



Proposed Revocation of Public Land Order No. 7923: Public Lands Withdrawal Surrounding Chaco Culture National Historical Park Boundary, New Mexico

**Environmental Assessment
DOI-BLM-NM-F010-2026-0002-EA
July 2026**



I have considered the factors mandated by the National Environmental Policy Act (NEPA). This environmental assessment represents the Bureau of Land Management's (BLM's) good-faith effort to fulfill NEPA's requirements by prioritizing documentation of the most important relevant considerations within the statutorily mandated page limits and timeline. This prioritization reflects the BLM's expert judgment; and any considerations addressed briefly or left unaddressed are, in the BLM's judgment, comparatively non-substantive and would not meaningfully inform the BLM's consideration of environmental effects and the Secretarial decision to be made. The EA is substantially complete, considers the factors mandated by NEPA, and, in my judgment, contains analysis adequate to inform the Secretary of the Interior's decision regarding the Proposed Action.

Responsible Official & Date: _____

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Chapter I. Introduction

I.1 BACKGROUND

On June 7, 2023, Public Land Order (PLO) No. 7923 withdrew approximately 338,690 acres¹ of public land in northwestern New Mexico adjacent to, but not within the Congressionally-established border of the Chaco Culture National Historical Park (CCNHP, 33,240 acres) from location and entry under the United States mining laws and from leasing under the mineral leasing laws, but not from disposal of mineral materials, for 20 years, subject to valid existing rights. Prior to this withdrawal, the acreage was comprised of multiple use BLM lands which are intermixed with various subsurface mineral estate – some of which belongs to native allottees. The withdrawal covers an approximately-10-mile buffer surrounding all units of CCNHP, with additional acreage to the northwest toward Bisti/De-Na-Zin Wilderness Area and the area between the main CCNHP and Kin Ya'a to the southwest.

On January 20, 2025, President Trump issued Executive Order (EO) 14154, *Unleashing American Energy*, directing the Secretary of the Interior to review agency actions that may unnecessarily restrict domestic energy and mineral development. In response, the Secretary of the Interior issued Secretary's Order 3418 on February 3, 2025, instructing Department officials to evaluate existing land withdrawals for their effect on domestic energy and mineral development. The BLM is conducting this evaluation for PLO No. 7923 and other withdrawals.

Following this review, and consistent with section 204 of the Federal Land Policy and Management Act (FLPMA), 43 U.S.C. 1714, the Secretary of the Interior is proposing to revoke PLO No. 7923 and reopen the subject lands to location and entry under the U.S. mining laws and to mineral leasing.

Revocation of PLO No. 7923, in full, would restore discretion over mineral leasing to the BLM and would re-open the subject public land to location and entry under the United States mining laws while protecting resources under existing laws, policies, and regulations. PLO No. 7923 did not withdraw the land in question from disposal under the Materials Act of 1947 (e.g., extraction and sale of common-variety sand and gravel from federal land could continue); the land also remained open to development through rights-of-way, and other surface land use authorizations under FLPMA and other authorities.

This environmental assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) to analyze and disclose the environmental consequences of revoking, or partially revoking, the withdrawal of approximately 338,690 acres of BLM-administered public land in northwestern New Mexico to reopen the lands to location and entry under the U.S. mining laws and to leasing under the mineral leasing laws.

PLO No. 7923 withdrew approximately 338,690 acres of public lands from location and entry under the U.S. mining laws and from the mineral leasing laws. Its stated purpose was “to protect these public lands and the greater connected landscape having a rich Puebloan, Tribal Nation, and cultural legacy from impacts associated with potential oil and gas development and locatable mineral exploration and mining...”

¹ PLO No. 7923 identified 336,404.42 acres as withdrawn. This EA describes the withdrawal area based on legal land descriptions and BLM Master Title Plats. For analysis purposes in this EA, BLM used digital spatial data (referenced to the NAD83 datum and UTM Zone 13 Projection) to derive “GIS acres,” totaling approximately 338,690 acres. GIS acres are rounded to the nearest 10 acres which may result in minor rounding discrepancies. Despite these differences in acreage figures, the 10-mile-wide perimeter around CCNHP evaluated in this EA is intended to be identical to that in PLO No. 7923; no changes to the boundary have occurred, and no lands have been added or removed.

A variety of designations, laws, regulations, and policies offer protections and management directions for the landscape connected to this cultural legacy. These include CCNHP, United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites, Chaco Culture Archaeological Protection Sites, Areas of Critical Environmental Concern (ACEC), National Historic Preservation Act (NHPA) of 1966, FLPMA, Archaeological Resources Protection Act (ARPA) of 1979, Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, Executive Order 13007: Indian Sacred Sites, and Executive Order 13175: Consultation and Coordination with Indian Tribal Governments. Each of these authorities remains in effect and would guide the BLM in managing cultural resources regardless of which alternative the Secretary selects.

I.2 PURPOSE AND NEED

The purpose and need for the proposed withdrawal revocation is to restore discretion over mineral leasing to the BLM and facilitate mineral development to meet the policies established by EO 14241—*Immediate Measures to Increase American Mineral Production*, EO 14154—*Unleashing American Energy*, and Secretarial Order (SO) 3418—*Unleashing American Energy*. In addition, opening lands to mineral leasing would facilitate development of mineral interests by Indian allottees on approximately 239,685 acres within the 10-mile buffer of the CCNHP.

I.3 DECISION TO BE MADE

Section 204 of FLPMA authorizes the Secretary of the Interior or a member of the Office of the Secretary who has been appointed by the President, by and with the advice and consent of the Senate, to make, modify, extend, or revoke withdrawals in accordance with the specific provisions of section 204. Therefore, the Secretary of the Interior or appropriate Secretarial official will decide whether to revoke, revoke in part, or take no action regarding PLO No. 7923 to return all or some of the 338,690 acres withdrawn in 2023 to location and entry under the U.S. mining laws or to leasing under the mineral leasing laws, or to both, or to neither.

I.4 RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER NEPA DOCUMENTS

Relevant statutes and regulations applicable to the Proposed Action include section 204 of FLPMA (43 USC 1714) and 43 Code of Federal Regulations (CFR) 2300 (Land Withdrawals), and 43 CFR 2370 (Restorations and Revocations). Mineral resources that may be affected by the proposed withdrawal revocation are managed under the following authorities: 43 CFR 3160 (Onshore Oil and Gas Operations); the Mining Law of 1872; the Mineral Leasing Act of 1920, as amended (30 USC 181 et seq.); 43 CFR 3800 (Mining Claims under the General Mining Laws); 43 CFR 3000 (Mineral Management) and 3400 (Coal Management); the Act of March 3, 1909; and FLPMA.

This EA incorporates by reference the September 2003 Farmington Field Office (FFO) Final Environmental Impact Statement (FEIS)/Resource Management Plan (RMP) and December 2003 Record of Decision (BLM 2003), as well as the EA prepared in support of PLO No. 7923.

I.5 PUBLIC INVOLVEMENT AND ISSUES

I.5.1 Public Involvement and Information Regarding the Proposed Action that Became PLO No. 7923

The FFO initiated public outreach via a notice of proposed withdrawal, which was published in the *Federal Register* (Volume 87, No. 4, Thursday, January 6, 2022); this notice described the Proposed Action and initiated a 90-day public comment period. Several documents related to the Proposed Action, including a Department of the Interior fact sheet and a map of the area proposed for withdrawal, were then made available to the public on the BLM National NEPA Register website at <https://eplanning.blm.gov/>. Two in-

person public meetings regarding the proposed withdrawal were held on February 23, 2022, in Farmington, New Mexico. A virtual meeting was also held on February 24.

The BLM then published a news release on March 25, 2022, extending the initial deadline (which had been April 6, 2022) for public comments and public meeting requests for an additional 30 days to May 6, 2022. The BLM held three additional public meetings from April 27 to April 29, 2022, in Farmington, Nageezi, and Albuquerque, New Mexico.

See Chapter 4. Consultation and Coordination for a summary of government-to-government consultation.

1.5.1.2 Summary of Public Comments Regarding the EA for PLO No. 7923

In developing this EA, the BLM reviewed and incorporated public input received during the development of the original EA associated with the Secretarial decision which established the withdrawal.

The BLM received over 95,000 submissions, including 928 unique written comments that generated 388 substantive issues used to inform the original NEPA analysis. Following the release of the draft EA on November 10, 2022, the BLM held a 30-day public comment period, during which the BLM received 16,715 submissions, including 16,478 letters containing non-unique, preformulated language (i.e., “form letters”). There were 237 unique submissions, from which 179 substantive comments were derived.

The public comment response report for the original Proposed Chaco Area Withdrawal EA is available at: <https://eplanning.blm.gov/Project-Home/?id=098dfbca-a7f2-f011-8407-001dd806295a>. The BLM considered this input in shaping the scope, alternatives, and analysis presented in the current EA.

1.5.2 Recent Public Information and Involvement

As a continuation of the previous years-long public engagement on this topic, on March 31, 2026, BLM notified Interested Parties of a new 7-day public scoping period to begin on April 1 and end on April 7. BLM also initiated further consultation under section 106 of the NHPA on March 31, 2026. The BLM invited the public to submit scoping comments through the BLM National NEPA Register at <https://eplanning.blm.gov> where a map of the Proposed Action area and a description of the Proposed Action was provided. The purpose of scoping is to identify potential issues for analysis in the agency NEPA document. Given the similarity in subject matter and geography between the current Proposed Action and the actions considered in the 2023 EA, the issues identified for analysis have substantial consistency between the two undertakings. The BLM acknowledges and values the input received during those prior scoping and public comment periods and will present that input to the Secretary as part of the current decision-making process.

1.5.3 Issues Identified for Analysis

Using internal and external scoping in accordance with the requirements of NEPA and the guidance provided in the Department of the Interior (DOI) Departmental Manual (DM) 516 DM 1 (DOI 2026), the FFO interdisciplinary team (IDT) developed a list of issues to analyze in this EA that evaluates the proposed revocation of PLO No. 7923, in whole or part. The key issues identified during scoping are summarized in **Table 1-1** below. This table also provides the impact indicators BLM used to describe the affected environment for each issue in **Section 3.4**, to assess changes in each issue correlated with each alternative, and to compare the impacts of each alternative.

The BLM also identified, considered, and analyzed in brief (AIB) additional issues during review of the Proposed Action. Those issues are presented in **Appendix C** with a concise discussion of the potential impacts related to each issue.

Table I-1. Issues Brought Forward for Detailed Analysis

Issue #	Issue Statement	Impact Indicator(s)
Issue 1	How would the proposed revocation affect the availability of locatable mineral resources (uranium) within the decision area?	Acres withdrawn from location and entry under the U.S. mining laws and proposed for withdrawal revocation, and locations of active mining claims, or production of minerals subject to location and entry under the U.S. mining laws.
Issue 2	How would the proposed revocation affect the availability of leasable mineral resources (coal and oil and gas) within the decision area?	Acres withdrawn from mineral leasing and locations of existing leases of Federal minerals and production of leased Federal minerals
Issue 3	How would future potential development of the mineral resources should the Secretary revoke PLO No. 7923, in whole or part affect local economy and government revenue?	Comparative socioeconomic conditions of counties (population, household income level, unemployment level, age structure, education level, employment and Gross Domestic Product by economic sector); federal mineral development costs, mineral production volumes, mineral sales prices, and local industrial structures (economic output, value added, labor income, employment).
Issue 4	How would the proposed revocation of PLO No. 7923 in whole or part affect the quality of life of the American people, including non-economic factors such as cultural resources and Native American religious concerns?	Relation across natural resources, ecosystem services, economic output, and human well-being; socioeconomic change, ecosystem change. Ecosystem services include consideration of cultural resources.
Issue 5	How would future potential development within the decision area if the Secretary revokes PLO No. 7923 in whole or part affect air quality (particularly National Ambient Air Quality Standards and volatile organic compounds) in the analysis area?	Emissions intensity resulting from reasonably foreseeable activity levels on re-opened lands.
Issue 6	How would future potential development that may occur should the Secretary revoke PLO No. 7923, in whole or part contribute to greenhouse gas (GHG) emissions?	Total emissions resulting from reasonably foreseeable activity levels on re-opened lands.
Issue 7	How would future potential development within the decision area affect surface and groundwater quantity?	Amount and source of water withdrawals.

I.5.4 Issues Identified but Eliminated from Detailed Analysis

Through the scoping process, BLM identified several potential issues which could appropriately be eliminated from detailed analysis. For each issue eliminated from detailed analysis, the supporting rationale is provided in **Table I-2**.

Table I-2. Issues Identified but Eliminated from Detailed Analysis

Resource	Rationale for Not Discussing in Detail in the EA
Cave and Karst	The decision area is not known to contain any cave or karst resources; therefore, analysis of potential effects on cave and karst resources is not warranted.
Farmlands, Prime or Unique	The decision area does not contain any prime or unique farmland soils as designated by the Natural Resources Conservation Service (NRCS); therefore, analysis of potential effects on farmlands is not warranted.
Lands/Access	PLO No. 7923 did not affect Lands/Access, because PLO No. 7923 did not restrict public access to public land. PLO No. 7923 only withdrew the area from location and entry under the U.S. mining laws and from mineral leasing. The BLM would be able to conduct realty actions under the No Action Alternative as well as the Action Alternatives. All proposed realty actions would continue to be evaluated as described in the 2003 RMP. Future potential development in the decision area would be subject to existing land rights and interests (e.g., easements and water rights). Any potential land use conflicts would be resolved through other processes, such as administrative or legal proceedings, independent of Secretarial decision-making regarding PLO No. 7923.
Wetlands/Riparian Zones	The decision area does not contain any designated riparian habitat on BLM managed lands. Should the BLM propose to authorize development within the decision area in the future, the BLM would conduct additional review to confirm the presence or absence of this resource.
Wild Horses and Burros	The decision area does not contain any Congressionally-designated Wild Horse and Burro Herd Areas.
LWC; Wilderness	The decision area does not contain any lands with wilderness characteristics as designated in the 2003 RMP. Bisti/De-Na-Zin and Ah-Shi-Sle-Pah Wilderness areas are currently withdrawn based on their wilderness status and have current protections through the 2003 RMP and Wilderness Act of 1964.
Livestock Grazing	The reasonably foreseeable development of approximately 2,723 acres that may occur under the Proposed Action represents 0.34% of the total grazing allotment acres for the four allotments with acres in the withdrawal area. Should the Secretary revoke PLO NO. 7923 in full, minimal Animal Unit Month (AUM) loss would occur that would not affect authorized livestock grazing within the four allotments. Standard design features on site specific projects addressing fencing and cattleguard installation, when required, would assist in management of authorized livestock within affected allotments.
Public Land Health Standards (PLHS)	The reasonably foreseeable development of approximately 2,723 acres that may occur under the Proposed Action represents 0.34% of the total grazing allotment acres for the four allotments with acres in the withdrawal area. Impacts to PLHS from mineral development that may occur following a Secretarial revocation decision are expected to be negligible given the acreage withdrawn within the four affected grazing allotments. Standard design features/Best Management Practices (BMPs) requiring reclamation would assist in mitigating any impacts from such development.
Invasive Species/Noxious Weeds	Should the BLM propose any surface disturbing activity within the decision area, regardless of the alternative selected by the Secretary, the BLM would employ or require best management practices to include prevention and treatment of invasive species and noxious weeds. Given the dispersed nature of the reasonably foreseeable development of approximately 2,723 acres that may occur under the Proposed Action, site specific management specifications would prevent spread of invasive species and Noxious weeds.

Resource	Rationale for Not Discussing in Detail in the EA
Vegetation excluding US Fish and Wildlife- Designated Species	Sagebrush (<i>Artemisia</i> sp.) and perennial grasses are the predominant vegetation types within the area withdrawn by PLO No. 7923. Given the dispersed nature of the reasonably foreseeable development of approximately 2,723 acres that may occur under the Proposed Action, standard design features requiring reclamation and utilizing site specific seed mixes would minimize any effects to long term impacts to vegetation types from such development.
Wildlife (Aquatic)	There are no aquatic wildlife species within the decision area; management of habitat for aquatic species and existing protections would continue as described in the 2003 RMP.

Chapter 2. Proposed Action and Alternatives

2.1 NO ACTION ALTERNATIVE (ALTERNATIVE A)

In 2023 the Secretary of the Interior withdrew approximately 338,690 acres of public land and federal mineral estate in PLO No. 7923 within an approximate 10-mile distance from the CCNHP's boundaries from location and entry under the U.S. mining laws and from leasing under the Mineral Leasing Act of 1920, for a 20-year term, subject to valid existing rights. The lands were not withdrawn from disposal under the Materials Act of 1947.

The withdrawal established by PLO No. 7923 affected public land where the BLM manages both the surface and mineral estates as well as land where the BLM manages the federal mineral estate, but where the surface may be managed by another federal agency or owned by another entity, such as the State of New Mexico, Indian and Tribal entities, or private parties.

Therefore, under this alternative, if the Secretary were to take no action:

- The approximately 338,690 acres of public land and federal mineral estate withdrawn by PLO No. 7923 from location and entry under the U.S. mining laws and the Mineral Leasing Act of 1920 would remain closed to exploration for minerals subject to location and entry under the U.S. mining laws and any mining activities not supported by valid existing rights. The area would also remain closed to any exploration for minerals subject to leasing under the Mineral Leasing Act and to any development of such leasable minerals not subject to an existing lease or permit to drill, for the remainder of the duration of the original 20-year term (e.g., until approximately the year 2043).
- These approximately 338,690 acres of public land and federal mineral estate would remain open to discretionary mineral material extraction under the Materials Act of 1947 and 43 CFR 3600. The BLM would continue to follow management direction outlined in the 2003 BLM FFO RMP for the specific types and varieties of mineral identified by law and regulation as "salable minerals" or "mineral materials," which includes common varieties of sand, gravel, and other similar materials. These regulations give BLM discretion to sell or dispose of federal mineral materials through contracts with the public, including individuals, corporations, local or state governments, and other government agencies.
- Approximately 1,250 Navajo allottees would continue to have limited or no access to economically feasible development opportunities for their allotted mineral rights absent adjacent federal minerals. The buffer effectively stranded these assets, making mineral development for Navajo allottees less desirable.

2.2 PROPOSED ACTION (ALTERNATIVE B)

The Secretary of the Interior proposes to revoke PLO No. 7923, which withdrew approximately 338,690 acres of public lands from location and entry under the United States mining laws and from leasing under the mineral leasing laws, subject to valid existing rights, for a 20-year term. Revocation of PLO No. 7923, in full, would re-open the public lands and federal mineral estate in the entire approximately 10-mile-wide withdrawal area surrounding CCNHP to mineral leasing and mineral entry.

Revocation of the withdrawal in full would restore BLM's discretion over mineral leasing and would re-open the land to location and entry under the U.S. mining laws and regulations such as 43 CFR Part 3809. If the Secretary of the Interior selects this alternative for implementation, the BLM would subsequently follow existing management direction outlined in the 2003 FFO RMP for leasable minerals (e.g., coal and oil & gas) and locatable minerals (e.g., most metallic minerals).

The 965,670-acre decision area (containing not only the acres withdrawn by PLO No. 7923 but all lands within the approximate 10-mile buffer shown in blue in **Map 1-1, Appendix D**) includes acres managed by FFO and by other surface management entities. In some instances, the FFO manages federal minerals where the surface is managed by another entity (see **Map 1-2, Appendix D**). **Table 2-1** lists the land managers or owners within the decision area along with the acres of federal minerals underlying the surface acres these entities own or manage.

Table 2-1. Federal Minerals Associated with Federal and Non-Federal Land within the Analysis Boundary (Acres)

Land Manager or Owner	Surface, GIS Acres	Federal Minerals in Withdrawal Boundary, GIS Acres
BLM	169,960	156,260
National Park Service	33,240	32,430
State of New Mexico	52,480	14,440
Individual Indian Allotted / Tribal Trust	672,850	129,990
Private	37,140	5,570
Total	965,670	338,690

In its decision-making regarding any future mineral leasing or development following Secretarial selection of the Proposed Action, the BLM would commit to implementing the Design Features in Section 2.4 to mitigate potential impacts to Federal resources. Additional descriptions of the lands summarized in **Table 2-1** and illustrated in **Map 1-1, Appendix D** are provided below.

New Mexico State Lands—In 2019, New Mexico's Commissioner of Public Lands Stephanie Garcia Richard signed Land Office Executive Order 2019-002, placing a moratorium on new oil and gas development on New Mexico state trust land (managed by the New Mexico State Land Office [NMSLO]) in a 12-mile buffer zone around Chaco Canyon. On December 14, 2023, Commissioner Garcia Richard extended the order through December 31, 2043. This order does not affect federal interests.

Decision Area—The decision area evaluated in this EA consists of the acres withdrawn by PLO No. 7923 from location and entry under the U.S. mining laws and from leasing under the mineral leasing laws, consisting of the public lands and federal mineral interests in a 965,670-acre portion of McKinley, Sandoval, and San Juan Counties formed by the approximate 10-mile radius surrounding the CCNHP; these 965,670-acres include lands managed by the FFO, the Bureau of Indian Affairs (BIA), NMSLO, the National Park

Service (NPS), and private landowners. The Proposed Action pertains only to the status of 338,690 acres of public lands (including mineral interests) within this Decision Area.

Navajo Tribal Trust Lands—Lands within the Navajo reservation that the United States holds in trust for the Tribe. These lands can be either on-reservation or off-reservation. Under Federal law, such lands generally may not be sold, taxed, or encumbered; however, Tribes may be able to lease Trust lands, and the lessee or sublessees of such lands may be able to grant leasehold mortgages on their leasehold interests, subject to federal approval.

Individual Indian Allotments (IIA)—Parcels of land held in trust by the United States for individual Indians or held by Indians and otherwise subject to a restriction on alienation (that is, where there is a restriction on the Indian owner's ability to sell or transfer the allotment to another party). Approximately 1,250 Navajo allottees would have an increased opportunity to develop their allotted mineral rights in a more economically-viable way by considering developments that could include adjacent federal minerals.

Mineral Estate—The ownership of minerals, which may be separately held from surface land ownership.

2.3 PARTIAL REVOCATION ALTERNATIVE (ALTERNATIVE C)

Under the partial revocation alternative, the Secretary of the Interior would revoke PLO No. 7923 only so far as it applies to approximately 220,970 acres of the 338,690 acres of public lands withdrawn by PLO No. 7923. Under Alternative C, the federal interests in an approximately 5-mile-wide radius immediately surrounding CCNHP would remain withdrawn by PLO No. 7923; however, PLO No. 7923 would no longer be in effect for the federal interests in the approximately 220,970 acres originally withdrawn beyond this approximately 5-mile-wide radius surrounding CCNHP (See **Table 2-1**).

For the approximately 220,970-acre area that would no longer be withdrawn should the Secretary elect Alternative C for implementation, BLM's discretion over mineral leasing would be restored and the land would re-open to location and entry under the United States mining laws and regulations such as 43 CFR 3809. Should the Secretary elect Alternative C for implementation, the BLM would follow existing management direction outlined in the 2003 FFO RMP for leasable minerals (e.g., oil, gas and coal) and locatable minerals (e.g., most metallic minerals).

In its decision making regarding any future mineral leasing or development following Secretarial selection of Alternative C, the BLM would commit to implementing the Design Features in Section 2.4 to mitigate potential resource impacts.

Table 2-2. Federal Minerals Associated with Federal and Non-Federal Land within the Outer 5 Miles of the Analysis Boundary (Alternative C)

Land Manager or Owner	Surface, GIS Acres	Federal Minerals in Outer 5 Miles of Withdrawal Boundary, GIS Acres
BLM	137,170	127,500
National Park Service	0	0
State of New Mexico	38,590	13,640
Individual Indian Allotted / Tribal Trust	392,200	74,900
Private	25,990	4,930
Total	593,950	220,970

2.4 DESIGN FEATURES COMMON TO ALL ALTERNATIVES

Should the Secretary revoke PLO No. 7923 in whole or part, the BLM would incorporate the following Design Features in any future decision making regarding mineral leasing or development of federal minerals within the withdrawal area to mitigate potential resource impacts from such leasing or development.

Cultural Resources

- If the area to be disturbed under a notice-level mineral exploration or mining operation has not been sufficiently inventoried for cultural resources, the FFO will conduct the necessary inventory and recordation of cultural resources as a Design Feature within the 15-day period of review (43 CFR 3809.311(a)). If BLM determines that any of the conditions in 43 CFR 3809.313 apply, BLM will notify the operator of any additional information or changes to the operation that are required to prevent unnecessary or undue degradation or to meet other objectives identified in 43 CFR 3809.313.
- Existing protections for and management of cultural resources would continue to apply, even in the absence of the mineral withdrawal. This includes the protection within the designated CCNHP, as well as the additional protections afforded cultural resources, either through physical protection or information documentation, associated with the requirements of NHPA, ARPA, NAGPRA, Executive Order 13007, and BLM's implementing regulations and policies.

2.5 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Sometimes alternatives are suggested or proposed that upon examination would not adequately respond to the agency's purpose and need for action, would be technically or economically infeasible, would not be suitable for consideration, would be remote or speculative, would be substantially similar in design to an existing alternative, would have substantially similar effects as an existing alternative, or the authority does not exist for the agency to approve such actions. In such cases, these alternatives can be eliminated from detailed analysis. Alternatives that were considered and eliminated from detailed analysis are listed below, along with the rationale for their elimination.

2.5.1 Revoke PLO No. 7923 for a Smaller Subset of the Withdrawn Lands

This alternative was not analyzed in detail because both a full and partial revocation of PLO No. 7923 is already being analyzed within this EA. The Secretary may select for implementation an alternative within the range of alternatives analyzed in detail, including a partial revocation of PLO No. 7923 for any acres fewer than the entire withdrawal area, because the Secretary has the authority to approve or deny the Proposed Action in part or in whole based upon this analysis.

2.5.2 Revoke PLO No. 7923 to Allow Only Leasing Under the Mineral Leasing Laws

Should the Secretary elect to revoke PLO No. 7923 in part, to allow only leasing under the mineral leasing laws on all or some of the 338,690 acres withdrawn under PLO No. 7923, but not re-open any lands to location and entry under the U.S. mining laws, minerals subject to mineral entry (including minerals meeting the Critical Minerals definition as set forth in EO 14241) would remain unavailable for development, except those subject to valid existing rights. Because Critical Minerals and energy-related minerals such as uranium would remain unavailable should the Secretary revoke PLO No. 7923 in part to allow only mineral leasing, while the BLM would no longer be prevented from issuing new leases of oil, gas, and coal in support of the President's energy agenda, this alternative may not be responsive to that aspect of EOs 14241, 14154, and SO 3418 and thus would not fully meet the purpose and need for the action set forth above.

Chapter 3. Affected Environment and Environmental Effects

3.1 INTRODUCTION

Chapter 3 contains the analysis of environmental effects related to the issues. **Section 3.2** describes the No Action Alternative (Alternative A) for all issues. **Section 3.3** broadly discusses reasonably foreseeable environmental and development trends within the Affected Environment. **Section 3.4** presents the issues that are analyzed in detail. **Appendix C** contains the issues that are analyzed in brief. **Section 3.5** describes the effects of the Proposed Action (Alternative B) and Reduced Action Alternative (Alternative C) in the context of the reasonably foreseeable environmental trends and planned actions that constitute the Affected Environment.

3.2 NO ACTION ALTERNATIVE FOR ALL ISSUES & REASONABLY FORESEEABLE ENVIRONMENTAL TRENDS

Under the No Action Alternative, the Secretary of the Interior (or appropriate Department of the Interior official) would not revoke PLO No. 7923 to re-open the public lands to location and entry under the U.S. mining laws and to leasing under the mineral leasing laws around the CCNHP. Absent such a revocation of the withdrawal, there would be no change to existing conditions and trends related to each issue -that is, conditions in the area withdrawn by PLO No. 7923 would remain as described for the Proposed Action in the 2023 EA supporting PLO No. 7923. While there would be no new location and entry under the U.S. mining laws under the No Action Alternative, development of minerals subject to mineral entry (locatable minerals) based on valid existing rights could continue; however, mining claims in the current withdrawal area would be subject to validity testing per 43 CFR 3809.100(a), which states in part that:

BLM will not approve a plan of operations or allow notice-level operations to proceed until BLM has prepared a mineral examination report to determine whether the mining claim was valid before the withdrawal, and whether it remains valid.

Given these requirements, and the limited information it has, the BLM has no evidence to indicate whether development of any of the existing 129 mining claims within the area withdrawn under PLO No. 7923 is reasonably foreseeable.

Similar to locatable minerals discussed above, while the BLM would not be able to issue new mineral leases under the No Action Alternative, the BLM could authorize activities under existing leases and would manage existing leases under the applicable laws and regulations and the provisions of the 2003 RMP. Also, because PLO No. 7923 did not withdraw the land from disposal of mineral materials under the mineral materials disposal laws, disposal of mineral materials (such as sand, gravel, and humate) could continue under the No Action Alternative.

Natural gas and crude oil from existing leased parcels both within (78 existing leases) and outside the withdrawal area would continue to be produced, and any royalties would accrue to federal and state treasuries. Continued oil and gas development on existing leases within the withdrawal could sustain or increase local and regional employment and revenue opportunities related to oil, gas, and service/support industries until such time as the existing leases have been fully developed.

Even under the No Action Alternative, ongoing industrial development would potentially affect natural and cultural resources on public lands within the larger regional landscape. Continued mineral

development activities would contribute to increased air emissions, noise sources, and traffic from exploration and production operations. BLM estimates up to 1,150 acres of future expansion is expected in communities within the decision area including development for roads, utilities, and communication lines and also future expansion of utilities, public spaces, roads, and/or residential areas within federal and Navajo Nation lands within the decision area, even if no new mineral leases are issued.

Additionally, regardless of any Secretarial decision made regarding PLO No. 7923, as supported by this EA, BLM estimates that 73 oil and gas wells (251 acres including access roads and well-tie pipelines) could be drilled and placed in production over the next 20 years due to continued infill of existing leases present within the current 10-mile Chaco withdrawal boundary (BLM 2025a). These 73 future wells (21 horizontal Mancos-formation wells and 52 vertical Fruitland-formation wells) are all predicted to occur within the outer 5-mile withdrawal boundary because the inner 5-mile boundary has limited resource potential and/or economic viability (BLM 2025a). This estimate is based upon the 16,780 acres of existing Federal leases in the decision area, using an 800-acre spacing per well for wells targeting the Mancos and 320-acre spacing per well for wells targeting the Fruitland. The 800-acre spacing assumes 2.5-mile horizontal laterals; the 320-acre spacing utilizes half of the available 160-acre spacing due to low expected production from the Fruitland in the decision area compared to wells further north. This further assumes the 21 horizontal wells would be clustered into 6 well pads with approximately 64 acres of disturbance and the 52 vertical wells would each occupy one well pad (as is typical for vertical wells) with approximately 187 acres of disturbance. Both estimates include a representative amount of disturbance from well-tie pipelines and well pad access roads (horizontal: 10.69 acres per pad; vertical: 3.6 acres per pad).

Therefore, in total, the reasonably foreseeable disturbance under the No Action alternative is approximately 1,401 acres over the next 20 years.

Should the BLM propose to authorize any future surface disturbing action, regardless of the presence, extent, or absence of PLO No. 7923, the BLM would employ or require best management practices (e.g., stipulations, conditions of approval, design features, etc.), consistent with any lease rights, to mitigate the effects of such activities on the area's setting and unique recreational opportunities.

3.3 REASONABLY FORESEEABLE DEVELOPMENT SUMMARY UNDER ACTION ALTERNATIVES

The area that could be affected by Secretarial revocation of PLO No. 7923 in whole or part (the decision area) is within the New Mexico portion of the San Juan Basin, a major oil and natural gas basin and the main structural feature of the Navajo physiographic section of the Colorado Plateau. This analysis employs the most recent update to the Reasonably Foreseeable Development Scenario (RFDS) for Oil and Gas Activities in the Farmington Field Office (Engler 2025) and other support documents (such as the 2018 RFDS [BLM 2018] and Chaco Mineral Potential Report [BLM 2022a]) to support the evaluation of the reasonably foreseeable environmental trends for oil and gas leasing and development and for development of minerals subject to location and entry under the U.S. mining laws in the area that could occur should the Secretary revoke PLO No. 7923, in full.

The San Juan Basin has been a producing oil and natural gas field since the early to mid-1900s. It is characterized by overlapping uses for oil and gas development, grazing, and dispersed recreation. Overall, the Mancos-Gallup RFDS (BLM 2018) estimates existing long-term surface disturbance across the 4.2-million-acre Mancos-Gallup planning area (a subset of the larger FFO management area, overlapping the current decision area) from oil and gas development to be approximately 56,500 acres from 37,300 wells.

Under both Action Alternatives, the following reasonably foreseeable development over the next 20 years is considered within the 965,670-acre decision area in this effects analysis scenario:

Energy Leasable Minerals: No new oil and gas wells are foreseen within the 5-mile area surrounding CCNHP under any of the three alternatives (BLM 2025a). If Alternatives B or C were selected by the Secretary, and the area withdrawn under PLO No. 7923 became available for leasing and subsequent development, FFO projects the development of 4 horizontal Mancos-formation wells and 10 vertical Fruitland-formation wells on new leases over the next 20 years within the outer approximately 5-mile radius within the decision area (BLM 2025a). The 2025 RFDS (Engler 2025) categorized the entire Chaco region as unlikely to see further development, whereas the 2018 RFDS (BLM 2018) took a more nuanced approach that assigned high, medium, low, and negligible potential. In making the prediction of 14 new wells, FFO considered the 2018 RFDS, the 2025 RFDS, and local industry trends.

New surface disturbance from these 14 potential wells (on new leases, if the decision area were to be fully leased) in this outer 5-mile radius is estimated at approximately 58 acres. The 2025 RFDS estimates new surface disturbance in this outer 5-mile radius, including access roads and well-tie pipelines at 10.69 acres per well for future horizontal wells (2 wells per pad) and 3.6 acres per well (one well per pad) for future vertical wells (BLM 2025a). While the decision area is known to contain coal resources, based on current market trends and the historic (pre-withdrawal) lack of recent commercial interest in those resources, the BLM does not foresee any new coal development within the decision area, regardless of whether the Secretary revokes PLO No. 7923 in whole or part.

Minerals Subject to Mineral Entry: While Secretarial selection of the Proposed Action (Alternative B) or Alternative C for implementation would re-open their respective decision areas to location and entry under the U.S. mining laws, a conservative estimate of the number of mining claims reasonably foreseeable to be developed consists of the 129 active mine claims within the decision area for a total of approximately 2,665 acres (Proposed Action). Although it is not possible to estimate how many new claims would be located under Alternative B, fewer new claims are likely to be located under Alternative C because fewer acres would be opened. Approximately 129 existing claims are located on lands that would be re-opened to mineral location under Alternative B, of which 109 existing claims would be re-opened to mineral location under Alternative C.

Table 3-1 presents a summary of quantifiable surface disturbances associated with reasonably foreseeable development associated with the Action Alternatives.

Table 3-1. Reasonably Foreseeable Development That Could Only Occur Under the Action Alternatives

Alternative B: Quantifiable Disturbance Sources	Number of Wells or Claims	Acres
Alternative B: Reasonably foreseeable additional future oil and gas development	14	58
Alternative B: Reasonably foreseeable additional future development of minerals subject to mineral entry	129	2,665
Alternative B Totals	14 (wells) 129 (claims)	2,723
Alternative C: Quantifiable Disturbance Sources	Number of Wells or Claims	Acres
Alternative C: Reasonably foreseeable additional future oil and gas development	14	58
Alternative C: Reasonably foreseeable additional future development of minerals subject to mineral entry	109	2,252
Alternative C Totals	14 (wells) 109 (claims)	2,310

3.4 ISSUES ANALYZED IN DETAIL

3.4.1 Resource Issue 1: Minerals Subject to Location and Entry under the U.S. Mining Laws

How would the proposed revocation affect the availability of locatable mineral resources (uranium) within the decision area?

3.4.1.1 Affected Environment

For more information on the mineral potential in the decision area, see the Mineral Resource Potential Bureau of Land Management Lands and Minerals Selected Chaco Area Mineral Withdrawal, San Juan and McKinley County, New Mexico report (BLM 2022a). In the San Juan Basin, there is low potential for locatable minerals outside of uranium; therefore, this EA does not address other major locatable minerals such as gold and silver.

3.4.1.1.1 Uranium

The Grants uranium district, located along the southern margin of the San Juan Basin in Cibola, McKinley, Sandoval, and Bernalillo Counties as well as on Tribal lands, was once one of the largest producers of uranium in the country (EPA 2025a). Parts of the Nose Rock, Chaco Canyon Church Rock-Crownpoint, Smith Lake, and Ambrosia Lake subdistricts of the Grants mineral belt are within the boundary of the area withdrawn by PLO No. 7923. Currently, there are no producing uranium mines in the Grants uranium district; however, several mines are still undergoing decommissioning and reclamation (NMMMD 2025). Approximately 409 million pounds of uranium resources that were never mined remain in the Grants district, as identified by companies in the 1980s and in recent exploration (McLemore 2020).

No uranium production has occurred in New Mexico since 2002 (McLemore et al. 2016). Records indicate that uranium exploration has occurred in New Mexico as recently as 2017, but the locations of most recent exploration and interest are largely southeast and southwest of the area withdrawn by PLO No. 7923 (NMMMD 2025). Uranium mining is highly dependent on the price of uranium, and existing sources in other states and foreign countries can be profitably mined at a lower cost than the New Mexico deposits (EIA 2020). Within the area withdrawn by PLO No. 7923, approximately 2,665 acres of federal minerals are currently claimed under the 1847 General Mining Law, although the validity of those claims has not been examined. (**Map 2-2, Appendix D**).

No new applications for uranium extraction or exploration have been submitted to the FFO. There are 129 unpatented mining claims (including uranium and all other locatable minerals) encompassing approximately 2,665 acres within the area withdrawn by PLO No. 7923.

3.4.1.2 Environmental Consequences

3.4.1.2.1 Proposed Action (Alternative B)

Under Alternative B, the Secretary of the Interior would revoke PLO No. 7923, which withdrew approximately 338,690 acres of public lands from location and entry under the United States mining laws and from leasing under the mineral leasing laws, subject to valid existing rights, for a 20-year term. Alternative B would affect the entire approximately 10-mile withdrawal surrounding CCNHP.

A revocation or partial revocation of the existing withdrawal would open BLM lands for exploration under the U.S. mining laws, including the Mining Law of 1872. As defined in 43 CFR 3809, three different types of operations with different levels of analysis are identified. Plan-level operations are generally over 5-acres in size and are subject to NEPA and NHPA analysis. The regulations also allow for Casual Use and Notice-level operations, which are not subject to NEPA analysis, but which still require operators to

prevent unnecessary or undue degradation (43 CFR 3809.605). This includes compliance with “...Federal and State laws related to environmental protection and protection of cultural resources” (43 CFR 3809.5).

There has been no notification provided to the BLM that casual use activities are occurring. Casual use generally includes the collection of geochemical, rock, soil, or mineral specimens using hand tools, hand panning, and non-motorized sluicing. The use of metal detectors, gold spears, and other battery-operated devices for sensing the presence of minerals is allowed but the use of mechanized earth-moving equipment and truck-mounted drilling equipment is prohibited. Casual use does not include use of mechanized earth-moving equipment, truck-mounted drilling equipment, motorized vehicles in areas designated as closed to “off-road vehicles” as defined in 43 CFR 8340.0-5, chemicals, or explosives. It also does not include “occupancy” as defined in 43 CFR 3715.0-5 or operations in areas where cumulative effects of such activities would result in more than negligible disturbance.

Under the current regulations, new notice-level operations are limited to 5 acres or less and must not cause more than casual use in certain special status areas defined in 43 CFR 3809.11(c). New notice-level operations are limited to exploration activities, which does not include extraction of material for commercial use or sale (43 CFR 3809.5), and must not exceed other limitations on notice-level activities (43 CFR 3809.11). Under 43 CFR 3809.312, operators must notify FFO fifteen calendar days prior to conducting notice-level operations. The BLM assesses the notice of operations for completeness and whether the activities described in the notice would prevent unnecessary or undue degradation. If the notice is incomplete (43 CFR 3809.311) or other circumstances described in 43 CFR 3809.313 apply, BLM will inform the operator in writing of the deficiency and operations must not begin until the circumstance is resolved. Operators must also provide to BLM a financial guarantee for reclamation before beginning operations. If the proposed activities would not prevent unnecessary or undue degradation, BLM can determine that the operator may not conduct operations and will notify the operator.

Compared to notice-level operations, plan-level operations are subject to additional requirements (e.g., 43 CFR 3809.401) and a broader range of review (e.g., 43 CFR 3809.411).

Uranium

The proposed revocation would open federal lands to exploration and characterization of most uranium resources within the withdrawal area. There are 129 mining claims (this tally includes claims for uranium and all other locatable minerals) within the revocation area; however, it is unlikely that any of these claims would be developed in the short term after implementation of the Proposed Action. While the proposed revocation area has known deposits of uranium in the federal mineral estate, given the typical timeline required to locate and record a claim, acquire permits, and bring online a uranium development, it is safe to assume that no production of any uranium on claims that are not already located would be reasonably foreseeable within the 20-year period PLO No. 7923 would otherwise be in effect (assuming no extension) (**Map 2-5, Appendix D**). Any proposed uranium development would be subject to site-specific NEPA and other environmental review, as well as oversight by the Nuclear Regulatory Commission.

There are currently no uranium producers operating locally, and uranium production in the United States has been declining since 2014. At the end of 2021, only two uranium recovery operations in the United States were producing, and nine were on standby (EIA 2022). Other countries have more accessible, high-quality uranium deposits, allowing them to produce at a lower cost than the United States (EIA 2020). As a result, any increases in future demand are likely to be met by foreign sources and resumption of production at existing facilities currently on standby, rather than by the costly construction of new facilities. Because of these factors, the development of any uranium claims on the federal mineral estate within the proposed revocation area is unlikely within the next 20 years.

3.4.1.2.2 Partial Revocation (Alternative C)

Under Alternative C, the Secretary of the Interior would revoke the withdrawal of approximately 220,970 Acres of the 338,690 acres of public lands withdrawn by PLO No. 7923.

Uranium

Under the partial revocation, 20 of the 129 mining claims (including uranium and all other locatable minerals) would be still subject to a validity exam, as they fall within the 5-mile area that would remain withdrawn. (**Map 2-8, Appendix D**). Due to low demand, and the fact there are no known active proposals for uranium developments of federal minerals in the withdrawal area, the development of any uranium claims within the proposed partial revocation boundary is unlikely. Any proposed uranium development would be subject to site-specific NEPA and other environmental review, as well as oversight by the Nuclear Regulatory Commission.

3.4.2 Resource Issue 2: Leasable Minerals

How would the proposed revocation affect the availability of leasable mineral resources (coal and oil and gas) within the decision area?

3.4.2.1 Affected Environment

3.4.2.1.1 Oil and Gas

According to the 2025 RFDS which forecast development for the entire Farmington Field Office management area, future oil and gas activity in the region would be primarily horizontal drilling for oil in the Mancos/Gallup plays, the Mancos shale basin-centered gas subplay to the north near the Colorado border and the Mancos/Gallup Southern Rim horizontal oil subplay located to the south near Nageezi and Counselor, NM (Engler 2025). These subplays have seen the highest drilling and completion activity levels over the last 15 years. Vertical development of oil and gas within the region is expected to be limited to infill drilling at low rates (Engler 2025). Within the 10-mile withdrawal area, approximately 65 vertical or directional wells have been completed since the year 2000 along the north-northeast fringe of the 10-mile withdrawal, with the vast majority completed in the Fruitland coal (Engler 2025). No wells have been drilled or completed within 5 miles of CCNHP in that timeframe. For more information on the mineral potential in the withdrawal boundary, see the Mineral Resource Potential Bureau of Land Management Lands and Minerals Selected Chaco Area Mineral Withdrawal, San Juan and McKinley County, New Mexico report (BLM 2022a).

The Mancos/Gallup Southern Rim horizontal oil subplay is adjacent to the north-northeast boundary of the 10-mile Chaco withdrawal area. This area has seen high levels of development since approximately 2013, with 482 wells drilled and completed producing 78 million barrels of oil (MMBO) and 312 billion standard cubic feet (Bscf) of natural gas (Engler 2025). The main target interval for this subplay sits mainly outside of the 10-mile withdrawal area with some overlap. The Mancos and Gallup reservoir in this area consists of barrier bars/islands where coarser intervals follow the Cretaceous shoreline trend of the Western Interior Seaway (see Figure 6 in Engler et al. 2015). Moving south-southwest into the 10-mile Chaco withdrawal area, the Mancos/Gallup reservoir becomes more water saturated and begins shallowing onto the Chaco Slope, which has limited development into the withdrawal area as the reservoir quality decreases and eventually becomes non-existent. The 2025 RFDS does not predict a significant expansion of oil and gas activity within the majority of the existing 10-mile withdrawal area, if it is opened to leasing, due to geologic and production constraints on both vertical and horizontal development. Both the Fruitland coal and Mancos shale shallow to the south-southwest, and the Fruitland coal outcrops around the 5-mile area from CCNHP (see Figure 4 and 6 in BLM 2022a).

Within or partially within the area withdrawn by PLO No. 7923, there are 78 existing oil and gas leases encompassing approximately 94,500 acres of federal mineral estate; approximately 71,900 acres of those leases lie within the proposed withdrawal revocation area (**Map 2-3, Appendix D**). As of November 18, 2025, all 78 of these leases are held by production (meaning there is one or more economically producing well on the lease) so the lease can continue to produce and remains valid beyond its primary term.

