten New Mexico counties for vehicle crashes, with 1,496 vehicle crashes in Lea County and 1,338 in Eddy County (NMDOT 2023). Within both counties, most crashes resulted in property damage only (68 percent in Lea and 73 percent in Eddy County; NMDOT 2023). However, there were 13 fatality crashes in each county in 2021 (NMDOT 2023).

Road maintenance and construction of various roadways are under different authorities. NMDOT is the authority over state highways; counties have authority over county roads; and cities have authority over city roads. In these instances, vehicular and traffic regulations are set by NMDOT, individual counties, and municipal authorities. Accidents, roadway hazards, rollovers, vehicle fires, and other roadway and traffic safety threats are typically responded to by municipal, county Offices of Emergency Management, or state law enforcement authorities, which have primacy over traffic regulations, accident response, and traffic control. To address safety and natural resource concerns on BLM roads, the BLM implements road design guidance, and designated road uses (such as types of vehicles allowed) from the Gold Book and standard CFO conditions of approval (see COAs and US DOI and USDA 2007) to minimize the potential for adverse human safety impacts from oil and gas development-related travel.

H_2S
H_2S is a colorless, flammable, and highly toxic gas that is a naturally occurring byproduct of oil and gas development in some areas, including the New Mexico portion of the Permian Basin. H_2S is an irritant and a chemical asphyxiant that affects oxygen utilization and the central nervous system. H_2S health effects vary depending on the level and duration of exposure (BLM 2023b). H_2S concentrations are measured in parts per million (ppm). H_2S effects range from mild (headaches or eye irritation [10 to 20 ppm]), to very

serious (Immediately Dangerous to Life and Health [IDLH-100 ppm], unconsciousness [500-700 ppm], and nearly instant death [1000 ppm]). H_2S worker safety, training requirements, air monitoring/detection, safe exposure levels, and H2S personal protective equipment are regulated under the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910 (General Industry, Subparts G, H, I, J, Z) and 29 CFR 1926 (Construction, Subpart D). In general, H_2S concentrations at or greater than 10 ppm and 20 ppm require worker exposure monitoring to prevent health impacts and special breathing equipment to work for longer periods of time or in higher concentrations of H_2S.

Wells in the CFO area may drill into 27 different oil and gas bearing formations, each of which may have different concentrations of H_2S gas in the producing formation. In addition, wells can switch from very low levels of H_2S to high levels of H_2S depending on the production processes used and the changing production/recovery state of the producing formation. Gas streams in the CFO administrative boundary have reported gas streams that range from >10 ppm to greater than 10,000 ppm. All gas streams are subject to requirements set out in 43 CFR 3162.5-3 (Safety). Gas streams containing IDLH H_2S concentrations of 100 ppm or more are subject to 43 CFR 3176 (Onshore Oil and Gas Production: Hydrogen Sulfide Operations), which sets (classed as “immediately dangerous to life and health” [IDLH]) H_2S standards and safety practices for all phases of oil and gas development. 43 CFR 3176 contains requirements for H_2S monitoring/detection, warning systems/signage, reporting H_2S gas streams, exposure radius calculations, and public protection plans.

Given the measures in place to minimize human health and safety effects from H_2S, the project’s incremental contributions to H_2S concentrations are unlikely to contribute to significant human health and safety risks related to H_2S within the project area.

Emission of Air Pollutants
As described in the Air Quality section and the Air Resources Technical Report (BLM 2023b), construction and operation activities for oil and gas development would result in emissions of air pollutants that can lead to human health effects depending on the level and duration of exposure as well as distance from the emission source. See Issue #1. Air Quality, for a discussion of the projected levels of criteria pollutants, HAPs, and VOC and nitrogen oxide (NO_x) emissions that contribute to ozone formation. Potential human health effects associated with criteria pollutant emissions are described in Chapter 3 of the Air Resources Technical Report (BLM 2023b), while human health effects from emission of HAPs are described in Chapter 5 of that report. Measures to minimize air pollutant emissions, described in Issue #1. Air Quality, would reduce the potential for adverse health effects.

Health and Human Safety Summary
As noted above, health and human safety concerns are addressed through a number of local, state, and federal policies, BLM guidance and policy (such as implementation of the Gold Book), lease stipulations, and COAs attached to each APD. APD compliance includes the following regulatory guidance on wildfire response coordination; federal and state laws related to reporting and cleaning up spills; well pad, vehicle, and workplace safety laws set by the Occupational Safety and Health Administration; laws on traffic and pipelines set by the Department of Transportation; H_2S monitoring and exposure requirements set by the Occupational Safety and Health Administration; H_2S safety and public protection requirements established by the BLM; and state and federal air quality regulations. The application of these regulations and guidance would reduce the potential for impacts on human health and safety among both the public and operator employees to levels that are less than significant.

The Proposed Action would contribute incrementally to the cumulative impacts on human health and safety in the project area as described above. The potential for cumulative impacts is greatest in areas of concentrated oil and gas development, as there is a corresponding increase in traffic, construction, and exposure to air pollutants and potentially harmful materials such as H_2S and HAPs. However, impacts from the Proposed Action and other developments within the vicinity of the project would be minimized by the application of the policies and regulations noted above; therefore, the cumulative impacts from the Proposed Action are anticipated to be minimal. Because the impacts from the Proposed Action, when

considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 2. Quality of Life

What are the potential effects on quality of life of individuals in nearby residences and businesses from the construction, operation, and maintenance activities in the Proposed Action?

Within the 6.2-million-acre CFO administrative boundary, approximately 109,000 acres have been impacted by past and present oil and gas activity (see Section 3.2). Another 208,000 acres have been impacted by other developments such as mining, agriculture, and seismic exploration. These developments have introduced activities that change the setting of the landscape and potentially impact the quality of life of nearby residents. The World Health Organization defines quality of life as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHO 2012, 3). Some common components of quality of life include health and security, social and work environments, and the quality of physical surroundings (Teoli and Bhardwaj 2022). The quality of the physical surroundings encompasses views, air quality (to include dust), and the olfactory environment. The proposed project includes activities that would generate increased human activity, traffic, noise, dust, odor, light pollution, and visual impacts. These activities have the potential to affect the quality of life of nearby residences, depending on the proximity of local residences and the intensity of development.

The distance from which residents may experience quality of life impacts from oil and gas development varies depending on the proposed activities, geography, and timing of the project (such as phase of development or the time of day of activities). There is no single distance from oil and gas wells that the scientific community has accepted as conveying quality of life impacts on nearby residents. However, monitoring studies have found that residents living within approximately 0.5 mile or less of oil and gas wells (at varying stages of development) experienced nuisance levels of noise (≥50 A-weighted decibels), with residents less than 1,000 feet away experiencing the greatest effects (Blair et al. 2018; Hays et al. 2017; Kroepsch et al. 2019); residents living within 0.5 mile of oil and gas wells experienced nuisance levels of odors (Adgate et al. 2014); and residents living within 1.25 miles or less experienced greater risk of air pollution effects (including, but not limited to, dust) than those living beyond 1.25 miles (Adgate et al. 2014; Czolowski et al. 2017; Haley et al. 2016; Kroepsch et al. 2019).

A review of the nearby landownership parcels and GIS data indicates that the project is not within 0.5 mile of a residence or business. Additionally, there are no residences or businesses within 1 mile of the Proposed Action that would be indirectly impacted by the proposed activities. Given the lack of nearby residences and businesses, the project is unlikely to have impacts on quality of life.

The CFO implements standard COAs that help minimize or avoid impacts on resource values and land uses, thereby reducing impacts on quality of life by protecting visual resources, minimizing air emissions, reducing the potential for impacts on human health and safety (see AIB Issue 1. Human Health and Safety), and minimizing noise.

As described in Section 3.2, approximately 5 percent of the planning area has been disturbed by the development of oil and gas well pads, construction of gas plants, potash mines, access roads, transmission lines, and other linear features. The BLM anticipates that another 70,000 acres would be disturbed, including 33,367 acres for oil and gas leasing development under the reasonably foreseeable development (RFD) scenario (Engler 2023; BLM 2018b). The Proposed Action would add 12.75 acres of development, or 0.037 percent of the total acres anticipated in the RFD scenario. As the Proposed Action does not intersect with populated areas, including nearby residences and businesses, the development would contribute minimally to cumulative impacts on quality of life. The distance of the Proposed Action from residences and businesses, coupled with the design features and requirements, would minimize or avoid the impacts described above, including cumulative impacts; therefore, this issue was not carried forward for detailed analysis.

AIB Issue 3. Socioeconomics

What are the potential effects from construction, operation, and maintenance of the Proposed Action on socioeconomics?

Development of the proposed project may result in economic impacts on communities and individuals in the vicinity of the APD project site. Development of the proposed project would provide short-term local and regional jobs and long-term revenue on a sustained basis. Impacts include employment opportunities related to the oil and gas and service support industries in the region, as well as federal, state, and county government revenue related to taxes, royalty payments, and other revenue streams. Continued demand for oil and gas industry-related goods and services, and continued demand for support goods and services, may contribute to stability in employment in sectors outside of the oil and gas industry. The development phase for oil and gas is typically the time of highest employment in these industries, with the number of jobs tapering off as the project reaches the final reclamation phase, according to the BLM socioeconomic strategy plan (BLM 2013). This is because the development phase requires the presence of more people to conduct drilling, routine maintenance, and cleanup of approved sites.

For decades, the oil and gas industry has been a substantial contributor to the social setting and economic basis of the CFO. The oil and gas sector of the economy relies on both ongoing operational activities (development of existing leases) and new development opportunities (acquisition and development of new leases) to continue to provide local and regional jobs and revenue on a sustained basis. In the 6.2-million-acre CFO, there are approximately 3 million acres of federal mineral estate. Over the last 5 fiscal years, approximately 757 oil and gas wells were completed per year on average within the CFO's administrative boundary. Development of 4 wells would account for a small percentage of total impacts from oil and gas projects in an area with substantial ongoing oil and gas development.

There would be additional direct and indirect economic and social impacts in the area from oil and gas development. Continued expansion of the oil and gas industry can be perceived as having a negative effect on quality of life from increased human activity, traffic, noise, dust, odor, light pollution, and visual impacts (see AIB Issue 2. Quality of Life, for more information on oil and gas impacts on nearby residents and businesses). Oil and gas development could also affect the way of life of those who use BLM-administered lands for livestock grazing and cattle ranching (see AIB Issue 14. Livestock Foreage and Operations, for more information on oil and gas impacts on livestock grazing). However, potential economic effects on recreation and tourism opportunities, quality of life, and range considerations would be minimized through best management practices, design features, and COAs, which would also limit impacts on visual resources and on wildlife resources. In addition, the area has long been developed for oil and gas and the existing recreational opportunities are adapted to that landscape. Opportunities for isolation and recreation on undeveloped landscapes are available in other locations administered by the CFO. Therefore, the impacts on recreation and tourism opportunities are expected to be minor.

The Proposed Action would contribute in a minor way to the cumulative regional gains in oil and gas-related jobs, income, and revenue. As described in Section 3.2, there are 42,650 existing wells in the CFO administrative boundary with 19,600 additional wells projected over the next 20 years under the RFD scenario (Engler 2023). The Proposed Action would represent 0.02 percent of the new wells projected in the RFD scenario. It also would contribute in a minor way to incremental indirect social impacts such as those described above. Due to the small scale of the project and minimal socioeconomic impacts associated with the development, operation, and reclamation of the APD, this issue was eliminated from detailed analysis.

AIB Issue 4. Cultural Resources: Archaeology

How would surface disturbance and auditory and visual impacts from construction and operation of the Proposed Action affect historic properties (including historic and archaeological districts and Traditional Cultural Properties [TCPs])?

NEPA requires a consideration of "important historic, cultural, and natural aspects of our natural heritage." This includes the necessity of independent compliance with the applicable procedures and requirements of other federal and state laws, regulations, and executive orders. The principal federal law addressing cultural resources is the National Historic Preservation Act (NHPA), as amended (54 USC 300101 et seq.) and its implementing regulations found at 36 CFR 800. These regulations, commonly referred to as the Section 106 process, describe the procedures for identifying and evaluating historic properties; for assessing the impacts of federal actions on historic properties; and for project proponents consulting with appropriate agencies to avoid, reduce, or minimize adverse effects. Historic properties are cultural resources that are over 50 years old and meet specific criteria for listing in the National Register of Historic Places (NRHP) and can include historic and archaeological districts, site, structures, and Traditional Cultural Properties (TCPs).

Through the Section 106 process, as well as other State of New Mexico cultural resource protection mandates, there have been over 28,000 cultural resource inventories conducted within the CFO's administrative boundary on BLM-administered, privately owned, New Mexico State Land Office–managed, and other federally managed lands (Railey 2012). Those inventories equate to over 940,000 acres of survey and the identification of over 13,000 cultural resource sites as of 2016 (Railey 2012). Most of the cultural resource inventories conducted within the CFO administrative boundary have been completed as a result of proposed development and surface-disturbing activities (see Section 3.2 for summary of existing disturbance). Of the known sites identified during these surveys, approximately 26 percent are historic properties and more than 60 percent are unevaluated and require further analysis to see if they could be historic properties. The remaining are cultural resources that have been determined not eligible for listing in the NRHP. Sites that are unevaluated are treated as historic properties and managed similarly. These sites represent a broad range of temporal and cultural affiliations, from precontact Native American artifact scatters to historic ranching and early oil and gas activities.

Given the extensive surveys across the CFO, the BLM has a robust data set that is used to facilitate identification of cultural resources and avoid impacting historic properties and other sensitive cultural and historic resources. The BLM complies with Section 106 of the NHPA through implementation of the Permian Basin Programmatic Agreement (PBPA) or through the BLM's National Programmatic Agreement and subsequent New Mexico State Historic Preservation Office (NMSHPO) Protocol.

The project falls within the area covered by the PBPA. The PBPA is an optional method of compliance with Section 106 of the NHPA for energy-related projects in a 39-quadrangle area of the CFO. The PBPA is a form of off-site mitigation that allows industry to design projects to avoid known NRHP-eligible cultural resources (i.e., historic properties) and to contribute to a mitigation fund in lieu of paying for additional archaeological inventory in this area, which has been adequately surveyed in the past. Contributions are made based on the physical disturbance the project would create, with every acre or linear square foot of disturbance requiring a contribution from industries that participate in the agreement. Funds received from the PBPA are used to conduct archaeological research and outreach in southeastern New Mexico. Research includes archaeological excavation of significant sites, predictive modeling, targeted research activities, and TCP surveys with tribal and other communities, as well as professional and public presentations on the results of the investigations.

Based on a review of GIS information garnered from previous archaeological inventories, there are no known historic properties located within or adjacent to (within 30 meters of) the project area, meaning the project meets the criteria to be covered under the PBPA. Per the PBPA, the proponent has contributed funds (**Report No. 24-5557**) commensurate with the undertaking for off-site mitigation. Participation in the PBPA serves as mitigation for any effects of this project on historic properties, including potential indirect or cumulative effects associated with visual and auditory impacts. Therefore, any impacts associated with the project, including cumulative impacts on historic properties, are likely to be mitigated through implementation of the PBPA.

The CFO's standard COAs include a provision for the inadvertent discovery of historic properties or human remains during construction, operation, or maintenance activities (see Archaeological, Paleontological, and Historic Sites COA in Attachment 1). In the event of an inadvertent discovery, the

operator will cease activities, notify the BLM cultural resource specialist, and follow the procedures outlined in the COA.

The BLM complies with Section 106 of NHPA by following the National Programmatic Agreement that allowed the creation of the BLM/NMSHPO protocol agreement, which was implemented for this project. A Class III cultural resource inventory of the area of potential effects for the proposed project located on BLM land was completed (**Report No. 24-0710, 24-0169, and 21-0129**), and no historic properties were identified. The project is not located within or adjacent to (within 30 meters of) a known historic property, including an archaeological or historical district or TCP. Therefore, no direct impacts on historic properties are anticipated from implementation of the Proposed Action. Additionally, due to the lack of NRHP-eligible historic properties within 100 feet, no indirect or cumulative impacts on historic properties are anticipated.

Cultural: Archaeology AIB Conclusion

The CFO's standard COAs include a provision for the unplanned discovery of historic properties or human remains and other NAGPRA items during construction, operation, or maintenance activities (see Attachment 1, Archaeological, Paleontological, and Historic Sites COA). In the event of an unplanned discovery, the operator will cease activities, notify the BLM cultural resource specialist, and follow the procedures outlined in the COAs. The CFO's standard COAs also include provisions that would require all permanent lighting to be downfacing and shielded, minimizing the potential impacts of light pollution on historic properties by reducing the amount of artificial light visible outside the project area.

The CFO would implement the COAs and best management practices noted above to minimize or avoid auditory and visual impacts on these resources, including avoiding all eligible or unevaluated sites by a minimum of 100 feet. Additionally, individuals accessing sites for public or traditional use generally do so with a permit from the BLM, which would allow the CFO to minimize some potential visual and auditory impacts by avoiding project-related activities during that time. Given the implementation of these COAs and best management practices, indirect impacts would be minimized to the point of insignificance. When these indirect impacts are considered with other past, present, or reasonably foreseeable future actions, the proposed project is not anticipated to substantially contribute to cumulative impacts on historic properties within the CFO administrative boundary.

AIB Issue 5. Cultural Resources: Native American Concerns

How would surface disturbance and auditory and visual impacts from construction and operations of the Proposed Action affect Native American traditional cultural and religious concerns?

The CFO regularly consults with seven Native American Tribes, including the Apache Tribe of Oklahoma, Comanche Indian Tribe, Hopi Tribe, Kiowa Tribe of Oklahoma, Mescalero Apache Tribe, Pueblo of Isleta, and Ysleta del Sur Pueblo (BLM 2018b). The Mescalero Apache Tribe has identified several areas of importance within the CFO administrative boundary, some of which are TCPs (see AIB Issue 4. Cultural Resources: Archaeology). In general, Native American cultural and religious concerns are associated with locations of tribal traditional use and importance. Many tribes consider these locations and uses confidential; they are often only known to tribal members and sometimes only a subset of tribal members. Therefore, there are potentially other locations of use and importance to tribes that are unknown to the BLM. These locations include places of traditional or religious use, plants or other natural resource collection, trails, water resources, or important views or geographic formations, to name a few.

Impacts on locations of cultural or religious importance or traditional uses are defined by tribes that maintain connections with or use of those locations. However, it is possible to define the potential for their presence within an area based on previous consultation and coordination. There is the potential for tribal uses and locations of importance to be impacted by activities associated with the Proposed Action. Potential impacts include surface disturbance, which might disrupt use of the area, remove an important resource, or change a viewshed. These impacts would be short term (during construction) but some, such as vegetation removal, may continue for the life of the project until final reclamation. Additionally, noise from construction and operation can impact activities and uses that occur within the proximity of the

Proposed Action. Longer-term (life of the proposed well) impacts include changes in views and the soundscape that alter tribal use of an area. One such concern is the use of artificial lighting during the construction and operation of the Proposed Action, which has the potential to change the natural night sky conditions thereby impacting the area's cultural or religious uses (BLM 2023d).

The BLM CFO relies on existing ethnographic research coordinated through the PBPA and past consultation during lease sales and other undertakings to identify locations important to tribes and analyze potential impacts on Native American religious and cultural concerns. Funds received from the PBPA have been utilized to conduct surveys to identify TCPs and ethnographic research with interested tribal communities. Alongside those ethnographic studies, during consultation on lease sales, Native American tribes are given the opportunity to comment on any potential impacts on Native American cultural and religious concerns associated with reasonably foreseeable development in association with that given lease. Additionally, consultation is going and being conducted as part of the development of the CFO RMP/EIS. While no new information has been provided to date, if additional information is provided on important locations or uses, the BLM would manage the area to protect tribal interests and resources.

Consultation has not identified any Native American cultural and religious concerns associated with uses or locations within 1 mile of the Proposed Action. Existing consultation and research have identified some locations that are culturally significant, and the CFO has undertaken efforts to protect these locations from development, which minimizes the potential for impacts from the Proposed Action.