Table 3-2, below, shows the development potential for the Mancos/Gallup Southern Rim horizontal oil subplay from the 2025 RFDS (Engler 2025), which overlaps with the “high” development potential assigned by the 2018 RFDS (BLM 2018) with the current lease status of each development potential rank. Areas outside of the Mancos/Gallup Southern Rim horizontal oil subplay and outside of “high” development potential area from the 2025 RFDS and 2018 RFDS, respectively, were not included as development targets as described above and in **Section 3.3**.

Table 3-2. Development Potential Rating and Lease Status of the Proposed Withdrawal Revocation Area

Development Potential Rating and Lease Status	Acres
Mancos/Gallup Southern Rim horizontal oil subplay	20,060
<i>Unleased</i>	3,280
<i>Leased—held by production</i>	16,780
<i>Leased—not held by production</i>	0
Negligible Development Potential	277,440
<i>Unleased</i>	224,230
<i>Leased—held by production</i>	53,210
<i>Leased—not held by production</i>	0
Statutorily Excluded	41,190
<i>Unleased</i>	40,080
<i>†Leased—held by production</i>	1,110
<i>Leased—not held by production</i>	0

Sources: BLM GIS, BLM 2018.

† This includes leases within wilderness areas that pre-date the designation.

*Acres are calculated using GIS and rounded to the nearest 10 acres. As a result, minor rounding errors may occur, and totals may not equal official acreages.

The development of oil and gas has been and continues to be a topic of interest for the local community. FFO will continue to engage with Tribes and Pueblos to better understand and address the full range of potential impacts of such development, particularly those that may fall outside conventional environmental assessment frameworks or standard BLM impact categories. As part of this effort, FFO is participating in the development of a Programmatic Agreement under section 106 of the NHPA. The agreement is intended to streamline consultation while enhancing cultural sensitivity, improving data transparency, and supporting cooperative stewardship with Tribes. These efforts reflect a broader commitment to ensuring that historic and cultural resources are meaningfully considered in land management decisions.

Navajo Allottee Mineral Owners

The following analysis incorporates by reference information from the EA for PLO No. 7923 (DOI-BLM-NM-F010-2022-0011 [BLM 2023]).

Beginning in the late nineteenth century under various authorities, Indian allottees applied for or were assigned patents of lands. While many of these land patents expressly reserved specific mineral commodities to the United States, many other patents failed to adequately address the topic of mineral rights. To alleviate confusion surrounding the mineral estates underlying those patents, the Mescal Settlement Agreement (MSA) was signed. Following the issuance of allotted supplemental mineral patents,

many allottees have leased minerals to oil and gas producers, coordinated through the Federal Indian Minerals Office (FIMO). FIMO was established by DOI to provide and improve services to individual Indian beneficiaries in the management of their oil and gas mineral resources.

3.4.2.1.2 Helium

Helium was trapped in the San Juan Basin in the same way that oil and natural gas were trapped (stratigraphically and structurally) but was likely created through radiogenic decay of uranium and thorium in granitic Precambrian basement rocks that underlie the study area (Broadhead 2005). Helium is limited due to tight constraints on conditions that create helium reservoirs (Engler 2025). After its creation, the helium migrated upwards into Paleozoic reservoir rocks along high-angle, strike-slip faults on the Four Corners Platform along the northwest edge of the San Juan Basin, where helium concentrations of up to 7.5% have been documented and production totals reached nearly 1 billion cubic feet (Broadhead 2005). The faults that the helium migrated along exist across much of the San Juan Basin, following the northwest-southeast trend of the paleo-shoreline from the Western Interior Seaway, and granitic basement rocks underlie the entire basin as well. However, no helium wells have been drilled off the Four Corners Platform in either the Central Basin or Chaco Slope, so it is unknown if commercial volumes of helium exist in Paleozoic strata off the structural high. No production has occurred within the decision area, and no proposals to test the helium reservoir exist at the time of writing. Triassic strata within the Basin may also contain commercial concentrations of helium, but no wells have been drilled to begin delineating fields or production potential. Helium production and exploration has slowed since the mid-2000s, but there has been renewed interest in the helium potential of the Four Corners Platform over the past several years as the global helium supply is low. Recently, Vision Energy has drilled six wells in the old Hogback Field and is awaiting a build-out of its facilities to process the gas. The nearest producing helium pool in the San Juan Basin, the North Tocito Dome (approximately 35 miles to the west of the withdrawn area), has averaged approximately 4.7 million standard cubic feet (mmscf) of helium over the last six years but is declining in production (Engler 2025). Based on burial depth of key strata and lack of producing or exploratory wells, it is unlikely that helium would be developed within the proposed revocation areas.

3.4.2.1.3 Coal

The area proposed for withdrawal revocation is intersected by parts of the Bisti Coal Field, Star Lake Coal Field, and Crownpoint Coal Field. There are no active mines in the withdrawal area. The nearest active coal mine is the El Segundo Mine located outside the withdrawal area, east of the town of Crownpoint. This operation is mining coal from the Cleary member of the Menefee Formation (Peabody Natural Resources Company 2019). The results of the coal unsuitability criteria conducted as part of the Farmington RMP (BLM 2003) found that in the area eventually withdrawn by PLO No. 7923, approximately 294,670 acres of federal minerals were suitable for coal leasing, 41,190 acres were unsuitable for leasing, and 2,830 acres were subject to an existing withdrawal (i.e., other than PLO No. 7923). However, absent a withdrawal, a coal lease could be issued; coal unsuitability criteria could be reapplied, and suitability results could change (**Map 2-1, Appendix D**).

In the area of proposed for withdrawal revocation, there are currently zero acres of issued federal coal leases. There were coal preference right lease applications within the withdrawal area that covered approximately 38,260 acres of federal mineral estate. The preference right lease applications are all closed, rejected, or transferred, and are no longer considered valid existing rights. Several federal coal leases that were issued, comprising approximately 7,740 acres within the withdrawal area, have since been closed or been relinquished or transferred; they are no longer considered valid existing rights.

The most recent detailed examination of past leases in the area was conducted as part of a Mineral Resource Report prepared prior to PLO No. 7923 (BLM 2022a). Demand for coal in the United States has been decreasing due to price competition from natural gas and changes to regulations of emissions

from coal power generation. Even if the Secretary were to revoke PLO No. 7923 in full, the BLM does not anticipate new coal operations would open in the proposed revocation area over the next 20 years.

3.4.2.2 Environmental Consequences

3.4.2.2.1 Proposed Action (Alternative B)

Under the Proposed Action, the Secretary of the Interior or appropriate Department of the Interior official would open approximately 338,690 acres of public land (including federal mineral estate) to leasing under the mineral leasing laws, and any subsequent leasing or development would be subject to current management practices under the 2003 BLM FFO RMP, or the terms of any applicable leases.

Oil and Gas

The proposed withdrawal revocation under Alternative B would re-open 3,280 acres of unleased Federal mineral estate that could reasonably be subject to leasing and subsequent development within the decision area in the Mancos/Gallup Southern Rim horizontal oil subplay, as well as 224,230 acres of negligible development potential (**Table 3-2**). The BLM predicts limited vertical and horizontal development within this unleased acreage to test the southern extent of the Mancos/Gallup oil subplay as water production increases, and to account for limited infill drilling of vertical Fruitland coal wells in areas near existing infrastructure. The BLM estimates that within the 3,280 acres of the Mancos/Gallup oil subplay that overlap with the 10-mile revocation area, 14 wells could be developed following Secretarial revocation of PLO No. 7923, in full: 4 horizontal Mancos wells with 2.5-mile lateral lengths and 10 vertical Fruitland coal wells. This assumes 800 acres of dedicated acreage per horizontal Mancos well and infill vertical Fruitland coal wells at 320-acre spacing. The Fruitland coal spacing is currently set at 160 acres, but low EURs for coal wells in the area (0.5 Bscf/well) (Engler 2025), low commodity price along with high transport cost, and lack of development within existing leased and/or unitized areas over the last 25 years all support a more limited development estimate for the Fruitland target.

The boundary of the area withdrawn by PLO No. 7923 and proposed for withdrawal revocation in full lies almost entirely outside of development targets identified in the 2025 RFDS; that is, the 2025 RFDS predicts little development within the withdrawal boundary, even absent a withdrawal. The oil subplay does not extend very far within the withdrawal area and what is present is largely already leased. For vertical development within the decision area, the Fruitland coalbed methane reservoir is the main target as evidenced by the vertical wells completed in the area since 2000 (Engler 2025). Two horizontal wells within the Mancos are currently producing within the 10-mile withdrawal area, but both have high water-oil ratios compared to wells further northeast. Recent development within the oil subplay has been focused north and northeast of the 20,060-acre area of the subplay that overlaps with the 10-mile decision area (**Table 3-2**).

As shown in **Table 3-2** above, much of the target area for development is already leased. Over the long term, the development of federal oil and gas in the withdrawal area under the Proposed Action is likely to be higher compared with the level of development within the area under the No Action Alternative, as the BLM would be able to offer and issue new leases. The best available estimate of projected oil and gas development is provided in the 2025 RFDS, which evaluated development potential irrespective of lease status or withdrawal status, and estimates 700 new horizontal oil and gas wells from within the Mancos/Gallup Southern Rim horizontal oil subplay (Engler 2025). As noted in **Table 3-2**, 20,060 acres of the oil subplay exist within the decision area, only 3,280 acres of which are currently unleased and would be affected by revocation of the withdrawal (**Map 2-6, Appendix D**).

The proposed withdrawal revocation would not affect existing leases, including the approximately 71,100 acres of existing federal oil and gas leases within the proposed revocation area (**Table 3-2**). The revocation would not apply to minerals owned by private, state, or Tribal entities, but may allow for

additional development of adjacent mineral ownerships via unitization and horizontal drilling implicating newly available federal leasable minerals. Existing leases not held by production could be developed, relinquished by the lessee, or expire if not developed within the lease term. Absent the withdrawal, any leases that expired or were relinquished in the future would be available for leasing again. As under the No Action Alternative, production from existing wells could continue, and additional wells could and would likely be drilled on existing leases.

Due to availability of adjacent Federal mineral estate that PLO No. 7923 made unavailable for leasing and subsequent development, following Secretarial revocation of PLO No. 7923, in full, and the possibility of new mineral leases, additional wells could be drilled that produce from other, non-Federal fluid mineral ownership or management types including Trust (Tribal, Individual Indian Allottee), private, and New Mexico State Land Office minerals. While Secretarial decision-making about PLO No. 7923 does not directly impact availability of fluid mineral under other ownerships for oil and gas development, the ability to lease large areas and unitize them for more structured development of these resources could promote additional drilling in the decision area. Due to uncertainties of individual lease availability for other ownership types along with the presence of unitized areas across much of the Mancos/Gallup horizontal oil subplay area that overlaps the decision area, the BLM is not able to estimate a well count for analysis in this EA.

Navajo Allottee Mineral Owners

The following analysis incorporates by reference information from the EA for PLO No. 7923 (BLM 2023).

To assess potential impacts to individual Indian allottees (IIA) from the Proposed Action, the analysis methodology looked at each allotment in the decision area and considered the land and leasing status of the allotment and of adjacent parcels (i.e., whether the land was withdrawn from oil and gas leasing). The goal was to qualitatively assess whether the Proposed Action (full revocation of the withdrawal) would influence whether a given allotment would be more or less likely to support a viable oil and gas lease.

In the PLO No. 7923 EA, allotments not sharing a boundary or corner with fluid minerals not proposed for withdrawal were assigned an unmodified score of Negligible Impact. Allotments with an active existing allotted lease or Mescal Lease were also assigned an unmodified score of Negligible Impact. Allotments such as these are not further analyzed for mitigating or aggravating factors. The remaining allotments were classified into four Future Allotted Lease Impact categories: negligible, low, medium, and high, correlating with and based upon the parcel's location in the four areas of development potential from the 2018 RFDS (BLM 2018). Classification of these areas is largely unchanged in the 2025 RFDS (Engler 2025); however, these classifications were modified by the mitigating presence of shared-boundary adjacent leases.

For this Proposed Action (revocation of PLO No. 7923 in whole or part), each of the 1,233 base allotments within or intersecting the withdrawal area boundary was analyzed with respect to its 2018 RFDS development potential, the character of its proximity to Federal fluid minerals that would become available for potential leasing under the Secretarial implementation of one of the Action Alternatives, the allotment's lease status, the allotment's lease sale nomination history or adjacency to Expressions of Interest (EOIs) within the last decade (the practical advent of horizontal drilling technology in the basin), and the allotment's adjacency to existing Federal, State, and allotted fluid mineral leases. In addition to the 1,233 base allotments *within* the proposed withdrawal revocation area, the BLM analyzed an additional 35 base allotments *adjacent* to the withdrawn Federal fluid minerals but exterior to the decision area because those allotments might be affected by that adjacency (e.g. where access is limited by terrain, where the development of oil and gas infrastructure was limited by the presence of the withdrawal, etc.). These 1,268 base allotments consist of 1,358 simple, geographic, and resource fractionated allotments (**Map 3-4, Appendix D**).

The result of that analysis (**Table 3-3**) indicates that 98 (just over eight percent) of the unleased 1,186 allotments analyzed may see a high or moderate increase in future lease viability due to conditions introduced by the proposed revocation of the withdrawal. An additional 173 unleased allotments (approximately 14.5 percent) may see low, but real, increases in future lease viability due to conditions attributable to the proposed withdrawal. Unleased Navajo allotments are displayed in **Map 3-6, Appendix D**. However, BLM acknowledges that the Navajo Nation and individual Indian allottees have submitted comments which assert that the economic impact of the withdrawal exceeds the BLM's estimates and that the number of allottees affected may exceed 22,000 individuals (Navajo Nation 2021).

The proposed revocation of the withdrawal is estimated to have negligible effect on the lease viability of the majority of allotments with respect to any augmentation of future lease viability by the proposed revocation. Specifically, the Proposed Action would have negligible effect on 915 unleased allotments (over 77 percent of unleased allotments) and negligible effect on a further 82 already-leased allotments for a total of 997 allotments with predicted negligible effect. These allotments were classified as negligible future lease impact for the following reasons: the parcel is not adjacent to the fluid minerals within the area proposed for withdrawal revocation, is isolated from existing adjacent leases and situated in areas with negligible development potential, is already actively leased, is a surface-only allotment with a Mescal Lease, or some combination of those factors.

In order to simplify the presentation of the data and focus on the predicted non-negligible effects, these parcels are not depicted in **Table 3-3** but all allotments are illustrated in **Map 3-5, Appendix D**.

Table 3-3. Potential Impacts from Proposed Action on Future Allotted Leases for Navajo Allotments

Allotted Impact Reason	Allotment Count within or Intersecting Analysis Boundary	Adjacent Allotment Count outside Analysis Boundary	Analyzed Allotment Count (Total)	Analyzed Allotment Count (Total Including Known Fractionation*)
IMPACTS TO FUTURE ALLOTTED LEASE LEVEL: Low				
Adjacent existing lease in high potential	3	2	5	6
Adjacent existing lease in medium potential	14	1	15	15
Isolated from adjacent lease in low potential	3	5	153	158
Total (Low)	165	8	173	179
IMPACTS TO FUTURE ALLOTTED LEASE LEVEL: Moderate				
Adjacent existing lease in high potential	6	0	6	7
Corner-Adjacent Existing Lease in Medium Potential, counter-mitigated by only Corner-Adjacency to Proposed Withdrawal	1	0	1	1
Adjacent Existing Lease in Medium Potential, aggravated by Allotted Lease Nomination and/or Corner/Boundary Adjacency to EOI	29	0	29	31
Isolated from adjacent Lease in Medium Potential	14	0	14	17
Isolated from Adjacent Lease in Low Potential, aggravated by Corner/Boundary Adjacency to EOI	7	0	7	7
Total (Moderate)	57	0	57	63

Allotted Impact Reason	Allotment Count within or Intersecting Analysis Boundary	Adjacent Allotment Count outside Analysis Boundary	Analyzed Allotment Count (Total)	Analyzed Allotment Count (Total Including Known Fractionation*)
<i>IMPACTS TO FUTURE ALLOTTED LEASE LEVEL: High</i>				
Corner-Adjacent Existing Lease in Medium Potential, aggravated by Allotted Lease Nomination and/or Corner/Boundary Adjacency to EOI	7	0	7	8
Corner-Adjacent Existing Lease in Medium Potential, counter-mitigated by only Corner-Adjacency to Proposed Withdrawal and aggravated by Allotted Lease Nomination	1	0	1	1
Corner-adjacent existing lease in negligible potential	2	0	2	2
Isolated from Adjacent Lease in High Potential, aggravated by Allotted Lease Nomination and/or Corner/Boundary Adjacency to EOI	2	0	2	2
Isolated from Adjacent Lease in Medium Potential, aggravated by Allotted Lease Nomination and/or Corner/Boundary Adjacency to EOI	28	1	29	30
Total (High)	40	1	41	43

Source: BLM 2023

*Geographic and resource fractionation only; does not account for simple heir fractionation

Coal

Over the short term, if the withdrawal is revoked, the BLM would regain discretion over issuance of new coal leases and the associated development and recovery of these resources. While the area proposed for revocation has known deposits of Federal coal, no data on existing conditions support the assumption that the development of any Federal coal deposits not already leased would be reasonably foreseeable within the short term. Existing Federal coal mines and leases in the surrounding area exist outside the area withdrawn by PLO No. 7923. Furthermore, there are only two active large-scale coal mines in the entirety of the Farmington District, the Navajo and El Segundo Mines – both are outside of the withdrawal boundary. In addition, non-Federal coal resources in the area are expected to be adequate to meet any local demand for coal. Therefore, the proposed revocation of the withdrawal would not significantly increase the potential for development of Federal coal resources (**Map 2-4, Appendix D**).

3.4.2.2.2 Partial Withdrawal Revocation (Alternative C)

Under the Alternative C, the Secretary of the Interior or appropriate Department of the Interior official would open approximately 220,970 acres of public land (including Federal mineral estate) to leasing under the mineral leasing laws, and any subsequent leasing or development would be subject to current management practices under the 2003 BLM FFO RMP, or the terms of any applicable leases.

Oil and Gas

The partial withdrawal revocation would re-open 3,280 acres of unleased Federal mineral estate that could reasonably be subject to leasing and subsequent development within the decision area in the Mancos/Gallup Southern Rim horizontal oil subplay, as well as 146,150 acres of negligible development potential (**Table 3-4**). As in Alternative B, the BLM predicts limited vertical and horizontal development

within this unleased acreage to test the southern extent of the Mancos/Gallup oil subplay as water production increases, and to account for limited infill drilling of vertical Fruitland coalbed methane wells in areas near existing infrastructure. The BLM estimates that 14 wells could be developed under Alternative C: 4 horizontal Mancos wells with 2.5-mile lateral lengths and 10 vertical Fruitland coal wells. This assumes 800 acres of dedicated acreage per horizontal Mancos well and infill vertical Fruitland coal wells at 320-acre spacing. As shown in **Table 3-4** below, the overlap between Alternative C and oil and gas development targets identified in the 2025 RFDS is the same as Alternative B. As described above under Alternative B, the 2025 RFDS predicts very little development within the withdrawal boundary, even absent a withdrawal. As in Alternative B, the oil subplay does not extend very far within the withdrawal area and what is present is largely already leased. For vertical development within the decision area, the Fruitland coalbed methane reservoir is the main target as evidenced by the vertical wells completed in the area since 2000 (Engler 2025).

The partial withdrawal revocation would not affect existing leases, including the approximately 69,920 acres of existing Federal oil and gas leases within the proposed partial withdrawal revocation area (i.e. revocation of the withdrawal on the area beyond an approximately 5-mile buffer around CCNHP) (**Table 3-4**). On the lands remaining withdrawn under Alternative C, production from existing wells could continue, and additional wells could be drilled on existing leases. Existing leases not held by production could be developed, relinquished by the lessee, or expire if not developed within the lease term; however, should the Secretary implement Alternative C, the lands beyond the approximately 5-mile buffer around CCNHP could subsequently be re-leased if existing leases are relinquished or expire.

Table 3-4. Development Potential and Lease Status of Lands within Alternative C

Development Potential Rating and Lease Status	Acres
Mancos/Gallup Southern Rim horizontal oil subplay	20,060
<i>Unleased</i>	3,280
<i>Leased—held by production</i>	16,780
<i>Leased—not held by production</i>	0
Negligible Development Potential	198,180
<i>Unleased</i>	146,150
<i>Leased—held by production</i>	52,030
<i>Leased—not held by production</i>	0
Statutorily Excluded	2,730
<i>Unleased</i>	1,620
† <i>Leased—held by production</i>	1,110
<i>Leased—not held by production</i>	0

Sources: BLM GIS, BLM 2018.

† This includes leases within wilderness areas that pre-date the designation.

*Acres are calculated using GIS and rounded to the nearest 10 acres. As a result, minor rounding errors may occur, and totals may not equal official acreages.

Navajo Allottee Mineral Owners

Because the estimated 14 wells on the new leases possible under Alternative C would occur in the area beyond the approximately 5-mile buffer around CCNHP, the land around CCNHP remaining withdrawn would not be expected to affect the lease viability of Navajo allottee mineral owners. Therefore, the predicted impact to IIA lease viability under Alternative C (Partial Withdrawal Revocation) would be the same as predicted under Alternative B.

Coal

Over the short term, the proposed revocation of PLO No. 7923, in part, to open the lands that lie beyond 5 miles from the CCNHP boundary would open these Federal lands to exploration and characterization of federal coal resources. However, the difference in acreage between a full revocation and a partial revocation of the withdrawal does not change the lack of infrastructure for coal development in the revocation area, and the economic forces in the Farmington District for coal (**Map 2-7, Appendix D**).

3.4.3 Resource Issue 3: Socioeconomics

How would future potential development of the mineral resources should the Secretary revoke PLO No. 7923, in whole or part affect local economy and government revenue?

A detailed Socioeconomic Analysis is provided in **Appendix F** and the Socioeconomics Technical Report (BLM, 2025e). It provides details for definitions of socioeconomic indicators, data sources, rationale for selecting data series, and data tables of the latest nation-wide datasets used to identify the current, changing, and comparative socioeconomic conditions of the study area. It also provides details for a Multi-Regional Input-Output Model developed to evaluate the specific and total economic impacts of the Proposed Action on the study area, a step-wise and reproducible methodology to carry out the Model, definitions of economic indicators, rationale for selecting data series, data sources, and calculations.

3.4.3.1 Affected Environment

The study area of this analysis is considered as the 10-mile withdrawal area which reaches four counties in the State of New Mexico, including San Juan County, Rio Arriba County, Sandoval County, and McKinley County.

The socioeconomic conditions of the study area are identified based on the following key socioeconomic indicators for the four counties, the State of New Mexico, and the United States (**Table 1, Table 2, Table 3, and Table 4, Appendix F**).

- Total population (numbers of people) (USCB, 2024)
- Median household incomes (\$) (USCB, 2024)
- Unemployment rates (%) (USCB, 2024)
- Population with high school or higher education (%) (USCB, 2024)
- Age structure: population under age 5 (%), population aged 5 to 64 (%), and population over age 64 (%) (USCB, 2024)
- Employment by 12 economic sectors (%) (USCB, 2024)
- Gross Domestic Product (GDP) by 12 economic sectors (\$) (BEA, 2024)
- Payments in Lieu of Taxes (PILT) (\$) (DOI, 2024)

For meaningful elaboration and consistent comparison, all the dollar values in this analysis are presented in the 2023 dollars, adjusted respectively with Consumer Price Index (CPI) (BLS, 2025) for median household incomes and PILT, and with GDP chained dollars for GDP by economic sectors.

The current, changing, and comparative socioeconomic conditions reveal the following characteristics of the study area.

- From 2016 to 2023, the United States, New Mexico, Rio Arriba County, and Sandoval County have had an increase in population (4.3%, 1.5%, 0.6%, and 9.7%, respectively) whereas San Juan County and McKinley County have had a decrease in population (-1.1% and -4.3%, respectively).
- From 2016 to 2023, the United States, New Mexico, and Sandoval County have had an increase in real GDP (18.4%, 18.6%, and 26.3% respectively) whereas San Juan County, Rio Arriba County, and McKinley County have had a decrease in real GDP (-8.9%, -4.9%, and -3.4% respectively).
- In 2023, except in Sandoval County (\$84,053), the other three counties (\$53,020 in San Juan County, \$53,901 in Rio Arriba County, and \$44,496 in McKinley) had a lower median household income level compared with the United States (\$78,538) and New Mexico (\$62,125).
- In 2023, both McKinley County (9.4%) and San Juan County (7.8%) had higher unemployment rates compared with the United States (5.2%) and New Mexico (6.0%).
- In 2023, for United States, New Mexico, and all four counties, the educational services, health care and social assistance sector (all greater than 23.4%) ranked as the highest sector of employment, and the wholesale trade and retail trade sector (all greater than 10.4%) ranked the second highest, among the 12 economic sectors.
- In 2023, for United States and Sandoval County, the finance, insurance, real estate, rental and leasing sector (21.0% and 24.0%, respectively) ranked as the highest sector of GDP among the 12 economic sectors; whereas it was instead the public administration and government sector in New Mexico, Rio Arriba County, and McKinley County (22.2%, 29.8%, and 41.3%, respectively), and the natural resources (forestry, fishing and hunting), agriculture and mining sector in San Juan County (23.2%) which ranked highest.

3.4.3.2 Environmental Consequences

An economic impact study examines the total economic impact of a final-demand change on a regional or local economy (BEA 2013). The accuracy of an economic impact study's results relies on the choice of the final-demand change, final-demand industry, and final-demand region (BEA 2013). For this analysis, the following considerations are made:

- Final-demand change consists of the reasonably foreseeable change in sales of two economic commodities (crude oil and natural gas) under the Proposed Action (Alternative B) and under the Partial Revocation Alternative (Alternative C) compared with the No Action Alternative (Alternative A).
- Final-demand industry is considered as the oil and gas drilling and extraction industry.
- Final-demand region is considered San Juan County, Rio Arriba County, Sandoval County, and McKinley County.

A Multi-Regional Input-Output Model is developed utilizing the IMPLAN platform. San Juan County is considered as the primary impact region and the other three counties as the broader impact regions with the rationale that the oil and gas wells for potential development on leases that could only be issued by the BLM following Secretarial revocation of PLO No. 7923, in whole or part are located in San Juan County as identified by this EA. IMPLAN is an economic impact model that regionalizes the data from the U.S. Input-Output Accounts published by the U.S. Bureau of Economics (BEA 2009). The IMPLAN modeling system includes a Social Accounting Matrices (SAM) system. A SAM is a matrix presentation of certain aspects of the national accounts and of other parts of the economy—such as employment by type of worker or income distributions—using the structural linkages provided by the Input-Output Accounts (BEA 2009).

The scale of each industry in the economy can be represented by its employment and total output. The structure of each industry in the Input-Output Accounts can be represented by eight indicators (BEA 2009; BEA 2013) in three equations as follows.

- Employee compensation + Proprietor income = Labor income
- Employee compensation + Proprietor income + Other property income + Tax on production and imports net of subsidies = Value added
- Value added + Intermediate input = Total output

The economic impact of industrial activities on a regional or local economy can be represented by four types of effects corresponding to each of the above eight indicators connected by the equation as follows.

- Direct effect + Indirect effect + Induced effect = Total economic effect

To evaluate the economic impacts of the revocation of PLO No. 7923, in whole or part, the following steps are carried out for the economic modeling process:

- (1) The direct effect of combined intermediate input and employee compensation (oil and natural gas well drilling and completion costs for new leases) and direct effect of output (oil and natural gas production sale values for new leases) reasonably foreseeable under the proposed revocation are estimated;
- (2) The baseline input-output dataset (2022 year data 2023 dollars, 546 industries) for the three main relevant economic industries (20 - Oil and gas extraction, 35 - Drilling oil and gas wells, 36 - Support activities for oil and gas operations, assuming PLO No. 7923 remains in place) are integrated as an oil and gas development industry via the IMPLAN platform, and dataset customization under this new industry structure for the four counties are carried out;
- (3) The baseline ratio of intermediate input versus employee compensation of the integrated oil and gas development industry in San Juan County is utilized to estimate the direct effect of intermediate input and direct effect of employee compensation, respectively, resulting from the BLM being able to issue new leases following the proposed revocation; and
- (4) The estimates for direct effect of intermediate input, direct effect of employee compensation, and direct effect of output resulting from the BLM being able to issue new leases following that proposed revocation are utilized to estimate the four types of economic effects (direct, indirect, induced, and total effects) in regard to employment, labor income, value added, and total output on the four counties resulting from new leasing that could follow the proposed revocation.

3.4.3.2.1 No Action Alternative (Alternative A)

The economic baseline scale and structure of the current integrated oil and gas development industry in San Juan County is presented in Table 8 in **Appendix F**. It includes an employment of 3,915 workers, value added of \$2,182,721,884 (that is 61.1% of total output), and intermediate input of \$1,391,422,642 (that is 38.4% of total output), which sums up to total output of \$3,574,144,525. The value added is composed of employee compensation of \$388,418,594 (that is 10.9% of total output), proprietor income of \$10,531,501 (that is 0.3% of total output), other property income of \$1,373,893,472 (that is 38.4% of total output), and tax on production and imports net of subsidies of \$409,878,316 (that is 11.5% of total output). Employee compensation and proprietor income sum up to labor income of \$398,950,096 (that is 11.2% of total output).

3.4.3.2.2 Proposed Action (Alternative B)

This EA identifies 4 horizontal wells and 10 vertical wells for potential development associated with new leases that the BLM could issue following Secretarial revocation of PLO No. 7923 in full in the next 20 years, which leads to 0.2 horizontal wells and 0.5 vertical wells for development on average annually. Drilling and completion costs per horizontal well and per vertical well are estimated as \$9,030,000 and \$3,225,000 in 2023 dollars, respectively, based on the estimates (\$7,000,000 and \$2,500,000 in 2015 dollars) for the Permian Basin (EIA 2016) which shares a similar geographical location and geological desert features as the Mancos/Gallup Southern Rim subplay in the withdrawal area, adjusted by CPI (BLS 2025). Consequently, the average annual cost for all wells amounts to \$3,418,500 (2023 dollars) (Table 5 in **Appendix F**).

This EA estimates the total oil production and the total natural gas production per horizontal well as 274,209 barrels (bbl) and 570,047 thousand cubic feet (mcf), respectively, and the total natural gas production per vertical well as 451,812 mcf. Given the estimates of 0.2 horizontal wells and 0.5 vertical wells for development on average annually in Step (1), this results in the estimates of average annual oil production and natural gas production for all wells as 54,842 bbl and 339,915 mcf, respectively. The latest Annual Energy Outlook (EIA 2025) projects the average crude oil prices and average natural gas prices from 2026 through 2045 for the Lower 48 States as 85.46 \$/bbl and 3.34 \$/mcf, respectively. Consequently, the average annual oil and natural gas sales value amounts to \$5,822,113 (2023 dollars) (Table 6 in **Appendix F**).

Therefore, the overall data input for the Multi-Regional Input-Output Model are direct effect of intermediate input of \$2,666,430 annually, direct effect of employee compensation of \$752,070 annually, and direct effect of total output of \$5,822,113 annually (Table 9 in **Appendix F**). Development on new leases that could be issued by the BLM following Secretarial revocation of the entire 10-mile withdrawal is likely to generate the following annual total economic impacts and annual specific economic impacts benefiting the four counties in New Mexico:

- For San Juan County, Rio Arriba County, Sandoval County, and McKinley County together, a total effect of increased employment of 14.14 workers, increased labor income of \$1,133,206, increased value added of \$3,963,152, and increased total output of \$7,423,893 (Table 10 in **Appendix F**); and
- For San Juan County, a direct effect of increased employment of 7.05 workers, an indirect effect of increased employment of 3.44 workers, and an induced effect of increased employment of 3.52 workers; a direct effect of increased labor income (that is, the sum of employee compensation and proprietor income) of \$766,178, an indirect effect of increased labor income of \$204,033, and an induced effect of increased labor income of \$156,549; a direct effect of increased value added of \$3,155,683, an indirect effect of increased value added of \$483,897, and an induced effect of increased value added of \$313,376; and, a direct effect of increased total output of \$5,822,113, an indirect effect of increased total output of \$1,024,035, and an induced effect of increased total output of \$553,962 (Table 11 in **Appendix F**).

In summary, the majority of these positive economic impacts that could follow development on new leases is expected for San Juan County and contributes to improving the socioeconomic condition of San Juan County which has had a decrease in population and a decrease in real GDP from 2016 to 2023, and a lower median household income level and a higher unemployment rate in 2023 compared with the United States and New Mexico. Moreover, when applying the current minimum Federal mineral royalty rate of 12.5%, the oil and natural gas sales value annually contributes \$727,764 of minimum Federal mineral royalties for Federal and state government revenue (BLM 2025e: Table 7).

3.4.3.2.3 Partial Revocation Alternative (Alternative C)

This EA identifies 4 horizontal wells and 10 vertical wells for potential development on new leases that the BLM could issue for land that lies beyond 5 miles from the CCNHP boundary following Secretarial revocation of PLO No. 7923, in part, in the next 20 years, which leads to the same level of socioeconomic impacts as that of the Proposed Action (Alternative B).

3.4.4 Resource Issue 4: Quality of Life

How would the proposed revocation of PLO No. 7923 in whole or part affect the quality of life of the American people, including non-economic factors such as cultural resources and Native American religious concerns?

3.4.4.1 Affected Environment

Quality of life or human well-being such as health, safety, and happiness is supported by economic prosperity, financial security, benefits from available and accessible natural resources, enjoyment from multiple and continuous ecosystem services, and social and cultural connections. It is closely related to how human society adapts to socioeconomic change and ecosystem change.

Ecosystem change reflects the changes of ecosystem functions which generate ecosystem services (MEA 2005). Ecosystem services are the benefits from ecosystems to human societies and they can be categorized as four general types (MEA 2005) including provisioning ecosystem services (such as food, fresh water, wood and fiber, and fuel), regulating ecosystem services (such as flood control, disease control, and water purification), cultural ecosystem services (such as aesthetic, spiritual, educational, recreational experience), and supporting ecosystem services (such as nutrient cycling, soil formation, and primary production). In the long term, the dynamics of ecosystem functions and the abundance and continuity of ecosystem services can be affected both positively and negatively by management actions on the landscape and in regard to natural resources.

From a broad perspective, ecosystem services are the foundation for the availability and accessibility of natural resources, and natural resources are the foundation for economic production system. Therefore, ecosystem services, natural resources, economic prosperity, and financial security all contribute to the quality of life of human society on various landscapes of the ecosystem.

The study area of this analysis is considered as four counties in the State of New Mexico, including San Juan County, Rio Arriba County, Sandoval County, and McKinley County. The socioeconomic changes from 2016 to 2023 in the study area reveal the following characteristics (Table 1, Table 2, and Table 3 in **Appendix F**).

- The United States, New Mexico, Rio Arriba County, and Sandoval County have had an increase in population (4.3%, 1.5%, 0.6%, and 9.7%, respectively) whereas San Juan County and McKinley County have had a decrease in population (-1.1% and -4.3%, respectively).
- The United States, New Mexico, and Sandoval County have had an increase in real GDP (18.4%, 18.6%, and 26.3% respectively) whereas San Juan County, Rio Arriba County, and McKinley County have had a decrease in real GDP (-8.9%, -4.9%, and -3.4% respectively).
- All four counties (3.1%, 4.7%, 4.6%, and 2.6% for San Juan County, Rio Arriba County, Sandoval County, and McKinley County, respectively) have had a larger increase of percentage of population over age 64 compared with that of the United States (2.3%).
- Except San Juan County (-2.1%), the other three counties (-4.4%, -3.1%, and -6.3% for Rio Arriba County, Sandoval County, and McKinley County, respectively) have had a larger decrease of unemployment rate compared with that of the United States (-2.2%) and New Mexico (-2.5%).

The most evident ecosystem goods and services within the withdrawal area include cultural and spiritual uses, rangelands, recreation, and water supply which have been analyzed in AIB-1, AIB-2, Section 1.5.3, AIB-13, AIB-14, and **Section 3.4.7**, respectively. These resources and their associated human benefits represent key areas which may interact with the quality of life of the American people.

3.4.4.1.1 Cultural Resources

The existing withdrawal established additional tools for the BLM to effectively manage the landscape surrounding CCNHP. Between approximately AD 850 and 1150, the Chacoan culture flourished, with Chaco Canyon serving as the social and religious center for much of the region. During the AD 900s and 1000s, communities in and around the San Juan Basin constructed structures in the style of those in Chaco Canyon. These sites are referred to as Chacoan Outliers. Much of the Chaco Canyon area is protected as the Chaco Culture National Historical Park (CCNHP), established in 1980. The park and six other nearby sites were designated as a UNESCO World Heritage Site in 1987. Some of the most sensitive and architecturally significant features are contained in the CCNHP. Those lands and resources benefit from the highest levels of legal protection due to the protection established by Congress.

There are various cultural resources in the landscape surrounding the CCNHP, many of which receive protection from other BLM designations (see the Cultural Resources portion of **Section 3.4.4.2.2** below). This landscape/setting itself has not been documented as a historic property. The BLM would consider effects to the landscape when determining whether to approve future leasing or development, should PLO No. 7923 be revoked in full or part.

3.4.4.1.2 Native American Religious Concerns

The San Juan Basin contains important places of cultural and religious significance for regional Tribes. It is out of concern for these important places that some, though not all, regional Tribes support limiting development within the withdrawal area. During past consultations regarding public land management, some tribal members and officials have expressed a general frustration with the inability of existing laws, regulations, and policy to fully meet the needs of tribal communities. Policy makers in the previous administration established broad protective efforts such as PLO No. 7923; however, even without a withdrawal the BLM considers potential impacts on known archaeological and historic sites and areas of traditional cultural and religious significance when proposing to issue fluid mineral leases or approve applications for permit to drill stages for oil and gas development or plan-level development of mining operations. Even without a withdrawal, the BLM uses existing management prescriptions, including no surface occupancy and controlled surface use designations, to help ensure the avoidance of adverse effects on historic properties and sites of traditional cultural or religious significance. Existing laws, regulations, and policies are applicable for avoiding, reducing, or mitigating any potential adverse effect even if the Secretary elects to revoke PLO No. 7923, in whole or part, to allow for BLM discretion over energy development, as discussed below.

In general, the Pueblo tribes view the Chacoan landscape as an integrated cultural system spanning northwest New Mexico and beyond, not a collection of isolated sites. They see its network of roads and interconnected communities as reflective of a society that thrived through regional connections rather than isolation. Pueblo tribes have expressed concern that revoking the withdrawal could further compromise what remains of the system. Maintaining this landscape is considered important by the Pueblo tribes for its cultural and historical integrity.

Additionally, the development of the Programmatic Agreement described in **Section 3.4.2.1.1** is intended to streamline consultation while enhancing cultural sensitivity, improving data transparency, and supporting cooperative stewardship with Tribes.

3.4.4.2 Environmental Consequences

3.4.4.2.1 No Action Alternative (Alternative A)

The stated purpose of PLO No. 7923 is to protect 338,690 acres of public lands and the greater connected landscape having a rich Puebloan, Tribal Nation, and cultural legacy from impacts associated with potential oil and gas development and locatable mineral exploration and mining. The cultural legacy whose protection PLO No. 7923 is intended to protect is focused on the people affiliated with Chaco Canyon between approximately AD 850 and 1150. During that period, monumental architecture connected communities to each other and to a landscape of sacred places. Today, this landscape is still considered sacred by regional Tribes and holds places of significant importance to these people.

PLO No. 7923 stated that it protected positive cultural values that support the quality of life in this region; however, the BLM anticipates that the following relevant socioeconomic trends in the study area, which generally do not positively contribute to the quality of life, are likely to continue without structural change in economic development, employment opportunity, and infrastructure improvement in the area.

- Decreased real GDP in San Juan County, Rio Arriba County, and McKinley County compared with increased real GDP in the United States, New Mexico, and Sandoval County.
- Smaller decrease of unemployment rate in San Juan County compared with larger decrease of unemployment rate in the United States and New Mexico.
- Decreased population in San Juan County and McKinley County compared with increased population in the United States, New Mexico, Rio Arriba County, and Sandoval County.
- Larger increase of percentage of population over age 64 in all four counties compared with smaller increase of percentage of population over age 64 in the United States.

3.4.4.2.2 Proposed Action (Alternative B)

- While the number of wells projected on new federal leases if the Secretary revokes PLO No. 7923 in full under the Proposed Action is modest (i.e., 14) relative to the 37,300 wells on existing leases, this development would activate a key economic sector in San Juan County, lead to economic activities in the other three counties, generate the following economic impacts for all four counties together (Table 10 in **Appendix F**), increase government revenue, and likely result in greater economic prosperity, higher financial security, further economic investment and improved infrastructure, and consequently contribute to the quality of life in the region. An increased employment of 14.14 workers annually over 20 years
- An increased labor income of \$1,133,206 annually over 20 years
- An increased value added of \$3,963,152 annually over 20 years
- An increased total output of \$7,423,893 annually over 20 years
- An increased minimum Federal mineral royalties of \$727,764 annually over 20 years

The oil and gas wells which are reasonably foreseeable (**Section 3.3**) on new leases that could be offered and subsequently issued by the BLM under Alternative B, would also be forecast to be developed under Alternative C because those 14 wells would be within the outer approximately-5-mile radius surrounding CCNHP that would be re-opened under Alternative C. Relative to the No Action alternative, either the Proposed Action (Alternative B) or the Partial Revocation Alternative (Alternative C) is expected to have the following effects on the quality of life of the American people, including:

- An incremental increase in access to products extracted or produced from federal lands, such as refined oil and gas products created from raw material within the withdrawal revocation area, owing to the RFD of 14 oil and natural gas wells which would otherwise have been precluded.
- Little to no effect on way of life and culture or education and knowledge (including research opportunities) because the future potential for leasing of oil and gas resources and development

of oil and gas wells on these leases would largely be confined to already-developed areas on the outer edges of the withdrawal area and the future potential development of minerals subject to location and entry under the U.S. mining laws (including uranium) is proportionately small (2,665 acres claimed out of 965,670 acres within the revocation area) and interest in exploring for these resources is not expected to be particularly intense, as demonstrated by the existence of a relatively dispersed total of only 129 active mining claims.

- Little to no effect on visitor experience. This aspect would be largely unaffected, or only incrementally affected, by future potential development because dispersed recreation is already affected by existing development on existing oil and gas leases, while concentrated recreation activities (i.e., CCNHP) would remain protected by current designations prohibiting development on National Park lands. Additionally, CCNHP is over 7 miles from the reasonably foreseeable oil and gas development to the northeast; therefore, even changes to visual resources from such development, including from the additional 14 anticipated wells on the estimated new leases that could be issued under the Proposed Action would not likely be experienced by Park visitors.
- No effect on public services including provisioning of emergency services, public utilities, transportation, education, social services, etc.
- May affect passive use of ecosystems, which may include evaluations of stewardship, existence values, and bequest values, especially because of the importance of the Chacoan landscape to the people who value this cultural resource in ways that are intangible and/or difficult to quantify. These aspects are further addressed below.

While the number of wells projected on new federal leases if the withdrawal is fully revoked is modest (i.e., 14 wells) relative to the 37,300 wells on existing leases, even small additions can influence localized conditions, particularly in this region with cultural sensitivity. The Greater Chaco Landscape is of profound cultural and spiritual importance to numerous Tribes and Pueblos in the region. Additional development could result in direct and indirect impacts to known and unknown cultural sites, disrupt the natural sights and sounds of the area, and interfere with traditional ceremonial practices. The BLM connects with relevant communities through ongoing community outreach to develop design features or other mitigation measures for authorized projects to reduce and mitigate such potential impacts. Additionally, the development of the Programmatic Agreement described in **Section 3.4.2.1.1** is intended to streamline consultation while enhancing cultural sensitivity, improving data transparency, and supporting cooperative stewardship with Tribes.

Cultural Resources

Surface disturbance associated with reasonably foreseeable actions would have the potential to impact cultural resources. Such impacts may include, but are not limited to, loss of or damage to cultural resources or contextual information. The magnitude of impacts associated with reasonably foreseeable actions would generally depend upon the location of the reasonably foreseeable development relative to the location of cultural resources and the degree to which the setting has already been affected. Effects from reasonably foreseeable development on federal lands or with a federal nexus would require separate National Historic Preservation Act of 1966 (NHPA) processes to avoid, minimize, and/or mitigate effects on cultural resources.

The FFO has conducted a records review of the New Mexico Cultural Resource Information System (NMCRIIS), and internal BLM data sources to identify known historic properties, traditional cultural properties (TCPs), sacred sites, and traditional use areas within the Area of Potential Effects (existing withdrawal area).

Within the FFO, one hundred twenty-five Great House and Great House Outlier structures are known to exist. Many of these are within the CCNHP boundaries while others are on lands managed by the

Bureau of Land Management (BLM), the Navajo Nation (Tribal Trust and Indian Allotted), the Ute Mountain Ute Tribe, the National Park Service, the State of New Mexico, and private individuals. On BLM managed surface there are twenty-one outliers with nineteen having additional protections by being within an Area of Critical Environmental Concern (ACEC), a Chaco Culture Archaeological Protection Site (CCAPS), or a UNESCO World Heritage Site (WHS) (**Table 3-5**). Of these twenty-one, nine are present within the Proposed Action area (Alternative B) with five located within the partial revocation area (Alternative C).