The CFO implements several standard COAs that would reduce potential impacts on locations and uses to tribes. These include provisions regarding the inadvertent discovery of cultural resources, some of which may also be important locations to tribal communities, as well as other COAs related to preventing the spread of noxious weeds, restoring areas of surface disturbance, and preventing erosion and sedimentation (see Attachment 1). These COAs can facilitate the preservation or restoration of important vegetation, prevent some long-term impacts on views, and decrease the potential for indirect impacts such as sedimentation of nearby water resources. The CFO's standard COAs also include provisions that would require all permanent lighting to be downfacing and shielded, minimizing the potential impacts of light pollution on traditional cultural and religious places by reducing the amount of artificial light visible outside of the project area.

Additionally, tribal uses of some culturally important locations are often coordinated with the BLM CFO in advance to ensure privacy. In the instance that a requested use is in the vicinity of the Proposed Action, the BLM would coordinate with the proponent to time construction and operation activities to avoid or minimize impacts, particularly those resulting from increased noise or changes in views. The CFO has a standard COA that details this coordination to avoid impacts (see Attachment 1).

While the BLM cannot on their own identify locations and uses of importance to Native American tribes, years of consultation have indicated that there are no locations of cultural or religious concerns within 1 mile of the Proposed Action. Therefore, there are no impacts anticipated to these locations as a result of the Proposed Action. Years of development and disturbance associated with oil and gas, as well as other activities, have likely changed tribal use of and access to locations of importance within the CFO administrative boundary. The Proposed Action would contribute additional disturbance to the landscape; however, as there are no known locations of tribal use or importance within 1 mile, the proposed project would have little to no incremental contribution to cumulative impacts. The BLM would continue to implement the above COAs as well as coordinate with tribes to identify potential impacts. Due to the lack of anticipated impacts, coupled with existing COAs, this issue was not carried forward for detailed analysis.

AIB Issue 6. Hydrology: Streams and Flood Zones

How would construction and production operations in the Proposed Action affect watershed hydrology and surface water quality, including streams and flood zones?

A watershed is an area of land defined by topographic boundaries that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. Streams can be ephemeral, intermittent, or perennial. The Proposed Action takes place within the City of Carlsbad-Pecos River, Watershed (HUC-10- 1306001110.) Within the watershed(s), there are 6.59 miles of intermittent streams and 10.77 miles of perennial streams.

Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (or FEMA flood zone). FEMA flood zones are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood.

As part of the Proposed Action, approximately 12.75 acres of surface disturbance would occur from construction of the well pad and associated infrastructure. This surface disturbance would include the removal of vegetation and cleaning of topsoil to build well pads, access roads, and other infrastructure. The Proposed Action is located 2843 meters from an ephemeral stream and 1.42 miles from a FEMA flood zone (FEMA 2023). There is the potential for the Proposed Action to impact hydrologic flow in streams and floodplains as well as water quality. Potential impacts on water quality are detailed in AIB Issue 8. Hydrology: Drilling and Water Quality, and are not repeated here.

The Proposed Action would result in localized reductions in vegetation surface cover within the project area, potentially increasing sedimentation, decreasing infiltration rates, and increasing runoff volume and velocity. By removing vegetation and potentially increasing runoff, disturbed areas would become more susceptible to erosion. Vegetation removal and erosion can affect hydrology and flood conditions in the watershed. Soil carried downgradient by runoff due to upslope erosion can create sedimentation issues in streams, which can affect stream form and function and flood conditions. Sedimentation would be most likely during construction of stream crossings for access roads and flowlines and where disturbance occurs near water features.

As required by the COAs, interim reclamation and revegetation would be conducted, erosion control structures would be used to reduce sedimentation, and water bars and turnouts would be constructed to dissipate surface water runoff and reduce the likelihood of erosion (see Attachment 1). No construction would occur within drainages, including those within mapped Federal Emergency Management Act (FEMA) flood zones or mapped within US Geological Survey (USGS) National Hydrographic Dataset (USGS 2023b). Compliance with regulations like the CWA, Onshore Order regulations codified in 43 CFR 3170, and NMOCD regulations (NMAC 19.15.26, NMAC 19.15.17, NMAC 19.15.29.11, NMAC 19.15.30) would further minimize impacts. These regulations and additional COAs would maintain water quality standards while working to lessen surface disturbance by keeping soil erosion low, thereby reducing direct and indirect impacts on hydrology and flood zones to less than significant levels.

Cumulatively, there are 317,000 acres of existing disturbance within the CFO administrative boundary, of which 109,000 acres are attributed to oil and gas development. As projected in the RFD scenario, the BLM anticipates that 33,367 acres would be required for oil and gas development, with the potential for 19,600 wells to be drilled over the next 20 years (Engler 2023). The Proposed Action would disturb approximately 12.75 acres, which is only 0.007 percent of the City of Carlsbad-Pecos River watershed and is 2843 meters from an ephemeral stream and 1.42 miles from a FEMA flood zone. A total of 10,010 acres, or 5.40 percent, have been previously disturbed by oil and gas well pads and roads within the CFO portion of the City of Carlsbad-Pecos River watershed (185,237 acres) (USGS 2023a). The Proposed Action, when considered with past and present activities, would contribute minimally to cumulative impacts within the watershed. Impacts would be minimized through compliance with regulations and implementation of COAs. While the Proposed Action would contribute to overall disturbance within the CFO administrative boundary, it is unlikely to be the primary contributor to cumulative impacts on hydrology and flood zones. Because the impacts from the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 7. Hydrology: Playas and Surface Depressions

How would construction and production operations in the Proposed Action affect the function of playas and surface depressions?

Playas are relatively small, round, shallow depressions. Their basins are lined with clay soil, which collects and holds water from rainfall and runoff, creating temporary lakes that slowly infiltrate and benefit groundwater systems in the area. Properly functioning playas have intact clay basins, are encompassed by grassy buffer strips or prairie, and collect water runoff from the surrounding area after large rain events. Despite their small size and relatively simple structure, playas are of value to the landscape because they provide important ecological and hydrological functions throughout the area. Surface depressions are similar to playas, although they are usually smaller in size and may not retain water as long, since they typically have less clay material at the bottom and sandier soils throughout. Furthermore, surface depressions form from more erosional processes than playas, which are usually formed by years of depositional processes and clay particle buildup.

The Proposed Action is located approximately 2311 meters from the nearest surface depression. While the project is not anticipated to directly disturb this surface depression, there is the potential for activities to accelerate dust and sediment accumulation. The increased transport of dust and sediments from the upland through airborne particles and water erosion could degrade the function of the playa features. Additionally, spills can occur during project activities that can impact nearby water features, such as surface depression, resulting in degrading surface depression function (see the WSD [BLM 2023a]). Potential impacts on surface water quality from spills are detailed in AIB Issue 8. Hydrology: Drilling and Water Quality.

Existing laws and regulations related to protection of watersheds and water quality and quantity further ensure these areas are considered and protected during project activities. These include regulations such as the CWA, Onshore Order regulations codified in 43 CFR 3170, and NMOCD regulations (NMAC 19.15.26, NMAC 19.15.17, NMAC 19.15.29.11, NMAC 19.15.30) would further minimize impacts. For example, 43 CFR 3170 states the surface use plan of operations must provide for safe operations, adequate protection of surface resources, groundwater, and other environmental components. Also, standard COAs such as the use of berms and erosion control structures and interim reclamation would minimize, avoid, or mitigate soil erosion and sedimentation that could otherwise affect playas and surface depressions (see Attachment 1). AIB Issue 8. Hydrology: Drilling and Water Quality provides a more detailed discussion of these regulations and how this minimizes effects on water resources to less than significant levels.

Past, present, and reasonably foreseeable actions are detailed in Section 3.2. The Proposed Action would disturb approximately 12.75 acres, which is only 0.007 percent of the City of Carlsbad-Pecos River watershed and is 2843 meters from an ephemeral stream and 1.42 miles from a FEMA flood zone. A total of 10009.55 acres, or 5.40 percent, have been previously disturbed by oil and gas well pads and roads within the CFO portion of the City of Carlsbad-Pecos River watershed (185,237 acres) (USGS 2023a). While the Proposed Action would contribute to overall disturbance within the watershed, there would be little potential for impacts on playas or surface depressions due to the implementation of the above regulations and COAs. Therefore, the Proposed Action is not anticipated to contribute to cumulative impacts on playas and surface depressions and this issue was not carried forward for detailed analysis.

AIB Issue 8. Hydrology: Drilling and Water Quality

How would construction and drilling operations of the Proposed Action impact surface and groundwater quality?

Water quality can be adversely affected following an undesirable event such as a leak or spill in the vicinity of surface water. The rate of recovery varies by spill type, but generally most spills are not recovered. As noted in the 2023 WSD, 38,741 spills associated with federal and nonfederal oil and gas wells and facilities were reported in Eddy, Lea, and Chaves Counties in 2022 (BLM 2023a).

Approximately 97 percent of the spills were natural gas liquid spills, while the remaining 3 percent were oil, brine, condensate, diesel, drilling mud and fluid, glycol, or produced water. The large increase in natural gas liquid spills reported in the years 2021 and 2022 compared with prior years is due to New Mexico Oil Conservation Division's (NMOCD's) new natural gas waste rules (NMAC 19.15.27 and 19.15.28), requiring more stringent recording of spills (BLM 2023a). Of the 38,741 spills in 2022 associated with federal and nonfederal oil and gas wells and facilities, only two produced-water spills and one natural gas liquid spill were reported as having affected surface water resources. Three natural gas liquid spills were reported as having affected groundwater (BLM 2023a).

Every two years, states are required to submit Water Quality Assessment Reports under Sections 305(b) and 303(d) of the Clean Water Act describing the condition of waters in the state. These reports include water quality information on rivers, lakes, estuaries, and coastal waters, and an analysis of the extent to which waters are meeting water quality standards. Waters are assessed as impaired when an applicable water quality standard is not being attained. The following waters are impaired in the watershed(s): There are 19.35 miles of impaired waters or lakes in the HUC10 watershed. The streams or lakes in the HUC10 watershed are impaired for the following reasons: Fish Consumption Advisory - Dde, Ddt|PCBS - Fish Consumption Advisory

Flow Regime Modification

Fish Consumption Advisory - Dde, Ddt|Mercury - Fish Consumption Advisory

An aquifer is an underground layer of water-bearing, permeable rock, rock fractures, or unconsolidated materials (gravel, sand, or silt). Wells can be drilled for accessing the groundwater in aquifers. The Capitan Reef, aquifers, Roswell Basin aquifer system, and other rocks are the principal aquifers within the City of Carlsbad-Pecos River HUC10 watershed.

As part of the Proposed Action, approximately 12.75 acres of surface disturbance would occur from construction of the well pad and associated infrastructure. The Proposed Action includes drilling 4 wells up to 7,443 feet below surface, potentially through groundwater resources. Produced water that is created would be disposed of in an approved site for remediation or evaporated off in ponds across the field area.

While 12.75 acres of surface disturbance would occur, any disturbed area not needed for the production phase would undergo interim reclamation to help stabilize the site and reduce sediment loss into nearby surface water features. The operator has submitted a surface use plan of operations and a drilling plan with the associated APD. The project is located 2843 meters from a ephemeral stream.

The dominant legislation affecting national water quality and BLM compliance with New Mexico water quality requirements is the Clean Water Act (CWA), or Federal Water Pollution Control Act. The BLM requires operators to also comply with 43 CFR 3170 for Onshore Oil and Gas Production. These regulations require oil and gas development to comply with directives in the Onshore Orders and the direction of the authorized officer. Onshore Order 2 and the regulations at 43 CFR 3170, Subpart 3172, Drilling Operations on Federal and Indian Oil and Gas Leases, provide regulatory requirements for hydraulic fracturing, including casing specifications, monitoring and recording, and management of recovered fluids. The State of New Mexico also has regulations for drilling, casing and cementing, completion, and plugging to protect freshwater zones (19.15.16 NMAC). Producers and regulators must verify the integrity of casing and cement jobs. Installation of casing and cementing operations are witnessed by certified BLM petroleum engineering technicians. At the end of the well's economic life, the operator must submit a plugging plan, which undergoes review by the BLM petroleum engineer prior to well plugging and ensures permanent isolation of usable groundwater from hydrocarbon-bearing zones. The BLM inspectors ensure planned procedures are properly followed in the field.

Per the above regulations, surface casing and cement are required to extend beyond usable water zones. Production casing must be extended and adequately cemented within the surface casing to protect other mineral formations, in addition to the usable water-bearing zones. These requirements ensure that drilling

fluids, hydraulic fracturing fluids, and produced water and hydrocarbons remain within the well bore and do not enter groundwater or any other formations.

The EPA's Underground Injection Control (UIC) program, administered under the Safe Drinking Water Act, regulates the construction, operation, permitting, and closure of injection wells that place fluids underground. The UIC Program includes objectives to protect public health through the protection of underground sources of drinking water, and provide a means for industries, municipalities, and small businesses to dispose of wastes and store fluids. The underground injection of fluid that includes diesel fuel during hydraulic fracturing is still regulated by the UIC Program. Diesel fuels may contain a number of chemicals of concern (Environmental Compliance Information for Energy Extraction 2023). EPA has recently approved an application from New Mexico under the Safe Drinking Water Act to revise the state's existing UIC program to establish new permit conditions, oversight, and enforcement requirements to manage Class I hazardous waste injection activities by petroleum refineries in such a manner that is protective of underground sources of drinking water. This program revision only affects UIC wells under New Mexico's authority; EPA remains the permitting authority for the UIC program in Indian country (EPA 2023g).

The BLM and proponent would comply with all necessary regulations, as discussed, including all applicable Onshore Orders codified in 43 CFR 3170, NMOCD regulations, the CWA, and the state's primacy agreement under the Safe Drinking Water Act. Regulations, lease stipulations, and COAs (such as creating berms around associated infrastructure, minimizing new surface disturbance, utilizing existing surface disturbance, and minimizing vehicular use) would minimize the potential for spills and any associated contamination. Secondary containment around chemical and fuel tanks required for drilling and completion are required to contain at least 150 percent of the total volume of the largest tank and are temporary structures removed after well completion. Berms surrounding pads would be constructed of mineral material and be 12 inches in height. They are routinely maintained to prevent erosion and breaching. If effects are measured, they would be reported in the CWA 303(d)/305(b) integrated report from the New Mexico Environment Department (NMED 2022). Additionally, the operator would implement best management practices in the Gold Book (US DOI and USDA 2007) to minimize the potential for impacts on water quality. Best management practices, COAs, and requirements under existing law and regulation would minimize the potential for impacts on water quality from the Proposed Action to less than significant levels.

When the Proposed Action is considered with other past, present, and reasonably foreseeable actions (as defined in Section 3.2), there is the potential that it would cause an incremental increase in potential impacts on water quality. There are 317,000 acres of existing disturbance within the CFO administrative boundary, of which 109,000 acres are attributed to oil and gas development. As projected in the RFD scenario, the BLM anticipates that a total of 33,367 future acres disturbed from 19,600 projected wells to be drilled over the next 20 years (Engler 2023). The proposed project would contribute approximately 12.75 acres of surface disturbance and 4 wells towards this projected disturbance, or approximately 0.037 and 0.02 percent of the RFD scenario project acres and wells. While there is the potential for impacts on surface and groundwater quality from the Proposed Action, particularly from spills, compliance with existing regulations minimizes many of these impacts. As noted above, while spills do occur, they rarely impact surface or groundwater, likely due to compliance with regulations. While the Proposed Action would contribute to overall disturbance within the CFO administrative boundary, it is unlikely to be a primary contributor to cumulative impacts on water quality. Because the impacts from the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 9. Karst: Cave Ecosystems and Hydrology

How would the construction and operation of the Proposed Action affect hydrology and ecosystems in nearby cave and karst features?

The CFO includes over 1 million acres of karst terrain, including more than 1,000 documented cave features (BLM 2018b). Karst features include sinkholes and depressions, caves, dry valleys, sinking

streams, and resurgences or springs (BLM 2018b). The BLM has delineated areas within the CFO's administrative boundary as having either low, medium, or high karst potential. Additionally, it has defined a critical karst resource zone, which is an area with a high density of significant cave systems and/or bedrock features and other karst features that lead to the rapid recharge of groundwater aquifers from surface runoff (BLM 2018b). The total acreage of each area of karst potential and the critical karst resource zone is detailed below.

	Low	**Medium**	**High**	**Critical**
Acres of karst potential	1,148,705	1,006,452	628,576	242,231

A medium karst potential zone is defined as an area that contains known soluble rocks within 300 feet of the surface, with shallow insoluble overburden or soils that could mask surface features. These areas may contain isolated karst features such as caves and sinkholes. Groundwater recharge may not be wholly dependent on karst features, but the karst features still provide the most rapid aquifer recharge in response to surface runoff. A high karst potential zone is defined as an area that contains a high frequency of significant caves and karst features such as sinkholes and bedrock fractures that provide rapid recharge of karst aquifers. Underground drainage occurs through conduits enlarged in solution. Critical karst areas provide critical drinking water supplies for major communities, ranching operations, and springs that support rivers and vital riparian habitat. These areas include Capitan Reef and the associated Capitan Aquifer west of the Pecos River, as well as the surface outcropping of the Castile gypsum formation in southern Eddy County.

The Proposed Action is within high and medium karst potential zones of the CFO. In karst terrains, rainfall and surface runoff are directly channeled into a complex natural underground drainage system via sinkholes, fractures, and caves. Due to the concentrated and extremely rapid nature of groundwater recharge in karst terrains, changes in geologic formation integrity, runoff quantity/quality, drainage course, rainfall percolation factors, vegetation, surface contour, and other surface factors could negatively impact cave ecosystems and aquifer recharge processes. In addition to groundwater recharge, sinkholes and cave entrances accumulate rich organic materials and soils. In conjunction with the stable microclimate near cave entrances, these support a greater diversity and density of plant life, which provides habitat for a greater diversity and density of wildlife such as raptors, rodents, mammals, and reptiles. Within the cave, the stable climate supports a large variety of troglobitic (cave environment-dependent) species. These species have adapted specifically to the cave environment due to constant temperatures, constant high humidity, and total darkness.

The BLM maintains an up-to-date inventory of known karst features, including caves and sinkholes, and a review of this database indicates that no karst features are located within the analysis area. The BLM ensures that site placement of the well pad and associated infrastructure allows for a protective buffer around any known karst features within the project area. This action is also subject to project design features designed to mitigate potential impacts on known and potential cave/karst resources, as outlined in Appendix 3, Practices for Oil and Gas Drilling and Production in Cave and Karst Areas, and as approved in the Carlsbad Resource Management Plan Amendment of 1997, pages AP3-4–AP3-7. Additionally, the CFO implements standard COAs for cave/karst to ensure that construction, drilling, and reclamation do not impact cave or karst features (see Attachment 1).

<u>Karst: Cave Ecosystems and Hydrology Conclusion:</u>
A detailed discussion of the potential impacts of oil and gas drilling on karst is provided in the Dark Canyon Environmental Impact Statement (BLM 1993). Such impacts include the introduction of contaminants into a cave ecosystem, loss of or changes in hydrological functions important to maintaining cave ecosystems, cave subsidence or collapse, and potential loss of important species. Site placement of any well pads would ensure a protective buffer is provided around any known karst features within the project area, minimizing the potential for effect. With the implementation of cave and karst protection measures from the 1997 CFO Resource Management Plan Amendment (RMPA) coupled with standard COAs applied in karst landscapes, the Proposed Action is not anticipated to contribute significant impacts on karst features or resources.

Past, present, and reasonably foreseeable actions are detailed in Section 3.2. As cave and karst ecosystems are intricately tied to the hydrology of the area, the watershed is considered the cumulative impact area of analysis. The Proposed Action would contribute 12.75 acres within high karst potential zone, or about 0.01 percent of the City of Carlsbad-Pecos River HUC 10 watershed. When the Proposed Action is considered with other past, present, and reasonably foreseeable future actions, there is potential for incremental cumulative impacts hydrology and ecosystems in cave and karst features. These impacts would be avoided or minimized through the application of the above best management practices, design features, and COAs. Given that the Proposed Action would result in little to no impact on cave ecosystems, this issue was not carried forward for detailed analysis.

AIB Issue 10. Karst: Cave-Dwelling Bats

How would noise and vibrations from construction and operations of the Proposed Action impact cave-dwelling bat species?