Table 3-5. Chacoan Outliers on BLM Managed Lands within Farmington Field Office

Outlier Name	Alt B Potential Impacts	Alt C Potential Impacts	ACEC Name	CCAPS Name	WHS Name	Oil and Gas Development Potential
Andrews	No	No	Andrews Ranch	Andrews Ranch	--	Negligible
Bee Burrow	No	No	Bee Burrow	Bee Burrow	--	Negligible
Bis'saani East	Yes	No	Bis sa'ani	Bisa'ani	--	Medium
Bis'saani West	Yes	No	Bis sa'ani	Bisa'ani	--	Medium
Casa Abajo	Yes	Yes	Indian Creek	Indian Creek	--	Negligible
Casa Cielo	Yes	Yes	Indian Creek	Indian Creek	--	Negligible
Casamero	No	No	Casamero Community	Casamero	Casamero	Negligible
Church Rock	No	No	Church Rock Outlier	--	--	Negligible
Halfway House	No	No	Halfway House	Halfway House	Halfway House	High
Kin Klizhin, Upper	Yes	No	Upper Kin Klizhin	Upper Kin Klizhin	--	Negligible
Kin Nizhoni, Lower	No	No	Kin Nizhoni	Kin Nizhoni	Kin Nizhoni	Negligible
Kin Nizhoni, Upper	No	No	Kin Nizhoni	Kin Nizhoni	Kin Nizhoni	Negligible
LA 72343	Yes	No	--	--	--	Negligible
La Plata	No	No	--	--	--	Medium
Morris 4I	No	No	Morris 4I	Morris 4I	--	Medium
Pierre's El Faro	Yes	Yes	Pierre's Site	Pierre's Site	Pierre's Site	Medium
Pierre's House A	Yes	Yes	Pierre's Site	Pierre's Site	Pierre's Site	Medium
Pierre's House B/C	Yes	Yes	Pierre's Site	Pierre's Site	Pierre's Site	Medium
Reservoir Ruin	No	No	Chacra Mesa Complex	--	--	Negligible
Toh-La-Kai	No	No	Toh-la-kai	Toh-La-Kai	--	Negligible
Twin Angels	No	No	Twin Angels	Twin Angels	Twin Angels	Medium

Bolded text highlights differences between Alternative B and C.

In addition to the Chacoan Outliers, other components of the Chacoan landscape are also within the FFO. A prominent feature would be the various “roads” that often emanate from Great Houses. Roads may extend only a short distance from a structure but also may serve to connect individual structures and features of the landscape across the San Juan Basin. On BLM managed lands, road segments often fall within, and receive protections from the ACEC, CCAPS, or WHS associated with the outliers. Three ACECs specific to Chacoan Roads (Ah-Shi-Sle-pah Road, Crownpoint Steps and Herradura, and North Road) are wholly or partially within the existing 10-mile mineral withdrawal area though portions of the North Road ACEC and all the Ah-Shi-Sle-Pah Road ACEC are out of the 5-mile area.

NMCRIS serves as a repository for historic property tabular and geospatial data within the area of the existing mineral withdrawal. As of November 2025, approximately 7,552 known historic properties from all cultural and temporal affiliations are present within the 10-mile withdrawal area and 4,710 within the 5-mile withdrawal area. These numbers only represent a fraction of the sites that exist as large portions of the region have not been formally inventoried.

The FFO used various ethnographic sources, including the 2022 Navajo study on the Chaco region (Ethnographic Report Concerning the Proposed 10-Mile Buffer Zone Encompassing 12 Navajo Chapters around Chaco Culture National Historical Park, Martin), to assess impacts on cultural resources and traditional uses. BLM's dataset lists at least 145 Traditional Cultural Properties (TCPs) in the 10-mile withdrawal area and 46 in the 5-mile area. These figures are minimum estimates, as past ethnographic studies were not comprehensive and BLM lacks access to all available data.

As described in **Section 3.4.2.5**, a revocation or partial revocation of the existing withdrawal would open BLM lands for exploration under the U.S. mining laws, including the Mining Law of 1872. As defined in 43 CFR 3809, three different types of operations with different levels of analysis are identified.

Plan-level operations are generally over 5-acres in size and are subject to NEPA and NHPA analysis. The regulations also allow for operations (Casual Use and Notice-level operations) which are not always inventoried for cultural resources or analyzed under NEPA and NHPA, but which still require operators to prevent unnecessary or undue degradation (43 CFR 3809.605). This includes compliance with “...Federal and State laws related to environmental protection and protection of cultural resources” (43 CFR 3809.5). It is further stated under 43 CFR 3809.420(b)(8) that:

- (i) Operators shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archaeological site, structure, building or object on Federal lands.
- (ii) Operators shall immediately bring to the attention of the authorized officer any cultural and/or paleontological resources that might be altered or destroyed on Federal lands by his/her operations, and shall leave such discovery intact until told to proceed by the authorized officer. The authorized officer shall evaluate the discoveries brought to his/her attention, take action to protect or remove the resource, and allow operations to proceed within 10 working days after notification to the authorized officer of such discovery.
- (iii) The Federal Government shall have the responsibility and bear the cost of investigations and salvage of cultural and paleontology values discovered after a plan of operations has been approved, or where a plan is not involved.

There is no notification provided to the BLM that casual use activities are occurring. Casual use generally includes the collection of geochemical, rock, soil, or mineral specimens using hand tools, hand panning, and non-motorized sluicing. The use of metal detectors, gold spears, and other battery-operated devices for sensing the presence of minerals is allowed but the use of mechanized earth-moving equipment and

truck-mounted drilling equipment is prohibited. Casual use does not include use of mechanized earth-moving equipment, truck-mounted drilling equipment, motorized vehicles in areas designated as closed to “off-road vehicles” as defined in 43 CFR 8340.0-5, chemicals, or explosives. It also does not include “occupancy” as defined in 43 CFR 3715.0-5 or operations in areas where effects of such activities would result in more than negligible disturbance.

Under the current regulations, new notice-level operations are limited to 5 acres or less and must not cause more than casual use in certain special status areas defined in 43 CFR 3809.11(c). New notice-level operations are limited to exploration activities, which does not include extraction of material for commercial use or sale (43 CFR 3809.5), and must not exceed other limitations on notice-level activities (43 CFR 3809.11). Under 43 CFR 3809.312, operators must notify FFO fifteen calendar days prior to conducting notice-level operations. The BLM assesses the notice of operations for completeness and whether the activities described in the notice would prevent unnecessary or undue degradation. If the notice is incomplete (43 CFR 3809.311) or other circumstances described in 43 CFR 3809.313 apply, BLM will inform the operator in writing of the deficiency and operations must not begin until the circumstance is resolved. Operators must also provide to BLM a financial guarantee for reclamation before beginning operations. If the proposed activities would not prevent unnecessary or undue degradation, BLM can determine that the operator may not conduct operations and will notify the operator. Should the Secretary elect to revoke PLO No. 7923, in whole or part, in the event that a notice properly served to BLM proposes to disturb an area within the boundary of the area previously withdrawn by PLO No. 7923, which has not been sufficiently inventoried for cultural resources, the FFO commits as a Design Feature (**Section 2.4**) to conducting the necessary inventory and recordation of cultural resources within the Notice review period (43 CFR 3809.311) before operations are allowed to begin.

Should the existing withdrawal area be fully or partially revoked, current laws and regulations would remain in place. Any potential future development (such as oil and gas development) the BLM proposed to approve would be subject to site-specific analysis under NEPA and pursuant to 54 U.S.C 300101, et seq., commonly known as the NHPA as amended, and 54 U.S.C 306108, commonly known as section 106 of the NHPA. At that time, if the BLM determines that an undertaking would result in an adverse effect that cannot be avoided or minimized, the BLM would develop mitigation in consultation with affected Tribes, the New Mexico State Historic Preservation Officer (NM SHPO), and the Advisory Council on Historic Preservation (ACHP), as appropriate. Based on the BLM’s experience with past oil and gas undertakings, including technological innovations such as directional drilling which reduces infrastructure footprint, the BLM does not expect it likely that future potential oil and gas development (including the 73 No Action and 14 Alternative B wells) would result in Adverse Effects to historic properties. Directional drilling can reduce the need to install access roads or additional development pads. Additional changes in industry, such as the establishment or satellite drilling pads, can also reduce potential development footprints. With the applicability of existing laws and the commitments made by the FFO regarding inventory and avoidance of historic properties associated with notice-level mining operations (**Section 2.4**), the BLM is documenting a determination of No Adverse Effect to Historic Properties from Secretarial revocation of PLO No. 7923, in whole or part.

Native American Religious Concerns

Surface disturbance associated with reasonably foreseeable oil and gas operations has the potential to adversely impact TCPs and religious properties should the Secretary revoke PLO No. 7923, in whole or part. The magnitude of impacts associated with reasonably foreseeable actions would generally depend upon the location of reasonably foreseeable development relative to areas of concern to Native American tribes. Development on federal lands or with a federal nexus would undergo Government-to-Government and NHPA consultation with regional Tribes, as necessary. In addition, the BLM could apply COAs to protect such properties, which would serve to avoid or minimize impacts. Through tribal consultation,

additional mitigation may be developed to avoid or minimize audible and visual impacts on sensitive TCPs. The processing of development applications is a separate undertaking that would be analyzed through the Section 106 process at that time, as directed in law, regulation, and policy.

Consultation was conducted in association with the initial withdrawal and is ongoing for the current proposed action. Though there were differences regarding the extent of the withdrawal boundary expressed at those meetings, all Tribes expressed concern for the appropriate management of cultural resources and places containing religious and cultural significance. Tribes have also indicated that potential impacts to the cultural landscape could include fragmentation and industrialization of setting, disruption of cultural use, interference with prayer, pilgrimage, visitation, and traditional practices, and degradation of the integrity of relationships between places.

Based on the FFO's records review, there are at least 145 TCPs wholly or partially within the proposed action area (Alternative B) and 99 within the partial revocation area (Alternative C), where 46 would remain within the withdrawn lands. These should be considered minimum numbers as past ethnographic efforts have not been exhaustive, and BLM does not have access to all known ethnographic data. The known TCPs represent a variety of locations including resource procurement areas, offering locations, springs, places of significant events, places of clan origins, and places noted in ceremonial prayers and songs. Such places are often connected with each other across the landscape and are integrated within daily life and practices of Tribal communities. The BLM will work with tribal partners at the development stage to provide additional opportunities for consultation. Alternative A would retain all 145 known TCPs at least partially within the existing withdrawal boundary. Alternative B would remove the current withdrawal boundary and increase the potential for adverse effects in the areas with development potential though existing laws, regulations, and policy would remain in place with the ability to avoid, reduce, or mitigate such effects.

3.4.4.2.3 Partial Revocation (Alternative C)

As noted above, the oil and gas wells which are reasonably foreseeable (**Section 3.3**) on new leases that could be offered and subsequently issued by the BLM under Alternative B would also be forecast to be developed under Alternative C as those 14 wells would be in the approximately-5-mile radius surrounding CCNHP that would re-open under Alternative C. Therefore, Secretarial selection of Alternative C would largely result in the same impacts to quality of life as Alternative B, with the following considerations:

- The same incremental increase (as with Alternative B) in access to products extracted or produced from federal lands, such as refined oil and gas products created from raw material within the withdrawal revocation area, owing to the RFD of 14 oil and natural gas wells on new leases, which would otherwise have been precluded.
- To the extent possible, an even smaller effect than Alternative B; in any case, little to no effect on way of life and culture or education and knowledge (including research opportunities) because the future potential development of oil and gas wells on new leases would largely be confined to already-developed areas on the outer edges of the withdrawal area and the future potential development of minerals subject to location and entry under the U.S. mining laws (including uranium) is proportionately small (less than 2,665 acres claimed out of 965,670 acres within the revocation area) and interest in exploring for these resources is not expected to be particularly intense, as demonstrated by the existence of a relatively dispersed total of only 20 active mining claims within Alternative C.
- Little to no effect on visitor experience. This aspect would be largely unaffected, or only incrementally affected, by future potential development because dispersed recreation is already affected by existing development on existing oil and gas leases, while concentrated recreation activities (i.e., at CCNHP) would remain protected by current designations prohibiting

development on National Park lands. Additionally, CCNHP is over 7 miles from the reasonably foreseeable oil and gas development to the northeast; therefore, changes to visual resources from such development would not likely be experienced by Park visitors.

- No effect on public services including provisioning of emergency services, public utilities, transportation, education, social services, etc.
- May affect passive use of ecosystems, which may include evaluations of stewardship, existence values, and bequest values, especially because of the importance of the Chacoan landscape to the people who value this cultural resource, in ways that are intangible and/or difficult to quantify. Alternative C would be expected to have a smaller effect than Alternative B due to the smaller area affected (220,970 acres vs 338,690 acres).
- Alternative C would retain 4 of the 9 Chacoan Outliers on BLM lands at least partially within the withdrawal boundary. Similar to Alternative B, existing laws, regulations, and policy would remain in place to protect the 5 Chacoan Outliers known to exist at least partially in the revocation area.
- Alternative C would retain 46 of the known 145 TCPs at least partially within the withdrawal boundary. Similar to Alternative B, existing laws, regulations, and policy would remain in place to protect the 99 TCPs known to exist at least partially within the revocation area.

3.4.5 Resource Issue 5: Air Quality

How would future potential development within the decision area if the Secretary revokes PLO No. 7923 in whole or part affect air quality (particularly National Ambient Air Quality Standards and volatile organic compounds) in the analysis area?

3.4.5.1 Affected Environment

Air quality within any geographic region is generally influenced by the quantity of pollutants released within and upwind of an area and can be highly dependent upon their chemical and physical properties. The area's terrain and weather (e.g., wind speed and direction, temperature, air pressure, rainfall, cloud cover) also influence how pollutants accumulate, form, or disperse in the local and regional environments. An area's air quality designation (i.e., compliance with applicable health-based standards) is determined by monitoring ground level concentrations of regulated pollutants by agencies with authority for determining compliance with the applicable standards.

The spatial scope for analyzing the effects on air quality is limited to the areas adjacent to where PLO No. 7923 would be revoked. Temporally, regardless of alternative selected –i.e., Alternative A, B, or C –the BLM expects the potential future development rate to be low, i.e., less than one oil and gas well per year, with only limited mining. This low development rate would also limit the spatial constraint, as too few wells are likely to be developed simultaneously to contribute to broader regional impacts.

The Clean Air Act (CAA), 42 U.S.C. §§ 7401-7671(q), requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Primary standards provide public health protection, and secondary standards provide for public welfare, including protection against degraded visibility and damage to animals, crops, vegetation, and buildings (EPA 2024a). The primary NAAQS are required to be set at a level to protect public health, including the health of at-risk populations, with an adequate margin of safety in order to prevent known or anticipated health-related effects from polluted air. The BLM does not issue air quality/emissions permits. Such permits are only required for stationary emissions sources, such as compressors, tanks, or dehydrators, which operators obtain separately through either the EPA or the New Mexico Environmental Department, depending on which entity has permitting jurisdiction. Mobile sources, such as drilling rigs and other vehicle-mounted equipment, are not subject to this stationary source permitting framework. While the BLM does not issue air quality/emissions permits, it can authorize activities that can affect air quality.

Historical trends and current conditions for air quality in the analysis area can be found in BLM New Mexico's Air Resources Technical Report (BLM 2024d). The Technical Report is hereby incorporated by reference to describe the Affected Environment. Highlights include the following:

- Section 2 provides background information on the regulatory entities and authorities, as well as laws and regulations applicable to types and sources of pollutants commonly associated with land management activities. This section also provides a description of New Mexico's air shed designations (Class I and II).
- Sections 3 and 5 provide background information on the regulated air pollutants (criteria and hazardous), the available monitoring trends and risk data, and standards-based design values for any applicable state and federal air quality standard. The available data shows that air quality in the analysis area is currently in compliance with all applicable standards. The latest EPA data (EPA 2025b) also shows that all of San Juan County is in compliance with the National Ambient Air Quality Standards (NAAQS).
- Section 4 provides a summary of the latest available National Emissions Inventory (NEI) data, which provides a complete county level accounting for all emissions by source type and pollutant (criteria and hazardous) within the San Juan Basin (which includes the analysis area). This data provides additional context for the analysis presented below.
- Section 8 provides background information on Air Quality Related Values (AQRVs) and any associated trends that are monitored at New Mexico's Class I areas, the closest of which is the San Pedro Parks Wilderness (approximately 70 km east of the analysis area). The available data indicates that visibility at San Pedro is improving on both the clearest and most impacted days. Deposition data is not available at San Pedro, but regional monitoring trends suggest deposition in the western U.S. as a whole is declining marginally.

3.4.5.2 Alternative A – No Action

Under the No Action Alternative, the Secretary would not revoke PLO No. 7923 in whole or part to re-open the lands to location and entry under the U.S. mining laws and to mineral leasing. The projected additional wells under the full revocation alternative would not be drilled, because no new leases could be offered. Although no new emissions resulting from development of federal oil and gas on potential new leases would occur under the No Action Alternative, **Section 3.2** of this EA states that an additional 73 wells could be developed (infill development) on existing leases present within the current 10-mile Chaco withdrawal boundary (BLM 2025a). The potential for infill development does not depend upon any Secretarial decision-making regarding PLO No. 7923. Therefore, current models account for the effects of the No Action Alternative as part of the baseline of projected impacts (i.e., the Affected Environment). The emissions projected to occur from drilling of 14 wells on new leases that might be offered and subsequently issued following Secretarial implementation of the Proposed Action are evaluated below in comparison to this baseline reflecting the environmental trends in the FFO area (see regional modeling study discussion and materials that are incorporated by reference).

3.4.5.3 Alternative B – Proposed Action – Full Revocation of Withdrawal

Secretarial revocation of PLO No. 7923, in full, would not, itself, result in any impacts to air quality from development of leasable minerals; rather, any potential effects on air quality from development of leasable minerals on a new lease would occur at such time that any subsequently issued lease is developed. The Proposed Action does not authorize or guarantee the number of leases issued or wells analyzed herein. If the Secretary does revoke PLO No. 7923 in full, and the BLM does lease the minerals, drilling of wells on a new lease would not be permitted until the BLM approves an APD. As is true for any mineral lease, existing or new, any APD received would be subject to site-specific NEPA and other environmental review. However, development assumptions have been made in this EA to better inform the decision

maker and the public of potential impacts on air resources if the lands withdrawn under PLO No. 7923 are re-opened to mineral leasing and to location and entry under the U.S. mining laws. The focus of this discussion is on oil, gas and other leasable minerals, as interest in minerals subject to location and entry under the U.S. mining laws (notably uranium) is less in the withdrawn area.

As stated above, under the Proposed Action, the Secretary would revoke PLO No. 7923, that withdrew lands within 10 miles of the boundary of CCHNP. The FFO considered multiple factors when estimating reasonably foreseeable development within the decision area assuming revocation in full of this PLO (**Section 3.3**) to provide assumptions that were used to inform the air resources analysis. Specifically, the BLM's RFD for the decision area (BLM 2025a) contemplates the development of 10 new Fruitland coal bed methane (CBM) wells and 4 new Mancos oil wells on new leases over the next 20 years, should the Secretary revoke PLO No. 7923, in full, and the lands are opened to oil and gas leasing. The CBM wells would be developed as single wells (1 well per pad) and either be vertical or directionally drilled, while the oil wells would likely be paired up (2 wells per pad) and horizontally drilled. We note that all this development is projected to occur within the 5-to-10-mile zone, which means the BLM does not expect any difference between the action alternatives regarding mineral leasing. To provide for the potential mineral yields on a per well basis, the BLM relied on its internal oil and gas production tool. The production tool uses recent development data from the IHS Markit Enerdeq database (commercial source) to estimate ultimate recovery (EUR) and the associated production decline over the life of a well. The single-well production estimates for both well types (i.e., horizontal oil wells in the Mancos Southern Rim subplay, and vertical CBM wells in the Fruitland outcrop) were obtained by intersecting existing wells within the target formations nearest to the withdrawal boundaries. Although the individual intersects provide a reliable characterization of the production potentials for the RFD wells (for the purposes of analysis), we note that this is by no means a guarantee of future production results. The results from the production tool provide a EUR of approximately 451,812 Mcf of gas and 0 bbls of oil per Fruitland well, and 570,047 Mcf of gas and 274,209 bbls of oil per Mancos well over the life of the wells (assumed 20 years).

The FFO has also identified 129 existing mining claims, some of which may be associated with potential uranium mining. Most of these claims (109) occur within the outer 5-mile buffer (i.e., that land which both Alternative B and C would revoke the withdrawal and re-open the land to mineral entry); it is presently unclear whether these claims would be economically viable to mine. However, wherever the withdrawal is revoked, surface disturbance may be authorized following the 43 CFR 3800 regulations without the BLM having to determine the validity of the claim(s).

During any oil and gas well development, there can be emissions of criteria air pollutants (CAPs) and hazardous air pollutants (HAPs) from earth-moving equipment, vehicle traffic, drilling, and completion activities. Fugitive dust can increase with additional vehicle traffic on unpaved roads and from wind erosion in areas of soil disturbance. These emissions are generally short-term in duration during the construction, drilling, and completion phases, which can last approximately 30 to 60 days. During well production and operations, there can be continuous longer-term emissions from separators, condensate storage tanks, flares or combustors, and daily tailpipe and fugitive dust emissions from traffic. Some sources that are affected by production volumes (e.g., tanks, traffic from site visits) can see reduced emissions over time with declining production. For the purposes of this analysis, the production phase is assumed to be 20 years of continuous operations.

Emissions estimates for the 14 RFD oil and gas wells that could be developed on new leases that the BLM could issue following Secretarial revocation of PLO No. 7923 were obtained from the BLM's Lease Sale Emissions Tool (hereafter referred to as the "Emissions Tool"). The Emissions Tool was developed using the EPA Compilation of Air Pollutant Emissions Factors (AP-42), EPA Motor Vehicle Emission Simulator, EPA Exhaust and Crankcase Emission Factors for Non-road Engine Modeling – Compression-Ignition, and

other sources of factors to build up typical emissions profiles associated with the development of geographically diverse wells of various mineral types and formations. The Emissions Tool also leverages the indirect GHG estimation methods used within the 2023 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2024a) (Annual GHG Report), which has been incorporated by reference. Whereas this information provides an estimate of emissions based on typical development occurring in New Mexico, actual emissions from the development of any given well on a new lease may differ. **Table 3-6** summarizes the maximum annual and total RFD emissions for each well type that were obtained from the Emissions Tool. The maximum annual emissions assume a single well pad of each type (CBM – 1 well, and Mancos oil – 2 wells) for a total of three wells being developed simultaneously over a 20-year projection period. In general, the distribution of development was assumed to be uniform over the projection period. **Table 3-6** shows the summarized emissions estimates for each well type, both individually and for the annual maximums, as provided for by the revocation RFD and the analysis assumptions.

For reasons discussed in **Section 3.4.1.2**, the potential for uranium mine emissions has been deemed not reasonably foreseeable; therefore, the BLM is not providing any emissions estimate for any associated mining activities.

Table 3-6. Future Potential Fluid Mineral RFD Emissions (Revocation in Full)

Future Potential Development	Emissions (tons per year)						
	PM ₁₀	PM _{2.5}	VOC	NO _x	CO	SO _x	HAPs
Fruitland CBM - Single-well Construction	3.066	0.471	0.32	2.487	0.948	0	0.016
Fruitland CBM - Single-well Production	1.40	0.23	5.14	1.39	2.33	0.00	0.36
Mancos Oil - Single-well Construction	9.45	1.48	1.07	14.5	3.69	0	0.02
Mancos Oil - Single-well Production	4.35	0.56	12.19	2.54	5.75	0.00	0.02
RFD Max Year - Construction	25.03	3.9	2.78	33.97	9.28	0	0.07
RFD Max Year - Production	31.36	4.53	100.17	24.08	46.31	0.01	3.66
2020 NEI Emissions (San Juan County)	8,669	3,078	51,789	32,327	50,149	2,996	4,285
Max Proposed Action percent compared to San Juan County	0.36%	0.15%	0.19%	0.011%	0.09%	0.00%	0.09%

Source: BLM (2024d). NEI data pulled September 13, 2024.

To estimate air resource impacts from the potential future development as projected under the RFD, the BLM is relying on two regional modeling studies that were conducted to analyze both CAP and HAP emissions from oil and gas operations in the intermountain west. The studies utilized the Comprehensive Air Quality Model with Extensions (CAMx) and EPA's 2016 v2 modeling platform (future year 2032) to analyze oil and gas emissions growth based on projections derived from the U.S. Energy Information Administration's (EIA) Annual Energy Outlook (AEO) report (EIA 2023). Several AEO scenarios were used to allocate development and production for the various basins within the intermountain west based on both historical patterns and input from individual fluid mineral specialists and petroleum engineers with firsthand knowledge of the areas. The full reports for these studies are available as the BLM Western US Photochemical Air Quality Modeling for 2032 (BLM and Ramboll 2024) and BLM Cumulative Hazardous Air Pollutants Modeling – Final Report (BLM and Ramboll 2023) and are hereby incorporated by reference to account for any potential impacts from the oil and gas emissions outlined above as projected from the 14 new wells on new leases under the action alternatives as anticipated by the RFD. Below, **Figure 3-1** illustrates the distribution of projected emissions growth (NO_x for example) adjacent to the northern border of the CCNHP, and the rest of the San Juan basin at large, as contemplated by the Regional Modeling Study. **Table 3-7** presents the emissions from the 5 grid cells to the north and north-east of CCNHP that would represent the emissions projected to occur under the RFD, as well as the rest of the San Juan County emissions.

Table 3-7. Modeled New Federal Oil and Gas Emissions in San Juan County (tons per year)

Type	PM ₁₀	PM _{2.5}	CO	NO _x	VOC	SO ₂	HAPs
County Total	1.38E+02	1.33E+02	9.43E+03	3.45E+03	2.07E+04	3.48E+01	2.27E+02
Grid Cell Ranges	0.000 - 9.081E+00	0.000 - 9.081E+00	3.461E+0 - 7.51E+02	1.957E+0 - 2.026E+02	3.271E+0 - 1.704E+03	0.000 - 1.088E+00	0.000 - 2.78E+01

Modeled HAPs are Benzene, Toluene, Ethylbenzene, Xylene, n-Hexane, and Formaldehyde.

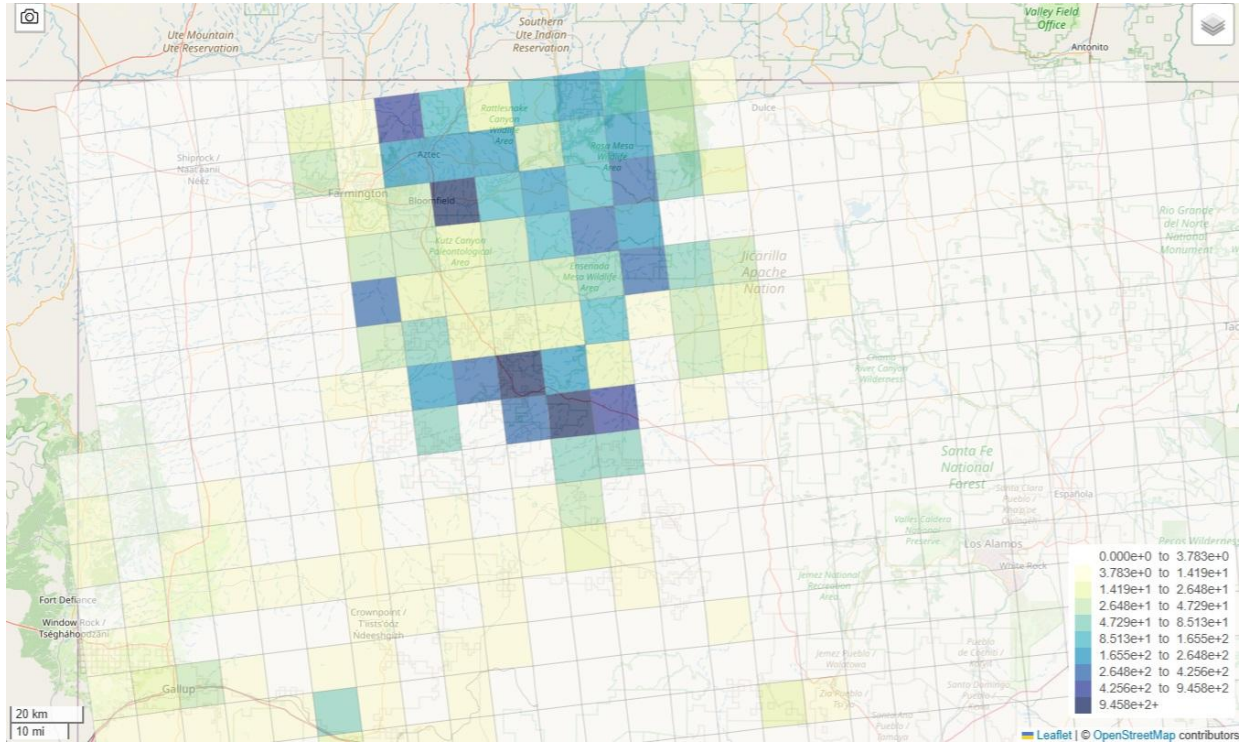
**Figure 3-1. San Juan Basin Federal Oil and Gas Emissions (NO_x)**

Table 3-8 below shows the maximum modeled results as contributions from the various model source groups tracked by the regional model. Note that the maximums can come from any cell, and do not represent any single cell or more accurately any single location. All of the NAAQS are being maintained.

Table 3-8. Maximum Model Concentrations of NAAQS Pollutants (Standard) in San Juan County

Source Group	PM ₁₀ (24hr)	PM _{2.5} (24hr)	PM _{2.5} (annual)	CO (1hr)	CO (8hr)	NO ₂ (1hr)	NO ₂ (annual)	O ₃ (8hr)	SO ₂ (1hr)	SO ₂ (3hr)
Cumulative	2.86E+01	8.58E+00	4.07E+00	1.69E+00	6.08E-01	6.00E+01	2.39E+01	6.27E+01	3.76E+00	3.14E+00
New Mexico Total	5.92E-01	3.58E-01	2.04E-01	—	—	1.23E+01	2.90E+00	1.24E+00	6.80E-02	6.22E-02
Farmington	5.54E-01	3.54E-01	2.04E-01	—	—	1.23E+01	2.90E+00	1.13E+00	6.80E-02	6.21E-02
Rest of New Mexico	4.77E-02	1.17E-02	8.52E-04	—	—	2.48E-03	3.13E-04	1.86E-01	4.92E-04	6.26E-04
Other Study States	1.56E-01	1.48E-01	9.01E-02	—	—	2.69E+00	1.47E+00	5.00E-01	2.23E-02	4.16E-02
Rest of 12km Grid	5.52E-05	5.70E-05	2.56E-05	—	—	3.42E-04	1.33E-03	2.86E-03	1.95E-06	8.72E-07

Units: All PM (ug/m3), CO (ppm), NO₂ & O₃ (ppb), SO₂ 1-hr (ppb), SO₂ 3-hr (ppm). Maximum value in any cell.

In general, the emissions from the regional model are more than the RFD estimates save for the particulate matter emissions. The RFD estimates for particulate matter are likely high due to the general nature of the Emissions Tool and a lack of project specific parameters available for input. The overwhelming majority of particulate matter emissions come from common earth disturbing activities, such that providing adequate controls for fugitive dust should alleviate any potential for significant impacts. For most of the emissions, the gridded data is more than adequate to account for the simultaneous development of the two well pads that make up the maximum year emissions. The level of development contemplated by the RFD over the geographically and temporally dispersed projection period is not likely to significantly impact air resources in the near-field or on a regional basis (based on BLM's previous experience with APD analyses). Further, the model contains grid cells with emissions closer to those contemplated by the RFD (about 2/3) and predicts no exceedance impacts with respect to the NAAQS. In fact, the model results predict particulate matter concentrations that are no more than 10% of the 24-hour PM_{10} standard on a cumulative basis in San Juan County. For the FFO source apportionment group, the NAAQS contribution drops to 0.37%. More information on other relevant modeling studies that describe potential impacts within the analysis area are available in the BLM New Mexico's Air Resources Technical Report (BLM 2024d), which has been incorporated by reference.

As previously stated, the BLM has incorporated a cumulative hazardous air pollutant study to address regional concerns for oil and gas development. Bright lines² 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 CAA framework akin to the NAAQS. Rather, values or ranges of values published by EPA (e.g., AirToxScreen [National Air Toxics Assessment] or 40 C.F.R. 300.430 [Remedial Investigation/Feasibility Study]) were used to provide useful context for risk estimates associated with the cumulative oil and gas HAPs study.

Cancer inhalation risk was calculated for three of the six HAPs—benzene, ethylbenzene, and formaldehyde—by multiplying the annual modeled concentration by the cancer unit risk estimate shown in **Table 3-9**. The other modeled HAPs—toluene, xylenes, and n-hexane—had a cancer risk estimate of zero. Total cancer risk was estimated by summing the individual cancer risks for benzene, ethylbenzene, and formaldehyde. As described in the Cumulative HAPs Final Report (BLM and Ramboll 2023), while no explicit risk thresholds are available, EPA uses 1 in 1 million and 100 in 1 million risks for context (EPA 2019a).

Table 3-9. Cancer Unit Risk Estimates (EPA 2021)

HAP	Cancer Unit Risk Estimate (1/[mg/m ³])
Benzene	0.0000078
Toluene	0
Ethylbenzene	0.0000025
Xylenes	0
n-Hexane	0
Formaldehyde	0.000013

The most conservative procedure for estimating carcinogenic risk is to assume constant exposure based on a 70-year lifetime exposure. However, it is a common and accepted risk assessment procedure to refine the assumed duration of exposure based upon geographic unit-specific sociological information. EPA exposure assessment guidance states that risk assessments may require that adjusted air concentrations

² A "bright line" in risk characterization would refer to a threshold value that separates acceptable and unacceptable levels of risk and would be regarded as a clear and unambiguous limit used to determine whether a particular level of exposure to a hazardous substance is safe or not.

be used to represent continuous exposure (EPA 2019a). The adjusted air concentration may be estimated by the following equation:

$$Conc_{ADJ} = Conc_{AIR} \times ET \times \frac{1 \text{ day}}{24 \text{ hours}} \times EF \times ED / AT$$

Where:

ConcADJ = adjusted concentration of contaminant in air (mg/m³ or µg/m³)

ConcAIR = Concentration of contaminant in air (mg/m³ or µg/m³)

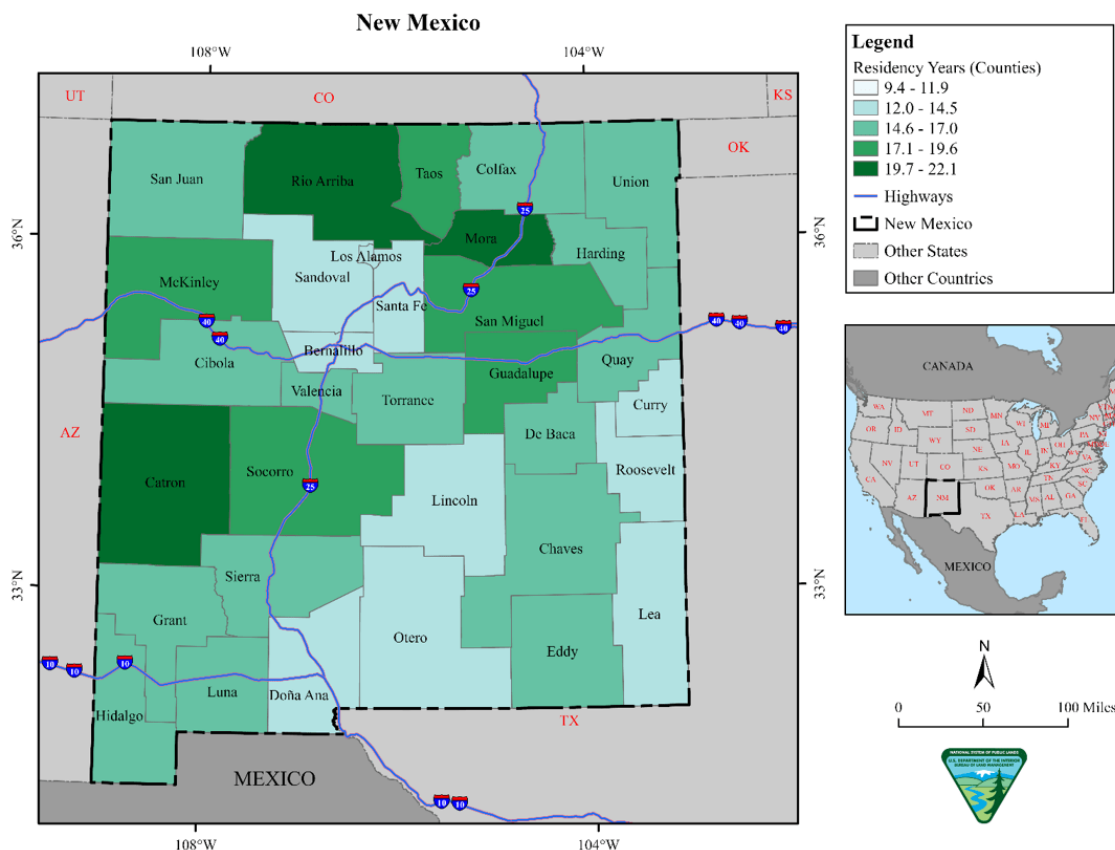
ET = Exposure time (hours/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

AT = Averaging time (days)

Because cancer risk is based on a 70-year lifetime exposure, the BLM refined the cancer risk assessments to present both the upper range of risk based on a 70-year exposure and an adjusted risk based on the average household residency rates for each county in the modeling domain. Time factors for exposure calculations (from the equation above) used in this study include: 1) Exposure time (ET) is assumed to be 24 hours/day, and 2) exposure frequency (EF) is assumed to be 365 days/year. Mathematically, when using the time factors cited above, exposure duration reduces to county residency in years divided by 70 years to yield a simple ratio representing exposure duration (sometimes called the exposure adjustment factor). Adjusted risk can be computed by multiplying the upper range of risk (represented by the assumption of constant exposure of an air concentration of a carcinogenic compound over the 70-year lifetime exposure) by the exposure adjustment factor. **Figure 3-2** shows the average householder residency periods for New Mexico (BLM 2025d).



A reference concentration for chronic inhalation (RfC) is defined by EPA as the threshold to assess noncancer health effects. RfC values for the HAPs included in this study are shown in **Table 3-10**. Hazard quotients (HQ) were calculated for each HAP by dividing the modeled HAP concentration by its RfC. An HQ value of 1 or less signifies a low likelihood of noncancerous health issues resulting from exposure, while an HQ value exceeding 1 only indicates that there is a potential for adverse effects but does not predict the statistical likelihood of them occurring.

Chronic noncancer hazards from multiple HAPs were assessed by summing individual HAP HQs to derive a hazard index (HI). An HI equal to or less than 1 suggests no expected non-cancer-related health issues from exposure. To demonstrate that a pollutant has a significant chronic hazard, it is necessary to establish that the chronic HI exceeds 1 and that at least 10,000 people are exposed to the pollutant.

As with the projected emissions estimates of criteria air pollutants, the estimates of HAP emissions from projected oil and gas development were based on the best available information at the time of study development. Sources of uncertainty, which may either overestimate or underestimate HAP emissions that contribute to potential health risk, include: 1) uncertainty in the estimation of emissions, 2) uncertainty in the spatial allocation of emissions from sources that have not yet been developed, and 3) uncertainty in the timing of emission sources.

Table 3-10. Cancer Unit Risk Estimates (EPA 2021)

HAP	Non-Carcinogenic Health-Based Chronic Threshold Concentration (mg/m³)
Benzene	0.03
Toluene	5.0
Ethylbenzene	0.26
Xylenes	0.1
n-Hexane	0.7
Formaldehyde	0.0098

The emissions presented herein represent a snapshot of estimated emissions for circa 2032 based on the methodology described in 2032 BLM Regional Air Modeling Study (BLM and Ramboll 2024). Actual rates of development over time may differ based on market conditions, changes in technology, or a variety of other factors that could result in a greater or lesser amount of oil and gas development than is represented here. Conversely, the BLM may overestimate emissions because emissions from wells are assumed to occur at a steady rate, while actual emissions would decline as production decreases over time.

The estimates of health risks are based on the current state of knowledge, and the cumulative oil and gas HAPs study followed well established practices for estimating emissions, simulating the transport and fate of these emissions, and estimating public health impacts. However, there is uncertainty associated with the processes of risk assessment. Sources of uncertainty, which may either overestimate or underestimate risk, include: 1) extrapolation of toxicity data in animals to humans (e.g., in the estimation of the cancer unit risk factors), 2) uncertainty in the estimation of emissions (discussed above), 3) uncertainty in the air dispersion models, and 4) uncertainty in the exposure estimates.

This uncertainty stems from the lack of data in many areas, which necessitates the use of assumptions. Such assumptions are consistent with current scientific knowledge and state-of-the-practice for both air modeling and risk assessment procedures but are often designed to be conservative on the side of health protection in order to avoid underestimation of public health risks. Examples include: 1) use of a simplifying assumption that a person will be exposed to the exact same air concentration of specific hazardous

compounds each year for the assumed period of exposure (70 years or less), 2) estimated duration of exposure is either based upon the simplifying assumption of a person residing at the same location for 70 years or use of sociological information to derive average length of residency, 3) simplified exposure duration calculations associated with this study do not take into account more refined exposure adjustments such as number of hours per day a person would be in their home as opposed to being away (e.g., place of employment) or the average number of days per year a person would be at their residence, and 4) the simulated air concentrations from this study represent outdoor concentrations and do not account for outdoor/indoor air exchange rates, which would attenuate the concentration of a person indoors by a certain amount depending upon air exchange rates, thus this study assumes exposure to the full annual air concentration (dose).

Due to the uncertainties described above, the risk estimates in this EA should not be interpreted as reflecting actual rates of disease in the exposed population, but rather as estimates of potential risk, based on current knowledge and a number of assumptions. However, a consistent approach to risk assessment is useful to compare different sources and different substances to characterize potential public health issues that may result from the impacts from emission and transport of HAPs resulting from oil and gas operations. Additionally, since locations and geographic distributions of emissions from emission sources yet to be developed within specific basins are not known in actuality, risk estimates should largely be used to characterize the range of conditions that could be realized (if full estimated oil and gas development were to occur) across an entire basin airshed as opposed to any specific location within that airshed.

The maximum modeled oil and gas HAP concentrations and carcinogenic risk for any grid cell in San Juan County (not a single grid cell) are shown in **Table 3-11** and **Table 3-12**. Additionally, **Table 3-13** shows the results from the chronic hazard quotient and summed hazard index findings. The maximum risks associated with either metric is below the levels of concern established by EPA.

Table 3-11. Maximum Regional Model HAP Concentrations in San Juan County (ug/m³)

Source Group	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde
Existing Federal	5.170e-2	1.680e-2	3.710e-3	1.450e-2	2.070e-1	9.690e-1
New Federal	4.730e-2	2.720e-2	5.670e-3	1.300e-2	1.630e-1	1.760e-1
Cumulative	1.007e-1	4.888e-2	9.649e-3	2.698e-2	2.950e-1	1.557e+0

Table 3-12. Maximum Regional Model Carcinogenic Risks in San Juan County (unitless)

Source Group	Benzene	Ethylbenzene	Formaldehyde	Total Risk	Adjusted Risk	Total Incidence
Existing Federal	1.290e-6	4.030e-8	1.550e-5	1.670e-5	3.698e-6	3.698
New Federal	1.180e-6	6.150e-8	2.800e-6	4.020e-6	8.901e-7	0.890
Cumulative	2.505e-6	1.046e-7	2.487e-5	2.748e-5	6.085e-6	6.085

Table 3-13. Maximum Regional Model Hazard Quotients in San Juan County (unitless)

Source Group	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	Formaldehyde	Hazard Index
Existing Federal	5.500e-3	1.270e-5	5.370e-5	6.310e-4	1.040e-3	1.210e-1	1.270e-1
New Federal	5.040e-3	2.050e-5	8.200e-5	5.650e-4	8.180e-4	2.200e-2	2.840e-2
Cumulative	1.073e-2	3.689e-5	1.396e-4	1.170e-3	1.483e-3	1.946e-1	2.079e-1

More information on HAPs in the FFO is available in section 5 of BLM New Mexico's Air Resources Technical Report (BLM 2024d), which has been incorporated by reference.

Due to modeling limitations, the regional model also assessed AQRV impacts from projected oil and gas development which is expected to occur under the No Action alternative and includes development which may occur on new mineral leases should the Secretary select the Proposed Action for implementation. In terms of nitrogen deposition, the most impacted Class I area from new federal development in FFO is the San Pedro Parks Wilderness, where the model predicts 0.005 kg/ha/yr of nitrogen deposition. This value is well below the established critical load for the area. Sulfur deposition is estimated to be an order of magnitude lower than the total nitrogen deposition and is not a concern. The maximum modeled light extinction from new federal development in the FFO on the 20% most impaired days was 0.03 Mm⁻¹ at Mesa Verde National Park in Colorado. At the closest Class I area to the decision area (San Pedro Parks Wilderness), the 20% most impaired days modeled light extinction value was 0.01 Mm⁻¹. The cumulative design values for visibility at both Class I areas are positive for the future study year, which means viability impairment is trending towards improvement overall.

For the areas included in the RFD, the cumulative NAAQS results are shown in **Table 3-8** above (i.e., within the "New Mexico Total" and "Cumulative" source groups). The primary Regional Modeling study report (BLM and Ramboll 2024) contains detailed cumulative maps showing the impacts to the NAAQS and a more complete accounting of all AQRV impacts to any Class I area in New Mexico and beyond. The report shows that all the emissions from the various oil and gas source groups (both federal and non-federal) contribute between 0.1 and 2.6 kg of nitrogen deposition per hectare per year, which is well below most critical loads established for any impacted Class I area. In terms of visibility impacts the modeled design values in New Mexico for the most impaired days are projected to be below the uniform rate of progress toward Year 2064 visibility goals established under the Regional Haze Rule for all areas analyzed save for the Salt Creek Wilderness, which is trending above the established progress glide path. Note that the FFO emissions are a minor contributor to the metric.

The Regional HAPs Modeling study assessed projected oil and gas HAPs out to year 2032, and again for any area included in the RFD supporting the analysis in this EA the cumulative results are shown in the tables above (see "Cumulative" source group). The HAPs study report lacks maps depicting statewide impacts, but the cumulative results from an internally developed mapping tool are shown below for both the carcinogenic risk and hazard index exposure metrics in **Figures 3-3** and **3-4**. The datasets associated with the figures are from the raw model results and do not provide any adjustments to risks from county level residency data or otherwise. The maximum risks associated with either metric are below the levels of concern established by EPA.

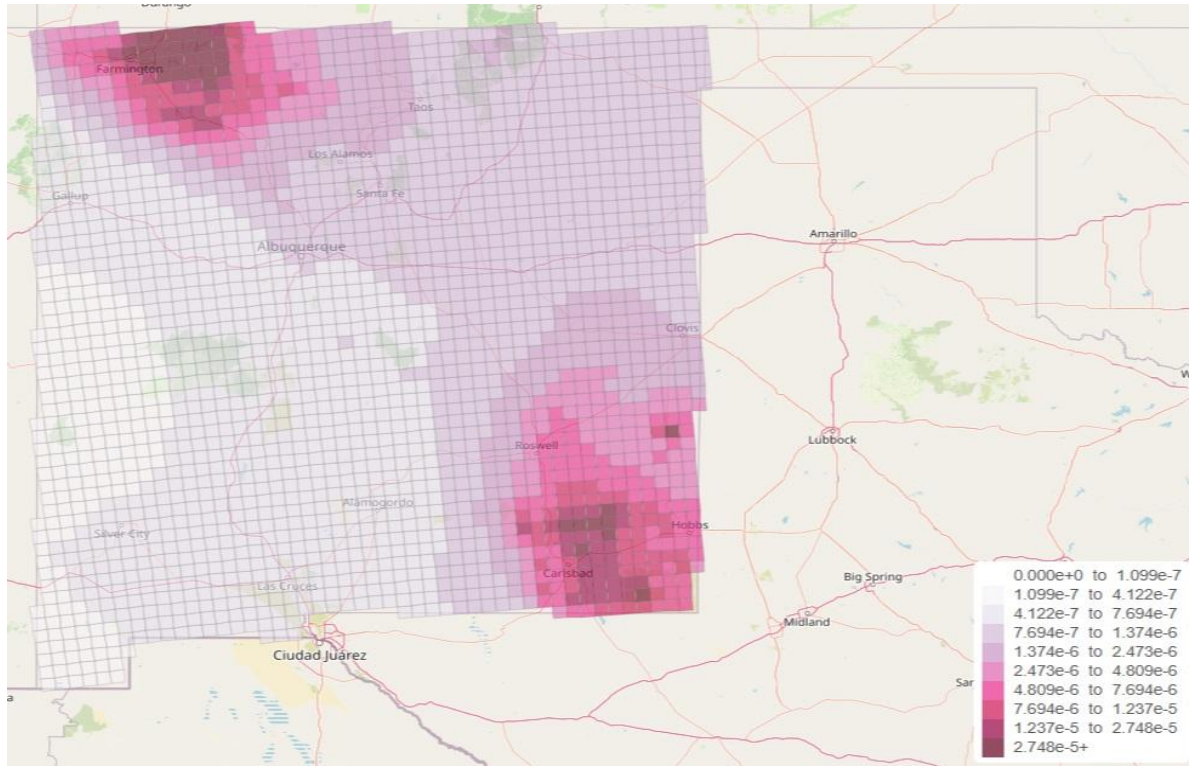


Figure 3-3. New Mexico Modeled Cumulative Carcinogenic Risks

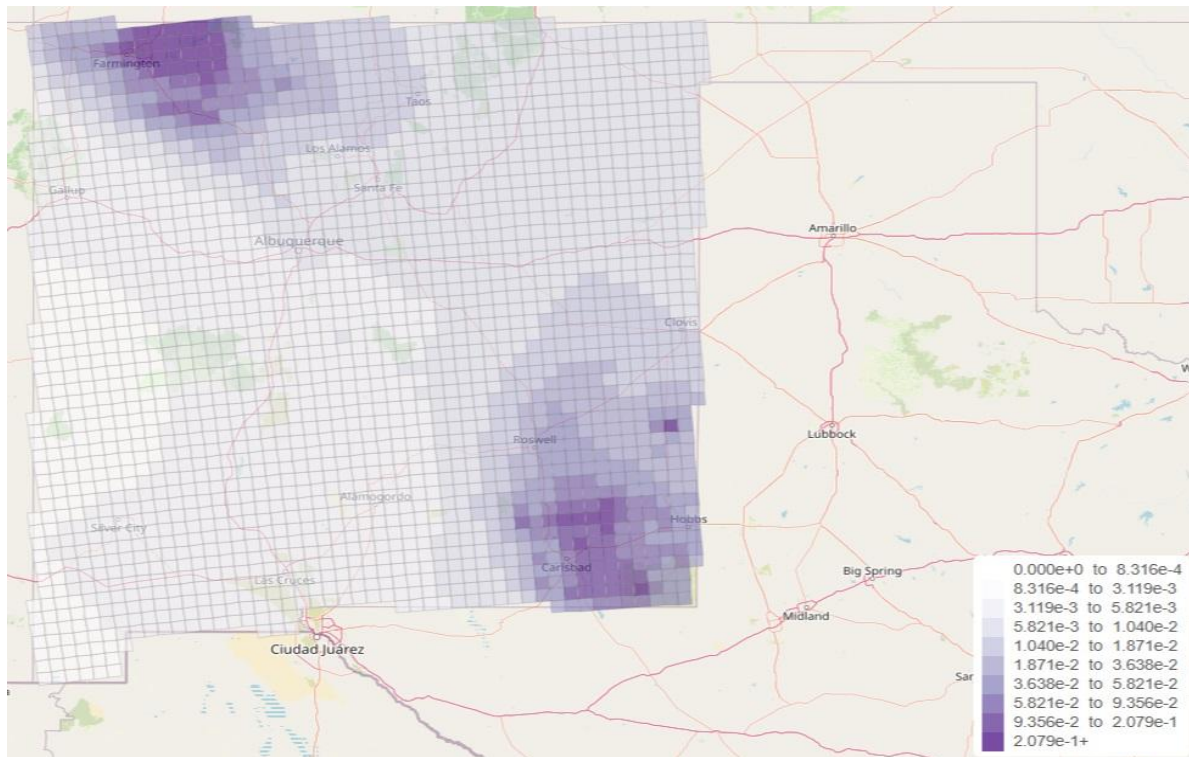


Figure 3-4. New Mexico Modeled Cumulative Hazard Index

More information on effects of oil and gas in the FFO and New Mexico is available in BLM New Mexico's Air Resources Technical Report (BLM 2024d), which has been incorporated by reference.

3.4.5.4 Alternative C – Partial Revocation of Withdrawal

Under the partial revocation alternative, lands within 5 miles of the CCNHP would remain closed to location and entry under the United States mining laws, and from leasing under the mineral leasing laws. However, the RFD estimated by the FFO for this analysis does not predict any oil and gas wells being developed on new leases within the inner 5-mile area that would remain withdrawn, and thus the impacts to air resources from oil and gas development would be the same as those disclosed under Alternative B.

The majority of the existing uranium and other mineral claims (109 claims) would no longer be subject to a validity exam under this alternative, as they fall within the outer 5-mile area where the withdrawal would be revoked under both Alternative B and C. However, due to low demand, and the fact there are no known active proposals for uranium developments of federal minerals in the withdrawal area, the development of any uranium claims within the proposed partial revocation boundary is unlikely. Therefore, potential impacts to air quality from mining would be the same or lesser than those analyzed for Alternative B.

3.4.5.5 Future Project-Level Analyses and Potential Mitigation

Based on the BLM's authority to impose standard terms and conditions (STCs) on mineral leases, the BLM requires industry to incorporate and implement BMPs, which are designed to reduce effects on air quality by reducing emissions, surface disturbances, and dust from field production and operations related to development of leasable minerals. Typical measures include requirements for watering dirt roads or applying magnesium chloride dust suppressants on dirt roads during periods of high use to reduce fugitive dust emissions of PM10; colocation of wells and production facilities to reduce new surface disturbance; implementation of directional and horizontal drilling and completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores; maintenance of vapor recovery systems at functional levels where petroleum liquids are stored; utilization of completion techniques that minimize venting where technically feasible; and interim reclamation to revegetate areas not required for production facilities and reduce the amount of fugitive dust. Additional air quality analysis conducted at the APD or other such project-level stage may necessitate submission of an emissions inventory for the plan of development and air quality modeling. For any future proposed project on the subject lands, the BLM would produce a site-specific analysis and may develop project-specific emissions inventories using operator-provided data, review the preliminary analysis conducted for any subsequent lease, and potentially conduct additional analysis and / or require additional mitigation. Additional mitigation strategies and rules governing sources outlined in this analysis are discussed at length in the incorporated by reference Air Resources Technical Report (BLM 2024d).

3.4.6 Resource Issue 6: Greenhouse Gases

How would future potential development that may occur should the Secretary revoke PLO No. 7923, in whole or part contribute to greenhouse gas (GHG) emissions?

Future development on potential new mineral leases the BLM would be able to offer and subsequently issue on the re-opened lands could lead to emissions of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), the three most common GHGs associated with oil and gas development. GHG emissions would be emitted from authorized activities occurring on the re-opened lands and from the consumption of any fluid minerals produced. However, the BLM cannot reasonably determine at the pre-leasing stage whether, when, and in what manner the lands would be explored or developed, nor can it predict whether the lands would be nominated for lease. The uncertainty that exists at the time prior to BLM offering a lease for sale and before development on the lease is proposed includes crucial factors that would affect actual GHG emissions and associated impacts, including but not limited to the future feasibility of

developing the lease, well density, geological conditions, development type (vertical, directional, or horizontal), hydrocarbon characteristics, specific equipment used during construction, drilling, and production, abandonment operations, product transportation, and potential regulatory changes over the 10-year primary lease term. Actual development on a lease is likely to vary from what is analyzed in this EA and will be evaluated through a site-specific resource review when an operator submits an APD or plan of development to the BLM. For purposes of this EA, the BLM has estimated that an additional 14 wells could be drilled on new leases, should the Secretary revoke PLO No. 7923, in whole or part, and assuming the lands would be nominated for lease, and development proposed. As the wells would be drilled in the area that would be re-opened under Alternative B or Alternative C, there is no difference between the effects of such drilling. While it is not possible to know what the yield of any of these wells might be, the BLM has made certain assumptions regarding such yield for the sake of the analysis of the difference between the action alternatives and what would occur should the Secretary take no action.

3.4.6.1 Affected Environment

There are many factors that can influence global atmospheric conditions. The incremental contribution to cumulative global GHGs from a single proposed land management action cannot be accurately translated into its potential effect on the global climate or any localized effects in the area specific to this action. Currently, global climate models are unable to forecast local or regional effects on resources resulting from a specific subset of emissions.

For the purposes of this EA, the BLM has relied on the 2025 BLM Specialist Report on Annual Greenhouse Gas Emissions Trends in 2025 (BLM 2026a) (Annual GHG Report) which is incorporated by reference as an integral part of this analysis. The report discusses emissions from oil and gas development authorized by the BLM and projection methodologies and presents the estimated emissions of greenhouse gases attributable to development and consumption of oil, gas and coal that may be produced on lands and mineral estate managed by the BLM.

Table 3-14 shows the total estimated GHG emissions at the global, national, and state scales from 2016 to 2022 (7 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 carbon dioxide equivalent (CO₂e). State and national energy-related CO₂ emissions include emissions from oil, gas and coal use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the materials are consumed.

Additional information on current state, national, and global GHG emissions as well as the methodology and parameters for estimating emissions from development of oil, gas or coal authorized by the BLM and cumulative GHG emissions is included in Chapters 4, 5, and 6 of the Annual GHG Report (BLM 2024a).

Table 3-14. Global, United States, and New Mexico GHG Emissions, 2016–2022 (Mt CO₂/year)

Scale	GHG Emissions (Mt CO ₂ /year)						
	2016	2017	2018	2019	2020	2021	2022
Global (CO₂ only)	36,465.6	36,935.6	37,716.2	37,911.4	35,962.9	37,500.0	38,522.0
United States	4,909.9	4,852.5	4,989.8	4,855.9	4,344.9	4,639.1	4,699.4
New Mexico	48.8	49.3	45.2	48.4	45.0	46.2	46.7

Sources: Annual GHG Report (BLM 2026a:Chapter 5, Table 5-1 [U.S.]). State data (EPA 2024b). Global emissions (CO₂ only): GHG Emissions of all World Countries 2024 Report (Emissions Database for Global Atmospheric Research 2024).

Mt (megatonne) = 1 million metric tonnes

3.4.6.2 Alternative A – No Action

Under the No Action Alternative, the Secretary would not revoke PLO No. 7923 in whole or part to re-open the lands to location and entry under the U.S. mining laws and to mineral leasing. The projected 14 new wells on new leases that BLM could offer and issue if nominated under the full revocation alternative would not be drilled. Although no new emissions resulting from development of federal oil and gas resources on new leases would occur under the No Action Alternative, **Section 3.2** of this EA states that an additional 73 wells could be developed (infill) on existing leases present within the lands withdrawn under PLO No. 7923 (BLM 2025a). The potential for infill development does not depend on any Secretarial decision-making regarding PLO No. 7923. As the BLM assumes for purposes of this EA, that these 73 wells would be drilled regardless of a Secretarial decision to revoke PLO No. 7923, in whole or part, GHG emissions would be more than zero under the No Action Alternative.

3.4.6.3 Alternative B – Proposed Action– Full Revocation of Withdrawal

While Secretarial revocation of PLO No. 7923 to re-open the lands to location and entry under the U.S. mining laws or to mineral leasing would not directly result in development that would generate GHG emissions, emissions from future potential development on new mineral leases in the decision area can be estimated for the purposes of this analysis, if the lands are nominated for lease and subsequently offered and sold. There are four general phases of post-lease development processes that would generate GHG emissions: 1) well development (construction, drilling, and 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-lease and the BLM has authority over these activities, mid-stream and end-use emissions (phases 3 and 4) typically occur off-lease where the BLM has little to no authority.

Emissions inventories prepared for the RFD are imprecise due to uncertainties including the type of development on new mineral leases (oil, gas, or both), the scale and duration of potential development, the types of equipment (drill rig engine tier rating, horsepower, fuel type), and the mitigation measures that an operator may propose. Further, the amount of oil or gas that may be produced is unknown. Due to these uncertainties, the BLM applies several assumptions to estimate emissions for the RFD that are described in Issue 5. The total estimated number of wells (14) and production volumes on new mineral leases are based on FFO data for past development combined with per-well drilling, development, and operating emissions data from representative wells in the area.

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). BLM acknowledges that there may be additional sources of GHG emissions along the distribution, storage, and processing chains (i.e., midstream operations) associated with production from the lease parcels. These sources may include emissions of methane (a more potent GHG than CO₂ in the short term) from pipeline and equipment leaks, storage, and maintenance activities. These sources of emissions are highly speculative at the pre-leasing stage; therefore, the BLM assumed that mid-stream emissions associated with the subject lands would be similar to the national level emissions identified by the Department of Energy's National Energy Technology Laboratory (NETL 2009; NETL 2019). Section 5 of the GHG Annual Report includes a detailed discussion of the methodology.

The emission estimates for development on any new mineral leases were generated using the BLM Lease Sale Emissions Tool that was previously described (see Issue 5) and are presented in **Table 3-15** for each of the four phases of post-leasing development. The term CO₂e or carbon dioxide equivalent is a way to measure and simplify the process of understanding and comparing the total impact of different gases by a common unit of measurement over different time intervals (relative to CO₂).

- Initial construction / 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.
- 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. These activities and emissions, as well as the midstream and downstream processes described below, are projected to last for 30 years.
- 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 GHG Annual Report (Chapter 5, Table 5-8 and 5-10).
- For the purposes of this analysis, end-use (downstream) 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 CFR § 98). Additional information on emission factors and EUR factors can be found in the GHG Annual Report (Chapter 5).

Table 3-15. Full RFD (14 new wells) Estimated Life-of-RFD GHG Emissions (tonnes)

Activity	CO ₂	CH ₄	N ₂ O	CO ₂ e (100yr)	CO ₂ e (20yr)	% Totals
Development	13,441	12	0	13,828	14,464	1.23%
Production	46,968	1,801	0	100,719	195,696	8.98%
Midstream	128,419	1,092	2	161,205	218,992	14.38%
Downstream	843,662	26	5	845,438	846,535	75.41%
Total Emissions	1,032,489	2,931	7	1,121,190	1,275,687	100.00%

GHG emissions vary annually over the production life of a well due to declining production rates over time. **Figures 3-5** and **3-6** show the estimated GHG emissions for the development and production processes over the life of the RFD for each well type, including gross (total) emissions as well as emissions during the four phases of lease development processes—well development, well production operations, midstream, and end-use.

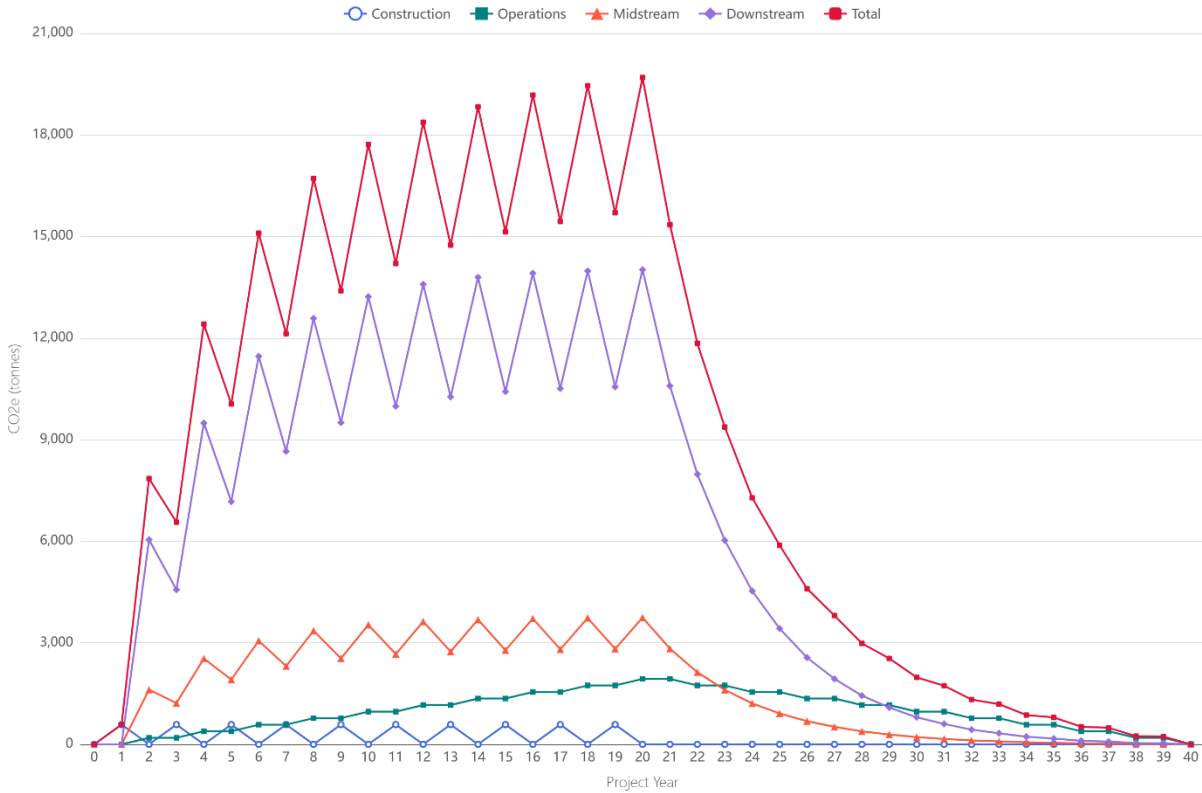


Figure 3-5. Full RFD Annualized Cumulative CO₂e Emissions - Fruitland CBM Wells (tonnes)

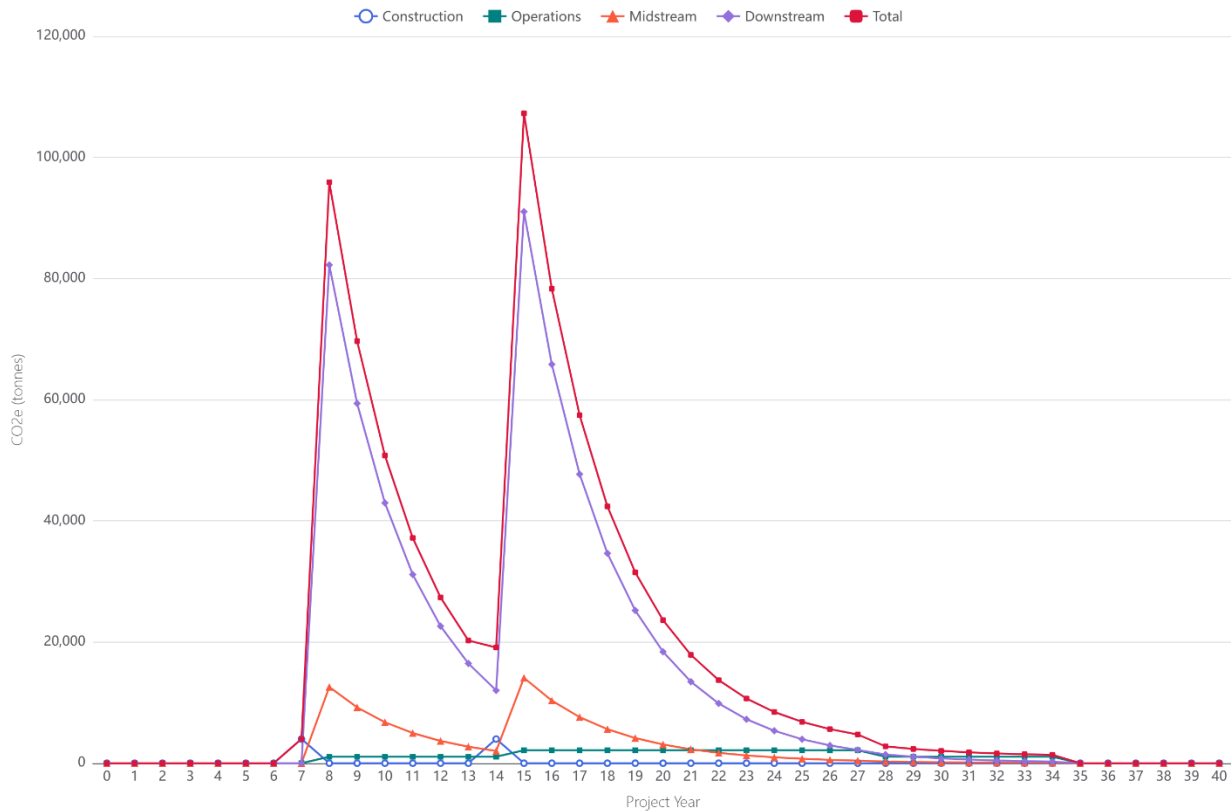


Figure 3-6. Full RFD Annualized Cumulative CO₂e Emissions - Mancos Oil Wells (tonnes)

To put the RFD estimated GHG emissions in a relatable context, potential emissions can be compared to other common activities that generate GHG emissions. The EPA GHG equivalency calculator (EPA 2025c) can be used to express the potential average year GHG emissions on a scale relatable to everyday life. For instance, the projected average annual GHG emissions (in addition to the No Action) from potential development of the decision area should the Secretary revoke PLO No. 7923, in full is equivalent to 8,887 gasoline-fueled passenger vehicles driven for one year, or the emissions from 7,940 homes' electricity use for one year.

Table 3-16 compares the maximum year GHG emissions from the Proposed Action RFD to the current development of Federal oil, gas, and coal emissions, State, and U.S. total GHG emissions.

Table 3-16. Comparison of RFD Emissions to Other Sources (Megatonnes)

Reference	Mt CO ₂ e (per year) ¹
PA RFD Emissions (Maximum Year)	0.116
New Mexico Onshore Federal (Oil & Gas) ²	463.78
U.S. Onshore Federal (Oil & Gas) ²	686.62
U.S. Federal-All (Oil & Gas) ²	1,092.94
U.S. Federal Onshore (Oil, Gas and Coal) ²	1,066.14
New Mexico Total (all sectors) ³	75.84
U.S. Total ⁴	7,213.47

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

2 – Federal values come from the 2023 BLM Specialist Report. Tables ES-1 and ES-2 and Figure ES-1. U.S. Federal-All includes offshore and onshore oil and gas production.

3 – Total state emissions from all sectors is found in Table 5-2 of the 2023 BLM Specialist Report.

4 – Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020 (EPA 2022b)

The analysis of GHGs contained in this EA includes estimated emissions from development of the 14 anticipated new wells on the potential new leases as described above. An assessment of nationwide GHG emissions from other BLM fossil fuel authorizations, including coal leasing and oil and gas leasing and development, is included in Chapter 6 of the GHG Annual Report. The Report also includes estimates of reasonably foreseeable GHG emissions related to BLM lease sales anticipated during the fiscal year, as well as the best estimate of emissions from ongoing production, and development of parcels sold in previous lease sales. It is, therefore, an estimate of cumulative GHG emissions from the BLM fossil fuel leasing program based on actual production and statistical trends as they are presently known.

The methodologies used in the GHG Annual Report provide estimates of foreseeable short-term and projected long-term GHG emissions from activities across the BLM's fluid mineral estate. The foreseeable short-term methodology includes a trends analysis of 1) leased federal lands that are held-by-production 2) approved APDs, and 3) leased lands from competitive lease sales projected to occur over the next annual reporting cycle (12 months). The data from the GHG report is used to provide a 30-year life of lease projection of potential emissions from all Federal oil and gas activities and potential lease actions over the next 12 months. The projected long-term methodology uses oil and gas production forecasts from the 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 lease parcels that are likely to go into production during the analysis period of the GHG Annual Report and represent both a hard look at GHG emissions from oil and gas leasing and the best available estimate of reasonably foreseeable cumulative emissions related to any one lease or set of leases that could occur annually across the entire federal onshore mineral estate.

Table 3-17 presents the summation of the 20-year life-of-project GHG emissions estimates for both the short and long-term as previously described for each state where federal mineral actions have been authorized. The differences between the short- and long-term GHG emissions estimates can be thought of as an approximation of additional leasing that could occur on federal lands and does not take into consideration additional policies, or technological advancements in production or end-use efficiency standards, or an accelerated economy-wide transition away from fossil fuel derived energy production. Details of the short-term and long-term emissions estimate methodologies are provided in sections 5.6 and 5.7 of the GHG Annual Report (BLM 2026a).

Table 3-17. Past, Present, and Reasonably Foreseeable Federal Onshore GHG Emissions (Mt CO₂e)

State	Existing Wells (Report Year)	Existing Wells (Projected)	Approved APDs	New Leasing	Short-Term Foreseeable Totals	Long-Term Foreseeable Totals
Alabama	0.24	3.63	0.00	0.18	3.81	7.15
Alaska	4.42	64.60	20.82	2.31	87.74	117.09
Arizona	0.00	0.00	0.00	0.00	0.00	0.00
Arkansas	0.57	8.95	0.71	0.24	9.89	16.70
California	4.42	61.44	1.90	1.90	65.24	108.44
Colorado	40.47	351.05	25.26	13.36	389.67	1,164.58
Idaho	0.00	0.00	0.00	0.29	0.29	0.00
Illinois	0.01	0.08	0.00	0.02	0.09	0.13
Kansas	0.24	3.48	0.05	0.27	3.81	6.69
Kentucky	0.01	0.06	0.00	0.03	0.09	0.19
Louisiana	3.38	42.30	22.48	1.87	66.65	99.04
Maryland	0.00	0.00	0.00	0.00	0.00	0.00
Michigan	0.05	0.97	0.00	0.29	1.26	1.45
Mississippi	0.12	1.67	0.19	0.19	2.05	3.02
Montana	2.15	21.88	0.97	0.97	23.82	54.70
Nebraska	0.01	0.20	0.00	0.03	0.23	0.32
Nevada	0.11	0.82	0.01	0.03	0.86	2.55
New Mexico	492.77	3,510.22	1,137.21	54.02	4,701.45	12,862.54
New York	0.00	0.00	0.00	0.00	0.01	0.01
North Dakota	34.32	287.97	39.01	8.92	335.90	878.98
Ohio	0.14	1.36	0.00	1.99	3.35	4.21
Oklahoma	1.24	12.20	3.55	0.47	16.22	34.51
Oregon	0.00	0.00	0.00	0.12	0.12	0.00
Pennsylvania	0.00	0.02	0.00	0.67	0.69	0.05
South Dakota	0.08	1.38	0.11	0.11	1.59	2.10
Tennessee	0.00	0.00	0.00	0.00	0.00	0.00
Texas	3.90	43.13	9.83	1.97	54.93	114.23
Utah	13.86	172.20	15.90	0.61	188.71	382.56
Virginia	0.01	0.13	0.00	0.03	0.16	0.25
West Virginia	0.00	0.02	0.00	0.59	0.61	0.04
Wyoming	105.38	928.25	125.96	42.18	1,096.39	2,917.56
Total Onshore Federal	707.90	5,517.99	1,403.95	133.66	7,055.60	18,779.07

EIA's recent short-term energy outlook reports (STEO) (EIA 2025c) predict that the world's oil and gas supply and consumption will increase over the next 18-24 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 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 projections for the next two years:

- U.S. liquid fuels consumption is projected to increase to 20.50 million barrels per day (b/d) in 2025 up from 20.31 million b/d in 2024 and decrease slightly in 2026 to 20.44 million b/d.
- U.S. crude oil production is expected to average 13.4 million b/d in 2025 and rise to 13.5 million b/d in 2026.
- Global liquid fuels consumption is expected to grow from 103.7 million barrels per day in 2025 and increase to 104.6 million barrels per day in 2026.
- U.S. natural gas consumption is expected to average 90.74 Bcf/d in 2025, decreasing slightly to 90.24 Bcf/d in 2026.
- U.S. LNG exports are expected to increase to 15 billion cubic feet/day in 2025 and 16Bcf/d in 2026.
- U.S. coal production is expected to total 506 million short tons in 2025, relatively unchanged from 2024 production levels.

The EIA 2026 Annual Energy Outlook (<https://www.eia.gov/outlooks/aeo/>) projects energy consumption will remain relatively flat or decrease slightly through 2050 as newer, more efficient technologies replace older ones thus reducing the amount to energy required to produce the same level of goods and services. However, U.S. production of natural gas and petroleum and liquids are expected to continue increasing due to growing electricity demand resulting in part from the considerable expansion of data centers in the U.S. and the associated energy requirements for those centers. Further discussion of past, present and projected global and state GHG emissions can be found in Chapter 4 of the BLM GHG Report.

3.4.6.3. / Emission Control Measures Considered in the Analysis

Emission controls (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.

Several federal agencies work in concert to 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 regulating air pollutants and establishing standards for protection of human health and the environment. These regulations include the NSPS for Crude Oil and Natural Gas Facilities, 40 C.F.R. § 60, Subpart OOOOa, and Waste Emissions Charge for Petroleum and Natural Gas Systems, 40 C.F.R. § 99. In December of 2023, the EPA released a separate rule under the CAA to reduce CH₄ and other harmful air pollutants from new and existing oil and gas operations nationwide, which includes the Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced after December 6, 2022, 40 C.F.R. § 60, Subpart OOOOb; and Emissions Guidelines for Greenhouse Gas Emissions from Existing Crude Oil and Natural Gas Facilities, Subpart OOOOc. These regulations impose emission limits, equipment design standards, and monitoring requirements on oil and gas facilities. A detailed discussion of existing

regulations 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 2024a).

The EPA's Methane Rule addresses emissions of CH₄ and other harmful air pollution from oil and natural gas operations—including, for the first time, from existing sources nationwide. The Rule includes NSPS to reduce CH₄ and smog-forming VOCs from new, modified, and reconstructed sources. It also includes emissions guidelines, which set procedures for states to follow as they develop plans to limit CH₄ from existing sources. First, the EPA Rule finalizes 40 C.F.R. § 60 Subpart OOOOb regulating GHG (in the form of a limitation on emissions of CH₄) and VOC emissions for the Crude Oil and Natural Gas source category pursuant to CAA Section 111(b)(1)(B). Second, the EPA finalizes the presumptive standards in 40 C.F.R. § 60 Subpart OOOOc to limit GHGs emissions (in the form of CH₄ limitations) from designated facilities in the Crude Oil and Natural Gas source category, as well as requirements under the CAA section 111(d) for states to follow in developing, submitting, and implementing state plans to establish performance standards. Third, the EPA finalizes several related actions stemming from the joint resolution of Congress, adopted on June 30, 2021, under the Congressional Review Act, disapproving the previous 2020 Policy Rule. Fourth, the EPA finalizes a protocol under the general provisions of 40 C.F.R. § 60 for Optical Gas Imaging to detect gas leaks from industrial sources.

At the state level, the EMNRD enforces the NMOCD Statewide Natural Gas Capture Requirements (Waste Prevention Rule), NMAC 19.15.27, 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 the prohibition of unnecessary venting and flaring of waste natural gas where it is technically feasible to recover the gas by routing it to a pipeline or using it for some other beneficial purpose (such as on-site fuel consumption). In limited circumstances, and if recovery is infeasible, operators must flare gas rather than venting it, which results in uncombusted VOC emissions. According to NMAC 19.15.27.8, venting is only permissible "in an emergency or malfunction ... to avoid a risk of an immediate and substantial adverse impact on safety, public health, or the environment." These provisions will likely reduce VOC emissions due to stringent limitations on natural gas venting (which results in uncombusted VOC emissions). Additionally, it requires that natural gas be recovered and reused rather than flared, which would result in reductions of VOCs, NO_x, CO, SO₂, GHGs, and particulate matter emissions. The NMED developed the Oil and Natural Gas Regulation for Ozone Precursors, NMAC 20.2.50, which went into effect on August 5, 2022, which has been discussed in this document and is incorporated by reference in the Air Resources Technical Report (BLM 2024d).

The majority of GHG emissions resulting from authorized development of the federal mineral estate occur outside of BLM's authority and control. These emissions are referred to as indirect emissions and generally occur off-lease 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 terms of the lease, which primarily occur in the "upstream" portions of natural gas and petroleum systems (i.e., the well development and well-production phases). When the BLM proposes to authorize development of federal minerals the BLM assesses the specific location, design, and plan of development through the NEPA process. The BLM has developed BMPs designed to reduce emissions from field production and operations that it can require operators to implement. BMPs may include limiting emissions from stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions that may occur during development of the lease parcel. Analysis and approval of the 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.

The FFO has also identified 129 existing mining claims, some of which may be associated with potential uranium mining. Most of these claims (109) occur within the outer 5-mile buffer (i.e., that land which both Alternative B and C would revoke the withdrawal and re-open the land to mineral entry); it is presently unclear whether these claims would be economically viable to mine. However, wherever the land does not remain withdrawn, surface disturbance may be authorized following the 43 CFR 3800 regulations without the BLM having to determine the validity of the claim(s).

3.4.6.4 Alternative C – Partial Revocation of Withdrawal

Under the partial revocation alternative, lands within 5 miles of the CCNHP would remain closed to location and entry under the United States mining laws, and from leasing under the mineral leasing laws. However, the RFD estimated by the FFO for this analysis does not predict any oil and gas wells being developed on potential new leases within the inner 5-mile area that would remain withdrawn, and thus the impacts to GHG emissions from oil and gas development would be the same as those disclosed under Alternative B.

The majority of the existing uranium and other mineral claims (109 claims) would no longer be subject to a validity exam under this alternative, as they fall within the outer 5-mile area where the withdrawal would be revoked under both Alternative B and C. However, due to low demand, and the fact there are no known active proposals for development of federal uranium in the withdrawal area, the development of any uranium claims within the proposed partial revocation boundary is unlikely. Therefore, GHG emissions from mining would be the same or lesser than those analyzed for Alternative B.

3.4.7 Resource Issue 7: Water Use and Quantity

How would future potential development within the analysis area affect surface and groundwater quantity if the Secretary revokes PLO No. 7923, in whole or part?

3.4.7.1 Affected Environment

The surface area for both Alternative B and Alternative C includes portions of San Juan, Sandoval, and McKinley Counties. Because the water sources expected to support potential future development under either action alternative are anticipated to be located within these three counties, the full extent of each county is defined as the analysis area for this assessment of water use and quantity.

While the potential for uranium development associated with Alternative B exists to a limited extent, water use associated with this development is not expected to meaningfully affect the general use or quantity in the analysis area.

For leasable fluid minerals, the BLM projects the development of a total of 73 wells (21 horizontal Mancos wells and 52 vertical Fruitland-formation wells) on existing leases over a 20-year period for the No Action Alternative and an additional 14 wells (4 horizontal and 10 vertical Fruitland wells) on new potential leases over the same period under either Alternative B or Alternative C. The BLM does not estimate a higher number of wells under Alternative B than under Alternative C because the area in the 5-mile buffer that would remain withdrawn under Alternative C does not have a high potential for development. Water uses associated with future potential development in each alternative would occur during the 30 to 60 day well construction and completion period (such as with hydraulic fracturing), the 20-year operation period (e.g., water use associated with dust control), and interim and final reclamation. While most of the water use associated with oil and gas development is expected to occur in a 30 to 60 day well construction and completion period, the effect of this use on groundwater aquifers is expected to last until recharge occurs. Because of uncertainty about water sources and recharge rates, the BLM assumes that all water

use associated with oil and gas development are likely to have a long-term effect. Additionally, the capacity for and rate of aquifer recharge may be affected by drought conditions associated with climate trends.

Fluid mineral development can lead to a significant amount of produced, non-potable water. Frequently, when an operator submits an APD, the operator will outline a design for recycling strategies to limit their obligation to treat and dispose of this resource. The need and ability to meaningfully analyze the impact of produced water on existing surface and groundwater quality and quantity will be more properly developed as specific use applications are processed.

The following analysis summarizes information from sources included the BLM Water Support Document (WSD) for Oil and Gas Development in New Mexico (BLM 2025c), the USGS Estimated Use of Water in the United States in 2015 (Dieter et al. 2018) and the Update to the Reasonably Foreseeable Development Scenario (RFDS) for Oil and Gas Activities in the Farmington Field Office, Northwestern New Mexico 2025 (Engler 2025). Water use for development under any of the alternatives is assumed to come primarily from groundwater sources based on the BLM's experience with previous oil and gas development in the area and the limited availability of surface water.

3.4.7.1.1 Total Water Use

The USGS provides estimates for total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power up through 2015 (Dieter et al. 2018). Water use for 2015 is summarized in **Table 3-18** for the eight water use categories in the three counties within the analysis area. Irrigation was the largest category of water use in all counties, accounting for an average of 75% (275,555 acre-feet [AF]) of the total water withdrawal for the analysis area (368,362 AF). Approximately 11% (40,292 AF) of the total water use was from groundwater. Mining (which includes oil and gas development) comprised approximately 3% of water withdrawals. Approximately 72% of mining-related water use (7,249 AF per year) was from groundwater.

Table 3-18. 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)	Percent Total Use
Aquaculture	0	0	0	1,087	0	1,087	1,087	0	1,087	<1%
Domestic	0	0	0	7,630	0	7,630	7,630	0	7,630	2%
Industrial	0	0	0	2,633	0	2,633	2,633	0	2,633	<1%
Irrigation	273,235	0	273,235	2,319	0	2,319	275,555	0	275,555	75%
Livestock	269	0	269	796	0	796	1,064	0	1,424	<1%
Mining	2,723	0	2,723	3,238	4,011	7,249	5,961	4,011	9,972	3%
Public water supply	21,222	0	21,222	16,280	0	16,280	37,502	0	37,502	10%
Thermo-electric power	30,622	0	30,622	2,297	0	2,297	32,919	0	32,919	9%
Total	328,071	0	328,071	36,280	4,011	40,292	364,351	4,011	368,362	100%

Source: USGS (Dieter et al. 2018)

Note: The Mining category (highlighted in *italics*) represents the category into which Alternative B and Alternative C fall.

Totals may not sum exactly due to rounding.

3.4.7.1.2 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 tri-county analysis 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 properties of the geologic formation.

Per New Mexico Administrative Code (NMAC) 19.15.16, oil and gas operators are required by the State of New Mexico to disclose water use to FracFocus, a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council (GWPC) and Interstate Oil and Gas Compact Commission to provide objective information on hydraulic fracturing. The BLM examined FracFocus data reported for the calendar years of 2015 to 2024 to ascertain actual water use associated with hydraulic fracturing in the analysis area (**Table 3-19**).

Table 3-19. Water Use by Oil and Gas Wells for Hydraulic Fracturing in the Analysis Area for Calendar Years 2015 to 2024

Year	Federal Water Use (AF)	Non-Federal Water Use (AF)	Total Water Use (AF)	Federal Water Use (%)	Average Water Use per Well (AF)	Total Number of Wells Reported to Frac Focus
2015	57	151	209	27	2.4	88
2016	46	51	96	47	1.6	61
2017	221	270	491	45	4.9	101
2018	323	601	924	35	7.8	119
2019	90	106	196	46	1.6	120
2020	51	51	102	50	5.7	18
2021	222	506	728	30	14.9	49
2022	769	789	1,558	49	8.8	177
2023	203	173	376	54	4.0	93
2024	774	1,085	1,859	42	14.9	125
Total	2,755	3,784	6,539	42	6.7*	951
* - Increases in water consumption per well suggest using an average with a shorter more recent timeframe is more applicable for projecting future use. For the past three years, water use has averaged 9.2 AF per well.						

Source: FracFocus (FracFocus 2025).

Note: Analysis area is San Juan, McKinley, and Sandoval Counties.

Totals may not sum exactly due to rounding.

Total water use (federal and non-federal) has increased from 209 AF in 2015 to 1859 AF in 2024, with a corresponding average water use per well increase from 2.4 AF per well to 14.9 AF per well. An increase in the amount of water used per well may be associated with changes in production stimulation techniques (BLM 2025c). Given the increasing trend in water use, the most recent 3-year average of 9.2 AF per well is a reasonable estimate of water use associated with future oil and gas development under any of the Alternatives.

While the BLM expects much of the water use associated with oil and gas development to occur within the 30 to 60 day well construction and completion period (such as with hydraulic fracturing), the effect of this use on groundwater aquifers is expected to last until recharge (i.e., replenishment of subsurface water levels) occurs. Long-term water requirements during operation would depend on the project but include the use of water as coolant for internal combustion engines and dust suppression on roads or well pads. The WSD (BLM 2025c) indicates that sources of groundwater in the FFO and RPFO are more readily available than surface water due to the ephemeral nature of many surface water features in the San Juan Basin, while groundwater can be found in nearly every area of the FFO. Potential sources of groundwater in the analysis area include the Rio Grande aquifer and the Colorado Plateau aquifer, which includes four sub-aquifers (Mesa Verde, Uinta-Animas, Dakota-Glen, and Coconino-De Chelly aquifers) (USGS 1995). Water yields in these areas vary, but most aquifers yield less than 20 gallons per minute (BLM 2003). Aquifers that are known to yield sufficient quantities of water are usually found within the sandstone units of the Jurassic, Cretaceous, and Tertiary periods (BLM 2003). Aquifers that have the potential to yield 100 gallons per minute include the Ojo Alamo Sandstone, the Nacimiento Formation, and the San Jose Formation, all of which are within the greater Uinta-Animas aquifer (BLM 2003). However, water used in hydraulic fracturing may also originate from regulated and controlled surface water sources. Principal surface water drainages in the analysis area are the San Juan River (which is impounded at Navajo Dam), the Animas River, and the La Plata River (Dieter et al. 2018). No additional information is available about recharge rates; recharge rates are likely to be low in the analysis area due to the relatively small amounts of precipitation the area receives, and high evapotranspiration. In addition, estimating overall aquifer volumes and water availability is difficult because of the size and complexity of water sources within the analysis area. In light of this uncertainty about water sources and recharge rates, the BLM assumes that water use associated with oil and gas development within the San Juan Basin, including under any of the Alternatives presented in this EA, may have long-term effects on aquifer water levels, depending on the amount and duration of pumping, and that sustained drought conditions could further affect aquifer recharge.

San Juan Basin oil and gas operators have recently included plans to use multiple hydraulic fracturing methods including slickwater fracturing technology. The two general water types that may be used for slickwater stimulation are categorized as “potable/fresh” and “non-potable.” Any water that has total dissolved solids (TDS) greater than 1,000 ppm has been defined as “non-potable” by the State of New Mexico (N.M.S.A. 1978, § 72-12-25), and the BLM has identified anything less than 10,000 ppm to be protected in the casing rule (43 CFR 3172.7). Non-potable water is outside the appropriative processes and is mainly diverted for mineral exploration purposes. The higher allowable TDS levels that are acceptable for slickwater stimulation expand the possible water sources beyond those that are traditionally used (e.g., surface water or groundwater) into non-traditional sources of water (e.g., non-potable groundwater sources). Recently, the NMOSE has approved permits to drill wells within the San Juan Basin to withdraw non-potable connate water (groundwater) from the Entrada Sandstone Formation for use as a potential source of water for slickwater stimulation operations. The Entrada Sandstone Formation has also been used for nitrogen stimulations. Water contained in the Entrada Formation typically measures much greater than 1,000 TDS, is highly saline water (Kelley et al. 2014), and as such, is considered non-potable and has not been declared an administrative aquifer by NMOSE. The NMOSE is the agency responsible for water withdrawal permitting actions. Their Notice of Intent process includes a model-based evaluation of the potential effects of proposed water withdrawals and the identification of possible requirements for applicants to obtain water rights to offset any depletions identified in NMOSE’s analyses prior to applicants commencing diversions.