Cave and karst features within the CFO's administrative boundary provide habitat that support a diverse ecosystem (Barr and Reddell 1967; Cokendolpher et al. 1996; Cokendolpher et al. 2004; Goodbar 2013). Several caves are used seasonally by large bat colonies to raise their offspring, and these habitats are sensitive to changes within these ecosystems. Major indicators used to determine the condition of karst resources involve the quality and quantity of groundwater and the health of riparian areas associated with karst discharge. Cave health is determined by the amount of human visitation to caves and the health of the biological communities within these cave systems. Bats are sensitive to disturbances, and their presence provides a good indicator of the health of cave ecosystems (BLM 2018b). Bat population monitoring has indicated an overall increase in population size (BLM 2018b). This can be greatly attributed to proactive management in limiting disturbance during roosting times and altering cave gates to be bat friendly. However, some roosts remain vulnerable due to unrestricted access.

The Proposed Action is located in an area of high karst potential zone. High karst potential areas are likely to contain sinkholes, sinking streams, caves, springs, and lineaments. These karst features can provide suitable habitat for cave-adapted species, including bats. The BLM maintains an up-to-date inventory of cave and karst locations, including ones with suitable bat habitat. A review of this inventory indicated that there are no cave features suitable for bats within 200 meters of the project area. The Proposed Action would not result in direct impacts on cave-dwelling bats or cave habitat. This action is also subject to project design features intended to mitigate potential impacts on known and potential cave/karst resources, as outlined in Appendix 3, Practices for Oil and Gas Drilling and Production in Cave and Karst Areas, and as approved in the Carlsbad RMPA of 1997, pages AP3-4–AP3-7. While there are many potential cave-roosting sites throughout the CFO, the impacts on bats from this project would be minimal as a result of the above minimization measures.

Karst: Cave Dwelling Bats Conclusion

Past, present, and reasonably foreseeable actions are detailed in Section 3.2. With 109,000 acres of existing disturbance within the CFO's administrative boundary attributed to oil and gas development (USGS 2023a), it is likely that past activities have contributed disturbance to bat habitat, including caves used for roosting, by introducing noise and ground disturbance as well as potentially impacting caves themselves. Some of these disturbances are likely to continue with future projected development; however, protective measures outlined in the CFO's 1997 RMPA and COAs would minimize the potential for these impacts. Therefore, while the Proposed Action would contribute to overall disturbance within the CFO administrative boundary, it is unlikely to contribute to cumulative impacts on bat species. Because the impacts from the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 11. Karst: Caving/Caver Experience

How would construction and operation of the Proposed Action impact recreational access to caves and caver experience?

The CFO includes over 1 million acres of karst terrain, including more than 1,000 documented cave features (BLM 2018b). Karst features can include sinkholes and depressions, caves, dry valleys, sinking streams, and resurgences or springs (BLM 2018b). A cave is defined in the Federal Cave Resources Protection Act of 1988 as a natural occurring void, cavity, recess, or system of interconnected passages occurring beneath the surface of the earth that is large enough to permit an individual to enter, regardless of whether the entrance is natural or human made. Visitation and exploration of caves is a popular recreation activity, as evidenced by visitation to Carlsbad Caverns National Park, which lies adjacent to the CFO boundary. Many of the documented caves within the CFO's administrative boundary were located and explored prior to the mid-1970s, with studies conducted by various caving clubs (grottos) organized under the National Speleological Society and the Cave Research Foundation (BLM 2018b).

Several caves within the CFO's administrative boundary were damaged by early exploration, mining, and the extraction of speleothems (BLM 2018b); however, the variety of speleothems present within CFO caves is immense (Hill 1987) and draws cavers from all over the world. While many visitors come to tour well-known caves such as Carlsbad Caverns, others come to explore more remote and uncharted cave systems. Caves that are well known and accessible are more prone to damage, including damage to archaeological resources associated with caves, while remote caves or those with restricted access tend to be in relatively pristine condition (BLM 2018b).

Experienced cavers come from all over the world to identify and explore caves within the CFO's administrative boundary. The potential location of new caves is tied to the karst potential of an area, which indicates the potential for cave features. The BLM has delineated areas within the CFO's administrative boundary as low, medium, or high karst potential or as critical karst areas (see AIB Issue 9. Karst: Cave Ecosystems and Hydrology). Caves are unlikely to be present within areas of low karst potential. There is a possibility for caves to be identified in areas of medium karst potential; however, they tend to be smaller. Caves of interests to recreationalists are most likely associated with areas of high karst potential.

The Proposed Action occurs in an area of high and medium karst potential. Areas of medium karst potential are unlikely to contain caves suitable for recreation. If there are nearby cave/karst features (within 0.25 miles), there is a possibility that recreational cavers may explore the area looking for recreation potential. However, the geology and prevalence of known karst features make it unlikely there are suitable recreation features within the analysis area.

Karst: Caving and Caver Experience Conclusion

Due to COAs that minimize long-term impacts on public access (see Attachment 1), the Proposed Action would not alter caver access and may improve the overall experience by facilitating access. COAs related to visual resource management (VRM) include using designated color palettes, which would also decrease the visual impact to recreational cavers as they travel to or explore nearby caves. Additional design features, as mandated in the Appendix 3, Practices for Oil and Gas Drilling and Production in Cave and Karst Areas, and as approved in the Carlsbad RMPA of 1997, pages AP3-4–AP3-7, protect caves and the recreational experience they provide. Given the distance of the proposed project from existing cave features, coupled with COAs and design features, the Proposed Action is unlikely to have negative impacts on recreational caving in the area. It is possible that the Proposed Action would facilitate access and recreational use of nearby caves.

Past, present, and reasonably foreseeable actions are detailed in Section 3.2. In addition to the 109,000 acres of past and present disturbance attributed to oil and gas development (USGS 2023a), the BLM anticipates that an additional 33,367 acres would be disturbed by future oil and gas development based on the RFD scenario (Engler 2023). The Proposed Action would contribute to this total acreage of disturbance within a high karst potential zone. While early exploration and mining resulted in damage to cave resources, COAs and design features now minimize the potential for impact from such development actions, reducing the overall cumulative impact on cave resources and caver experience. Conversely, reasonably foreseeable actions can identify new caves or karst features, which can improve cave access. Overall, the continued development of medium, high, or critical karst potential areas could increase the

discovery and access to caves, improving the recreational caver experience. Given that the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would result in a minor impact on caving or caver experience, this issue was not carried forward for detailed analysis.

AIB Issue 12. Karst: Drilling and Caves

How would drilling through a cave or void impact human health and safety through the introduction of foreign materials or instability?

In karst terrains, rainfall and surface runoff are directly channeled into a complex natural underground drainage system via sinkholes, fractures, and caves. In the Guadalupe Mountains, the most extensive cave development is along linear or curvilinear surface features, indicative of joints or fractures at depths that have penetrated the surface (i.e., lineaments). To effectively analyze the potential impacts on caves and karst features, the BLM has delineated areas within the CFO's administrative boundary as having either low, medium, or high karst potential based on geology, occurrence of known caves, and density of karst features. Additionally, it has defined a critical karst resource zone, which is an area with a high density of significant cave systems and/or bedrock features and other karst features that lead to the rapid recharge of groundwater aquifers from surface runoff (BLM 2018b).

The Proposed Action is located within the high karst potential zone. During drilling, previously unknown cave and karst features could be encountered. If a void is encountered while drilling and a loss of circulation occurs, lost drilling fluids can directly contaminate groundwater recharge areas, aquifers, and groundwater quality. Cementing operations may plug or alter groundwater flow, potentially reducing the water quantity at springs and water wells. Inadequate subsurface cementing, casing, and cave/aquifer protection measures can lead to the migration of oil, gas, drilling fluids, and produced saltwater into cave systems and freshwater aquifers. Drilling operations can also lead to the sudden collapse of underground voids, causing instability within an area and potentially putting personnel at risk. A detailed discussion of the impacts of oil and gas drilling is in the BLM's Dark Canyon Environmental Impact Statement (BLM 1993).

Potential impacts on human health and safety and introduction of foreign materials into cave/karst features, and potentially water resources, are avoided or minimized through compliance with a number of state and federal regulations (see AIB Issue 1. Human Health and Safety and AIB Issue 8. Hydrology: Drilling and Water Quality).

Additionally, the CFO implements standard drilling COAs to minimize impacts on areas of medium/high karst potential, ensuring the protection of groundwater resources to maintain the health of local cave ecosystems. This would ensure that impacts from the Proposed Action would remain below a level of significance.

Karst: Drilling and Caves Conclusion

As projected in the RFD scenario, the BLM anticipates that a total of 33,367 acres would be required for oil and gas development, with the potential for 19,600 wells to be drilled over the next 20 years (Engler 2023). There are a total of 1,877,259 acres in medium, high, and critical karst potential zones, or approximately 30 percent of the CFO administrative boundary. Given the amount of karst geology within the CFO administrative boundary, there is the potential for drilling to encounter cave/karst features, such as voids, and potentially impact human health and safety. When this future development is considered with past and present development across the CFO administrative boundary (see Section 3.2), there is a potential for the Proposed Action to contribute to cumulative effects on cave/karst resources, and through that, human health and safety. However, these impacts are avoided or minimized through compliance with existing regulations as well as implementation of COAs and other design features, including any detailed in applicable lease stipulations to help protect and avoid these sensitive cave karst zones. The application of these regulations and COAs and other design features reduces the potential for foreign materials to impact water quality and for void collapse. Because the impacts from the Proposed Action,

when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 13. Induced Seismicity

How would drilling, hydraulic fracturing, and disposal of produced water from the Proposed Action contribute to induced seismicity?

Induced seismicity refers to seismic events that are triggered by human activities rather than natural tectonic forces. A broad range of human activities have been attributed to induced seismicity, including, but not limited to, underground fluid injection (e.g., for produced water disposal and during hydraulic fracturing) and oil and gas extraction (Groundwater Protection Council [GWPC] 2021). Between 2008 and 2015, seismicity events increased in the mid-continental US and studies pointed to a connection between increasing seismic events and the widespread disposal of wastewater into deep Class II injection wells (GWPC 2021). Although most disposal wells in the US do not pose a hazard for induced seismicity, seismic events can occur when specific geologic conditions are present such as sufficient pore pressure build-up near a pre-existing fault of concern (GWPC 2021; OCC 2021). A combination of factors is necessary to induce felt earthquakes: high injection rates and fluid volumes, the proximity to faults large enough to produce felt earthquakes, crustal stress large enough to produce earthquakes, and the presence of pathways for fluid migration from the injection point to faults (Machette et al. 2000; USGS 2021a). High injection rates greater than 300,000 barrels (bbls) per month are more likely to be associated with earthquakes (Weingarten et al. 2015). Additionally, active saltwater disposal (SWD) wells can contribute to the induction of seismic events up to 15 kilometers (km) (9.3 miles) away (Weingarten et al. 2015).

Several areas of heightened induced seismicity have been identified in the state of New Mexico; most areas of concern occur in southeastern New Mexico. Seismic Response Areas (SRAs) are areas within 10 miles of the epicenter of seismic events of 2.5 Richter or higher (NMOCD 2023b). Within the Permian Basin, there are four Seismic Response Areas, or areas of concern for induced seismicity (NMOCD 2023b):

- County Line Seismic Response Area: approximately 35 miles southeast of Carlsbad, New Mexico, along the border of Eddy and Lea Counties. This area extends slightly into Texas. 374 injection wells are active within the 10-mile buffer of this SRA.
- Jal Seismic Response Area: approximately 6 miles northeast of Jal, New Mexico in Lea County and extends slightly into Texas. 901 injection wells are active within the 10-mile buffer of this SRA.
- Hat Mesa Seismic Response Area: approximately 12 miles southwest of Lovington, New Mexico in Lea County. 102 injection wells are active within the 10-mile buffer of this SRA.
- Dagger Draw/McKittrick Seismic Response Area: approximately 9 miles south of Artesia and 10 miles northwest of Carlsbad, New Mexico in Eddy County, and is associated with an area known as the Dagger Draw Field. 122 injection wells are active within the 10-mile buffer of this SRA.

The Proposed Action is not within a Seismic Response Area.

The BLM's regulations state that "for an injection well proposed on Federal or Indian leases, the operator shall obtain an Underground Injection Control (UIC) permit pursuant to 40 C.F.R. §§ 144, 146 from the EPA or the State/Tribe where the State/Tribe has achieved 'primacy'" (see 43 C.F.R. § 3177.7). The EPA classifies these wells as Class II injection wells, which are wells used for disposal of fluids associated with the production of oil and natural gas (hydrocarbons), to inject fluids for enhanced oil recovery (EOR), or for the storage of liquid hydrocarbons. New Mexico's UIC Program monitors and regulates the injection of fluids into the subsurface. New Mexico regulations set limits on maximum allowable injection pressures and require mechanical integrity testing of the boreholes, pressure monitoring, and reporting. All injection wells permitted by NMOCD are subject to limitations on surface-injection pressure. Wells are required to be equipped with a pressure-limiting device that ensures that the maximum surface injection pressure is not

exceeded (NMOCD 2004). Compliance officers from the NMOCD periodically inspect wells and surface facilities to ensure wells and related surface equipment are in good repair and meet regulations.

In November 2021, NMOCD issued a new seismic response protocol to address seismic activity related to Class II injection wells in New Mexico. The protocol includes requirements that are implemented either through voluntary actions by operators or by orders issued by the NMOCD. The protocol directs operators to report seismic events and implement reduced injection rates if the seismic event has a magnitude (M) of 2.5 or greater. Earthquakes with a magnitude of 2.5 or less are generally imperceptible except with sensitive detection equipment. The magnitude of reductions varies based on the earthquake magnitude and proximity of wells to these events, with 10 miles being the maximum distance for injection reductions to apply (NMOCD 2021).

The disposal of produced water at high rates and volumes is considered the primary cause of anthropogenic-felt earthquakes in New Mexico and across the central part of the US (Weingarten et al. 2015). There is the potential for the Proposed Action to contribute to induced seismicity due to disposal of produced water into injection wells within the Permian Basin. However, the Proposed Action is not anticipated to noticeably contribute to induced seismicity because produced water disposal would occur in adherence to BLM and NMOCD regulations, which limit injection well pressure and reduce the potential for seismic events. Although hydraulic fracturing can also contribute to induced seismicity, seismic events triggered by hydraulic fracturing are relatively uncommon and generally have smaller magnitudes than injection-induced seismicity and are therefore considered to pose less risk (GWPC 2021; OCC 2018). Even relatively extreme seismic events associated with hydraulic fracturing have been well below the damage threshold for modern building codes (Petersen et al. 2018; USGS 2021b).

The RFD scenario estimates development of an additional 19,600 federal and nonfederal wells in the CFO planning area over 20 years; it is not known how many would be completed within each area of concern for induced seismicity. The RFD predicts approximately 30 billion barrels of cumulative water production for the 20-year period beginning in 2023, or 1.5 billion barrels per year (Engler 2023). The wells from the Proposed Action would comprise 0.02 percent of the RFD 20-year scenario. When the impacts of the Proposed Action are considered with past, present, and reasonably foreseeable impacts, no significant impacts are anticipated. The Proposed Action would comprise a small percentage of the RFD scenario and with the adherence to the above regulations would not significantly contribute to induced seismicity. Therefore, this issue was not carried forward for detailed analysis.

AIB Issue 14. Livestock Foreage and Operations

How would the construction and operation of the Proposed Action impact livestock operations and forage species composition and biomass?

There are 279 grazing allotments within the CFO's administrative boundary. Allotments range in size from 40 acres to over 100,000 acres. Cattle are the most commonly raised livestock and are typically managed as cow/calf operations. Most allotments are grazed year-round, although some allotments are grazed seasonally. Structural range improvements on allotments include livestock fencing and livestock water systems. Nonstructural improvements include vegetation restoration treatments such as herbicide applications, prescribed fire, and reseeding.

The Proposed Action is located within the Alkali Lake grazing allotment (22,443 acres) and, therefore, may impact livestock productivity, operations, and forage.

Livestock health could be negatively impacted by dust inhalation, potential entrapment in excavations during construction, and risk of injury or death from vehicle collisions in areas of open range (Haggerty et al. 2019). Additionally, the grazing permittee(s) may need to change or adjust their operations because of the Proposed Action. For example, they may need to move livestock, change livestock rotation schedules, change livestock water access due to pasture reorganization or pasture splitting, and/or coordinate with oil and gas operators to protect existing structural range improvements in the project

area. Grazing permittee(s) would spend increased time planning and implementing these adjustments (Haggerty et al. 2019).

The Proposed Action is located in the Sandy ecological site (R042XC004NM). Impacts on the vegetation community during construction of the Proposed Action would include removal of all vegetation biomass in the project area from surface-disturbing activities for the life of the project (excluding areas of interim and/or final reclamation)—a total of 12.75 acres. Surrounding plant communities could also be impacted by rainfall runoff and fugitive dust from caliche-surfaced pads, unpaved roads, bare soil associated with recently buried infrastructure, and other surface disturbance (Nasen et al. 2011). With less available vegetation biomass, grazing management practices may need to be adjusted to prevent overutilization. Overutilization could increase bare ground and cause a shift in vegetation species composition (Southern et al. 2019). If existing livestock trails or access to water are altered by the project area, livestock may begin to underutilize or overutilize pasture areas, which also could cause a shift in vegetation species composition.

Typical direct impacts from oil and gas development on livestock grazing are the disturbance of soils within allotments and the alteration of the hydrology and dominant flow paths in the area. Impacts on soils can cause increases in erosion, which then affects downgradient environments. Furthermore, the amount of forage available would decrease since the amount of vegetation (forage) would decrease from the impact to soils. Access to range improvements could also be impacted by proximity to oil and gas development. Indirect impacts from oil and gas on livestock grazing can be any effects upgradient of the known allotments that would affect the downgrade allotments over time. Furthermore, climate change factors impacting plant communities could further reduce AUMs over time. Another indirect or direct impact could be the spread of invasive plants from increases in bare ground percentages, as documented in rangeland health assessments. Rangeland health assessments are used to better understand the health of the known allotments by looking at the health of the soils, plant community, and hydrologic indicators and comparing them with reference conditions, or areas that have not been disturbed from human activities. Reference condition comparisons help managers understand which allotment areas have deviated from undisturbed norms and need potential rest or other strategies to help improve their health.

The CFO would implement a number of standard COAs and best management practices when projects are proposed within grazing allotments. These include locating the project within existing disturbance, where possible, stockpiling topsoil for use in reclamation of the site, and performing interim reclamation on temporary workspaces not necessary for ongoing operation of the site. Additionally, before construction the operator would be required to consult with the grazing permittee if crossing fences, crossing livestock watering systems, or splitting pastures. The operator would be required have escape ramps for open trenches that cannot be backfilled immediately and to maintain cattleguards in the project area during the project lifetime. These standard COAs and best management practices would reduce the potential for impacts on livestock grazing operations to less than significant levels.

In general, the stocking rate of the rangeland within this area is 6 acres per AUM. To support one cow for one year, about 72 acres are needed. The project area is 12.75 acres, which is 0.06 percent of the total acreage within the grazing allotment. Given the acreage of the project area, the construction and operation of the Proposed Action are not anticipated to change the AUMs for the allotment. Additionally, when the Proposed Action is considered with other past, present, and reasonably foreseeable projects (see Section 3.2), the total acreage of disturbance within the allotment is unlikely to change AUMs. Other potential impacts on grazing operations would be minimized or avoided through the application of the above COAs and best management practices. Given the limited potential for impacts, this issue was not carried forward for detailed analysis.

AIB Issue 15. Soils

How would the construction and operation of the Proposed Action impact the physical, chemical, and biological properties of soils?

Soils in the project area are diverse, with changes in soil properties within a short distance of each ecological site. As discussed in the CFO Draft RMP/EIS, the distribution of soils across CFO-administered lands is dependent on a number of factors, including slope, parent material (geology), living organisms, climate, and time factors (BLM 2018b). The geographic and geologic variation in the area results in a wide diversity of soil types and a variety of approaches to managing this resource. General information on soils within the CFO's administrative boundary is provided in the US General Soils Map (NRCS 2006). More detailed information can be obtained from the Soil Survey Geographic Database, maintained by the Natural Resources Conservation Service. Over 100 general map units, representing many unique soil series, are present in the CFO administrative boundary; however, 10 map units comprise approximately 44 percent of the soils within the boundary (BLM 2018b).