Other sources of non-potable water that can be used in stimulation are flowback fluid and produced water. Flowback fluid is a mixture of water and small amounts of chemicals and other proppants that flow

back through the wellhead directly after stimulation activities. Generally, 10% to 40% of the initial volume used for stimulation activities returns as flowback fluid; of this flowback fluid, 10% to 40% is non-potable water that may be used in future stimulation activities. Produced water is naturally occurring water that exists in a formation targeted for mineral extraction and is produced as a byproduct, thereby becoming produced water. The WSD (BLM 2025c) contains additional information about potential water sources that may be used.

3.4.7.2 Environmental Consequences

3.4.7.2.1 Alternative A – No Action

Under the No Action Alternative, the Secretary would not revoke PLO No. 7923 in whole or part to re-open the land to location and entry under the U.S. mining laws or to mineral leasing. However, the BLM expects continued development (infill) of existing leases regardless of any Secretarial decision-making on this EA.

The BLM predicts this infill development under the No Action Alternative to result in the drilling and completion of 21 horizontal Mancos wells and 52 vertical Fruitland coal wells on existing leases within the analysis area, estimated to use approximately 672 AF (**Table 3-20**). This calculation is based on a factor of 9.2 AF per well for 73 wells, which the BLM considers a reasonable current estimate of water use associated with drilling and completion of wells within the analysis area (BLM 2025c). Under either the Proposed Action (Alternative B) or the Partial Revocation Alternative (Alternative C), the BLM predicts drilling of an additional 14 new wells on new leases that the BLM could issue if the lands are nominated, should the Secretary revoke PLO No. 7923, in whole or part (**Table 3-20**). Vertical wells may require less water than horizontal wells; therefore, this water use analysis may overestimate actual water use. If more water-intensive stimulation methods (e.g., slickwater fracturing) are implemented or if laterals become longer, water use could increase from estimates provided in the Water Support Document. Alternatively, water use could be lower if produced water is reused or recycled, or if less water-intensive stimulation methods are used (e.g., nitrogen) in hydraulic fracturing. Water sourced from outside of the geological formation that is used in hydraulic fracturing, which remains in the geological formation after hydraulic fracturing is complete, is unlikely to be recovered for other uses (Kondash et al. 2018).

Table 3-20. Predicted Water Use by Oil and Gas Wells for Hydraulic Fracturing by Alternative Analysis Area

Scenario	Number of Expected Wells*	Total Water Use (AF)	Total Water Use Increase (%)	Total Groundwater Use Increase (%)	Total Water Use for Mining Increase (%)
No Action	73	672	0.18 (<0.01*)	1.7 (0.08*)	6.7 (0.34*)
Alternative B	73 + 14	800	0.22 (0.01*)	2.0 (0.10*)	8.0 (0.40*)
Alternative C	73 + 14	800	0.22 (0.01*)	2.0 (0.10*)	8.0 (0.40*)

Note: Percent increase if total is averaged over a 20-year development period

* The 14 wells in Alternatives B and C are in addition to the 73 wells in the No Action Alternative

Assuming that all wells are developed in the same year, groundwater water use associated with future potential development of the 73 wells on existing leased parcels would result in a 0.18% increase over the 2015 total water use in the analysis area (368,362 AF), a 1.7% increase over the 2015 total groundwater use in the analysis area (40,292 AF), and would result in a 6.7% increase over 2015 water use in the mining category for the analysis area (9,972 AF) (**Table 3-20**).

Assuming a uniform 20-year development scenario for the No Action Alternative (consistent with the RFD time frame), the water use associated with the development of the expected 73 wells on leased parcels would be approximately 33.6 AF for any given year. Annual water use associated with future potential development of the expected 73 wells on leased parcels would result in less than a 0.01% increase of the analysis area total water use (368,362AF), 0.08% increase of the analysis area total groundwater use (40,292 AF), and a 0.34% increase over 2015 water use in the mining category for the analysis area (9,972 AF) (**Table 3-20**).

Water used for the purpose of oil and gas drilling, completion, and operations could be purchased legally from those who hold water rights in or around the New Mexico portion of the San Juan Basin. The transaction would be handled by the NMOCD, as well as the NMOSE. All water uses would be evaluated at the time of proposed lease development in site-specific environmental review documentation and subject to STCs and site-specific mitigation. Table 4-10 of the WSD (BLM 2025c) identifies the potential sources of groundwater in the analysis area.

Produced water would be either recycled, reused, or disposed of in accordance with all applicable federal and state laws and regulations. Disposal of produced water would occur at regulated and permitted commercial facilities (such as SWD wells).

3.4.7.2.2 Alternative B – Proposed Action – Full Revocation

The drilling and completion of an additional four horizontal Mancos wells and ten vertical Fruitland coal wells within the analysis area predicted for new leases that could be issued, if nominated and offered for lease, under Alternative B are estimated to use approximately 129 AF of groundwater (**Table 3-20**). This would represent an increase of about 20% above the 672 AF already expected to occur under the No Action Alternative for a total of approximately 800 AF.

Assuming that all wells are developed in the same year, groundwater water use associated with the future potential development of all wells that could be drilled under Alternative B, including 14 on new leases (801 AF) would result in a 0.22% increase over the 2015 total water use in the analysis area, a 2.0% increase over the 2015 total groundwater use in the analysis area and a 8.0% increase over 2015 water use in the mining category for the analysis area (**Table 3-20**).

Assuming a uniform 20-year development scenario for the Proposed Action (consistent with the RFD time frame [BLM 2025a]), the water use associated with the development of all expected wells (the 73 predicted for drilling regardless of whether the Secretary revokes PLO No. 7923, in whole or part, along with the 14 wells that could be drilled on new leases if the Secretary revokes PLO No. 7923, in whole or part) would be approximately 40 AF for any given year. Annual water use associated with all these projected wells would result in a 0.01% increase of the analysis area total water use (368,362AF), 0.1% of the analysis area total groundwater use (40,292 AF), and a 0.40% increase over 2015 water use in the mining category for the analysis area (9,972 AF) (**Table 3-20**).

The FFO has also identified 129 existing mining claims, some of which may be associated with potential uranium mining. Most of these claims (109) occur within the outer 5-mile buffer (i.e., that land which would be opened to mineral entry under both Alternative B and C); it is presently unclear whether these claims would be economically viable to mine. However, wherever the withdrawal is revoked, surface disturbance may be authorized following the 43 CFR 3800 regulations without the BLM having to determine the validity of the claim(s).

3.4.7.2.3 Alternative C – Partial Revocation

Under the partial revocation alternative, lands within 5 miles of the CCNHP would remain closed to location and entry under the United States mining laws, and from leasing under the mineral leasing laws. However, the RFD estimated by the FFO for this analysis does not predict any oil and gas wells being developed on potential new leases within the inner 5-mile area that would remain withdrawn; therefore, the impacts to water use and quantity from oil and gas development would be the same as those disclosed under Alternative B.

The majority of the existing uranium and other mineral claims (109 claims) would no longer be subject to a validity exam under this alternative, as they fall within the outer 5-mile area where the withdrawal would be revoked under both Alternative B and C. However, due to low demand, and the fact there are no known active proposals for uranium developments of federal minerals in the withdrawal area, the BLM does not expect development of any uranium claims under either action alternative. Therefore, potential impacts to water use and quantity from mining would be the same or less under Alternative C than those analyzed for Alternative B.

3.5 SUMMARY OF REGIONAL CONTEXT FOR PROPOSED ACTION

The BLM has considered the reasonably foreseeable environmental trends and planned actions in the entire Decision Area to provide context for considering the effects of the Proposed Action or Action Alternatives. To incorporate a broader landscape, the analysis area for this context summary includes the existing 10-mile withdrawal area as well as the surrounding lands within the FFO jurisdictional boundary.

In addition to the reasonably foreseeable environmental trends and planned actions described in the Affected Environment of the sections above in **Chapter 3**, the BLM has also considered the following development trends that are occurring regardless of whether the Secretary elects to revoke PLO No. 7923, in whole or part:

- **Solar Development:** Areas within the FFO jurisdiction have favorable conditions for solar development due to strong solar irradiance, flat terrain, and proximity to existing transmission infrastructure. Solar development in the region is reasonably foreseeable and may contribute to land use and visual impacts, particularly in areas near existing or former energy infrastructure.
- **Technology and Data Infrastructure Development:** As national interest in data infrastructure grows, the broader Four Corners region may see increased interest in development of data processing infrastructure due to large tracts of land and proximity to existing energy corridors. The repurposing of former coal infrastructure and transmission lines could make the area attractive for future data processing or energy-intensive computing facilities. Development of such facilities may contribute to land use and visual impacts, as well as potentially air and water quality impacts, depending on the energy sources used.
- **Sand, Gravel and Humate Mining:** Sand and gravel extraction is an ongoing land use in northwest New Mexico. Multiple aggregate and asphalt facilities exist in the region. These facilities support road construction and infrastructure development across San Juan County and surrounding areas. New gravel pits are expected to continue to be developed. These operations contribute to impacts from other human activities on air quality, noise levels, visual resources, and rural character.

Humate mining is active in parts of northwestern New Mexico. The region contains some of the richest humate deposits in the U.S., and several small-scale surface mines are currently operating or permitted. While individual humate mines typically disturb smaller areas than aggregate

operations, their effects, taken together, can include vegetation loss, dust emissions, and localized habitat fragmentation. Together, sand, gravel, and humate mining represent a reasonably foreseeable set of land uses that may incrementally contribute to landscape-level impacts.

The Proposed Action in Context

Any Secretarial revocation of PLO No. 7923, either in full or in part, would occur within a broader regional context shaped by a long history of land use and development. When considered alongside past, present, and reasonably foreseeable future actions within northwest New Mexico, any such revocation could facilitate future actions that could contribute incrementally to changes in the evolving landscape but would be consistent with existing land uses.

To quantify the extent of landscape change, **Table 3-21** summarizes estimated surface disturbance from various development sources within the analysis area. In total, approximately 132,402 acres have been or are projected to be disturbed in the area subject to PLO No. 7923, regardless of whether the Secretary revokes PLO No. 7923, in whole or part. This includes:

- 56,752 acres from oil and gas development, and
- 75,650 acres from other development (e.g., urban expansion, other infrastructure).

**Table 3-21. Past, Present, and Reasonably Foreseeable Future
Estimated Landscape Disturbance in the Analysis Area Regardless of Secretarial Action**

Disturbance Sources	Number of Wells	Acreage
Past and present oil and gas development	37,300	56,500
Past and present other development	N/A	74,500 ¹
Reasonably foreseeable future oil and gas development	73	252
Reasonably foreseeable future locatable mineral development	N/A	N/A ²
Reasonably foreseeable future coal development	N/A	0
Roads, transmission lines, and urban expansion	N/A	1,150
Total	37,373	132,402

¹ This number is likely an underestimate of total non-oil- and gas-related disturbance in the analysis area. No study calculating existing disturbance for the analysis area was available at the time of writing. It should also be noted that an average of 4 acres of disturbance per well pad is typical for interim reclamation.

² Given the validity testing requirements per 43 CFR 3809.100(a), the BLM has no evidence to indicate whether development of any of the existing 129 mining claims within the current withdrawal is reasonably foreseeable

When compared to the broader FFO jurisdictional area, which encompasses approximately 6.3 million acres across all land ownerships, the 132,402 acres of total disturbance within the FFO jurisdictional area represents just over 2% of the total landscape (Engler 2025).

While the number of additional wells projected on existing federal leases (73 wells) and the number of wells projected on potential new federal leases (assuming the lands will be nominated and offered for lease) if the withdrawal is revoked in whole or part (14 wells) are both modest relative to the 37,300 wells on existing leases, even small additions can influence localized conditions, particularly in this region with cultural sensitivity. The Greater Chaco Landscape is of profound cultural and spiritual importance to numerous Tribes and Pueblos in the region. Additional development could result in impacts to known and unknown cultural sites, disrupt the natural sights and sounds of the area, impact the cultural and historical integrity of the Chacoan landscape and interfere with traditional ceremonial practices.

As described in **Section 3.4.6**, oil and gas activity, along with other types of mineral development (i.e., mining of minerals subject to location and entry under the U.S. mining laws), contributes to regional air quality degradation through emissions VOCs, NO_x, and fugitive dust. **Section 3.4.8** further notes that oil and gas operations require large volumes of water use and may pose contamination risks through spills, leaks, and the disposal of produced water. Additional demands from mining and potential industrial uses could place further strain on limited aquifers and aging water infrastructure.

Surface disturbance from well pads, access roads, pipelines, and mining operations fragment habitat and can disrupt wildlife movement. Adverse effects from surface disturbance include reduced habitat connectivity, increased noise and light pollution, and the spread of invasive species. These impacts are magnified when multiple land uses overlap in ecologically sensitive areas or migration corridors.

Emerging land uses such as solar energy development, data processing infrastructure, and other types of industrial development could offer new economic opportunities while also introducing new considerations for land and water use.

In addition to the physical and environmental impacts analyzed in this document, it is important to acknowledge that Tribes and Pueblos may experience effects that do not conform to conventional scientific or cause-and-effect frameworks typically used in NEPA analysis. These may include impacts to cultural identity, spiritual relationships with the land, and intergenerational responsibilities tied to sacred landscapes. While such effects may not always be quantifiable or spatially bounded, they are no less real to the communities who experience them.

As described in the corresponding sections of this document, the FFO applies a suite of regulatory tools and mitigation measures to avoid or minimize impacts when exercising its management discretion. In addition, FFO will continue to engage with Tribes and Pueblos to better understand and address the full range of potential impacts, particularly those that may fall outside conventional environmental assessment frameworks or standard BLM impact categories. As part of this effort, FFO is participating in the development of a Programmatic Agreement under section 106 of the NHPA. The agreement is intended to streamline consultation while enhancing cultural sensitivity, improving data transparency, and supporting cooperative stewardship with Tribes. These efforts reflect a broader commitment to ensuring that historic and cultural resources are meaningfully considered in land management decisions.

Chapter 4. Consultation and Coordination

4.1 ENDANGERED SPECIES ACT COMPLIANCE

In complying with its duty under section 7 of the Endangered Species Act, the BLM has examined the effects of the proposed Secretarial revocation of PLO No. 7923 in whole or part on listed species and designated critical habitat (see **AIB-7** in **Appendix C**). The BLM has determined that such Secretarial revocation, in whole or part would have “no effect” on federally listed plants and animals or their habitat under the Endangered Species Act due to lack of suitable habitat in the decision area. The monarch butterfly (proposed Threatened) has potential to occur in the decision area; however, since the Proposed Action does not include ground-disturbing activities, and there is a low likelihood of exploration for minerals subject to location and entry under the U.S. mining laws, the BLM has determined that the Proposed Action would have no effect on the monarch butterfly. That is, no effects from such exploratory activities are reasonably certain to occur, given this low likelihood of exploratory activities; therefore, there is no requirement to formally or informally consult and gain concurrence from the US Fish and Wildlife Service under section 7 of the Endangered Species Act. Should the Secretary revoke the withdrawal as proposed and should the BLM propose to approve an application to develop (e.g. Application for Permit to Drill) any of the affected acres under the mineral leasing laws, or propose to approve any mining plan of operations, the BLM would conduct appropriate compliance with section 7 of the ESA at that time.

4.2 TRIBAL GOVERNMENT-TO-GOVERNMENT CONSULTATION AND COORDINATION

The federal government engages on a Government-to-Government relationship with federally recognized Native American Tribes, acknowledging their status as distinct sovereign entities. This relationship was formally affirmed through Executive Order 13175, issue on November 6, 2000 (65 *Federal Register* 67249). Executive Order 13175 further requires that during the NEPA process, federal agencies must consult with tribes identified as being directly and substantially impacted by the proposed federal action. Additional guidance for conducting Tribal consultation is outlined in BLM Manual 1780, Tribal Relations, and BLM Handbook H-1780-I, Improving and Sustaining BLM-Tribal Relations.

In alignment with these policies and guidance, the BLM actively coordinates with Tribal governments, affiliated Native communities, Native organizations, and individual Tribal members whose interests might be directly and substantially affected by activities on public lands. The FFO extends invitations to 24 tribes with both current and historical ties to the region for consultation under NHPA Section 106, as well as on a government-to-government basis for all undertakings within its jurisdiction. Tribes frequently request additional information, such as clarification regarding the Area of Potential Effect for NHPA Section 106 or access to cultural survey reports. Between 2017 and 2022, most tribal consultation requests pertained to oil and gas development activities, including fluid mineral lease sales, site specific oil and gas projects, and notably, the Draft FFO Resource Management Plan Amendment (RMPA)/Environmental Impact Statement and the related NHPA Section 106 Programmatic Agreement (PA) (see **Appendix G**). The RMPA was under development primarily to address fluid mineral allocations in the same area that is the focus of PLO 7923, prompting frequent discussions about the Chacoan landscape and potential impacts.

Tribal consultation for the Proposed Action was initiated by the FFO on a Government-to-Government basis with various Pueblos and Tribes located in New Mexico, Arizona, and Colorado. On May 28, 2025, the FFO held a preliminary information meeting on the potential for changes to PLO No. 7923, and on October 30, 2025, the FFO sent a letter and accompanying map describing the Proposed Action and alternatives and formally inviting consultation. These materials were delivered via certified mail and email, with a request for a response within 30 days. **Table 4-1** lists the Pueblos and Tribes invited to consult,

along with the dates on which meetings were held, where applicable. In total, 51 consultation meetings have occurred since 2017; additional invitations have been sent but consultation was not scheduled.

Table 4-1. Pueblos and Tribes Receiving Consultation and other Invitations from FFO

Entity	Date of Meeting
Pueblo of Acoma	12/16/2025 6/16/2026 (informational meetings)
Pueblo of Cochiti	6/12/2026
Pueblo of Isleta	1/12/2026 7/1/2026 (informational meeting)
Pueblo of Jemez	12/18/2025 (informational meeting)
Kewa Pueblo	Invitation sent
Pueblo of Laguna	7/22/2025
Pueblo of Nambe	Invitation sent
Ohkay Owingeh	Invitation sent
Pueblo of Picuris	5/14/2026
Pueblo of Pojoaque	7/23/2025
Pueblo of San Felipe	5/13/2026
Pueblo of San Ildefonso	6/22/2026
Pueblo of Sandia	12/17/2025 (informational meeting)
Pueblo of Santa Ana	12/17/2025 5/15/2026
Pueblo of Santa Clara	4/17/2026
Pueblo of Taos	Invitation sent
Pueblo of Tesuque	4/30/2026 (informational meeting)
Pueblo of Zia	Invitation sent
Pueblo of Zuni	5/18/2026
Jicarilla Apache Tribal Council	Invitation sent
Navajo Nation	12/3/2025 5/12/2026
Southern Ute Indian Tribe	5/8/2026
The Hopi Tribe	5/7/2026
Ute Mountain Ute Tribe	Invitation sent

Chaco Heritage Tribal Association

The Department of the Interior funded the development process of the Chaco Heritage Tribal Association (CHTA) study which was completed in 2025. The CHTA study is covered by a Memorandum of Agreement (MOA), signed in January 2025, regarding data sharing. In the consultation meetings described above, the consulting parties requested that BLM obtain the CHTA study to include in this EA. BLM has made good-faith efforts to comply with the MOA to obtain the study from the CHTA, but that process is ongoing. In the absence of the CHTA study, BLM has used the best available data to inform this analysis.

Previous Government-to-Government Consultation Regarding PLO 7923

Tribal consultation for the original withdrawal effort was initiated by the FFO with the same tribes and pueblos listed above. At that time, on January 24, 2022, the BLM sent a letter and accompanying map via certified mail describing the Proposed Action and alternatives and inviting consultation. The BLM sent a follow-up letter on March 25, 2022, and held in-person, town-hall style consultation sessions on April 28 and April 29, 2022. Table 4-2 shows the dates and participating tribes.

Table 4-2. Tribal Consultation Meetings on the Establishment of PLO 7923

Entity	Date of Meeting
Navajo Nation	4/28/2022, 4/29/2022
Pueblo of Acoma	4/29/2022
Pueblo of Zia	4/29/2022
Pueblo of Jemez	4/29/2022
Pueblo of Nambe	4/29/2022
Pueblo of Santa Clara	4/29/2022
Pueblo of Cochiti	4/29/2022
Pueblo of Isleta	4/29/2022
Pueblo of Zuni	4/29/2022
Pueblo of Laguna	4/29/2022
Pueblo of Pojoaque	4/29/2022

Additional outreach efforts were conducted, targeting current residents in the withdrawal area. These efforts included radio announcements in Navajo language, distribution of maps and flyers containing information, and comment cards delivered to each Navajo Chapter House located within the withdrawal area boundary. In addition, three in-person outreach sessions with Navajo allottees took place in coordination with the Federal Indian Minerals Office (FIMO).

Given the similarity in subject matter, the BLM acknowledges and values the input received during these prior consultations and will present that input to the Secretary as part of the current decision-making process.

Should the Secretary revoke the withdrawal as proposed and should the BLM propose to lease any of the affected acres under the mineral leasing laws, or propose to approve any mining plan of operations, the BLM would conduct appropriate Government-to-Government consultation at that time.

4.3 COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the NHPA and its implementing regulations (36 CFR 800) require federal agencies to consider what effect their licensing, permitting, funding, or otherwise authorizing an undertaking, such as approving an application for permit to drill, issuing a right-of-way, or making or revoking a withdrawal may have on historic properties on, or eligible for listing on, the National Register of Historic Places. Specific definitions for key cultural resource management concepts, such as undertakings and effects, are set forth at 36 CFR 800.16.

On March 31, 2026, BLM FFO sent invitations to consult under section 106 of NHPA to the same 24 Tribes listed in table 4-1 above. The request sought information regarding any cultural resource concerns the tribe may have regarding any change to PLO No. 7923.

The New Mexico BLM has a two-party agreement with the New Mexico SHPO that implements an authorized alternative to 36 CFR 800 for most undertakings (BLM New Mexico and SHPO 2014). This agreement offers a streamlined process for reporting and review that expedites consultation with the SHPO.

In accordance with NHPA, the BLM has determined that any Secretarial revocation of PLO No. 7923, in whole, or part, would be an undertaking under section 106 of the NHPA. Re-opening the land to location and entry under the U.S. mining laws and to leasing under the mineral leasing laws would authorize members of the public to locate and enter mining claims on the previously withdrawn area, without the need for specific authorization by the BLM. By contrast, for mineral leasing, the BLM would retain the discretion whether to lease the land and would comply with section 106 prior to any lease issuance and development of any new wells or other surface disturbing activity associated with minerals subject to the mineral leasing laws.

As described in the preceding sections, if the withdrawal is revoked (either fully or in part), the potential for mineral exploration in the area remains low. Opening the area to location and entry under the U.S. mining laws is also unlikely to result in increased recreational or informal mineral collection activity. There is no documented evidence of rockhounding or casual prospecting within the withdrawn area. According to the BLM Mineral Potential Report, there are no known occurrences of gemstones, fossils or other collectible minerals typically sought by recreational users. The area's geology, primarily composed of sedimentary formations such as the Morrison formation, does not support concentrations of minerals that would attract hobbyist interest. Additionally, there are no known hobby claims or informal collection sites in the area, and no evidence of public interest in casual mineral gathering. In addition, should the Secretary revoke PLO No. 7923 in whole or in part, the BLM has developed the Design Feature described in **Section 2.4** to ensure the prevention of unnecessary or undue degradation of cultural resources that might be associated with notice-level activities. Any potential future development subject to BLM discretion would be subject to site-specific analysis. At that time, if the BLM determines that an undertaking would result in an Adverse Effect that cannot be avoided or minimized, the BLM would develop mitigation in consultation with affected Tribes, the New Mexico State Historic Preservation Officer (NM SHPO), and the Advisory Council on Historic Preservation (ACHP), as appropriate. With the applicability of existing laws and the commitments made by the FFO regarding inventory and avoidance of historic properties associated with notice-level mining operations, the BLM has determined that Secretarial revocation of PLO No. 7923, in whole or part, would result in No Adverse Effect to Historic Properties.

Chapter 5. List of Preparers

This EA was prepared by an interdisciplinary team of staff from the FFO and other BLM offices. The following is a list of BLM staff who prepared or contributed to the development of this EA.

Name	Title	Area of Analysis
Sarah Scott	Project Manager	Project Management, Sensitive Soils, Public Health and Safety
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Dave Mankiewicz	Assistant Field Manager	Fluid & Solid Minerals
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Rose McAloon	Planning & Environmental Specialist	Technical Editing
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Erik Simpson	Lead Archaeologist	Cultural Resources, Native American Religious and other Concerns
Cody Walton	Archaeologist	Paleontology
Alek Knapowski	Geologist	Solid Minerals
Jake McBride	Outdoor Recreation Specialist	Recreation, Special Designation Areas, VRM
Barb Witmore	Rangeland Management Specialist	Livestock Grazing, Public Land Health Standards, Vegetation excluding USFWS Designated Species, Invasive Species & Noxious Weeds
Bob Culp	Rangeland Management Specialist	Wild Horses and Burros
John Kendall	Biologist	Special Status, T&E, Candidate Plant and Animal Species; Migratory Birds, Wetlands & Riparian Zones
Brian Garland	Biologist	General Wildlife
Rylee Hostrawser	Ecologist	Special Status Plants, T&E Plants
Hebin Lin	Socioeconomic Specialist	Socioeconomics, Quality of Life
Chad Meister	Physical Scientist	Air Quality, GHG
Michael Brown	Hydrologist	Water Use, Quality, and Quantity
Peter Burck	Hydrologist	Water Use, Quality, and Quantity
Ray Hewitt	GIS Specialist	Mapping
Jake Quintana	Prescribed Fire and Fuels Specialist	Fuels/Fire Management

Note: Additional BLM field office and state office staff provided necessary data and reviewed interim drafts of this EA.

Appendix A – Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS	Full Phrase
ACEC	area of critical environmental concern
APD	Application for Permit to Drill
Bscf	billion standard cubic feet
BIA	Bureau of Indian Affairs
BLM	United States Department of the Interior, Bureau of Land Management
CCAPS	Chaco Culture Archaeological Protection Site
CCNHP	Chaco Culture National Historical Park
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DM	Departmental Manual
DOI	Department of the Interior
EA	environmental assessment
FFO	Farmington Field Office
FIMO	Federal Indian Mineral Office
FLPMA	Federal Land Policy and Management Act of 1976
H.R.	House Resolution
IDT	interdisciplinary team
IMPLAN	Impact Analysis for Planning
IRA	Inflation Reduction Act of 2022
LWC	lands with wilderness characteristics
mcf	thousand cubic feet
MSA	Mescal Settlement Agreement
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
RFD	reasonably foreseeable development [specific to this EA] (BLM 2025a)
RFDS	reasonably foreseeable development scenario [regional] (BLM 2018, Engler 2025)
RMP	resource management plan
RMPA	resource management plan amendment
SHPO	State Historic Preservation Officer
STC	Standard Terms and Conditions
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
USC	United States Code
WHS	World Heritage Site

Appendix B – Literature Cited

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Appendix C – Issues Analyzed in Brief

The BLM has identified and considered the following additional issues which are analyzed in brief (AIB) below with a concise discussion of the potential impacts related to each issue. Except where noted in this section, no substantive differences in potential resource impacts were identified between the two Action Alternatives. Therefore, the following issues have primarily been analyzed with respect to Alternative B (Full Revocation) because that alternative nominally represents a larger area by acreage.

How would future potential development of the decision area affect the following resources should the Secretary revoke PLO No. 7923, in whole or part?

AIB-I PALEONTOLOGICAL RESOURCES

The Paleontological Resources Preservation Act of 2009 (PRPA) mandates the Bureau of Land Management (BLM) to “manage and protect paleontological resources on Federal land using scientific principles and expertise.” The PRPA defines a “paleontological resource” as “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth.”

The BLM uses Potential Fossil Yield Classification (PFYC) as a predictive model to identify the potential of a geologic unit to contain scientifically important paleontological resources (BLM 2022c). The PFYC uses a numeric system of 1 to 5 to rank that likelihood, as well as “U” for areas with unknown potential. A geologic unit identified as PFYC 1 has very low likelihood of containing paleontological resources, whereas an area identified as PFYC 5 is a geologic unit that has a very high likelihood to contain scientifically important paleontological resources. Paleontological resource management concerns and mitigation efforts are related to a geologic unit’s PFYC classification, as well as paleontological localities that are known to occur in a project area. Generally, mapped geological units identified as PFYC 4, 5, and U require a paleontological assessment by a qualified paleontologist. Geologic units with lower ranked PFYC values may require surveys/monitoring if paleontological localities are known to occur in the affected area.

Within the decision area, reasonably foreseeable actions would add to past and present disturbance, resulting in 2,723 acres of reasonable foreseeable development over the next 20 years (**AIB Table I**). Surface disturbance and the risk of effects on paleontological resources associated with reasonably foreseeable actions within the decision area would depend on the locations of proposed disturbance relative to known paleontological localities and to the PFYC class. Disturbance associated with development could cause immediate physical loss of fossils and their contextual data. Ground disturbance could also subject fossils to long-term damage or destruction from erosion and create improved access to the public and increased visibility, potentially resulting in unauthorized collection or vandalism. Ground disturbance can also reveal scientifically significant fossils that would otherwise remain buried and unavailable for scientific study. Such fossils can be collected properly and curated into the museum collection of a qualified repository, making them available for scientific study and education.

The decision area is geologically mapped as containing the Paleocene (56.0–66.0 Ma) Naciminto Formation, and is dominated by the Late Cretaceous (66.0–83.6 Ma) Ojo Alamo Formation, and the Late Cretaceous Kirtland and Fruitland Formations (Table 3 9; Anderson et al. 1997; BLM 2025b; Cohen et al. 2024; Jasinski et al. 2011; New Mexico Bureau of Geology and Mineral Resources 2003). The BLM (2025b) has designated all these geologic units as having very high potential (PFYC 5) to contain scientifically important paleontological resources, with the exception of the Ojo Alamo Formation, symbol Toa, which is assigned moderate paleontological potential (PFYC 3). As such, much of the withdrawal overlaps areas of mapped geologic units with very high paleontological potential (PFYC 5) and moderate paleontological potential (PFYC 3) (see Table 3-9 for a full list of geological formations and their correlating PFYC).

AIB Table I. Geologic Units and PFYC Classifications within the Decision area

Mapped Geologic Unit(s) (age)	(PFYC classification; total acreage of geologic unit)
Menefee Formation (Late Cretaceous)	(high 4) 6,904.08 acres
Nacimiento Formation (Paleocene)	(very high 5) 32,270.30 acres
Ojo Alamo Formation (Late Cretaceous)	(moderate 3) 10,131.88 acres
Kirtland and Fruitland Formations (Late Cretaceous)	(very high 5) 4,595.29 acres
Crevasse Canyon Formation (Late Cretaceous)	(high 4) 5,377.25 acres
Cliff House Sandstone (Late Cretaceous)	(moderate 3) 6,372.92 acres
Point Lookout Sandstone (Late Cretaceous)	(moderate 3) 1,662.51 acres
Pictured Cliffs Sandstone (Late Cretaceous)	(moderate 3) 2,515.51 acres
Mancos Shale (Late Cretaceous)	(moderate 3) 4,595.29 acres
Lewis Shale (Late Cretaceous)	(moderate 3) 4,155.49 acres
Gallup Sandstone (Late Cretaceous)	(moderate 3) 309.7

Public land within the decision area includes up to 338,690 acres of potential surface disturbance, and a reasonably foreseeable development of 2,723 acres that could occur under the Action Alternatives from development of oil & gas and locatable minerals. Within the decision area, up to 36,865.59 calc acres overlap with geological units with very high paleontological potential (PFYC 5) and 15,509.13 acres with high paleontological potential (PFYC 4). This places up to 15% of the decision area within formations with a high potential for paleontological resources to be present. With 2,723 acres of reasonably foreseeable development, some potential for impacts to paleontological resources is possible.

Future development within the decision area would be analyzed further through separate NEPA processes at the APD or project-level stage, as directed by regulations and current policy. In the event that paleontological resources may be present, effects on paleontological resources can be mitigated by standard terms and conditions (STCs), which require a lessee to conduct inventories and/or monitoring or special studies at the discretion of the BLM. Site-specific projects that would cause surface disturbance in areas with high or very high paleontological potential may require a survey and/or monitoring conducted prior to or during ground disturbing activities in accordance with NEPA and FLPMA.

Special Designation Areas (SDAs) are subject to Controlled Surface Use stipulations as specified in the Farmington FMP (BLM 2003). These areas within the withdrawal include Bettonie Tsosie Paleontology SDA, which is known for type specimens of North American Pleistocene mammals (BLM 2003), and the Fossil Forest Research Natural Area (RNA), is completely within the decision area. The Bettonie Tsosie SDA would be subject to stipulations and Controlled Surface Use constraints. The Fossil Forest RNA is subject to closure on new oil and gas leasing from designation under the Bisti/De-Na-Zin Wilderness Expansion and Fossil Forest Protection Act of 1996 (BLM 2003). Under other STCs, if during operations paleontological resources are discovered and a permitted paleontological monitor is not on-site, the operator would be required to cease any operations that would result in the damage or destruction of such specimens and contact the BLM Authorized Office (AO). Scientifically important paleontological resources discovered through surveys or monitoring would be collected by a permitted paleontologist and curated at an appropriate repository. With consideration of these protections, potential effects on paleontological resources of scientific interest would be avoided or mitigated.

As described in the EA (**Sections 3.4.1.2 and 3.4.2.5**), if the withdrawal is revoked (either fully or in part), the potential for mineral exploration in the area remains low. Opening the area to location and

entry under the U.S. mining laws is also unlikely to result in increased recreational or informal mineral collection activity. There is no documented evidence of rockhounding or casual prospecting within the withdrawn area. According to the BLM Mineral Potential Report, there are no known occurrences of gemstones, fossils or other collectible minerals typically sought by recreational users. The area's geology, primarily composed of sedimentary formations such as the Morrison formation, does not support concentrations of minerals that would attract hobbyist interest. Additionally, there are no known hobby claims or informal collection sites in the area, and no evidence of public interest in casual mineral gathering. This low potential for surface disturbance related to exploration for locatable minerals suggests that there is a similarly low potential for effects on paleontological resources of scientific interest.

AIB-2 RECREATION AND SPECIAL DESIGNATIONS INCLUDING AREAS OF CRITICAL ENVIRONMENTAL CONCERN AND LANDS WITH WILDERNESS CHARACTERISTICS

Recreation activities within the FFO include camping, hiking, hunting, shooting, fishing, nature viewing, sightseeing, horseback riding, mountain biking, and motorized recreation including off-highway travel (on existing maintained or primitive roads). Designated recreational areas such as OHV³ areas, ERMA⁴s, special recreation management areas (SRMA⁵s), and ACECs are found throughout the FFO and provide general recreational opportunities, are for locations with special management concerns, or are areas that require explicit recreation management. Additionally, there are several wildlife areas throughout the state of New Mexico; these areas are managed specifically for wildlife, recreation, and hunting opportunities. Oil and gas-related and other surface disturbances have the potential to modify special designations, recreation opportunities, and the recreation experience over the long term, primarily as a result of changes in the landscape (viewshed), soundscape (noise), habitat loss, and presence of oil and gas development-related activities (construction, traffic, etc.). Some of the past impacts on recreational uses and special designations (e.g., effects on scenic quality and visitor experience) have been mitigated through vegetation restoration projects and surface reclamation of well pads, roads, and facility sites.

The BLM estimates that 2,723 additional acres could be disturbed as a result of future potential development of oil & gas and locatable minerals within the decision area. Although oil and gas development-related equipment and structures would be present in the area of development, this disturbance would generally be consistent with the surrounding landscape, which is already highly modified in character, and would therefore have minimal effects on special designations and recreation opportunities or experiences (e.g., visual landscape and soundscape) (see also AIB-13). There may be some small increases in access to these areas because of new roads created by industry.

Hunting opportunities based on the NMDGF permit system and the supporting business section contribute to the economy within Sandoval, McKinley, and Rio Arriba Counties. An analysis conducted for the NMDGF on the economic benefit of fishing, hunting, and trapping in 2013 (Southwick Associates 2014) reported 46,403 anglers, 17,198 hunters, and 351 trappers in Sandoval, McKinley, and Rio Arriba Counties. Fishing, hunting, and trapping activities were reported as resulting in 256, 464, and three jobs, respectively, and total angler, hunter, and trapper spending of approximately \$9.6 million, \$11.4 million, and \$34.9 million within each county, respectively (Southwick Associates 2014). Given that existing GMU-

³ OHV areas are allowed throughout the FFO planning areas and include any motor vehicle that may travel over land. There are several OHV designated areas throughout the FFO planning areas. OHVs are used in general recreation for the transport of recreational visitors, but they may also provide recreational activities themselves in the form of motorcycle and all-terrain vehicle pursuits.

⁴ ERMA⁴s are areas where recreation is unstructured and dispersed and where minimal recreation-related investments are required. ERMA⁴s provide recreation visitors the freedom of choice with minimal regulatory constraint. These areas consist of the remainder of land areas not included in SRMA⁵s within a District or Field Office area. An ERMA is not designated recreational area but may provide dispersed recreation opportunities.

⁵ SRMA⁵s are areas requiring explicit recreation management to achieve BLM's recreation objectives and to provide specific recreation opportunities. The BLM's recreation investments are concentrated in these areas (BLM 2003, 2024a).

hunting opportunities and hunting-related economic benefits in Sandoval, McKinley, and Rio Arriba Counties occur amidst a landscape of existing oil and gas development, impacts on hunting opportunities and the hunting sector of the economy are not anticipated from future potential development within the decision area. Information on GMUs managed by the NMDGF and populations of big games species are discussed in AIB-I I.

AIB-3 VISUAL RESOURCES

Visual resources on BLM lands are managed using four visual resource management (VRM) classes: VRM Class I, II, III, and IV (BLM 1986). In general, development is not compatible with VRM Class I designated areas, is often not compatible with VRM Class II designated areas, is generally compatible with VRM Class III designated areas, and is compatible with VRM Class IV designated areas (BLM 1986). The objective of VRM Class I is to preserve the existing character of the landscape; the objective of VRM Class II is to retain the existing character of the landscape, where the level of change to the characteristic landscape should be low; the objective of VRM Class III is to partially retain the existing character of the landscape; and the objective of VRM Class IV is to provide for management activities which require major modification of the existing character of the landscape (BLM 1986). Within VRM Class IV, the level of change to the characteristic landscape can be high, and management activities may dominate the view and be the major focus of viewer attention (BLM 1986). However, the BLM will make every attempt to minimize the effect of these activities through careful location, minimal disturbance, and repetition of basic visual elements (BLM 1986).

AIB Table 2 presents the acreage of each VRM class within the decision area, based on the 5- and 10-mile buffer zones. Most of the area consists of lands classified as Class III and Class IV, which are managed primarily for multiple-use objectives.

AIB Table 2. Visual Resource Management Classes within Decision Area

Distance	Class I	Class II	Class III	Class IV
10 miles	13,903 acres	16,542 acres	72,306 acres	66,644 acres
5 miles	4,023 acres	5,220 acres	17,556 acres	6,662 acres

Future potential development of oil & gas and locatable minerals within the decision area could result in approximately 2,723 acres of additional surface disturbance. Future potential development within the decision area could introduce new visual elements; however, the degree of effect would depend on the location of proposed infrastructure relative to sensitive viewsheds and areas already highly modified in character. At the landscape level, state and federal efforts to plug and reclaim inactive wells would continue to help offset negative effects on visual resources. Mitigation measures could include siting of well sites, roads, and associated infrastructure to follow the contour of the landform and mimic the lines in vegetation to screen and hide locations. In addition, per 43 C.F.R. § 3171.25(b)(2), interim reclamation (reclamation of surface disturbance not necessary for production) and final reclamation (reclamation following well plugging and abandonment) are required within 6 months of well completion and well plugging, respectively.

AIB-4 FUELS AND FIRE MANAGEMENT

Reasonably foreseeable environmental trends and planned actions would continue to affect fire management within the decision area through increased population growth, desertification and drought, and the introduction and spread of invasive species that can increase fuel loading.

Under the Action Alternatives, future potential development of oil & gas and locatable minerals within the decision area could result in new surface disturbance (estimated to be around 2,723 acres). Noxious and invasive weeds, including cheatgrass (*Bromus tectorum*), readily invade disturbed sites. The potential spread

of cheatgrass could provide an opportunity for increased fine fuel loading and an environment conducive to wildland fires. However, the BLM's authority to apply STCs would mitigate this potential through application of measures to reduce or eliminate the spread of noxious and invasive weeds. If needed, the BLM may require other avoidance, minimization, and/or mitigation measures at the project application stage to reduce the risk of wildland fires during future potential development.

AIB-5 PUBLIC HEALTH AND SAFETY INCLUDING HAZARDOUS OR SOLID WASTES

Much of the information presented in this section is drawn from prior environmental and technical documents. The following materials are summarized below and incorporated by reference to provide context and clarity for the proposed project. Additional details can be found in the following documents:

- Environmental Assessment for the Quarter 4 2025 Farmington and Rio Puerco Field Offices Competitive Oil and Gas Lease Sale, BLM ePlanning Project Number DOI-BLM-NM-F010-2025-0011-EA. Available at: <https://eplanning.blm.gov/>
- 2025 BLM Water Support Document for Oil and Gas Development in New Mexico; 2024 BLM Water Support Document for Oil and Gas Development in New Mexico. Available at: <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/about/new-mexico>
- 2024 BLM Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas and Kansas; 2023 BLM Air Resources Technical Report for Oil and Gas Development in New Mexico, Oklahoma, Texas and Kansas. Available at: <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/about/new-mexico>

Fluid Minerals

Within the withdrawal area, there are approximately 736 existing active well bores of all well types across all land jurisdictions. This level of development has resulted in a range of public health and safety risks, including occasional fires; spills of hazardous materials, hydrocarbons, produced water, and hydraulic fracturing fluid; and potential impacts to air, soil, or water. Exposure to naturally occurring radioactive material (NORM) associated with fluid minerals is also a concern. Additional risks include traffic congestion and collisions from heavy industrial use, infrequent industrial accidents, and potential exposure to hydrogen sulfide. Air quality impacts from oil and gas operations include increased levels of particulate matter (PM₁₀ and PM_{2.5}), volatile organic compounds (VOCs), hazardous air pollutants (HAPs) and other criteria pollutants. See the analysis in **Section 3.4.5** for projected levels and potential health effects of criteria pollutants, HAPs, and VOC and nitrogen oxide (NO_x) emissions that contribute to ozone (O₃) formation, as well as National Ambient Air Quality Standards (NAAQS), as well as the potential health effects of other air pollutants. See the analysis in **Section 3.4.6** for greenhouse gas emissions.

Although the use of per- and polyfluoroalkyl substances (PFAS) in hydraulic fracturing is limited in New Mexico, their persistence and potential for bioaccumulation continue to be an issue of concern (BLM 2025b). PFAS use in hydraulic fracturing is likely to occur in areas not associated with New Mexico's drinking water (BLM 2025b).

The 2019 EPA AirToxScreen results, which remain the most complete dataset available, indicate that cancer, neurological, and respiratory risks in northwest New Mexico are lower than national levels and generally consistent with statewide levels (EPA 2019a). The 2019 AirToxScreen evaluates cancer and other health risks based solely on exposure to HAPs, but broader health outcomes are also influenced by socioeconomic factors such as poverty, education, and language proficiency. Populations in McKinley and Rio Arriba Counties, for example, face higher socioeconomic vulnerability than state averages, which may increase their risk of adverse health outcomes (Headwaters Economics 2025). See **Section 3.4.3** for more information on socioeconomic conditions in the decision area.

As discussed in **Section 3.4.2**, future potential development in the withdrawal area could include approximately 14 new wells on new leases over 20 years. Residents living within 1.25 miles of oil and gas operations are more likely to experience health effects from air quality impacts. Those within 0.5 miles may also be affected by noise and odors, depending on the development phase (Adgate et al. 2014; Blair et al. 2018; Hays et al. 2017)

Communities near future development could also experience increased traffic, road wear and tear, noise, flaring, light pollution, and general safety concerns. Local roads may face congestion, rutting, and damage to culverts and cattle guards. Construction activities would generate short term (30–60 days) emissions of fugitive dust and diesel exhaust, contributing to criteria pollutants, VOCs and HAPs. These emissions would primarily affect areas within 1.25 miles of construction sites. Air pollution and associated health effects could have a greater effect on socially vulnerable populations with limited access to healthcare, or have pre-existing health conditions (EPA 2021).

During lease- and project-level NEPA analysis for any future development, BLM would evaluate and apply appropriate site-specific enforcement requirements and/or mitigation measures. At the APD or project-level stage, these may include:

- Designating transportation routes to avoid sensitive areas and school bus routes
- Measures to prevent road degradation
- Measures to minimize light impacts on communities
- Community notification requirements
- Identification of sensitive receptors and noise limits

Operators must comply with all applicable federal, state, and local regulations related to hazardous materials, worker safety, and transportation. Operators must follow rules for handling hazardous materials and responding to spills, especially those set by the New Mexico Oil Conservation Division (NMOCD). To reduce risks related to hydrogen sulfide exposure, operators are required to use venting, flaring, and vapor recovery systems, as outlined in 43 C.F.R. 3176. Standard design features, project-specific conditions of approval (COAs), and applicable federal and state regulations would be implemented to minimize potential risks to public health, safety, and environmental quality.

Solid Minerals

Coal

As discussed in **Section 3.4.1**, coal resources are present in the decision area. If the area were reopened to leasing, coal mining operations are not reasonably foreseeable (**Section 3.4.2.5**) but could introduce a range of public health and safety risks, particularly for communities located near areas of potential development.

If development were to occur, these risks could result in adverse health outcomes, environmental degradation, and disruptions to local communities. Impacts may be more pronounced in areas with limited infrastructure or where residents live near mining operations. To reduce these risks, a range of mitigation measures would be considered during project-level review. These strategies would be tailored to site-specific conditions and applicable regulatory requirements.

Uranium

Uranium mining and processing activities present a range of potential human health and safety risks. These risks can be categorized into three primary areas: (1) those specific to radioactive materials, (2) those common to the mining industry, and (3) those associated with any (not sector-specific) large-scale

industrial operation (OECD NEA 2014; National Research Council 2012). Exposure to potentially harmful radiation while on the job, particularly radon gas and its decay products, is the most substantial health concern, with prolonged exposure linked to an increased risk of lung cancer (National Research Council 2012; OSHA 2025). Additional occupational hazards include exposure to respirable dust, heavy metals, noise, and physical dangers such as equipment accidents and mine collapse (OECD NEA 2014).

Beyond the workforce, uranium mining can also pose risks to nearby communities through environmental pathways. Improperly managed tailings, waste rock, and process water can lead to contamination of air, soil, and groundwater with radioactive and toxic substances (EPA 2025h; OECD NEA 2014). These exposures may contribute to long-term health effects such as kidney damage and non-cancerous respiratory diseases (EPA 2025h; National Research Council 2012). The extent of these risks depends on site-specific factors, including geology, hydrology, mining methods, and the effectiveness of mitigation and regulatory controls (OECD NEA 2014).

While the BLM does not anticipate high interest in development of new or already-located uranium deposits (see **Section 3.4.1.2**), if a mining plan were to be reviewed by BLM, a number of mitigation measures are recommended by industry professionals and organizations, including the OECD Nuclear Energy Agency (NEA), U.S. EPA, National Research Council (NRC) and OSHA, to reduce potential adverse effects to human health and safety from uranium mining and processing. These measures include:

- Radiation Safety Protocols – Implementation of radiation protection programs to monitor and limit occupational exposure to ionizing radiation, including radon gas and radioactive dust (OSHA 2025; OECD NEA 2014).
- Engineering Controls – Use of ventilation systems, dust suppression technologies, and containment structures to minimize airborne and waterborne contaminants (OECD NEA 2014).
- Tailings and Waste Management – Design and operation of tailings storage and waste handling systems to prevent environmental contamination and protect groundwater and surface water resources (EPA 2025f).
- Monitoring and Surveillance – Establishment of environmental and health monitoring programs to track potential off-site impacts and ensure compliance with regulatory standards (EPA 2025f; National Research Council 2012).
- Public Safety Measures – Create setbacks, access restrictions, and emergency response plans to protect nearby communities.
- Regulatory Compliance – Adherence to applicable federal and state regulations, including those administered by the Nuclear Regulatory Commission, EPA, and OSHA.

As with oil and gas, and coal, the BLM would evaluate the proposed development and tailor these and additional protective measures during subsequent environmental reviews and permitting processes, based on site-specific conditions and regulatory requirements.

Hazardous or Solid Wastes

While Secretarial revocation of PLO No. 7923, in whole or part, would not generate hazardous or solid waste, future mineral development on areas opened to such activities could produce waste materials that pose risks to human health and the environment if not properly managed, as described above. The handling, storage, and disposal of such waste would be subject to site-specific environmental review and permitting processes. Operators must comply with all applicable federal, state, and local regulations, including those governing hazardous materials, radiation safety, and environmental protection. They would also be required to implement appropriate measures and regulatory safeguards to ensure that hazardous and solid waste is safely managed, minimizing risks to nearby communities and ecological systems.

AIB-6 SENSITIVE STATUS PLANT AND ANIMAL SPECIES

In accordance with Manual 6840 (BLM 2008b, BLM 2024b), the BLM designates species as sensitive when they require special management consideration to avoid potential future listing under the Endangered Species Act. The BLM compared known habitat requirements of sensitive species with habitat types within the proposed project area, based on mapped vegetation communities, published descriptions of species habitat requirements, and BLM sensitive plant and animal species lists for New Mexico (BLM 2024c).

If the Secretary elects to revoke PLO No. 7923, in full (Alternative B), the BLM projects that reasonably foreseeable development of oil & gas and locatable minerals would add approximately 2,723 acres of disturbance within the decision area; however, the BLM does not expect surface disturbance associated with reasonably foreseeable actions within the decision area to create significant effects to any BLM sensitive species or habitat. Depending on the proximity of ground disturbance and development activity to sensitive species habitat and/or populations, there may be short-term effects (i.e., temporary displacement from habitat because of noise and construction) or long-term effects on sensitive species and the ecological processes that sustain them related to changes in the following habitat conditions: loss of habitat, ground cover, soil nutrient flows and processes, hydrological flows and processes, solar exposure, thermal cover, fugitive dust loads, nonnative species dispersal, habitat connectivity, noise levels and human activity, light pollution, forage availability, and pollinator and dispersal agents' visitation behaviors; these include both direct and indirect impacts. Sensitive plant species may also face a loss of individuals due to construction. If detected and avoided, actual impacts on special-status species would be less than the potential effects estimated in this analysis. It is not certain that occupied habitat could be avoided, given existing lease rights and other resource conflicts in the vicinity of proposed development locations. However, methods to avoid or minimize impacts on sensitive species and habitats would be applied for foreseeable actions whenever applicable and consistent with existing lease rights. At the landscape level, implementation of land restoration and conservation activities may offset the effects of surface disturbance on habitats and may result in beneficial impacts on habitat dependent on the success of restoration activities.

The BLM has identified potential habitat within the decision area for 12 sensitive species (**AIB Table 3**); therefore, sensitive species have the potential to occur within decision area. Four of these sensitive species have been documented within the decision area and surrounding area. Site selection of potential surface disturbing activities would not occur until after pre-disturbance biological surveys and an additional impact analysis are conducted. The BLM would implement efforts to avoid, minimize, and mitigate impacts on BLM sensitive species at the project-level stage through policy and procedure. Impacts on any sensitive species would be documented in subsequent biological reports and NEPA documents.

During future potential development of the decision area, if leasing of oil and gas resources is proposed, BLM would apply lease notices/stipulations such as NM-I-LN, which provides protections to sensitive plant species, would be applied to any surface disturbing projects containing potentially suitable habitat for sensitive plant species (**AIB Table 3**). In addition, lease notice FFO-BS-LN-4I, which requires biological survey for any proposed project on FFO-managed lands, would be applied to any nominated lease parcels within the FFO. Stipulations applied to future nominated lease parcels for other ecological concerns may provide secondary protections to sensitive species found within these parcels.

STCs would be applied to proposed projects on FFO-managed lands, including a requirement for pre-disturbance surveys at the time of proposed development. The surveys would identify occurrences of sensitive species and habitat for avoidance during project siting and construction (BLM 2008a, 2017, 2022b). The BLM would conduct site-specific evaluations at the development stage for any reasonably foreseeable actions to determine the effects (if any) on sensitive species would occur. Avoidance, minimization, and/or mitigation measures would also be determined at that time.

AIB Table 3. BLM Sensitive Species with Potential to Occur within the Decision Area

Species (scientific name)	Discussion
Clover's cactus (<i>Sclerocactus cloverae</i>)	This species occurs on soils derived from the Nacimiento and San Jose Formations and occupies a variety of vegetation communities, including desert scrub and sparse pinyon-juniper woodlands within the proposed action area. The proposed action area contains potential habitat, per the USGS habitat model, and contains historic occurrences. Lease notice NM-I-LN provides protections to sensitive plant species and would be applied if necessary during future potential development.
San Juan milkweed (<i>Asclepias sanjuanensis</i>)	Sandy loam soils, usually in disturbed sites, in juniper savanna and Great Basin desert scrub; Historic occurrences of this species occur within the proposed action area and indicate potential habitat for this species. Lease notice NM-I-LN provides protections to sensitive plant species and would be applied if necessary during future potential development.
Mancos saltbush (<i>Proatriplex pleiantha</i>)	In New Mexico, this species occurs on sandstone rim rock ledges and mesa tops within pinyon-juniper and desert shrubland vegetative communities in San Juan County. This species occurs in badland areas of the Mancos and Fruitland Formations and is known to occur in the proposed action area. The area contains shrubland and pinyon-juniper habitat, which may indicate potential habitat for this species. Lease notice NM-I-LN provides protections to sensitive plant species and would be applied if necessary during future potential development.
Parish's alkali grass (<i>Puccinellia parishii</i>)	Occurs in alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 2,600 to 7,200 feet above mean sea level range-wide. The species requires continuously damp soils during its late winter to spring growing period. The proposed action area contains historic occurrences for this species. Lease notice NM-I-LN provides protections to sensitive plant species and would be applied if necessary during future potential development.
Bendire's thrasher (<i>Toxostoma bendirei</i>)	Sparse desert shrublands, degraded grasslands, and open woodlands with scattered shrubs. Open sagebrush shrublands with scattered junipers. Avoids riparian areas and arroyos with dense shrub cover.
Pinyon jay (<i>Gymnorhinus cyanocephalus</i>)	Piñon-juniper woodlands and less frequently pine. May occur in scrub oak and sagebrush.
Golden Eagle (<i>Aquila chrysaetos</i>)	In the west, mostly open habitats in mountainous, canyon terrain. Nests primarily on steep cliffs typically over 30 meters in height, but sometimes 10 meters in height. Nesting cliffs are normally directly adjacent to foraging habitat of desert grasslands or desert scrub.
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Breeds in open country with scattered trees and shrubs, savanna, desert scrub and, occasionally, open woodland. Suitable hunting perches (poles, fenceposts) are an important part of the habitat.
Mountain Plover (<i>Charadrius montanus</i>)	Nesting habitat includes high plains/shortgrass prairie and desert tablelands, commonly prairie dog towns, such as sagebrush/blue grama habitats. Preferred winter habitat consists of short-grass plains, plowed fields, and sandy deserts.
Virginia Warbler (<i>Vermivora virginiae</i>)	Breeding during the summer and commonly transient in areas of pinon/juniper woodlands, ponderosa/oak forests, and mixed conifer forests near terrestrial regions.
Gunnison's prairiedog (<i>Cynomys gunnisoni</i>)	Grasslands from low valleys to montane meadows. High mountain valleys and plateaus with open or slightly brushy country with scattered junipers and pines.
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	In New Mexico, most commonly found in evergreen forests. Roosts and nurseries are located in mines and tunnels.

* Source: BLM (2024b)

AIB-7 THREATENED, ENDANGERED, OR CANDIDATE PLANT AND ANIMAL SPECIES

The BLM compared mapped habitat within the Proposed Action area to all species protected under the Endangered Species Act of 1973. To do so, the BLM used the USFWS Information for Planning and Consultation (IPaC) system (USFWS 2025), USFWS descriptions of species habitat requirements and

current mapped critical habitat (USFWS 2025), and BLM-mapped potential habitat for special status plant species (BLM 2022b). Based on review of USFWS IPaC data (USFWS 2025), six species (ESA-listed or Proposed) were evaluated for the potential to occur within the Proposed Action area:

- Two bird species: Southwestern willow flycatcher (*Empidonax traillii extimus*), and yellow-billed cuckoo (*Coccyzus americanus*)
- Two fish species: Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*)
- Two insect species: monarch butterfly (*Danaus plexippus*; Proposed Threatened) and Suckley's cuckoo bumble bee (*Bombus suckleyi*; Proposed Endangered)
- No designated critical habitat within the decision area.

One of the six ESA-listed species, the monarch butterfly was determined to be the only ESA-listed species with the potential to occur within the Proposed Action area based on the presence of suitable habitat and species distribution information. The monarch butterfly has been proposed for listing in December 2020 for 'threatened' status under the Endangered Species Act. The monarch butterfly is further discussed in **AIB Table 4**. The Proposed Action area does not contain any designated critical habitat for any ESA-listed species. Since the Proposed Action does not include any ground-disturbing activities or actions that would impact any ESA-listed species, the FFO has determined that the Proposed Action would have "no effect" under Endangered Species Act (ESA) on any ESA-listed species protected under the ESA. The FFO would make a new effects determination under ESA for any future proposed action on FFO-managed land and will consult or conference on impacted species and/or critical habitat as appropriate. Effects on an ESA-listed species would also include indirect impacts that could go well beyond the footprint of the proposed disturbance or decision area), as described in ESA.

Surface disturbance associated with reasonably foreseeable actions within the decision area may reduce potential habitat and increase fragmentation, which could have some indirect impact to the monarch butterfly occurring within the planning area. At the landscape level, implementation of land restoration and conservation activities would continue to help offset the impacts of surface disturbance on habitats and may result in beneficial impacts on habitat, depending on the site-specific success of restoration activities and concurrent climate trends.

AIB Table 4. USFWS IPaC System ESA-listed T&E Species with Suitable Habitat Within the Decision Area

Species (scientific name) (status)*	Discussion [†]
Monarch butterfly (<i>Danaus plexippus</i>) (PT)	Monarch butterflies can feed on the nectar of many flowering plants in various habitat types (e.g., fields, roadside areas, wetlands, or urban gardens), but they only breed on milkweed species (family Asclepiadaceae) (BLM 2024b). Given the lack of site-specific flowering plant species data, and the generalist habitat requirements for monarch butterflies, the BLM does not presently know if the proposed action area contains suitable habitat for host plants. Site-specific analysis at time of any future potential lease development will provide an additional opportunity to evaluate suitable habitat for this species. No critical habitat has been designated for this species in New Mexico, but there is proposed critical habitat for overwintering grounds in California. Since the proposed action area contains potential habitat for this species, there is potential for the monarch butterfly to occur.

*PT = Proposed Threatened

[†] The proposed action area is not within species-specific critical habitat.

According to lease notice HQ-TES-1, which would reasonably be expected to apply to any future nominated lease parcels on FFO-managed lands, the BLM would not approve any ground-disturbing activity that may affect species or critical habitat until it completes its obligations under applicable requirements of the ESA. In addition, the BLM may require modifications to or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat.

Lease notice FFO-BS-LN-41, which requires biological survey and potential seasonal closures within sensitive species habitat, would likely be applied to future nominated lease parcels within FFO-managed lands. The BLM would require biological surveys for all sensitive species at the APD or project-level stage where proposed activities could affect these species' habitat or potential habitat (BLM 2008a, BLM 2022d). The applicability of stipulations to parcel-specific species concerns would be determined at the APD or project-level stage after site-specific surveys have been completed to confirm the presence and precise location of ecological features within a proposed project area on FFO-managed lands. Biological surveys would identify occurrences of ESA plant and wildlife species and habitat for avoidance during project siting and construction (e.g., milkweed occurrences for monarch butterflies). The BLM would conduct site-specific evaluations at the unit development stage for any reasonably foreseeable actions within a proposed project area to determine whether effects on ESA species (current or future) would occur. Avoidance, minimization, and/or mitigation measures would also be determined at that time. The BLM is working with other land management agencies to restrict and manage development through establishment of management protocols to identify and map potential and occupied habitat requiring species-specific inventories and studies, as well as other requirements, ahead of locating well pads and infrastructure.

The Proposed Action and future potential development are not anticipated to create short- or long-term significant adverse effects on any ESA-listed species for the following reasons: 1) lack of suitable habitat for ESA-listed species within the decision area 2) neither the Proposed Action nor any Action Alternative are reasonably certain to result in any ground-disturbing impacts to ESA-listed species, 3) for any future BLM decision-making following Secretarial decision-making regarding the Proposed Action, site-specific analysis at the lease/unit development stage would provide an opportunity to evaluate effects from such leasing or development on current (and future) ESA-listed species and develop measures to reduce or avoid effects, and 4) the BLM would conduct a new effects determination under ESA prior to authorizing any leasing or development or other ground-disturbing activities. Section 7 consultation under ESA is not required for the Proposed Action (incl. alternatives).

Following Secretarial decision-making, the BLM would continue to review the available data in connection with its statutory responsibilities and how any future BLM proposed action would comply with T&E species management guidelines outlined in the Farmington RMP (BLM 2003), and the 2002 biological assessment for the 2003 Farmington RMP (BLM 2002).

AIB-8 MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) is a federal law that protects migratory birds, their parts, nests, and eggs from being killed, captured, sold, or transported without a permit. The FFO has management steps to comply with the MBTA to protect migratory birds on federal lands, which includes taking measures to avoid, minimize, or mitigate impacts on nesting birds from BLM authorized actions (BLM 2022d). Loss, alteration, or fragmentation of habitat are among the reasons why biodiversity decreases (Taylor and Stutchbury 2016). At FFO, the primary driver of habitat loss and fragmentation is oil and gas development, as well as, to a lesser degree, livestock grazing and surface mining.

If the Proposed Action (Alternative B) were implemented, reasonably foreseeable development of oil & gas and locatable minerals is projected to add approximately 2,723 acres of disturbance within the decision

area. This landscape-level disturbance would further contribute to migratory bird nesting habitat loss and fragmentation/modification, especially obligate species with narrow nesting requirements (e.g., sage sparrow or pinyon jays). By contrast, land restoration and conservation projects (e.g., rangeland restoration and noxious weed treatments) have improved habitat, in which migratory birds have benefitted from the improved herbaceous cover associated with these activities. Future restoration projects would likely produce similar effects where they are implemented.

Most of the effects associated with reasonably foreseeable actions within the Proposed Action area would occur at the initial stages of lease/unit development. These disturbances include construction, drilling, human presence, traffic, heavy equipment, and noise associated with development activities. Bird species not tolerant of noise and human disturbance may exhibit vigilance, flight behaviors, or abandon the area for the duration of construction; this is especially true in areas with high densities of development. Habitat loss and habitat fragmentation/modification effects would be long term, and in most cases, reclamation would not fully rehabilitate migratory bird habitat to pre-development conditions. Strategic planning to reduce surface disturbance prior to any lease/unit development could have significant impacts to migratory bird nesting habitat by reducing habitat loss/fragmentation. Reduction of vegetation disturbance at a landscape level would minimize the impacts to migratory birds. For more information regarding wildlife, including game species, and the New Mexico State Action Plan focused on mapping game corridors.

The Proposed Action area falls within the North American Bird Conservation Initiative Bird Conservation Region (BCR) 16 (Southern Rockies / Colorado Plateau) (North American Bird Conservation Initiative 2025). The New Mexico Avian Conservation Partners developed two lists reflecting the species of highest conservation concern in New Mexico (Level 1 and Level 2) based on distribution, threats, global population size, New Mexico population trends, and the importance of New Mexico to breeding or wintering (New Mexico Avian Conservation Partners 2016). BCR 16 is a topographically complex region in which birds often segregate by elevation bands, each with a different type of habitat. Characteristic breeding habitats include coniferous forests, alpine tundra, pinyon-juniper woodlands, prairies, and wetlands. There are 25 migratory bird species of conservation concern listed for BCR 16 (USFWS 2021). In BCR 16, some of the continent's highest-priority birds breed in this area.

If the Proposed Action (Alternative B) were implemented, reasonably foreseeable development of oil & gas and locatable minerals would add approximately 2,723 acres of disturbance within the decision area, which is less than 0.008% of the total acreage of BCR 16 (32,798,043.80 acres). This surface disturbance could result in long-term habitat loss and fragmentation, depending on the proximity of disturbance to migratory bird habitat. Potential timing restrictions within suitable nesting habitat would apply to comply with the Migratory Bird Treaty Act and FFO's migratory bird management. For future potential development on BLM surface, the BLM would require timing restrictions during the nesting season to avoid direct impacts to migratory birds during nesting period. Prior to authorizing any such use of the public lands, the FFO would analyze impacts from any proposed action and document any impacts, including habitat loss, indirect/direct. Timing stipulations and other management measures may be applied to avoid or minimize impacts from BLM authorized activities on FFO managed lands. Additionally, stipulations applied for other resources may provide secondary protections to potential habitat (e.g., surface water features, shrublands, grasslands, or riparian areas) for migratory birds. The BLM would apply STCs to proposed projects on FFO-managed lands, including a requirement for pre-disturbance surveys at the time of any potential future lease development. Following surveys, management measures may be applied within 0.5 miles of any occupied or unoccupied raptor nests between Feb 1 and June 30 as detailed in the BLM FFO RMP (BLM 2008a). Stricter standards may apply to bald and golden eagles to comply with the Bald and Golden Eagle Protection Act.

Compliance with the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act would be required for any future potential developments and would follow FFO's Migratory Bird Policy (BLM 2010),

which could include timing limitation constraints on future developments within the decision area during nesting seasons, or requirements for netting/covers over open water containing fluids that are harmful to migratory birds. The BLM applies measures to mitigate effects on migratory birds at the leasing/unit development stage where conflicts exist and coordinates with NMDGF and USFWS, as needed, to identify appropriate measures. Developmental constraints during nesting seasons, including avoidance and nest surveys, may be required prior to implementation of any future lease development activities. Some of these include the application of netting over open tanks, raptor-safe power line construction standards, and sound mufflers. In addition, the BLM may require avoidance of active avian nests and burrows or delays of development activities to accommodate migratory birds.

AIB-9 GENERAL WILDLIFE AND GAME SPECIES

The decision area contains populations of big-game species, including mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*), as well as a multitude of other non-game species. Carnivores include bobcat (*Lynx rufus*), coyote (*Canis latrans*), badger (*Meles meles*), kit fox (*Vulpes macrotis*), mountain lion (*Felis concolor*), and black bear (*Ursus americanus*). Upland game bird species include Gambel's quail (*Callipepla gambelii*) and scaled quail (*Callipepla squamata*). Oil and gas-related surface disturbance can result in the long-term loss of vegetation, burrows, and nests, and could also cause habitat disturbance, loss, and fragmentation; behavioral responses (e.g., wildlife avoidance); and mortalities (Northrup and Wittemyer 2013; Sawyer et al. 2019; Sawyer et al. 2017). Developments and surface disturbances may also have effects on elk, mule deer, bobcat, coyote, badger, kit fox, mountain lion, and black bear, such as avoidance of areas within and near the areas of development.

If the Proposed Action (Alternative B) were implemented, reasonably foreseeable development of oil & gas and locatable minerals would add approximately 2,723 acres of disturbance within the decision area, which would impact wildlife habitat. Past, present, and future vegetation restoration projects which include habitat restoration, noxious weed treatments, wildlife-friendly fencing, and surface reclamation of well pads, roads, and pipelines, have contributed to improved habitat conditions for wildlife and big-game species. These reclamation activities improve nesting cover for ground nesting birds, improve fawning and calving habitat for elk and mule deer, and restore proper hydrological functionality by increasing ground cover, slowing water movement across the surface, and increasing percolation where applicable. Migratory birds have also benefitted from the improved herbaceous cover associated with these vegetative treatments. It is assumed that future vegetative restoration will produce similar effects where they are implemented. Additionally, since 1990 the BLM has installed many wildlife habitat improvements within the decision area, including numerous watering developments. These habitat improvements have been implemented through the HSP funding, which is generated through the sale of a \$10.00 stamp or authorization associated with hunting and fishing licenses (NMDGF et al. 2017). The BLM has also funded many of these projects through its annual budget.

Overall, landscape habitat fragmentation and human presence could be considered long-term effects for wildlife, and the potential exists for a decline in species numbers and/or use of the decision area. Where implemented, restoration projects would help offset disturbance to wildlife habitat at the landscape level. Additionally, new wildlife watering developments would improve water availability for wildlife species.

Game management units (GMUs) are subdivisions used to manage big-game species in the state. These GMUs are designated and mapped by the NMDGF and are readily available through its annual hunting proclamation (NMDGF 2025) and website.⁶ The NMDGF has provided a set of guidelines that are useful

⁶ <http://www.wildlife.state.nm.us/hunting/maps/big-game-unit-maps-pdfs/>

to guide oil and gas development statewide. Specifically, these guidelines can be applied in areas where potential conflicts occur between development and the various wildlife species present (NMDGF 2007).

Pre-disturbance surveys would be required for future proposed lease development in accordance with the lease STCs. Avoidance, minimization, and/or mitigation measures would also be determined at that time. The BLM has the authority under the STCs and lease stipulations to attach COAs at the site-specific level to minimize adverse effects on resource values at the time operations are proposed. Examples of potential mitigation measures include implementing design modifications to avoid or minimize effects on sensitive habitats; limiting the number of well pads under simultaneous construction; incorporating seasonal restrictions; limiting the number of proposed roads; reclaiming old and/or unnecessary roads; minimizing truck traffic; implementing noise-buffering measures; conducting pre-development surveys; or using special construction techniques to minimize surface disturbance to sensitive areas.

Impacts on wildlife are reduced by implementing the appropriate timing, and/or surface use stipulations. During future potential development of the PPA, if leasing of oil and gas resources is evaluated, BLM would apply lease notices/stipulations such as FFO-BS-LN-41, which requires a biological survey and potential seasonal closures within sensitive species habitat. Stipulation FFO-BGWR-TL-4 (Big Game Habitat) would be attached to lease parcels within a mule deer migration route (Kauffman et al. 2022). Additionally, stipulations applied to future potential developments for other ecological concerns may provide secondary protections to wildlife found within the decision area.

The broader list of available FFO lease stipulations is derived from the 2003 RMP. The NMDGF was a cooperating agency during the development of the RMP and stipulations were developed with their input and data. Refer to the RMP for more information about wildlife impacts, including but not limited to barriers, wildlife waters, and brush treatments, to improve habitat. Subsequently, site-specific analysis of impacts on wildlife will also be addressed with COAs at the development stage.

AIB-10 SENSITIVE SOILS

Surface disturbance from potential development activities either from wells on existing leases or development of minerals subject to location and entry supported by existing rights under the No Action Alternative, or from wells on new leases, and new mineral entry under the Proposed Action (Alternative B) or Partial Revocation Alternative (Alternative C), would disrupt soil horizons, halting natural soil-forming processes and potentially leading to compaction, erosion, and degradation of soil microbial communities. These impacts are more pronounced in fragile and sensitive soils, which are easily damaged and difficult to restore. Sensitive soils may include those prone to compaction, erosion, or mechanical damage, particularly on slopes or in areas with unique soil characteristics.

Within the FFO, fragile soils are scattered throughout the decision area. Using Natural Resources Conservation Service soil data for San Juan, Sandoval and McKinley counties, it is estimated that approximately 132,000 acres, or about 14% of the 965,670 surface acres within the withdrawal area, are considered fragile soils. Additionally, soil piping (subsurface erosion that creates underground channels) has been observed within the FFO jurisdictional area. These areas could pose a risk to surface stability.

The severity of potential impacts depends on site-specific conditions and the nature of the development activity. Because soil regeneration is a slow process, impacts are generally considered long term.

Future development could further affect the physical and biological integrity of soils in disturbed areas. Surface disturbance may result in long-term soil degradation, including reduced soil-forming processes, compaction of subsurface layers, and potential loss or decline of soil microbial communities. Site-specific permitting will address mitigation measures, which may include surface use restrictions, topsoil

preservation, strategic project placement, and reclamation measures to minimize impacts on sensitive soils. Additionally, site-specific studies and mitigation may be necessary to address soil piping concerns in future project areas.

AIB-1 I NIGHT SKIES/DARK ENVIRONMENTS

Night sky and dark environments are considered one of the critical features protected by Chaco Cultural National Historical Park (CCNHP). The natural photic environment, unencumbered by light pollution, is critical to ecosystem function, as well as providing both natural aesthetic and experiential qualities to park visitors. In 2013, Chaco Canyon was certified as an International Dark Sky Park. Night sky measurements were collected from 2001 to 2016 using photographic equipment configured by the National Park Service Night Skies Program. Three measures were used as an indicator for sky glow, which is the brightening of the night sky that results from light pollution. The zenith limiting magnitude (ZLM) was measured at 7.0 magnitude under most conditions. A ZLM of 6.3 usually indicates significantly degraded sky quality. A ZLM of 6.6 is considered near pristine under average conditions. Bortle sky classification was Class 3: rural sky, based on the visibility of astronomical objects. The scale ranges from class 1, the darkest skies available, through class 9, inner-city skies. The zenith sky brightness ranged from 21.72 to 22.23 magnitudes per square arcsecond. Overall, the current night sky condition at CCNHP is considered “good.”

The main sources of sky glow in the decision area are the light domes from Albuquerque, Bloomfield, Crownpoint, Farmington, Gallup, Grants, Rio Rancho, and Santa Fe. These light domes were observable along the horizon with a few exceeding the brightness of the Milky Way. Additionally, glare sources from oil and gas development sites are observable along the north and east horizons. The artificial lighting from oil and gas development is associated with infrastructure lighting, flaring, and traffic.

If the Proposed Action (Alternative B) were implemented, reasonably foreseeable development of oil & gas and locatable minerals is projected to amount to add approximately 2,723 acres of disturbance within the decision area, which could contribute to sky glow over the long term with an incremental increase as wells are developed on new mineral leases. While NPS monitoring data indicates that dark sky conditions in the area currently retain their natural characteristics, sky quality index ratings could be affected by sky glow associated with community and urban growth, as well as oil and gas well development associated with reasonably foreseeable actions.

Future potential development could introduce additional artificial lighting that would contribute to sky glow over the short and long term. The degree to which artificial lighting contributes to sky glow would be generally temporary and transient in nature and would vary based on conditions such as cloud cover, weather, and wind speed or direction. For example, most artificial lighting would be short term and would occur during the drilling, completion, and potential flaring of a well, which could last for approximately 30 to 60 days. Long-term lighting sources from oil and gas development and production include those associated with vehicle traffic as well as safety lighting required at night. There is wide variability in both types of lighting and potential impacts of that lighting on night skies that are dependent on environmental factors best understood at the site-specific development stage. Because site-specific information such as the average number of lumens per well or proposed lighting plans for each proposed development is not known at the leasing stage, the number of proposed wells and anticipated new surface disturbance is used as the proxy for determining the change in oil and gas-related lighting from existing conditions. Given that the NPS reports that the primary sources that contribute to an increase in night sky effects (sky glow) are cities (NPS 2024), contributions to sky glow from future potential development would be a small contribution to the existing sources.

Under standard terms and conditions, the BLM has the authority to require mitigation measures to reasonably reduce resource effects at the site-specific permitting stage of any potential future

development. The BLM may require completion of a viewshed analysis and use of mitigation measures such as preparation of lighting plans by a qualified lighting designer, flare shields, alternatives to lighting, outdoor luminaires certified to minimize light pollution including appropriate warm color temperature, controls to limit unnecessary lighting such as timers and/or motion sensors, and project alignment.

AIB-12 GROUNDWATER QUALITY

Future potential development of the decision area could result in oil and gas activities, including well pad construction, drilling, and completion of an estimated 4 horizontal Mancos and 10 vertical Fruitland coal wells. The wells would employ standard industry practices related to well completion (i.e., hydraulic fracturing). Types of chemical additives used in well completion activities could include acids, hydrocarbons, thickening agents, gelling agents, lubricants, and other additives that are operator- and location-specific. The primary components in hydraulic fracturing fluid are water and sand.

The BLM Water Support Document for Oil and Gas Development in New Mexico (BLM 2025c) contains a detailed summary of the regulatory program associated with hydraulic fracturing and measures to protect groundwater quality. A list of the potential environmental effects of hydraulic fracturing can be found in the U.S. Environmental Protection Agency (EPA) report *Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States* (EPA 2016). In summary, this report examines six different scenarios in which drinking water resources could be affected by hydraulic fracturing: 1) water withdrawals during periods of low water availability; 2) spills of hydraulic fracturing fluids/chemicals and/or produced water; 3) release of hydraulic fracturing fluids from wells with inadequate casing; 4) direct injection of hydraulic fracturing fluids into groundwater; 5) discharge of insufficiently treated wastewater to surface water; and 6) contamination of groundwater from unlined storage/disposal pits.

Section 2.2.2 of the Water Support Document also contains information on perfluoroalkyl and polyfluoroalkyl substances (PFAS), which is a broad classification for a large group of human-made chemicals that are found in a wide variety of industrial processes and common household items. PFAS are a main component of aqueous film-forming foam, which is used regularly in fire suppression and prevention activities performed at airports and military bases. Aqueous film-forming foam is a major source of PFAS groundwater contamination and has been recognized as a national challenge in the United States (Sunderland et al. 2018). PFAS are very persistent in both the environment and the human body because they break down very slowly (EPA 2024c). PFAS persistence has been linked to bioaccumulation in both the environment and human body, which could lead to adverse effects on human health (EPA 2024c). In 2020 and 2021, the USGS partnered with the New Mexico Environment Department (NMED) to conduct a statewide assessment of PFAS to improve our understanding of PFAS contamination throughout the state (USGS 2024). The study analyzed PFAS presence in groundwater across New Mexico. Of the 117 groundwater sample locations across New Mexico, 27 sample locations (23% of sampling locations) were found to have one or more PFAS above the laboratory detection limit (USGS 2024). There were no PFAS sample locations that had concentrations exceeding the EPA's 2016 health advisory limit of 70 nanograms/liter in drinking water⁷ (USGS 2024).

PFAS may be used during the hydraulic fracturing process due to their stability at high temperatures and pressures and may be used in well drilling (in the form of drilling fluids), well completion, and workover operations (Gaines 2022). In addition to drilling efficiency purposes, PFAS are used as an effective method to mitigate oil spills in water. The use of PFAS chemicals makes up a minimal amount (less than 1%) of

⁷ After this study was completed, in June 2022, the EPA reduced the health advisory level to 0.004 parts per trillion (ppt) and 0.02 ppt for PFAS compounds perfluorooctanoic acid and perfluorooctane sulfonate, respectively, and established health advisory levels for two other PFAS compounds, perfluorobutane sulfonic acid and GenX, at 2,000 ppt and 10 ppt, respectively (USGS 2024).

chemical constituents disclosed to FracFocus for hydraulic fracturing in New Mexico (FracFocus 2025). In total, 63 of the approximately 31,000 ingredient disclosures (0.2%) in 2023 were related to PFAS used in hydraulic fracturing processes in New Mexico. PFAS use in hydraulic fracturing is likely to occur in areas not associated with New Mexico's drinking water (BLM 2025c).

Reasonably foreseeable well development associated with the alternatives may involve drilling wells that would pass through a usable water zone currently- or potentially-supplying stock, residential, and/or irrigation water. If proper cementing and casing programs are not followed, there may be a loss of well integrity, surface spills, or loss of fluids in the drilling and completion process that could result in high concentrations of chemicals reaching groundwater resources. If contamination of usable water zones (resulting in total dissolved solids greater than 10,000 parts per million [ppm]) from any source occurs, springs and water wells that are sourced from the affected aquifers could be subject to long-term decreases in water quality depending on the severity of the contamination event, and individuals and communities that use those wells could be affected. According to New Mexico Administrative Code (NMAC) 19.15.16, operators are required to seal and isolate strata containing fresh water from oil and gas-bearing strata (including sealing the annulus). BLM regulations and state authorities include requirements for casing and cementing, monitoring and recording, and management of recovered fluids (wastewater or produced water). See 43 C.F.R. § 3160; 43 C.F.R. § 3162.3-3; 43 C.F.R. § 3162.3-5; 43 C.F.R. § 3171; 43 C.F.R. § 3172; 43 C.F.R. § 3177; New Mexico Statute Annotated (N.M.S.A.) 1978, §§ 74-1-7 and 74-1-7 (describing the state's role in implementing the federal Safe Water Drinking Act); NMAC 19.15.26 (state rules for injection wells). The BLM and State of New Mexico enforce these safeguards, which have been put in place to prevent these situations from occurring.

Freshwater in the groundwater basin is typically found where it is confined at depths less than 2,500 feet below the ground surface with saline and brackish water dominant at deeper depths (BLM and BIA 2020). The Mancos Shale formation is approximately 2,500 feet deep, and the average oil and/or gas well depths within the counties are 1,902 feet (McKinley County), 5,551 feet (Sandoval County), and 4,494 feet (San Juan County) (Mineral Answers 2025a, 2025b, 2025c). Based on estimated aquifer thicknesses and depths within the decision area, future potential development would likely result in wells drilled beyond (through and deeper than) the regional aquifers. Although wells drilled would likely pass through these aquifers, the regulatory programs described previously would provide protection to these water resources.

While groundwater resources are regional in nature and water withdrawals for oil and gas development activities are not anticipated to affect domestic water sources, impacts on local water wells and diversion features (for example, a spill that affects groundwater) could force residents to find other means of supplying water for domestic use. Best management practices and COAs applied, as appropriate, to any future development would help to minimize this risk. STCs would also apply to all leases, which allows for siting of wells to minimize potential impacts on existing groundwater wells and groundwater resources.

Protection of groundwater quality is enforced in concert with the State of New Mexico and any other entities with jurisdiction, and mitigation of any water-contaminating event would occur in addition to the enforcement of applicable regulations. If effects were to occur during future potential development, lessees and operators would be obligated by the standard terms of the lease, as well as the approved APD and applicable BLM and New Mexico Oil Conservation Division (NMOCD) regulations, to report, respond to, and mitigate the spill or release. Additionally, all injection wells permitted by the NMOCD (including injection wells and producing wells and all related surface facilities) are subject to a surface injection pressure limitation. Wells are required to be equipped with a pressure-limiting device, which ensures that the maximum surface injection pressure is not exceeded (NMOCD 2004). The BLM inspection and enforcement personnel regularly inspect wells and surface facilities to ensure that all wells and related surface facilities are in good condition and leak-free (NMOCD 2004). The NMOCD is also responsible

for oversight of hydraulic fracturing wastewater pits, regulating the use of liners as well as depth restrictions to protect groundwater resources (NMAC 19.15.17).

Spill occurrences could affect groundwater on-site or during material transport. The Water Support Document (BLM 2025c) notes there were 564 spills in the New Mexico portion of the San Juan Basin in 2024. The rate and ability for spill recovery varies by spill type, but in 2024 the average loss volume for all liquid spill types was approximately 90%. Spills that are not recovered are remediated, which may include removal of contaminated soil. However, in 2024 no spills occurring in the San Juan Basin were reported as having affected groundwater (BLM 2025c). Should a spill occur, the BLM would work with the NMOCD to immediately remediate spills on BLM lands in accordance with federal and state standards, including NMAC 19.15.29.11. According to NMAC 19.15.29.11, the operator shall complete division-approved corrective action for releases that endanger public health or the environment in accordance with a remediation plan submitted to and approved by the NMOCD or with an abatement plan submitted in accordance with NMAC 19.15.30. The remaining contaminants from unrecovered spills are remediated in accordance with federal and state standards. Some remediation could consist of removal of contaminated soil, replacement with uncontaminated soil, and subsequent chemical testing. See the Water Support Document (BLM 2025c) for further information on spills.

In summary, the BLM, NMED, and NMOCD have put in place numerous requirements for oil and gas producers that minimize the risk of drilling or completion fluids, and produced water and hydrocarbons inadvertently existing the well bore and entering groundwater or any other formations. With these requirements in place, including the use of casing and cementing measures, contamination of groundwater resources from development of wells under the alternatives is unlikely. The BLM would require the use of site-specific mitigation tools as appropriate for the individual circumstances, including groundwater-quality monitoring studies. The regulation at 43 C.F.R. § 3162.5-2(d) gives the BLM the authority to require an operator to monitor water resources to ensure that the isolation procedures used to protect water and other resources are effective.

AIB-13 SURFACE WATER QUALITY

Watersheds are delineated by USGS using a nationwide system based on surface topographic and hydrologic features. Hydrologic unit codes (HUCs) are used to identify a hydrologic area, ranging from the largest 'regions' to smaller 'cataloging units.' HUC-10 is a level of classification that divides subbasins into watersheds typically ranging from 40,000 to 200,000 acres (Jones et al. 2022). The Proposed Action area (Alternative B) falls within 12 HUC-10 watersheds (**AIB Table 5**). The Partial Revocation Alternative area (Alternative C) falls within 10 HUC-10 watersheds

Under the No Action Alternative, reasonable foreseeable development for the entire area under PLO No. 7923 is estimated to result in approximately 1,401 acres of surface disturbance associated with existing oil and gas development on mineral leases issued prior to PLO No. 7923, development of minerals subject to location and entry where that development is supported by existing rights, and other development, which represents 0.15% of the approximately 965,670 total acres and 0.41% of the 338,690 BLM managed acres. Under Alternative B, reasonably foreseeable development of oil & gas and locatable minerals within the area is estimated to result in approximately 2,723 acres of new surface disturbance for a total expected disturbance of 4,125 acres. This total represents 0.43% of the approximately total acres and 1.2% of the BLM managed acres in the decision area. For Alternative C, the same amount of development as Alternative B is projected. These actions would disturb vegetation, soils, and mineral substrate, which would create dust and increase runoff during precipitation events. Disturbed areas would become more susceptible to erosion. Soil that is carried downgradient by runoff because of upslope erosion might create sedimentation issues in streams and waterbodies. Sedimentation would be most likely to occur during construction of stream crossings for access roads and flowlines, and at disturbances

nearest streams; however, effects would remain until disturbed areas are restored to preconstruction conditions. Development of the RFD also carries a risk of spills that could result in the delivery of contaminants to surface water depending on the proximity of development activities to surface water and the measures applied to address the possibility of spills reaching surface water bodies. However, as noted in the BLM Water Support Document (WSD) for Oil and Gas Development in New Mexico (BLM 2025c), 12 of the 564 spills in 2024 (2.12%) in the FFO were reported as having affected surface water. No surface waterways in either Alternative B or Alternative C have been assessed as Clean Water Act 303(d) Impaired Waters. For detailed discussion of risk of spills associated oil and gas development, see Section 3.2 of the WSD (BLM 2025c).

Based on review of the USGS's National Hydrography Dataset (NHD), Federal Emergency Management Agency floodplain data, and the USFWS's National Wetlands Inventory (NWI) data set,⁸ surface water features are present on the lands associated with Alternative B and Alternative C (**AIB Table 5**). Both Alternatives contain ephemeral and/or intermittent streams, perennial and/or intermittent lake/pond waterbodies, Federal Emergency Management Agency-mapped Zone A floodplains, freshwater emergent and/or forested/shrub wetlands, and developed water wells. Alternative B contains 3 seeps and/or springs while this feature type is not present in Alternative C. **AIB Table 5** lists the mapped surface water features and HUC-10 watersheds for Alternative B and Alternative C.

AIB Table 5. Surface Water Feature Impact Summary

Alternative	Water Features Present (acres or miles) *	HUC-10 Watershed (total decision area acres within each watershed; percent total watershed acreage)
Alternative B	Ephemeral/Intermittent stream/river (638 miles), Perennial/Intermittent waterbody (146 acres), Wetland (80.3 acres), FEMA Zone A Floodplain (12,124 acres), 3 springs/seeps, 7 water wells	Hard Ground Canyon-Puerco River (1,337 acres; 0.49%) Ah-Shi-Sle-Pah Wash-Chaco River (25,302 acres; 10.24%) Indian Creek (9,963 acres; 2.96%) Mitchell Draw (4,755 acres; 1.58%) De-na-zin Wash (69,768 acres; 32.54%) Headwaters Kim-me-ni-oli Wash (15,460 acres; 4.95%) Outlet Kim-me-ni-oli Wash (7,715 acres; 5.1%) Hunter Wash (101 acres; 0.05%) Coyote Wash-Chaco River (9,795 acres; 4.46%) Canada Alemita-Chaco Wash (59,244 acres; 18.23%) Fajada Wash (1,828 acres; 0.93%) Escavada Wash (56,202 acres; 24.84%)
Alternative C	Ephemeral/Intermittent stream/river (516 miles), Perennial/Intermittent waterbody (131 acres), Wetland (68.2 acres), FEMA NFHL Zone A (4,023 acres), 3 springs/seeps, 2 water wells	Hard Ground Canyon-Puerco River (922 acres; 0.34%) Ah-Shi-Sle-Pah Wash-Chaco River (8,220 acres; 3.33%) Indian Creek (1,601 acres; 0.48%) De-na-zin Wash (< 0.1 acre; < 0.01%) Headwaters Kim-me-ni-oli Wash (6,605 acres; 2.12%) Outlet Kim-me-ni-oli Wash (4,834 acres; 3.19%) Canada Alemita-Chaco Wash (8,756 acres; 2.69%) Escavada Wash (20,207 acres; 8.93%)

Previously mapped surface water features have been identified based on analysis of the USGS's NHD and the USFWS's NWI. Additional surface water features may be identified during site-specific analysis at future potential lease-development stages, and the lessee would be required to follow applicable STCs, as well as COAs as determined by the BLM.

* Wetlands may overlap or surround other surface water features depending on site-specific delineation; therefore, acreage of wetlands may be included in other surface water features presented in this table.

⁸ Delineation size of surface water features varies between the NHD and NWI data sets. Site-specific analysis of any future nominated lease parcels would identify aquatic features and wetlands at that time.

Both Alternative A and Alternative B contain lands subject to stipulations which are routinely applied to lease sales in the Farmington Field Office. Such stipulations state that surface disturbance will not be allowed within up to 0.25-mile of the channels of ephemeral, intermittent, and perennial streams. The stipulations are designed to protect the unique biological and hydrological features associated with steams, riparian/wetland areas, and 100-year floodplains, and the protection of riparian habitat for purposes of preventing further habitat fragmentation and loss of use of otherwise suitable/effective habitat (For all lands that contain surface water features, the BLM would use STCs, COAs, and BMPs to minimize potential impacts on surface waters. Additionally, stipulations applied to the developed areas for other ecological concerns may provide secondary protections to surface water features found within these areas.