Soils within the CFO's administrative boundary can be broadly described as loamy (243,391 acres of public land), sandy (999,797 acres of public land), shallow (692,941 acres of public land), or gypsum (156,479 acres of public land; BLM 2018b). These soils are generally well drained, low in organic matter, and moderately permeable. When undisturbed, soil in the planning area is generally in good condition and capable of producing forage and maintaining watershed integrity and surface water quality. Based on descriptions from the soil surveys, approximately 60 percent of the soils are uneroded or slightly eroded, 30 percent are slightly to moderately eroded, and 10 percent are moderately to severely eroded (BLM 2018b). All soils need good management to maintain a vegetative cover adequate to protect them from erosion, and all are subject to erosion if the vegetative cover is lost. Once this cover is lost, reclamation potential is low due to high temperatures, low organic content, and undependable rainfall.

The Proposed Action is located in the Sandy ecological site(s) (R042XC004NM). The soil map unit is Tonuco-Berino loamy sands, 0 to 5 percent slopes; Tg; code 56002.The Proposed Action would result in 12.75 acres of disturbance. Construction of the Proposed Action would include vegetation removal, topsoil removal, topsoil salvage for reclamation purposes only, and soil grading/compaction. These disturbances could result in physical, chemical, and biological changes to the topsoil, underlying soil, and surrounding soil. Changes could occur to soil texture, soil structure, nutrient availability, soil organic matter, soil salinity, and soil pH (Rowell and Florence 1993; Nasen et al. 2011). Impacts from these change could include soil compaction, reduced water-holding capacity, reduced rainfall infiltration, increased potential for wind and water erosion, and difficulty in preferred native plant, biological soil crust, and belowground biological soil community reestablishment after reclamation.

The CFO implements a number of standard COAs to avoid or minimize impacts on soils, particularly to reduce the potential for soils to erode due to project activities (see construction and reclamation requirements in Attachment 1). Other COAs related to minimizing impacts on the watershed or vegetation are equally important to soil due to the interrelated nature of these resources. Other COAs include locating the project along existing disturbance where possible, stockpiling topsoil for use in reclamation of the site, and performing interim reclamation on temporary workspaces not necessary for ongoing operation of the site. Additionally, at the time of plugging and abandonment, soil testing would occur to ensure only clean, non-contaminated soils are utilized for final reclamation. All mitigation applied to the Proposed Action with regard to soils would help to reduce soil erosion and help to stabilize the site, minimizing the level of impact.

The BLM anticipates that 72,000 new acres of surface disturbance, including 33,367 acres of new disturbance from oil and gas leasing development, would occur over the next 20 years. This development would contribute to cumulative impacts on soils. The Proposed Action would add 12.75 acres of new development within the Sandy ecological site. Given the small area of disturbance within the ecological site, the Proposed Action is not anticipated to substantially contribute to cumulative impacts. The existing COAs described above would minimize or avoid overall impacts to the point of being minimal; therefore, this issue was not carried forward for detailed analysis.

AIB Issue 16. Noxious Weeds and Invasive Plants

How would construction and operation of the Proposed Action affect the introduction and establishment of noxious weeds and invasive species?

A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property (Radosevich 1999). Noxious weeds alter the structure, organization, or function of ecological systems (Radosvich 1999). The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread (Westbrooks, 1998). Depending on the weed species, environmental and economic impacts of noxious weeds include displacement of native plants and wildlife, toxicity for wildlife and livestock, increased fire danger, increased soil erosion, increased soil salinity, increased flood severity, decreased water quality, and decreased livestock forage and crop yields (Beck and Wanstall 2021). According to the CFO Draft RMP/EIS, invasive and noxious plant infestations begin as small patches in disturbed areas, such as pipeline and utility corridors, roads, oil and gas locations, undeveloped vehicle trails, range improvement projects, and mining operations (BLM 2018b).

The Proposed Action would disturb 12.75 acres within the Sandy ecological site. The project is located near other areas of surface disturbance where noxious weeds might be present. Construction of the Proposed Action would cause additional soil disturbance, which may create more habitat for noxious weeds. Disturbed soils promote establishment of early successional plant species, including invasive plants and nonnative, noxious weeds (Bergquist et al. 2007; Nasen et al. 2011). Construction equipment and vehicle traffic could introduce invasive weeds, including noxious weeds, into newly disturbed areas if weeds are not already present in the project area, creating the potential for noxious weeds to impact native plant communities by reducing their habitat and outcompeting them for resources in a low organic and low precipitation zone.

No noxious weeds were observed within a 1-mile radius of the project area.

The CFO controls noxious weed species on BLM-administered lands through cooperative agreements with the Eddy, Lea, and Chaves County Coordinated Weed Management Groups. In addition to county agencies, the CFO works in cooperation with other federal and state agencies, private landowners, and industry to minimize the spread of noxious weeds. The CFO also addresses noxious weed management by incorporating prevention and control measures into their standard COAs for all APDs. These standard COAs detail the process for addressing noxious weeds if identified during the, operator responsibilities should noxious weeds become established, and appropriate weed-free seed mixes (seed mixture for sandy sites). Implementing these COAs would minimize the potential for the establishment and spread of noxious weeds under the Proposed Action. The Federal Noxious Weed Act and Executive Order 13112 require the detection, control, eradication, suppression, prevention, or retardation of the spread of plant pests or noxious weeds regardless of land ownership.

The BLM anticipates that 72,000 new acres of surface disturbance, including 33,367 acres of new disturbance from oil and gas leasing development, would occur over the next 20 years. Past, present, and reasonably foreseeable actions contribute to cumulative impacts by disturbing soils and creating conditions that could increase noxious weed habitat. The Proposed Action would add 12.75 acres of development, 0.037 percent of the total new disturbance anticipated from the RFD scenario. While the Proposed Action represents a small portion of the anticipated overall disturbance, when considered with past, present, and reasonably foreseeable actions, it would contribute incrementally to cumulative impacts associated with noxious weeds. Impacts, including cumulative impacts, are minimized through continued efforts to control noxious weeds by the BLM and others, as well as through standard COAs attached to the APD. When these minimization efforts are taken into account, the Proposed Action is anticipated to have minimal impacts on the spread of noxious weeds. Because the impacts from the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

AIB Issue 17. Visual Resource Management

How would construction, temporary and permanent surface disturbance, and operations of the Proposed Action cause alterations to the visual quality of a landscape and is it in compliance with the current VRM classification?

The BLM completed a visual resource inventory (VRI) for the CFO in 2011 (BLM 2018b). The VRI is a systematic process for documenting the current state of scenic quality and visual resource values; it results in the assignment of VRI classes (I–IV) to polygons within the CFO's administrative boundary. The BLM uses a VRM system for managing and analyzing impacts on visual resources. While the VRI classes document scenic value, VRM classes (I–IV) represent land use planning decisions on the management of the visual resource inventory. VRI Class I is assigned to areas where management decisions have been made to preserve or maintain a natural landscape, while VRI Classes II to IV are used for considering visual values during planning processes (BLM 2018b). The VRI class assignments are used to inform the VRM classes, which provide management objectives for the areas.

The VRM classes and their objectives are detailed in the CFO Draft RMP (BLM 2018b). VRM Class I is intended to preserve the existing character of the landscape and allows for natural ecological change and limited management activities. VRM Classes II to IV allow for increasing levels of changes to the character of the landscape. In VRM Class II, visual changes should not attract the attention of the casual observer, while in VRM Class IV, management activities can dominate the landscape and attract viewer attention (BLM 2018b).

The acreages of each VRI class and corresponding VRM class acreages on BLM-administered lands within the CFO's administrative boundary are shown below.

VRM Class	**VRI Class I** (acres)	**VRI Class II** (acres)	**VRI Class III** (acres)	**VRI Class IV** (acres)	**Total** (acres)
VRM Class I	6,984	35	8	28	7,055
VRM Class II	8	12,297	9,108	22,186	43,599
VRM Class III	10	54,074	65,832	282,655	402,571
VRM Class IV	0	9	110,830	2,219,262	2,330,101
Total	7,001	66,414	185,878	2,524,131	2,783,424

Source: BLM 2018b

The Proposed Action is located within VRM IV. The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities may dominate the view and may be the major focus of viewer attention. However, the impact of these activities should be minimized through careful siting, minimal disturbance, and repeating the basic elements of form, line, color, and texture. Presence of structures, removal of vegetation, surfacing with caliche, and leveling the area during construction and operation of the Proposed Action would modify the form, line, color, and texture within the existing setting. Additionally, the construction and operation of the Proposed Action may change the natural night sky conditions through the use of artificial lighting. This has the potential to degrade the diversity of scenery, as well as the contrast, variety, harmony, and balance of the scenery, resulting in impacts to the area's scenic quality (BLM 2023d). Moreover, artificial light has the potential to extend beyond the traditional bounds of VRM classes and impact areas of greater management concern. After the life of the project, removal of structures, revegetation, and returning disturbed areas to natural grade would eliminate visual impacts.

Short-term impacts associated with surface disturbance or removal of vegetation would be minimized by standard COAs that require the interim reclamation of disturbed areas, to include revegetation (see Attachment 1). Additionally, the CFO's standard COAs include provisions requiring that all permanent lighting is downward facing and shielded and aboveground structures would be painted a nonreflective environmental color. These COAs would minimize potential impacts to the area's scenic quality. Additionally, the CFO would implement best management practices in the Gold Book (US DOI and USDA 2007) to minimize the potential for impacts on visual resources. Implementation of these measures, along with conformance with the VRM class objective, would minimize the impact on visual resources to below a level of significance.

As described in the CFO Draft RMP/EIS, lands within the CFO administrative boundary have been modified by human activities, including oil and gas development, potash and other mining, commercial

and agricultural development, and wind and solar development, with most of the BLM-administered lands classified as VRI Class IV with a low scenic quality (BLM 2018b). The proposed project would contribute 12.75 acres of surface disturbance, representing , 0.037 percent of the 389,107 acres of surface disturbance that is existing or projected to occur within the CFO administrative boundary (see Section 3.2). This would have an incremental cumulative impact on visual resources through changes in landscape characteristics from development of 4 wells and associated infrastructure. The cumulative effects of this and other existing and reasonably foreseeable projects in the area would be offset by COAs and best management practices to minimize to level of change of individual projects and by reclamation and restoration efforts, including for wells and associated infrastructure as they are plugged and reclaimed. Because the proposed project conforms to the objectives of VRM 4 and effects would be minimized through standard COAs and best management practices, this issue was not carried forward for detailed analysis.

AIB Issue 18. Special Status Plant Species

How would construction, temporary and permanent surface disturbance, and operations (such as fugitive dust and spills) of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for special status plant species?

Based on GIS-modeled potential SSPS habitat, the CFO manages 500,463 acres of Scheer's beehive cactus, 75,613 acres of Wright's waterwillow, and 190,178 acres of Tharp's Bluestar habitat . The nearest known occurrence is 082 miles from proposed project features. Surveys were conducted by third-party contractors and/or BLM botanists on 3/11/2024. No SSPS were observed.

The proposed project may contribute to declines in species' abundance, habitat quality, and species' occurrence connectivity through the removal of potential habitat, increased fugitive dust during construction, and an increased potential for spills. The Proposed Action is not expected to significantly impact SSPS, pollinators, or ecosystem integrity on BLM-administered land because of best management practices and standard stipulations (BLM Reference Manual 6840, Special Status Species Management [BLM 2008b]). Best management practices include minimizing surface disturbance and using existing disturbance, implementing erosion control measures, and implementing contamination prevention measures to reduce overall habitat degradation and fragmentation. Additionally, stockpiling topsoil to be used for reclamation, reclaiming with approved seed mixes, and managing noxious weeds would promote restoration of suitable habitat.

Cumulatively, other past, present, and reasonably foreseeable actions also impact SSPS. Additionally, over the next 20 years, approximately 72,000 acres of additional disturbance are predicted within the CFO's administrative boundary from the RFD scenario and other reasonably foreseeable future development (see Section 3.2); however, it is not known how many of those acres would disturb SSPS-modeled potential habitat. Impacts on SSPS from past, present, and reasonably foreseeable future actions would be minimized or avoided through the application of the above COAs and best management practices. Because the impacts from the Proposed Action, when considered with past, present, and reasonably foreseeable impacts, would not be significant, this issue was not carried forward for detailed analysis.

For this project, no additional SSPS COAs are needed.

AIB Issue 19. Raptors

How would the construction, operation, and reclamation of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for raptors?

Several raptor species, including Harris's hawks (*Parabuteo unicinctus*), Swainson's hawks (*Buteo swainsoni*), red-tailed hawks (*Buteo jamaicensis*), common black hawks (*Buteogallus anthracinus*), use

the southeastern New Mexico region as either a migratory or permanent residence. Potential nesting habitat includes, but is not limited to, escarpments, cliff faces, and any tree large enough to support a nest. Nesting territories of some raptors remain remarkably stable from year to year. Furthermore, several species seldom build new nests, but they repeatedly repair and reuse old ones. Alternate nest sites are contained within territories; therefore, raptors may change their nest site annually. The limits of territories remain essentially constant (Newton 1979). Grasslands, riparian areas, and xeric-riparian areas provide hunting grounds. These areas have an abundant food base to support a substantial population of raptors year-round in most years.

The effects of human-associated disturbance are a primary threat to raptor populations. Disturbance associated with oil and gas exploration and development may adversely affect potential nest sites and the associated foraging areas that support nesting efforts. The specific effects and tolerance limits to disturbance on raptors vary among and within raptor species. This is due to the broad range of direct and indirect human-associated impacts and the fluctuating levels of sensitivity for individual raptors, depending on the life stage and time of year.

Behavioral data suggest that adults that become sensitized to human presence are less-than-normally attentive to their young, which can reduce fledging success. Furthermore, raptors have the tendency to shift or expand their home ranges or move to new areas (Anderson et al. 1990). Disruption of foraging areas can result in lowered hunting success, increased intraspecific encounters, and reduced food intake (Anderson 1984). Raptors displaced from foraging areas may have to expend more energy, adversely affecting their productivity and resulting in less time for other activities (Stalmaster and Kaiser 1997). The noise caused by pump jack engines or other loud equipment could cause abandonment of nests or cause a shift or expansion of the raptors' home range.

There are no known raptors nest within 200m of the proposed action. As a result of project design and COAs (see AIB Issue 20. General Wildlife), direct impacts on raptors are not anticipated.

Cumulatively, past, present, and future landscape-scale disturbances (see Section 3.2) contribute to declines in raptor abundance and habitat quality through decreased foraging habitat, reduced nesting sites, and increased noise disturbance. If they become familiar with noise, raptors may tolerate considerable noise close to their nests, especially if humans are not visible or otherwise obviously associated with it (Schueck et al. 2001). Spatial and temporal buffer zones could protect raptors during periods of extreme sensitivity, such as nesting activity. Because the Proposed Action would would contribute incrementally to direct, indirect, and cumulative impacts, this issue was not carried forward for detailed analysis.

AIB Issue 20. General Wildlife

How would the construction, operation, and reclamation of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for general wildlife?

This project occurs in a transition zone from the Chihuahuan Desert habitat type to the west and to a sand shinnery habitat type to the east; the zone is primarily dominated by mesquite scrublands intermixed with various grasses. Bird, mammal, reptile, and invertebrate species inhabit this ecosystem in southeast New Mexico. Impacts of the Proposed Action on wildlife in the localized area may include, but are not limited to, possible mortality, habitat degradation and fragmentation, avoidance of habitat and water sources during construction and drilling activities, the potential loss of burrows and nests, and the disruption of physiological processes and behaviors due to light pollution (BLM 2023d).

General Wildlife Conclusion

The Proposed Action includes standard design features and COAs that would minimize impacts on wildlife. These include the NTL-RDO 93-1 (modification of open-vent exhaust stacks to prevent perching and entry from birds and bats), nets on open-top production tanks, interim reclamation, closed-loop

systems, exhaust mufflers, creating berms, collection facilities, minimization of cut and fill, road placement, avoidance of wildlife waters, stick nests, drainages, playas, dune features, and provisions requiring that all permanent lighting be downfacing and shielded. These practices would reduce impacts on habitat in the immediately surrounding area and reduce stressors on wildlife populations at a localized level by minimizing the amount of human disturbance in the area. As a result of design features, project location, and COAs, impacts on local wildlife populations are expected to be minimal.

Cumulatively, past, present, and future disturbances (see Section 3.2) have the potential to exacerbate the impacts on the habitat described above. These impacts can impair breeding, feeding, sheltering, dispersal, and survival, causing declines in abundance or even a loss of populations. While the Proposed Action would contribute incrementally to cumulative impacts, impacts would be minimized through the proper implementation of design features and COAs. Therefore, this issue was not carried forward for detailed analysis.

ISSUES DISMISSED FROM ANALYSIS

Table A-1. Issues Dismissed from Analysis

Issue Shortname	Issue Statement	Rationale for Dismissal
Paleontology	How would surface disturbance from the Proposed Action impact vertebrate fossils?	The location of the proposed project is within a PFYC 2, where management concern is negligible. A pedestrian survey for paleontological resources was not necessary. There are no known paleontological localities in proximity to the proposed action. Given the lack of identified or known resources within the proposed project area and provisions for the inadvertent discovery of paleontological resources, there is little potential for impacts on paleontological resources as a result of the Proposed Action.
Potash Resources	How would the Proposed Action impact current mining operations, availability of potash resources, and possible oil and gas permeation into potash resources?	The project is not within the Designated Potash Area and therefore, no impacts to potash are expected and the issue was dismissed from analysis.
Hackberry SRMA	How would the construction, temporary and permanent surface disturbance, and operations of the Proposed Action impact recreation user experience at Hackberry Lake OHV Area?	This issue is dismissed because the project is not within or near the Hackberry Lake OHV recreation area.
Recreation Areas	How would the construction, temporary and permanent surface disturbance, and operations impact recreationists utilizing the nearby recreation area?	This issue is dismissed because the project is not within or near a recreation area, except Hackberry (see the Hackberry issue).
Lesser Prairie Chicken	How would construction, temporary and permanent surface disturbance, and operations contribute to declines in lesser prairie-chicken (LPC)	The project is not located within an LPC COA zone and therefore, was dismissed from analysis.

	abundance, habitat quality, and occurrence connectivity?	
Dunes Sagebrush Lizard	How would construction, temporary and permanent surface disturbance, and operations contribute to declines in the dunes sagebrush lizard's (DSL) abundance, habitat quality, and occurrence connectivity?	The project is not within or near DSL habitat. This issue is dismissed.
Texas Hornshell Mussel	How would the construction, operation, and reclamation of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for the Texas hornshell mussel?	Since the project Is located outside of a Texas hornshell mussel zone, this issue was dismissed from analysis.
Pecos Bluntnose Shiner	How would the construction, operation, and reclamation of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for the Pecos bluntnose shiner?	The project is not near Pecos bluntnose shiner habitat and this issue is dismissed.
Heronries and Shorebirds	How would the construction, operation, and reclamation of the Proposed Action contribute to declines in the species' abundance, habitat quality, and species' occurrence connectivity for heronries and shorebirds?	The Proposed Action is not located within proximity (200 meters) of a heronry, or within the Desert Heronry ACEC, Desert Heronry SMA, or proposed Salt Playas ACEC, where herons and shorebirds reside. Therefore, this issue was dismissed from analysis.
Game Species	How would the construction, operation, and reclamation of the Proposed Action contribute to declines in species abundance, habitat quality, and species occurrence connectivity for game species?	The Proposed Action is not located within the Guadalupe Escarpment area, where game species are common, and therefore, the issue was dismissed from analysis.
Northern Aplomado Falcon	How would the construction, operation, and reclamation of the Proposed Action contribute to declines in species' abundance, habitat quality, and species' occurrence connectivity for the northern aplomado falcon?	The Proposed Action is located outside of the Hope Grasslands, where the Aplomado falcon resides, and therefore, this issue was dismissed from analysis.
Existing Special Designations	How would the Proposed Action impact resource values in the existing special designation?	The project is not within any existing special designations.
Proposed ACECs	How would the Proposed Action impact relevant and important resource values in the proposed Area of Critical Environmental Concern?	The project is not within any proposed ACECs.