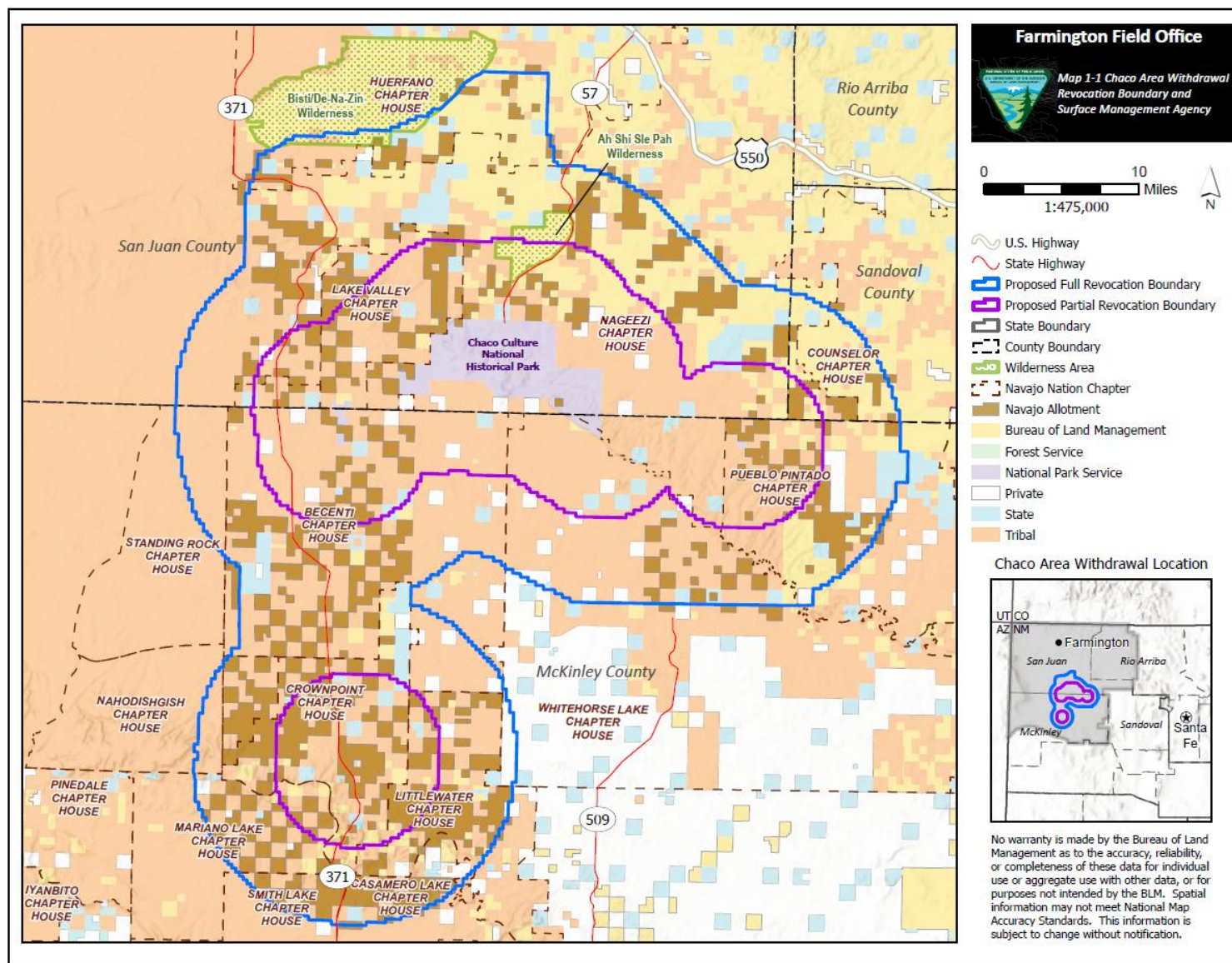
For further information on measures that may be required, such as casing, cementing, or remediation (that could consist of removing contaminated soil, replacing it with uncontaminated soil, and performing corresponding chemical testing), see the WSD (BLM 2025c). The NMOCD prohibits pollution of any surface or subsurface fresh water from well completion activities, or treatment, transportation, and disposal of produced water. Finally, NMAC 19.15.16 contains minimum casing and cementing standards. Site-specific mitigation tools would be developed as appropriate for the individual circumstances and could include surface water monitoring studies. For instance, if hydraulic fracturing were to take place in an area with potential connections to water resources, NMOCD regulations would require the operator to test the water before, during, and after the operations to ensure it is not contaminated during the process.

The BLM's authority to require additional protective measures, and the low level of surface disturbance relative to the total watersheds (4,125 acres of the 12 applicable HUC-10 watersheds [approximately 1.96 million acres collectively, or less than 0.22% of the applicable watershed acreage]) would serve to minimize the risk of effects on watershed hydrology and surface water quality. Should a spill occur, the BLM would work with the NMOCD to immediately remediate it in accordance with federal and state standards, including NMAC 19.15.29.11. The responsible person shall complete the corrective action for releases that endanger public health or the environment in accordance with a remediation plan submitted to and approved by NMOCD. The remaining contaminants from unrecovered spills are remediated in accordance with federal and state standards. Some remediation consists of removal of contaminated soil, replacement with uncontaminated soil, and subsequent chemical testing. See the WSD (BLM 2025c) for further information on spills. Additionally, as groundwater is mostly used for oil and gas operations, surface water quantity is not expected to be impacted.

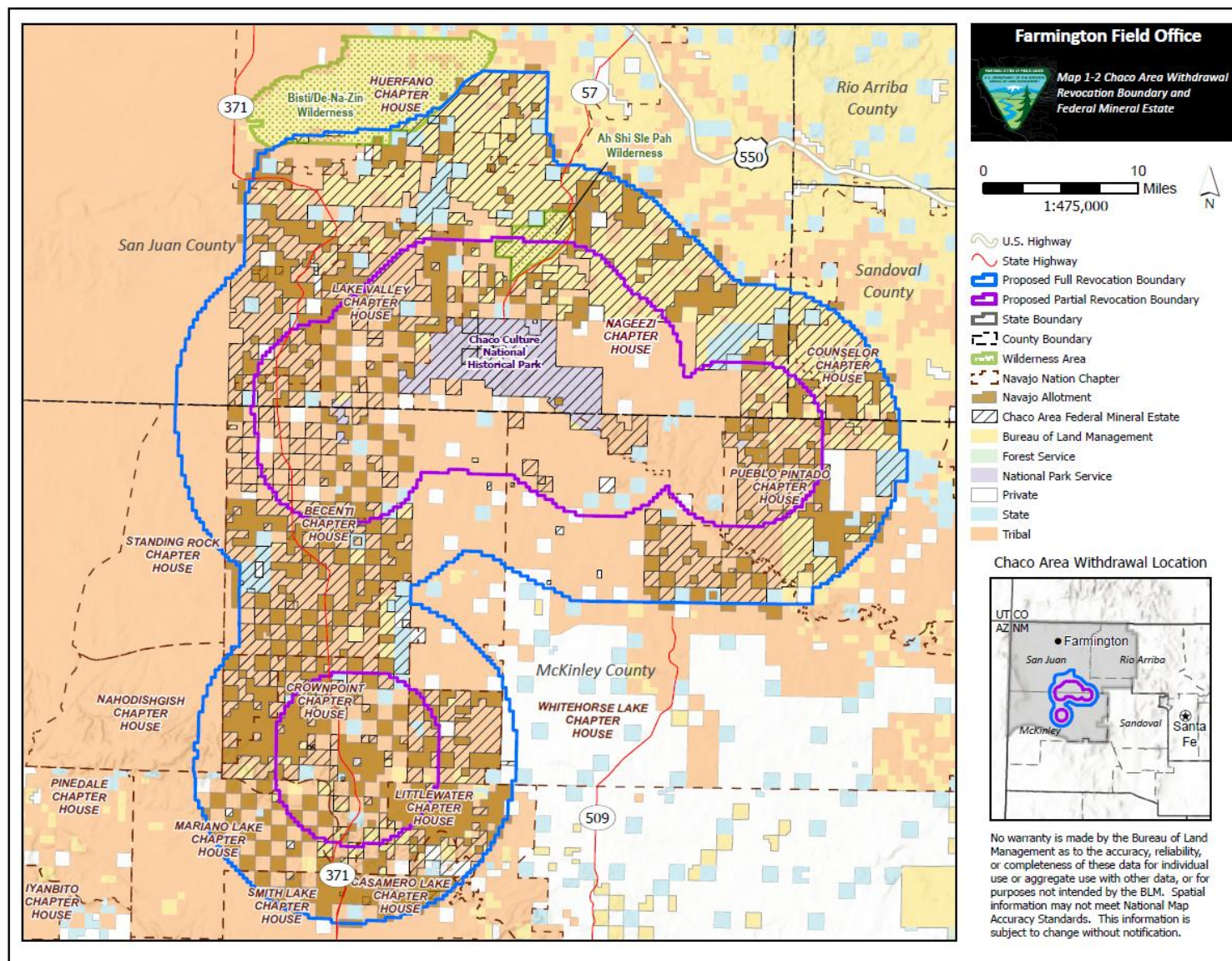
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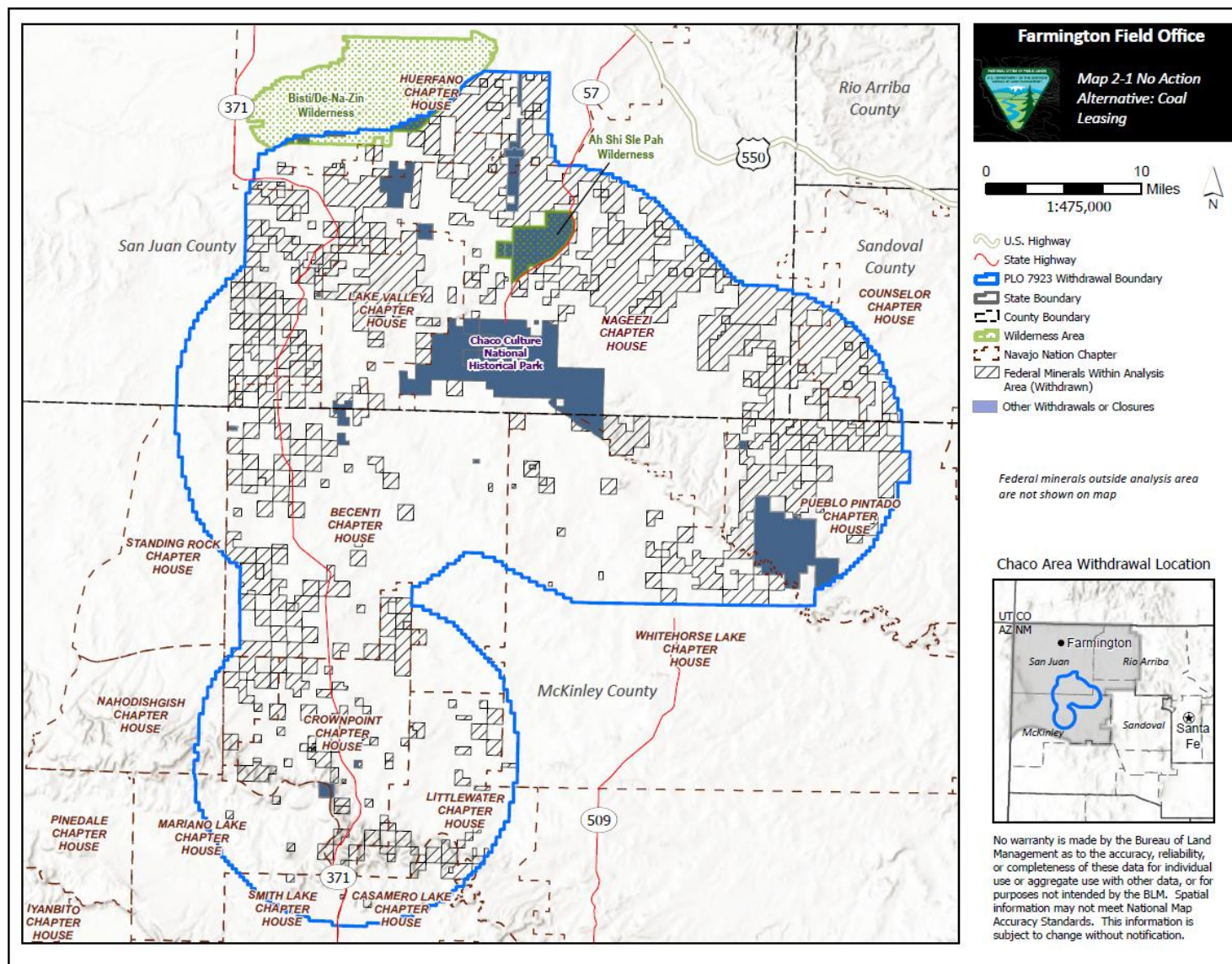
Map I-1: Chaco Area Withdrawal Proposed Revocation and Surface Management Agency



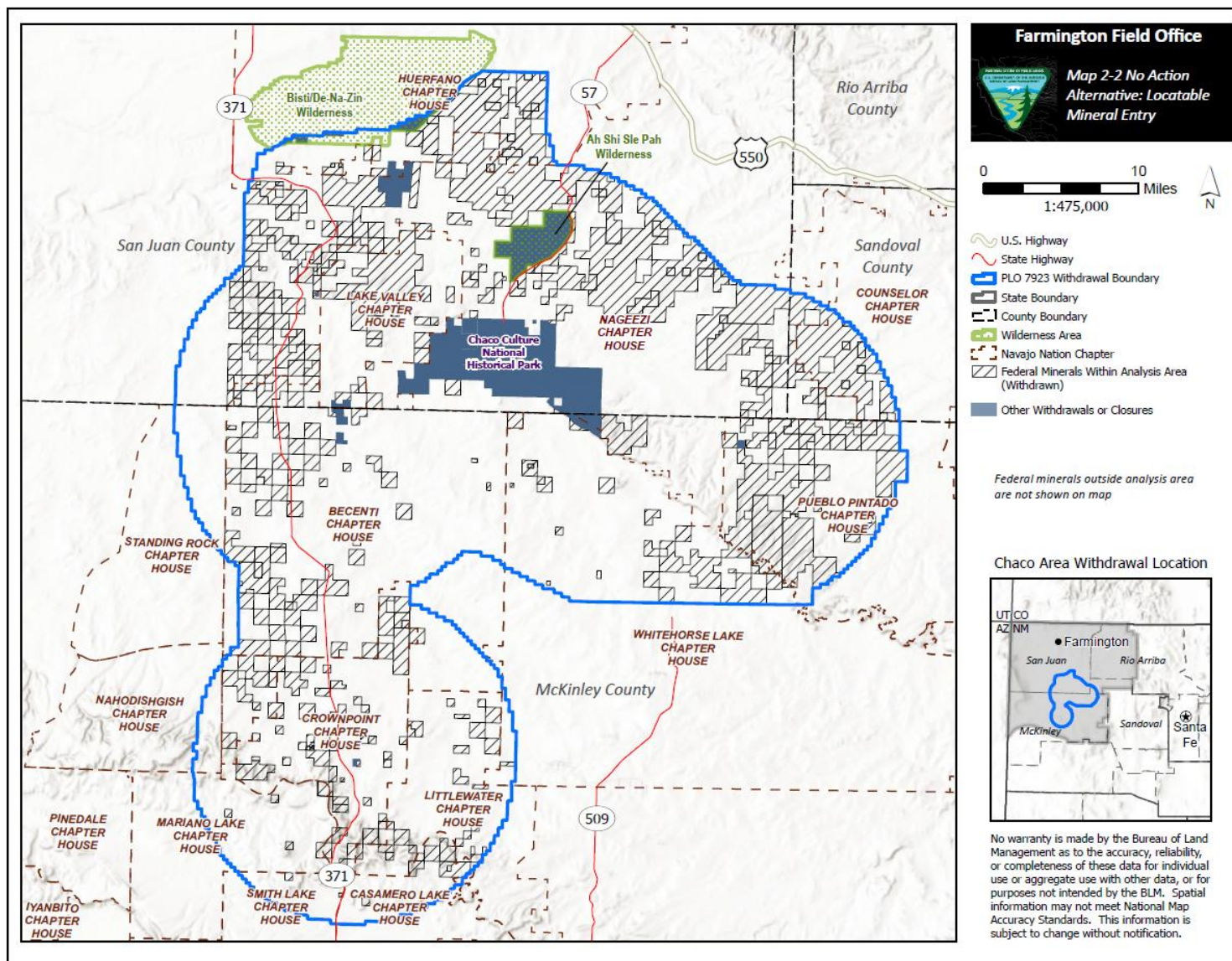
Map I-2: Chaco Area Withdrawal Proposed Revocation and Federal Mineral Estate



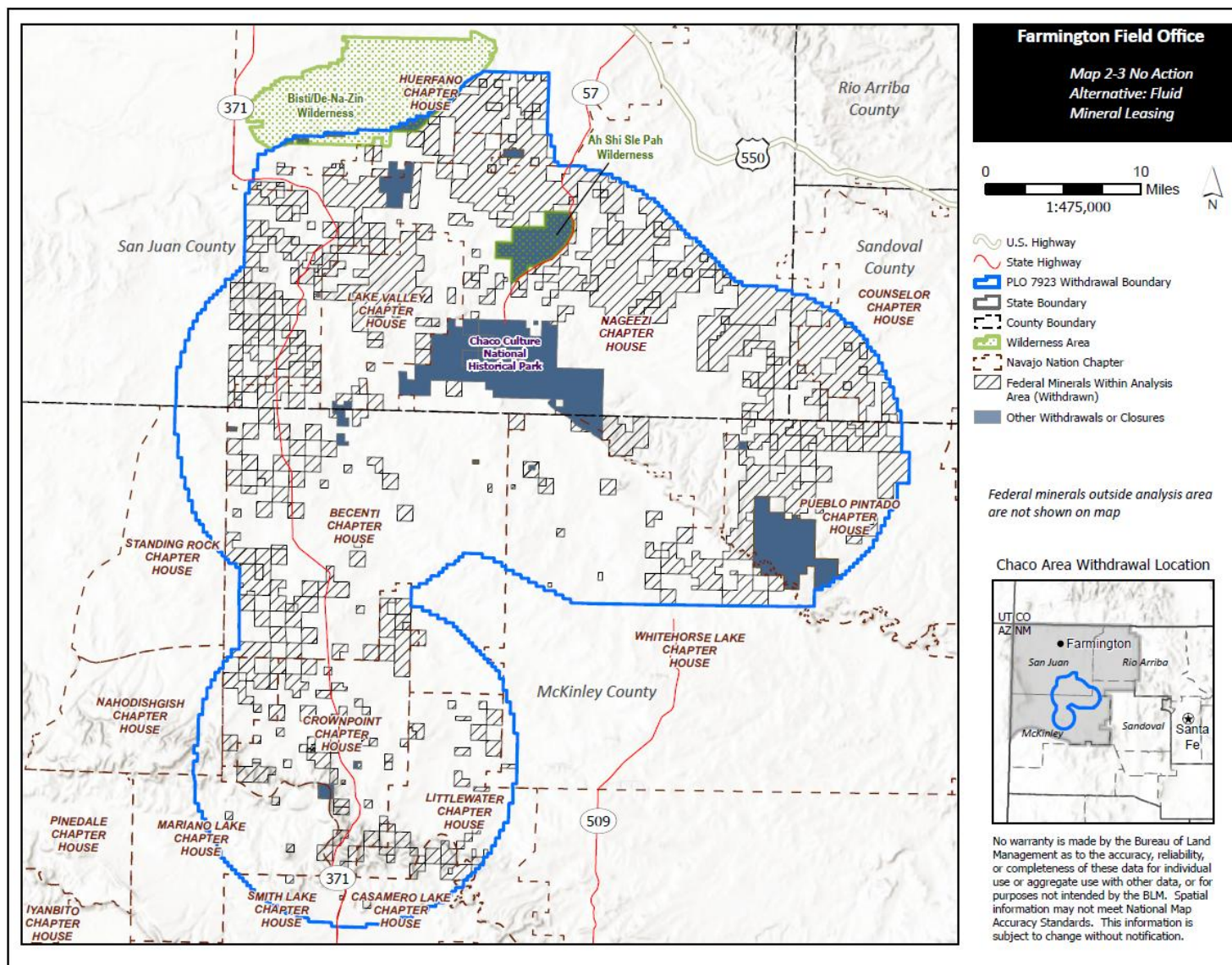
Map 2-1: No Action Alternative: Coal Leasing



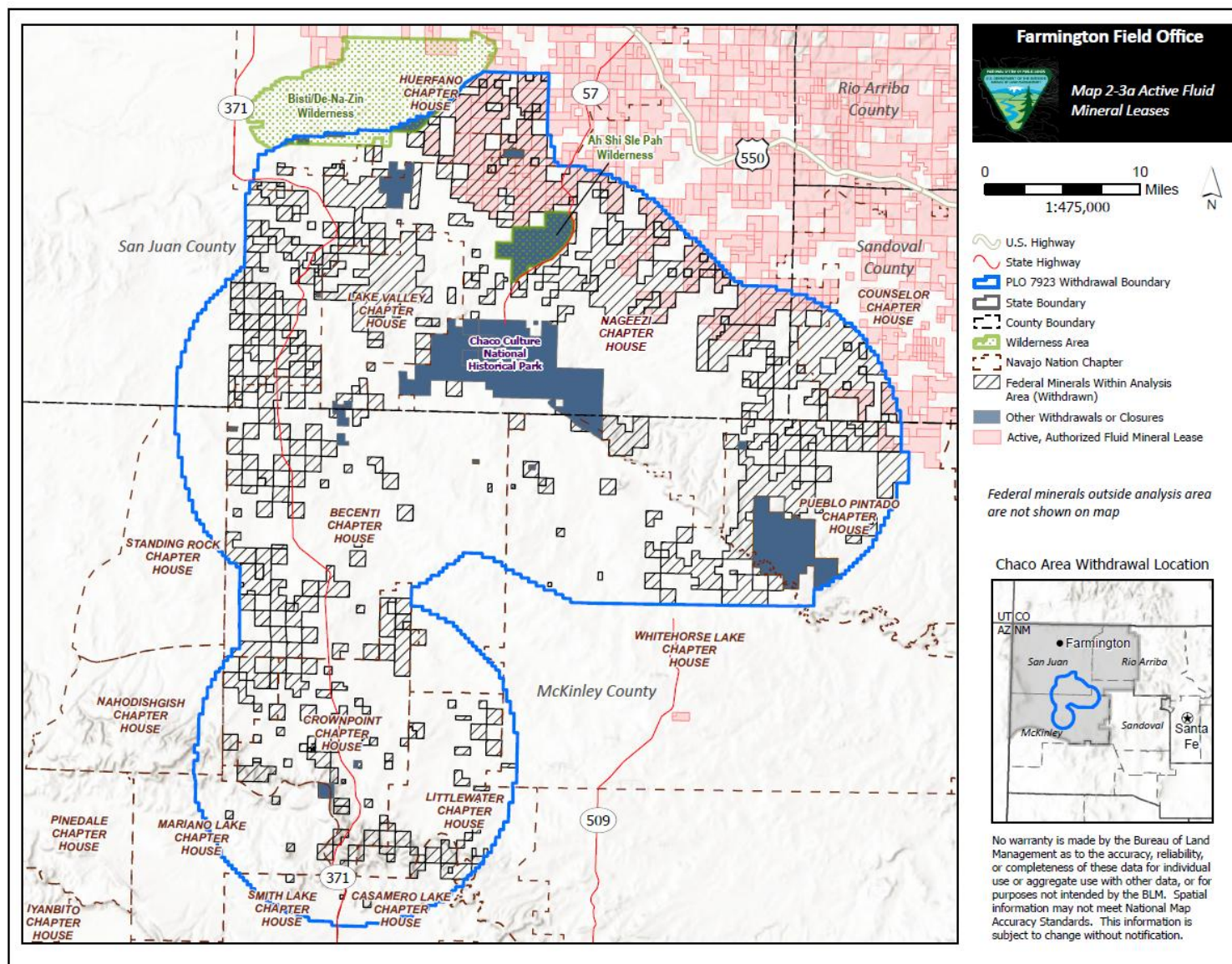
Map 2-2: No Action Alternative: Locatable Mineral Entry



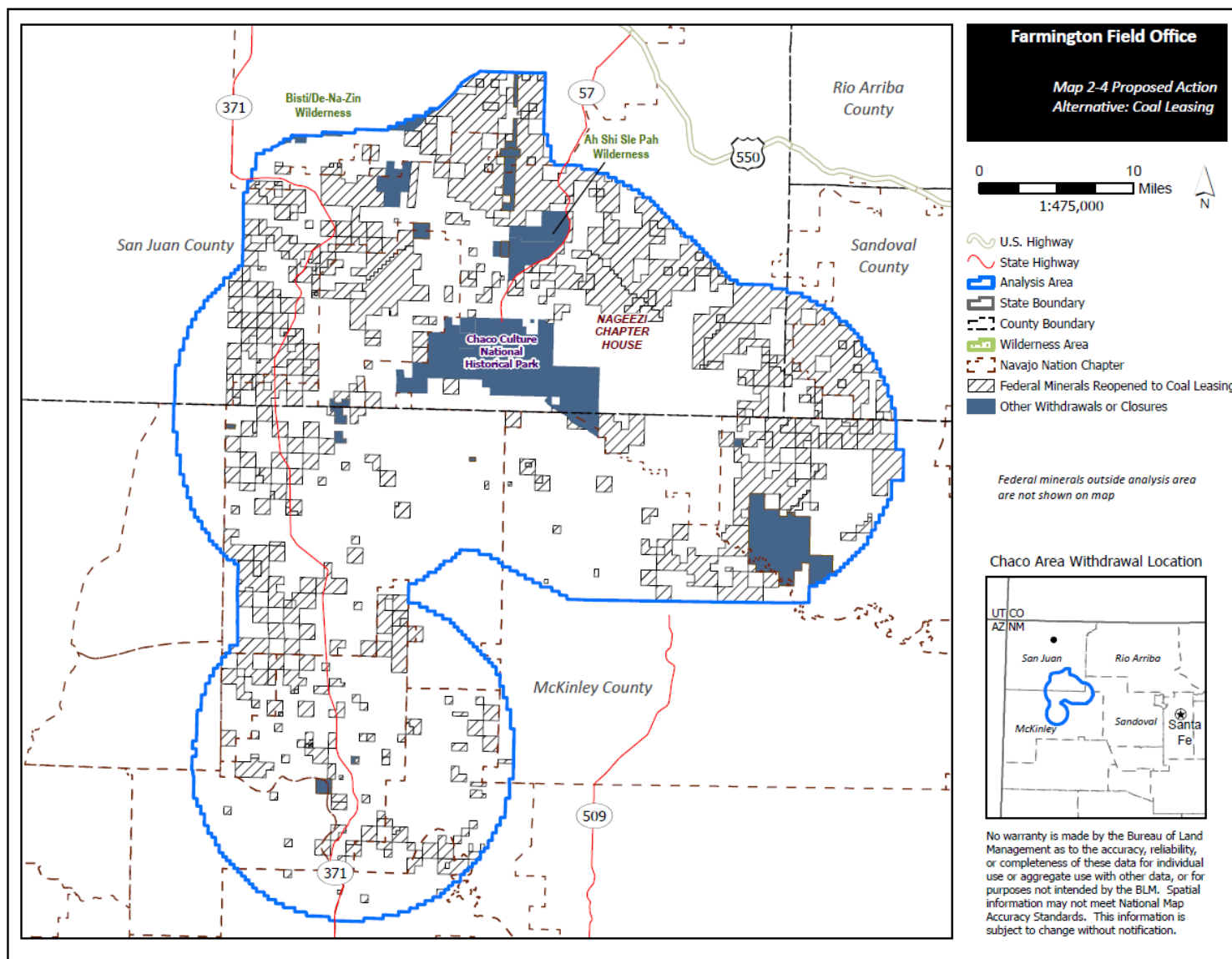
Map 2-3: No Action Alternative: Fluid Mineral Leasing



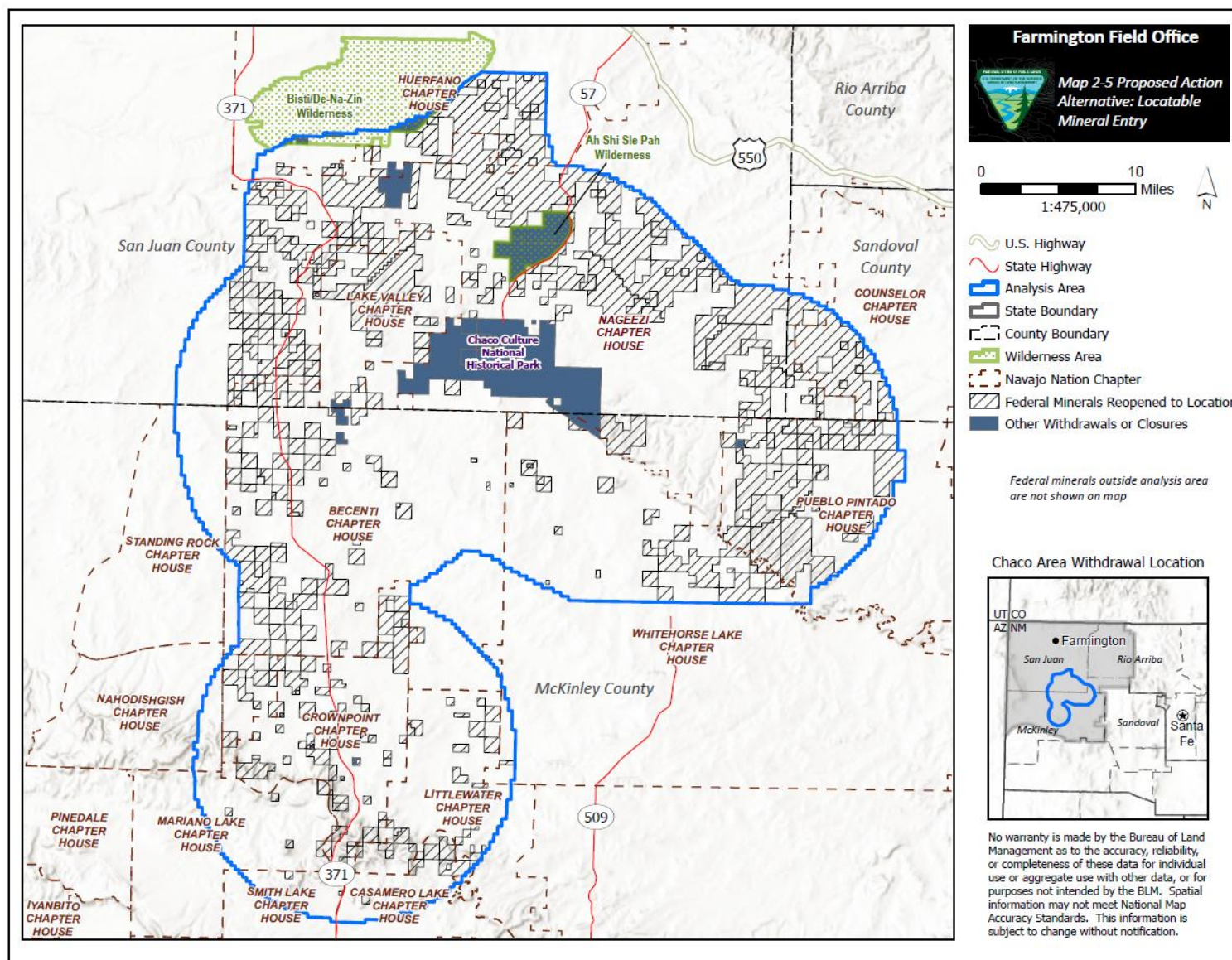
Map 2-3a: Active Fluid Mineral Leases



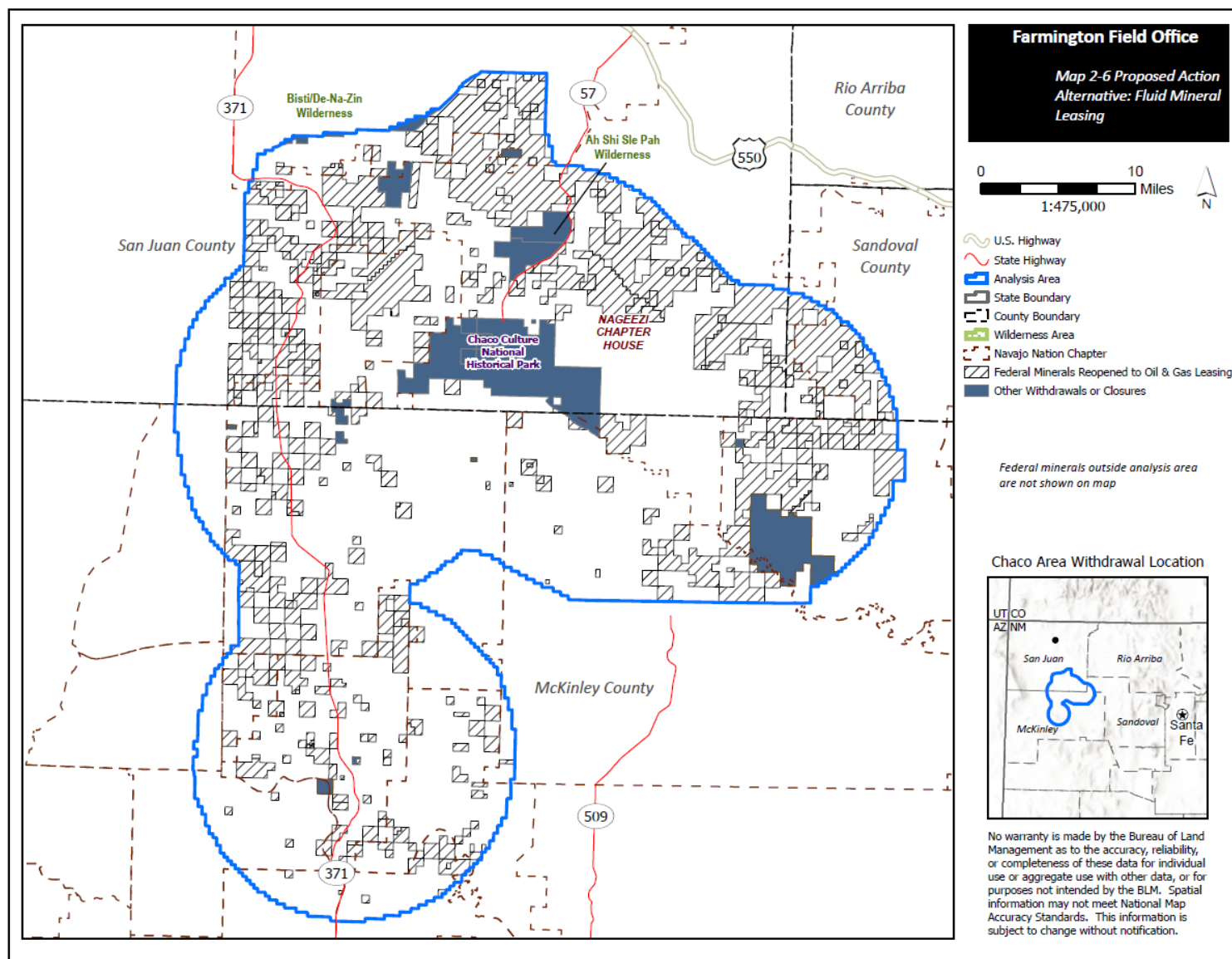
Map 2-4: Proposed Action Alternative: Coal Leasing



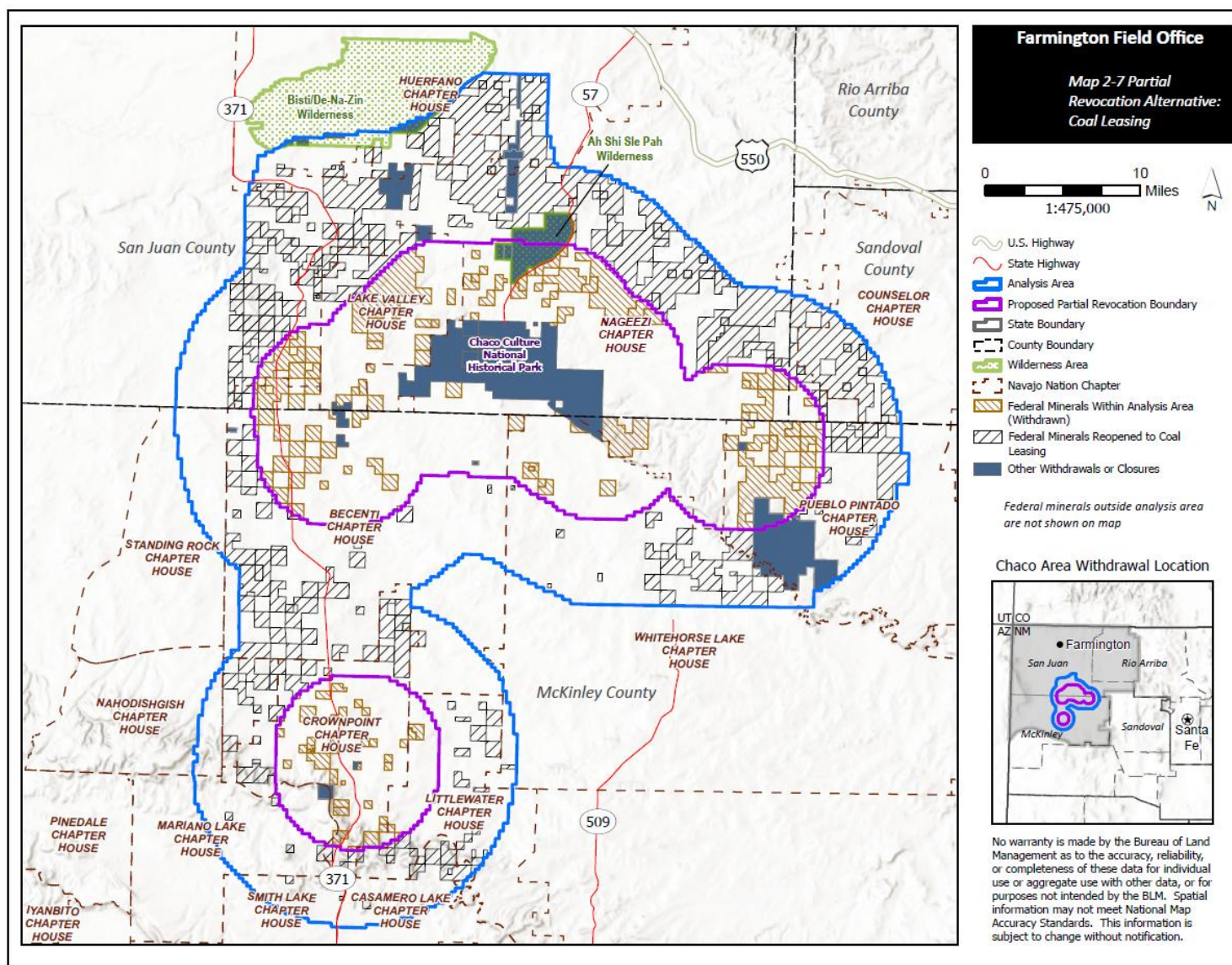
Map 2-5: Proposed Action Alternative: Locatable Mineral Entry



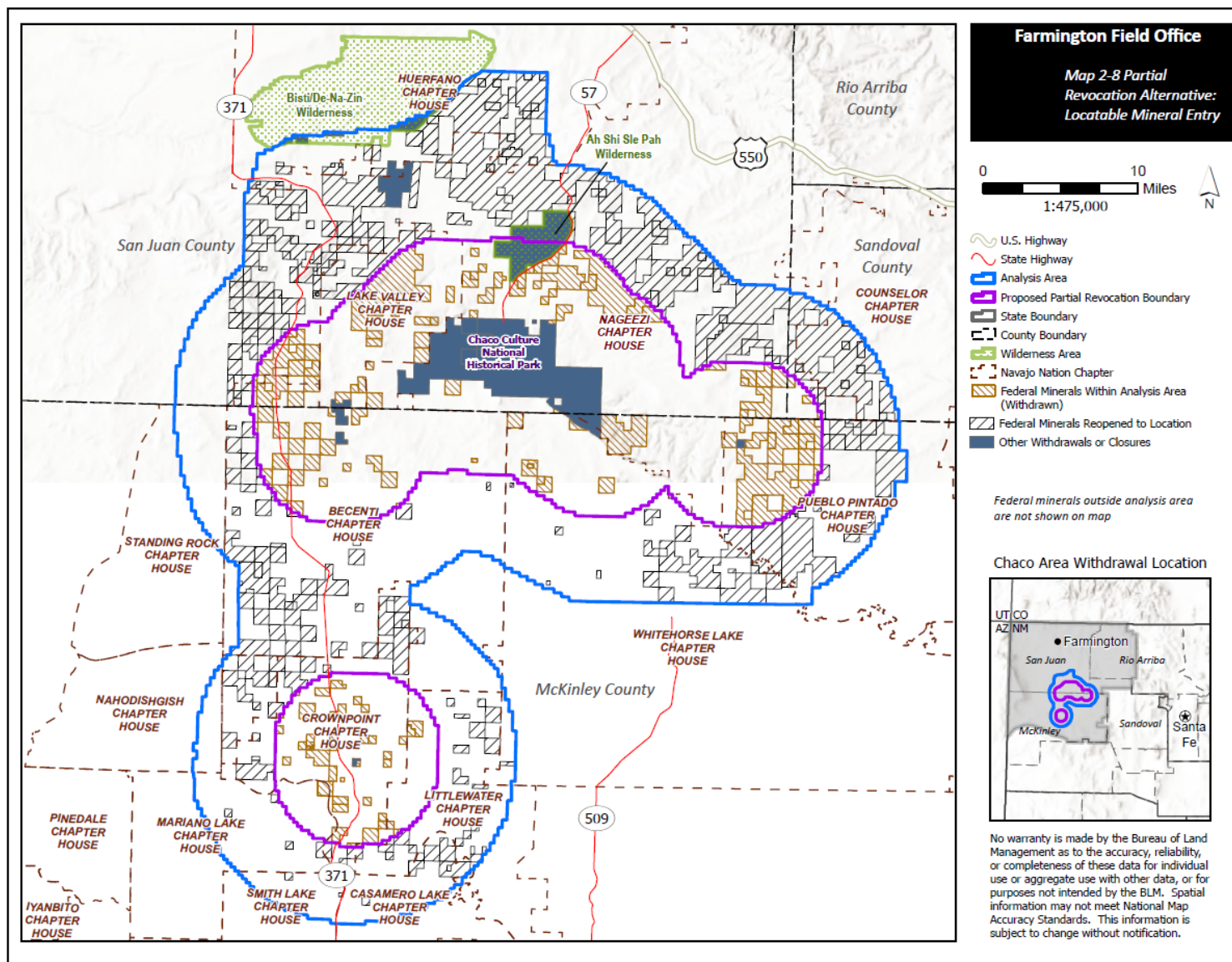
Map 2-6: Proposed Action Alternative: Fluid Mineral Leasing



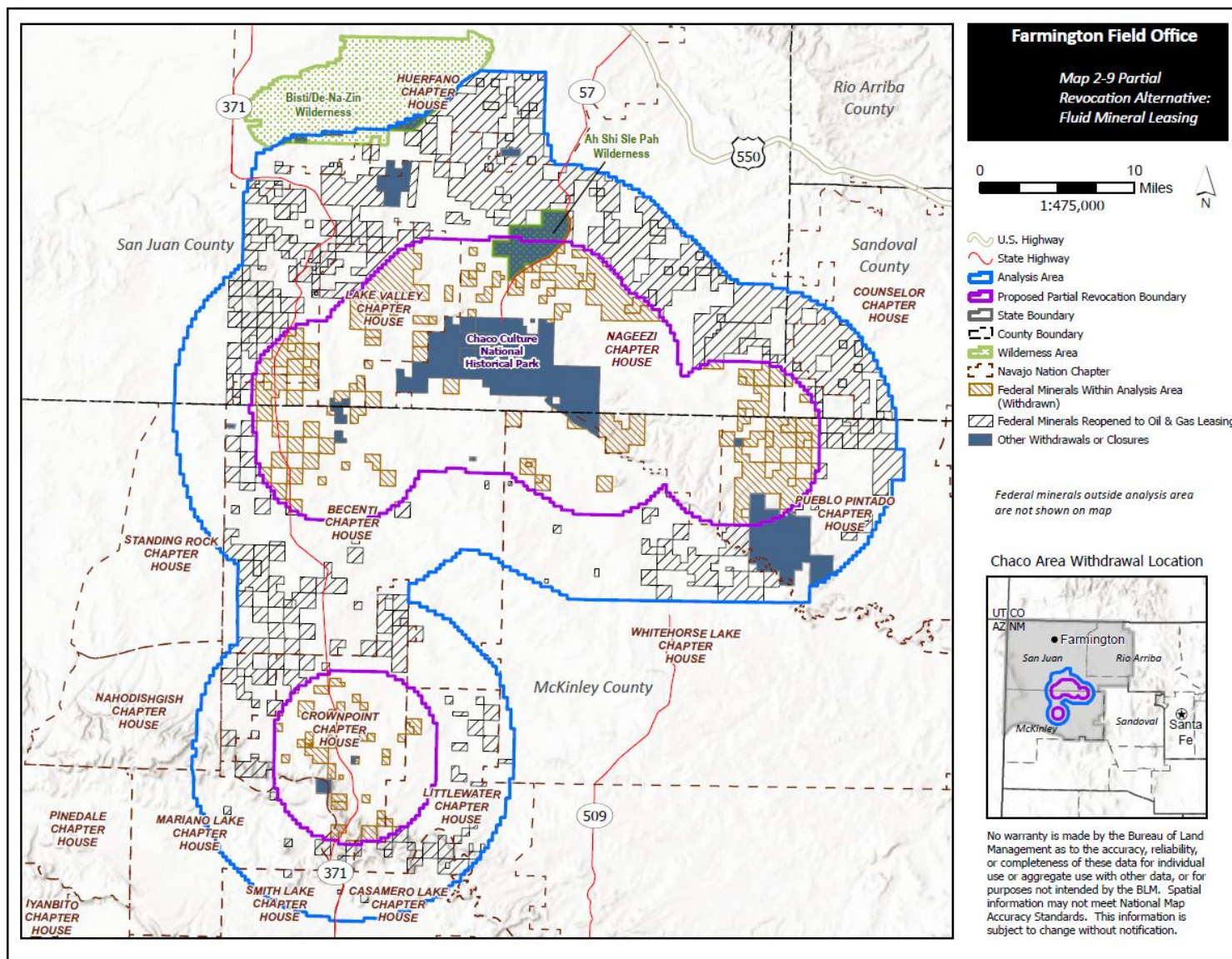
Map 2-7: Partial Revocation Alternative: Coal Leasing



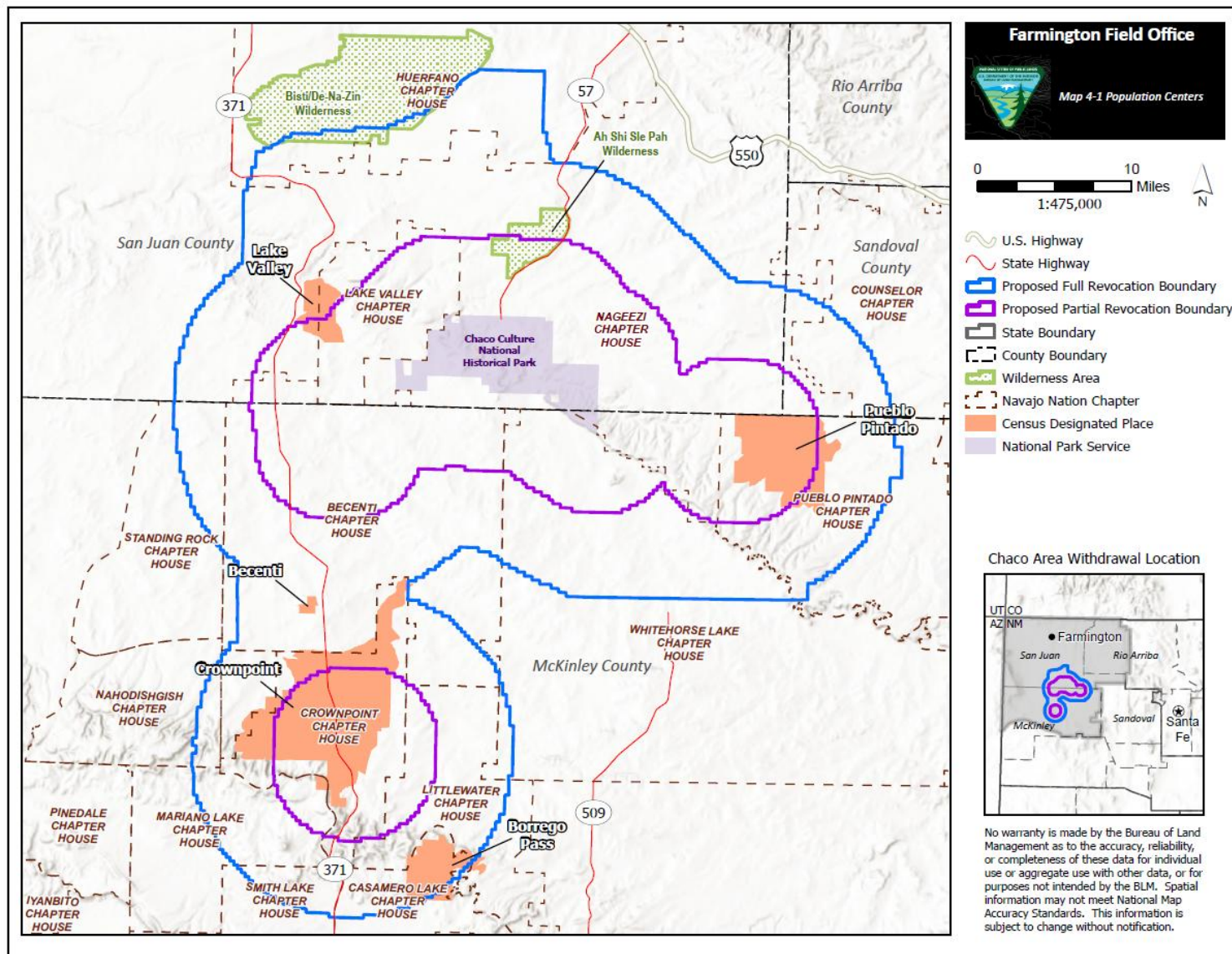
Map 2-8: Partial Revocation Alternative: Locatable Mineral Entry



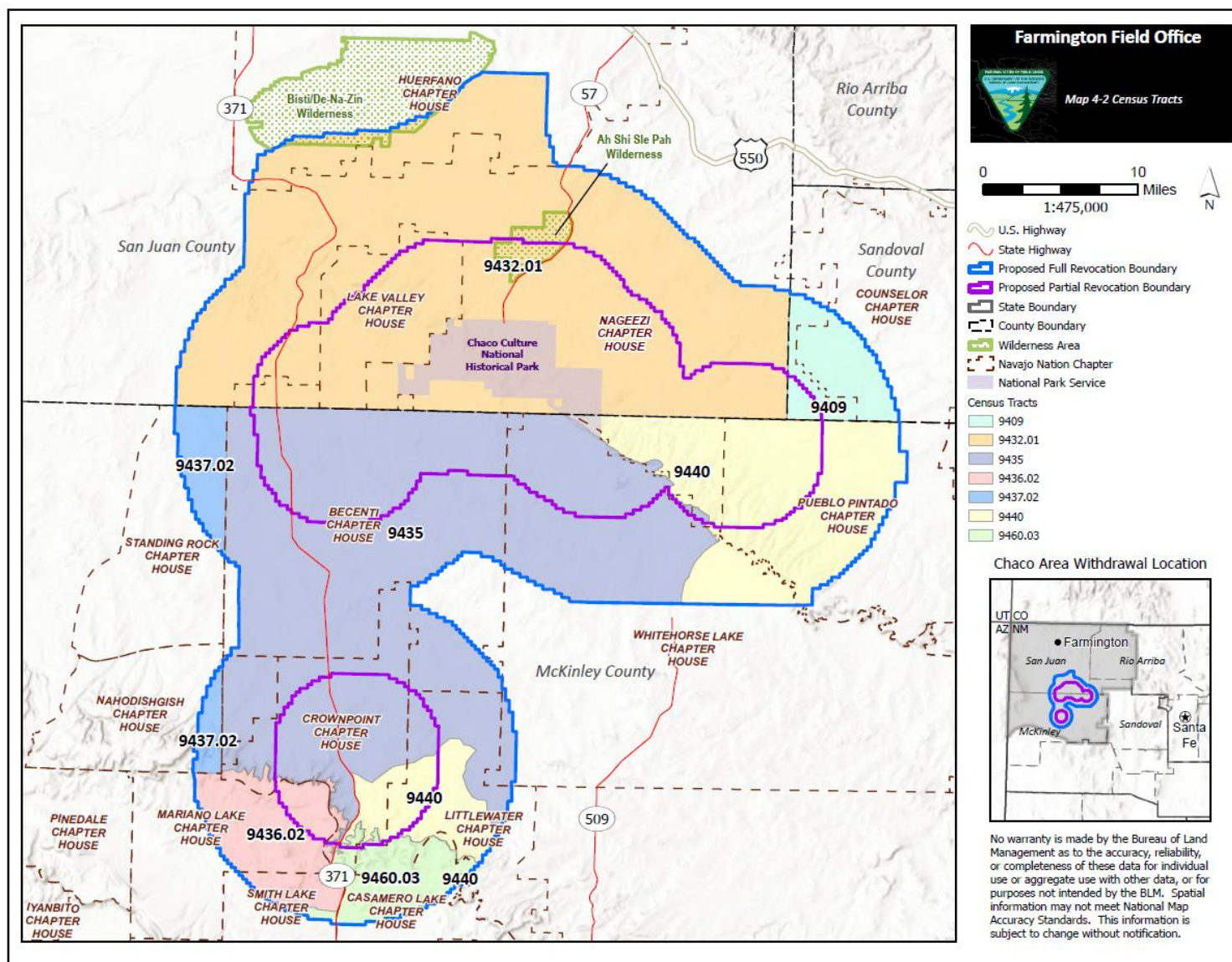
Map 2-9: Partial Revocation Alternative: Fluid Mineral Leasing



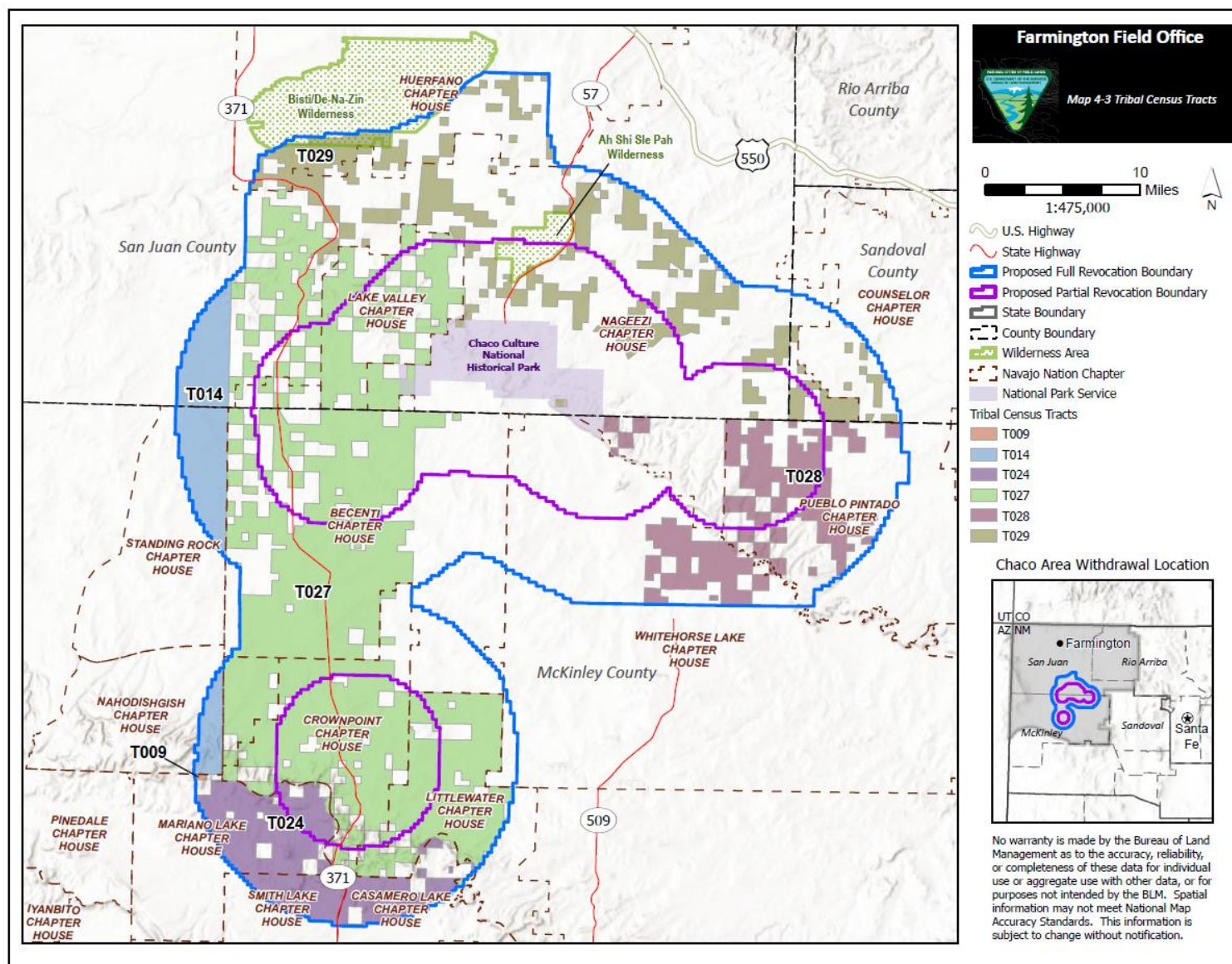
Map 3-1: Population Centers



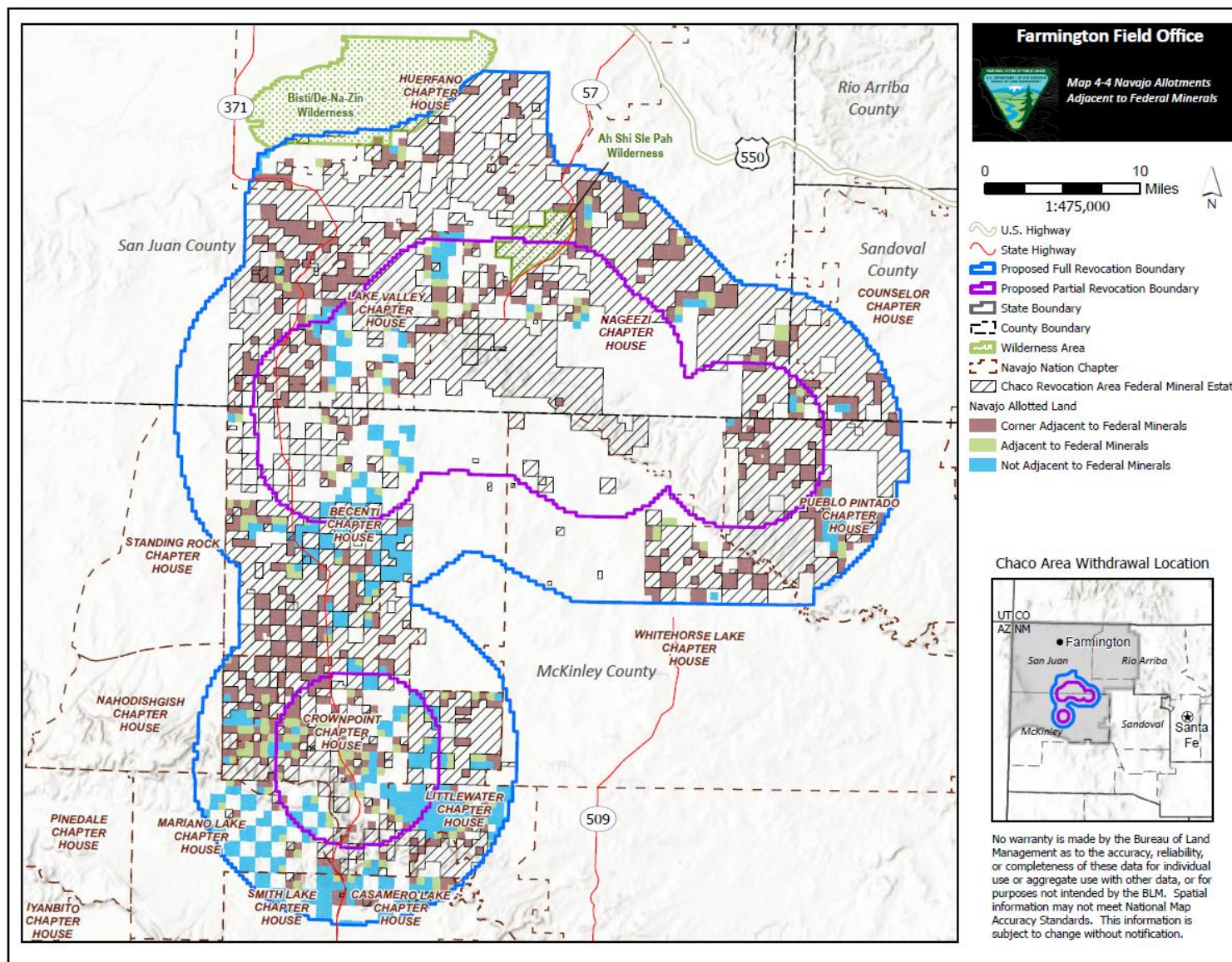
Map 3-2: Census Tracts



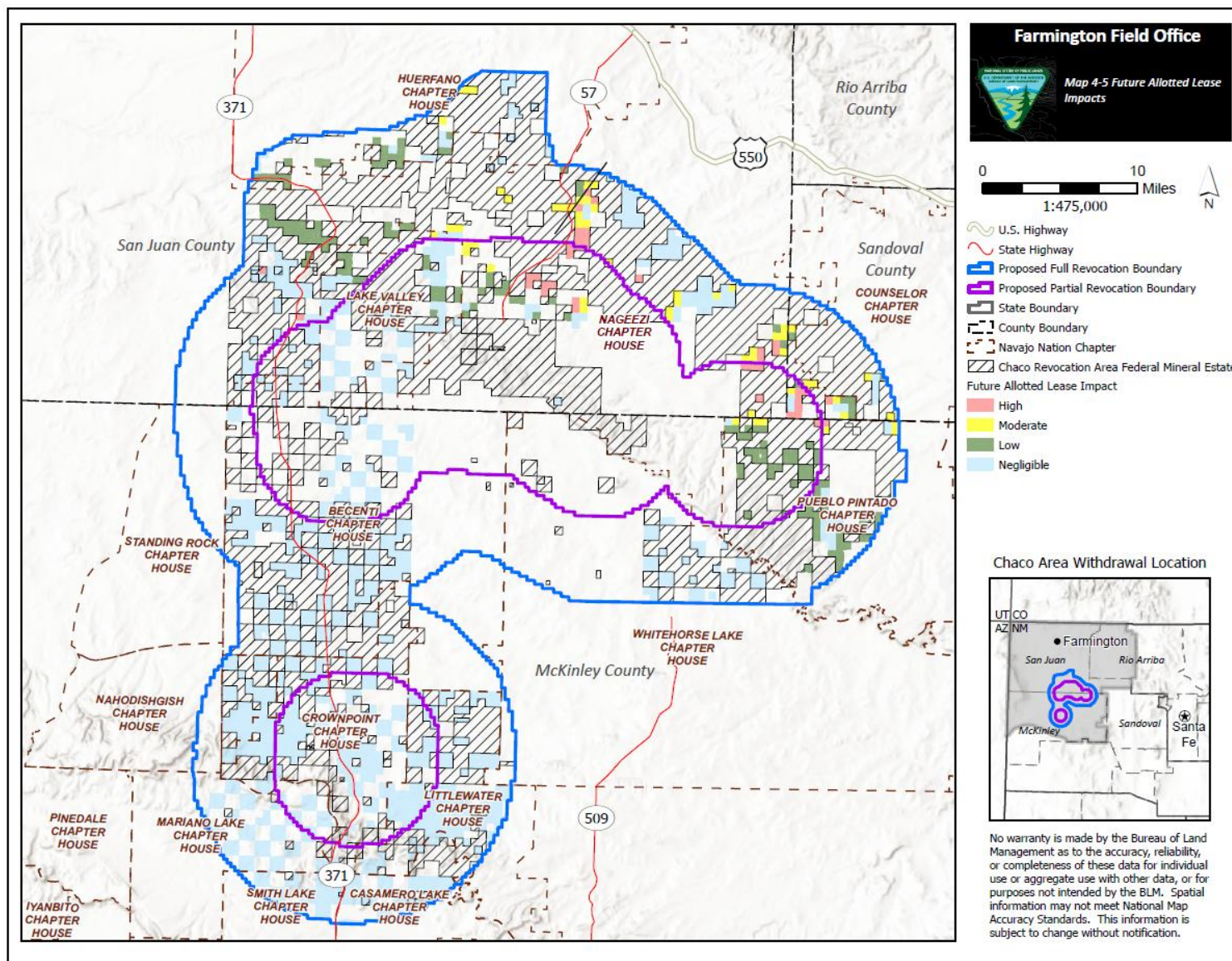
Map 3-3: Tribal Census Tracts



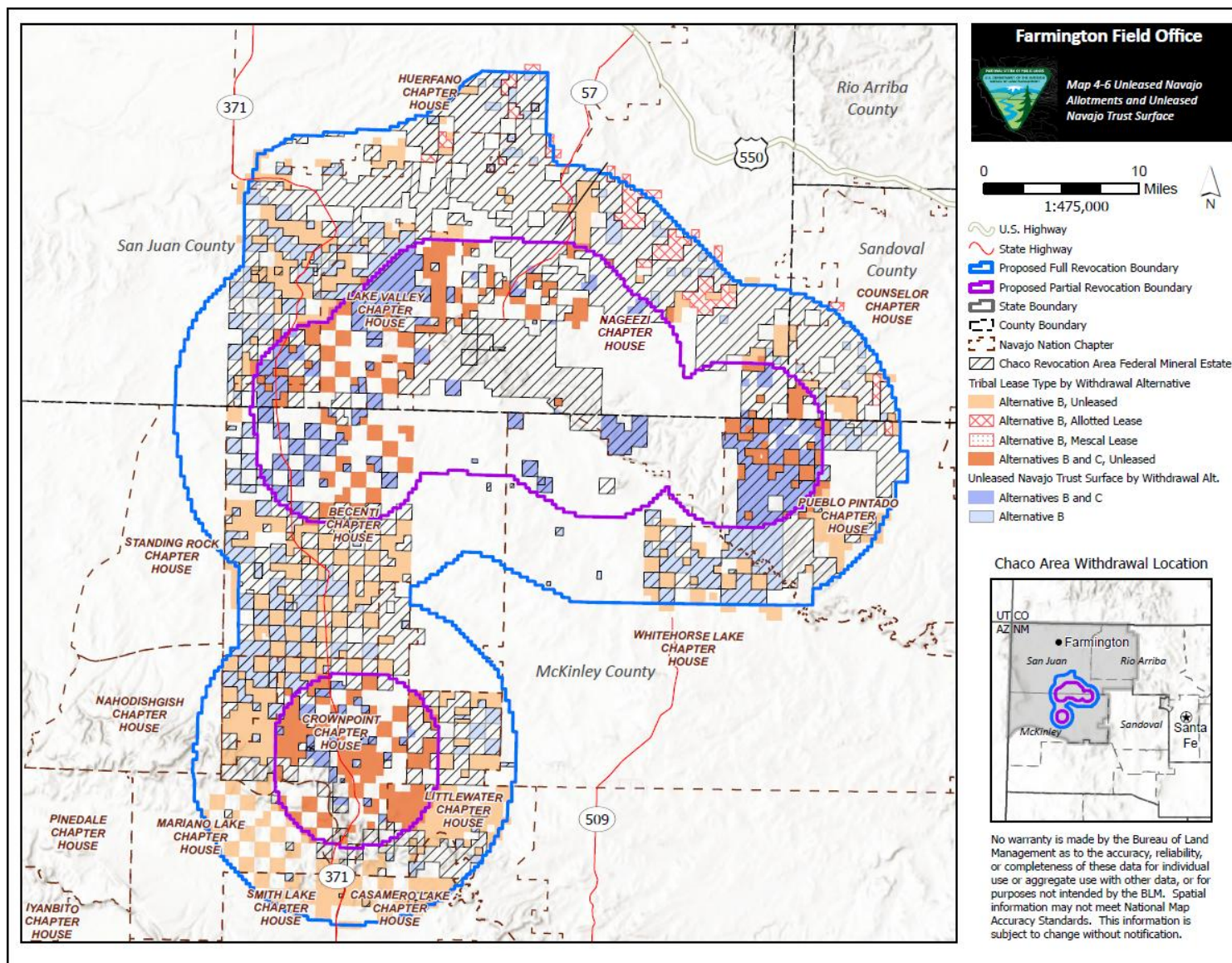
Map 3-4: Navajo Allotments Adjacent to Federal Minerals



Map 3-5: Future Allotted Lease Impacts



Map 3-6: Unleased Navajo Allotments and Unleased Navajo Trust Surface



Appendix E – Report Summarizing Public Input Received

This page intentionally left blank – the summary will be included with the Final EA.

Appendix F – Socioeconomic Analysis

F.1 PURPOSE

This Appendix presents the details of the socioeconomic condition and economic impact analysis contained within the EA for the proposed revocation of PLO No. 7923 that withdrew public lands within an approximately 10-mile wide “buffer” surrounding the Chaco Culture National Historical Park (CCNHP) from location and entry under the United States mining laws and from leasing under the mineral leasing laws for 20 years, subject to valid existing rights.

F.2 OVERVIEW OF THE STUDY AREA

The study area of this analysis is considered as the 10-mile withdrawal area which reaches four counties in the State of New Mexico, including San Juan County, Rio Arriba County, Sandoval County, and McKinley County.

F.3 SOCIOECONOMIC CONDITIONS

F.3.1 Data

The socioeconomic conditions of the study area are identified based on the following key socioeconomic indicators for the four counties, the State of New Mexico, and the United States (Table 1, Table 2, Table 3, Table 4).

- Total population (numbers of people)
- Median household incomes (\$)
- Unemployment rates (%)
- Population with high school or higher education (%)
- Age structure: population under age 5 (%), population aged 5 to 64 (%), and population over age 64 (%)
- Employment by 12 economic sectors (%)
- Gross Domestic Product (GDP) by 12 economic sectors (\$)
- Payments in Lieu of Taxes (PILT) (\$)

The statistics presented are based on the following latest nation-wide datasets which are consistent in terminologies and comparable across location and time:

- 2019-2023 American Community Survey 5-Year Estimates and 2012-2016 American Community Survey 5-Year Estimates published by the U.S. Census Bureau (USCB 2024a);
- Consumer Price Index Retroactive Series published by the U.S. Bureau of Labor Statistics (BLS 2025a);
- GDP in Current Dollars by County and Metropolitan Areas and Real GDP in Chained Dollars by County and Metropolitan Areas published by the U.S. Bureau of Economic Analysis (BEA 2024a); and
- Fiscal Year 2024 Payments in Lieu of Taxes published by U.S. Department of the Interior (DOI 2024).

The 2012-2016 American Community Survey 5-Year Estimates dataset is selected to compare with the latest 2019-2023 American Community Survey 5-Year Estimates dataset with a reasonable non-overlapping data collection period (USCB 2020).

For meaningful elaboration and consistent comparison, all the dollar values in this analysis are presented in the 2023 dollars, adjusted respectively with Consumer Price Index (CPI) for median household incomes and PILT, and with GDP chained dollars for GDP by economic sectors.

The definitions of socioeconomic indicators are listed below in alphabetic order, respectively.

- **Consumer Price Index (CPI)** is “a measure of the average change over time in the prices paid by urban consumers for a representative basket of consumer goods and services. The CPI measures inflation as experienced by consumers in their day-to-day living expenses.” “CPI indexes are used to adjust income eligibility levels for government assistance, federal tax brackets, federally mandated cost-of-living increases, private sector wage and salary increases, poverty measures, and consumer and commercial rent escalations” (BLS 2025b).
- **Economic sectors** are a set of industry units used to measure an economy based on a standardized industry classification system such as the North American Industry Classification System (NAICS). “NAICS United States is used by U.S. statistical agencies to facilitate the collection, tabulation, presentation, and analysis of data relating to establishments; and to provide uniformity and comparability in the presentation of statistical data describing the U.S. economy” (OMB 2022). NAICS classifies all economic activities into 20 sectors. In this Report, these 20 sectors are grouped into 12 sectors to present statistics for both employment data (USCB 2024a) and economic output data (BEA 2024a): (1) ADM – public administration and government sector; (2) ART – arts, entertainment, recreation, accommodation and food services sector; (3) CON – construction sector; (4) EDU – educational services, health care and social assistance sector; (5) FIN – finance, insurance, real estate, rental and leasing sector; (6) INF – information sector; (7) MAN – manufacturing sector; (8) NAT – natural resources (forestry, fishing and hunting), agriculture and mining sector; (9) OTH – other private industry services sector; (10) SCI – professional, scientific, technical and managerial services sector; (11) TRA – wholesale trade and retail trade sector; and (12) UTI – transportation and warehousing and utilities sector.
- **Employment** as an aspect of economic impact is the number of full- and part-time employees (BEA 2013).
- **Employment status** is “key to understanding work and unemployment patterns and the availability of workers” (USCB 2024b). Employed population refers to all civilians 16 years old and over who either (1) were “at work,” that is, those who did any work at all during the reference week as paid employees, worked in their own businesses or profession, worked on their own farm, or worked 15 hours or more as unpaid workers on a family farm or in a family business; or (2) were “with a job but not at work,” that is, those who did not work during the reference week but had jobs or businesses from which they were temporarily absent due to illness, bad weather, industrial dispute, vacation, or other personal reasons (USCB 2024b). **Unemployment rate** is “the number of unemployed people as a percentage of the civilian labor force” (USCB 2024b).
- **Gross Domestic Product (GDP)** “measures the value of final goods and services produced within the United States. Also known as value added, GDP is the value of goods and services produced by private industry and government, less the value of goods and services used up in production. GDP is also equal to the sum of personal consumption expenditures, gross private

domestic investment, net exports of goods and services, and government consumption expenditures and gross investment” (BEA 2025). Current-dollar GDP is GDP in the prices of the period when the transactions occurred, also referred to as “nominal GDP” or “current-price GDP”; Real GDP is inflation-adjusted GDP to exclude the effects of price changes (BEA 2024b).

- **Median household income** is the income of households in the past 12 months. “This includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not...The median divides the income distribution into two equal parts: one-half of the cases falling below the median income and one-half above the median” (USCB 2025b). “Income is a vital measure of general economic circumstances. Income data are used to determine poverty status, to measure economic well-being, and to assess the need for assistance. These data are included in federal allocation formulas for many government programs” (USCB 2024b).
- **Payments in Lieu of Taxes (PILT)** are “Federal payments to local governments that have certain Federal lands within their boundaries. The Office of the Secretary, Department of the Interior (DOI), administers the program, calculates the payments according to formulas established by law, and distributes the funds to local governments...The annual PILT payments to local governments are computed based on the number of acres of Federal entitlement land within each county or jurisdiction. Federal entitlement lands include acreage within the National Forest and National Park Systems, those managed by the Bureau of Land Management, those affected by U.S. Army Corps of Engineers and Bureau of Reclamation water resources development projects, and certain other Federal lands. Individual county payments may increase or decrease from the prior year due to changes in computation variables, including prior-year payments, inflation, acreage, and population” (DOI 2024).

Table I Socioeconomic Characteristics in the Study Area in 2016 and 2023

Areas	San Juan County	Rio Arriba County	Sandoval County	McKinley County	New Mexico	United States
Total population in 2016	122,537	39,924	138,117	74,346	2,082,669	318,558,162
Median household incomes in 2016 (2023 \$)	\$61,924	\$43,264	\$76,613	\$37,279	\$58,167	\$70,454
Unemployment rates in 2016	9.9%	9.5%	8.5%	15.7%	8.5%	7.4%
Population with high school or higher education in 2016	83.5%	84.2%	90.8%	73.8%	84.6%	87.0%
Population under age 5 in 2016	7.3%	7.0%	5.8%	8.3%	6.4%	6.2%
Population aged 5 to 64 in 2016	79.5%	76.5%	79.1%	81.2%	78.3%	79.3%
Population over age 64 in 2016	13.2%	16.5%	15.0%	10.6%	15.3%	14.5%
Total population in 2023	121,178	40,165	151,538	71,172	2,114,768	332,387,540
Median household incomes in 2023 (2023 \$)	\$53,020	\$53,901	\$84,053	\$44,496	\$62,125	\$78,538
Unemployment rates in 2023	7.8%	5.1%	5.4%	9.4%	6.0%	5.2%
Population with high school or higher education in 2023	86.4%	86.4%	92.6%	80.9%	87.7%	89.4%
Population under age 5 in 2023	5.8%	5.0%	4.9%	5.9%	5.3%	5.7%
Population aged 5 to 64 in 2023	77.9%	73.8%	75.5%	80.8%	75.9%	77.5%
Population over age 64 in 2023	16.3%	21.2%	19.6%	13.2%	18.8%	16.8%

Source: compiled based on BLS (2025a) and USCB (2024a).

Table 2 Employment Characteristics of the Study Area in 2016 and 2023

Areas	San Juan County	Rio Arriba County	Sandoval County	McKinley County	New Mexico	United States
ADM (2016)	5.3%	12.8%	8.3%	9.6%	7.6%	4.7%
ART (2016)	9.6%	12.2%	9.6%	11.2%	11.2%	9.7%
CON (2016)	7.7%	8.8%	7.2%	5.4%	6.9%	6.3%
EDU (2016)	24.5%	24.9%	25.2%	35.4%	25.4%	23.1%
FIN (2016)	3.7%	3.9%	5.6%	2.6%	4.6%	6.6%
INF (2016)	1.0%	0.6%	1.9%	1.2%	1.5%	2.1%
MAN (2016)	3.5%	1.8%	7.4%	6.1%	4.5%	10.3%
NAT (2016)	11.0%	2.1%	1.3%	2.3%	4.2%	1.9%
OTH (2016)	5.5%	5.4%	4.3%	2.7%	4.9%	4.9%
SCI (2016)	6.1%	14.8%	10.5%	6.0%	11.2%	11.2%
TRA (2016)	14.7%	9.4%	14.4%	13.1%	13.5%	14.2%
UTI (2016)	7.4%	3.5%	4.2%	4.4%	4.4%	5.0%
ADM (2023)	6.3%	9.8%	8.3%	8.9%	7.5%	4.7%
ART (2023)	12.3%	10.1%	8.5%	12.3%	10.1%	8.8%
CON (2023)	6.5%	8.6%	6.7%	6.1%	7.4%	6.9%
EDU (2023)	27.2%	25.6%	24.6%	34.1%	25.8%	23.4%
FIN (2023)	3.6%	2.4%	7.1%	3.2%	4.7%	6.7%
INF (2023)	0.9%	0.6%	1.2%	1.3%	1.4%	1.9%
MAN (2023)	3.4%	1.0%	6.1%	3.5%	4.3%	10.0%
NAT (2023)	9.4%	2.3%	1.0%	1.7%	3.8%	1.6%
OTH (2023)	5.3%	5.8%	5.0%	5.0%	5.4%	4.7%
SCI (2023)	5.6%	20.6%	13.6%	4.1%	12.5%	12.4%
TRA (2023)	12.6%	10.4%	13.6%	16.4%	12.5%	13.2%
UTI (2023)	7.0%	2.8%	4.4%	3.6%	4.7%	5.9%

Source: based on USCB (2024a).

Note: (1) ADM – public administration and government sector; (2) ART – arts, entertainment, recreation, accommodation and food services sector; (3) CON – construction sector; (4) EDU – educational services, health care and social assistance sector; (5) FIN – finance, insurance, real estate, rental and leasing sector; (6) INF – information sector; (7) MAN – manufacturing sector; (8) NAT – natural resources (forestry, fishing and hunting), agriculture and mining sector; (9) OTH – other private industry services sector; (10) SCI – professional, scientific, technical and managerial services sector; (11) TRA – wholesale trade and retail trade sector; and (12) UTI – transportation and warehousing and utilities sector.

Table 3 Real Gross Domestic Product (GDP) in the Study Area in 2016 and 2023

Areas	San Juan County	Rio Arriba County	Sandoval County	McKinley County	New Mexico	United States
ADM (2016)	\$1,296,819,000	\$398,405,000	\$763,334,000	\$1,121,669,000	\$27,817,575,000	\$2,923,147,949,000
ART (2016)	\$235,093,000	\$53,692,000	\$213,181,000	\$134,208,000	\$5,528,046,000	\$1,103,007,769,000
CON (2016)	\$373,624,000	\$35,291,000	\$243,460,000	\$65,010,000	\$5,320,977,000	\$1,195,735,824,000
EDU (2016)	\$581,715,000	\$120,786,000	\$241,869,000	\$191,624,000	\$9,318,334,000	\$1,957,057,609,000
FIN (2016)	\$870,342,000	n/a	\$1,146,068,000	\$298,012,000	\$18,846,803,000	\$4,999,036,466,000
INF (2016)	n/a	\$6,890,000	\$50,884,000	\$21,571,000	\$2,516,533,000	\$872,445,351,000
MAN (2016)	\$127,662,000	\$11,226,000	\$551,121,000	\$222,067,000	\$4,507,209,000	\$2,511,315,507,000
NAT (2016)	n/a	\$313,309,000	n/a	\$259,158,000	\$9,689,102,000	\$578,647,649,000
OTH (2016)	\$172,457,000	\$32,167,000	\$140,350,000	\$64,887,000	\$2,979,021,000	\$603,680,948,000
SCI (2016)	n/a	\$47,119,000	n/a	\$42,454,000	\$10,694,423,000	\$2,471,045,488,000
TRA (2016)	\$874,381,000	\$91,622,000	\$404,944,000	\$347,253,000	\$12,359,782,000	\$3,162,757,623,000
UTI (2016)	n/a	n/a	n/a	\$287,938,000	\$5,618,490,000	\$1,214,242,993,000
Total GDP (2016)	\$7,489,502,000	\$1,356,488,000	\$4,266,844,000	\$2,979,860,000	\$113,862,827,000	\$23,405,163,971,000
ADM (2023)	\$1,395,184,000	\$384,251,000	\$912,801,000	\$1,188,730,000	\$29,919,499,000	\$3,105,093,000,000
ART (2023)	\$274,754,000	\$66,225,000	\$287,945,000	\$157,516,000	\$6,498,401,000	\$1,211,474,000,000
CON (2023)	\$351,297,000	\$42,435,000	\$435,531,000	\$55,300,000	\$5,835,485,000	\$1,220,566,000,000
EDU (2023)	\$585,076,000	\$136,072,000	\$404,360,000	\$196,656,000	\$10,371,561,000	\$2,350,905,000,000
FIN (2023)	\$826,670,000	n/a	\$1,293,146,000	\$291,624,000	\$20,698,255,000	\$5,811,618,000,000
INF (2023)	n/a	\$17,376,000	\$68,533,000	\$22,918,000	\$2,965,548,000	\$1,477,938,000,000
MAN (2023)	\$161,826,000	\$10,788,000	\$848,157,000	\$114,989,000	\$5,062,758,000	\$2,840,447,000,000
NAT (2023)	\$1,585,206,000	\$172,695,000	\$81,218,000	\$240,176,000	\$16,821,221,000	\$685,931,000,000
OTH (2023)	\$167,074,000	\$35,626,000	\$150,003,000	\$70,011,000	\$3,140,578,000	\$589,391,000,000
SCI (2023)	n/a	\$80,988,000	\$483,316,000	\$65,621,000	\$15,921,725,000	\$3,611,702,000,000
TRA (2023)	\$702,798,000	\$87,084,000	\$359,376,000	\$275,606,000	\$11,939,794,000	\$3,425,394,000,000
UTI (2023)	\$515,211,000	n/a	\$65,468,000	\$200,767,000	\$5,834,796,000	\$1,390,249,000,000
Total GDP (2023)	\$6,822,347,000	\$1,290,272,000	\$5,389,854,000	\$2,879,914,000	\$135,009,620,000	\$27,720,709,000,000

Source: based on BEA (2024a).

Note: unit—2023 dollars; (1) ADM – public administration and government sector; (2) ART – arts, entertainment, recreation, accommodation and food services sector; (3) CON – construction sector; (4) EDU – educational services, health care and social assistance sector; (5) FIN – finance, insurance, real estate, rental and leasing sector; (6) INF – information sector; (7) MAN – manufacturing sector; (8) NAT – natural resources (forestry, fishing and hunting), agriculture and mining sector; (9) OTH – other private industry services sector; (10) SCI – professional, scientific, technical and managerial services sector; (11) TRA – wholesale trade and retail trade sector; and (12) UTI – transportation and warehousing and utilities sector; “n/a” indicates that the data point is not available.

Table 4 Payments in Lieu of Taxes (PILT) in the Study Area in 2023

Areas	San Juan County	Rio Arriba County	Sandoval County	McKinley County	New Mexico	United States
BLM portion of entitlement land (acres)	813,749	582,761	504,040	228,756	12,774,772	241,184,889
Total entitlement land (acres)	861,851	2,017,384	908,563	419,726	22,374,142	606,713,940
BLM portion of section 6902 PILT payment (2023 \$)	\$2,703,613	\$941,625	\$1,602,821	\$678,068	\$28,446,357	\$246,756,605
Total section 6902 PILT payment (2023 \$)	\$2,863,428	\$3,259,690	\$2,889,184	\$1,244,132	\$49,821,855	\$620,729,900

Source: based on DOI (2024).

F.3.2 Trends

Based on the data presented in Table 1, Table 2, Table 3, and Table 4, the current, changing, and comparative socioeconomic conditions are presented from the broader scale to the more specific scale in the order of the United States, New Mexico, San Juan County, Rio Arriba County, Sandoval County, and McKinley County.

F.3.2.1 The United States

In 2023, the United States had a population of 332,387,540 people, a median household income of \$78,538, and an unemployment rate of 5.2%, with 89.4% of the population having a high school or higher education, 16.8% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) wholesale trade and retail trade sector, and (3) professional, scientific, technical and managerial services sector, and a GDP of \$27,720,709,000,000, with the top three economic sectors by GDP being (1) finance, insurance, real estate, rental and leasing sector, (2) professional, scientific, technical and managerial services sector, and (3) wholesale trade and retail trade sector, a total entitlement land area for PILT of 606,713,940 acres, a BLM portion of entitlement land area for PILT of 241,184,889 acres, a total section 6902 PILT payment of \$620,729,900, and a BLM portion of the section 6902 PILT payment of \$246,756,605.

From 2016 to 2023, in the United States, the population has increased by 4.3%, the median household income has increased by 11.5%, the unemployment rate has decreased by 2.2%, the percentage of the population with high school or higher education has increased by 2.4%, the percentage of population over age 64 has increased by 2.3%, and the GDP has increased by 18.4%.

F.3.2.2 New Mexico

In 2023, New Mexico had a population of 2,114,768 people, a median household income of \$62,125, an unemployment rate of 6.0%, with 87.7% of population having a high school or higher education, 18.8% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) professional, scientific, technical and managerial services sector, and (3) transportation and warehousing and utilities sector, and a GDP of \$135,009,620,000, with the top three economic sectors by GDP being (1) public administration and government sector, (2) finance, insurance, real estate, rental and leasing sector, and (3) natural resources, agriculture and mining sector, a total entitlement land area for PILT of 22,374,142 acres, a BLM portion of entitlement land area for PILT of 12,774,772 acres, a total section 6902 PILT payment of \$49,821,855, and a BLM portion of the section 6902 PILT payment of \$28,446,357.

From 2016 to 2023, in New Mexico, the population has increased by 1.5%, the median household income has increased by 6.8%, the unemployment rate has decreased by 2.5%, the percentage of population with high school or higher education has increased by 3.1%, the percentage of population over age 64 has increased by 3.5%, and the GDP has increased by 18.6%.

In 2023, comparatively, in New Mexico, the median household income was 0.79 times the national level, the unemployment rate was 1.15 times the national level, the percentage of population with a high school or higher education was 0.98 times the national level, and the percentage of population over age 64 was 1.12 times the national level.

F.3.2.3 San Juan County

In 2023, San Juan County had a population of 121,178 people, a median household income of \$53,020, an unemployment rate of 7.8%, with 86.4% of population having a high school or higher education, 16.3% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) wholesale trade and retail trade sector, and (3) arts, entertainment, recreation, accommodation and food services sector, and a GDP of \$6,822,347,000, with the top three economic sectors by GDP being (1) natural resources, agriculture and mining sector, (2) public administration and government sector, and (3) finance, insurance, real estate, rental and leasing sector, a total entitlement land area for PILT of 861,851 acres, a BLM portion of entitlement land area for PILT of 813,749 acres, a total section 6902 PILT payment of \$2,863,428, and a BLM portion of the section 6902 PILT payment of \$2,703,613.

From 2016 to 2023, in San Juan County, New Mexico, the population has decreased by 1.1%, the median household income has decreased by 14.4%, the unemployment rate has decreased by 2.1%, the percentage of population having a high school or higher education has increased by 2.9%, the percentage of population over age 64 has increased by 3.1%, and the GDP has decreased by 8.9%.

In 2023, comparatively, in San Juan County, the median household income was 0.85 times the state level and 0.68 times the national level; the unemployment rate was 1.30 times the state level and 1.50 times the national level; the percentage of population having a high school or higher education was 0.99 times the state level and 0.97 times the national level; and, the percentage of population over age 64 was 0.87 times of the state level and 0.97 times the national level.

F.3.2.4 Rio Arriba County

In 2023, Rio Arriba County had a population of 40,165 people, a median household income of \$53,901, an unemployment rate of 5.1%, with 86.4% of population having a high school or higher education, 21.2% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) professional, scientific, technical and managerial services sector, and (3) wholesale trade and retail trade sector, and a GDP of \$1,290,272,000, with the top three economic sectors by GDP being (1) public administration and government sector, (2) natural resources, agriculture and mining sector, and (3) educational services, health care and social assistance sector, a total entitlement land area for PILT of 2,017,384 acres, a BLM portion of entitlement land area for PILT of 582,761 acres, a total section 6902 PILT payment of \$3,259,690, and a BLM portion of the section 6902 PILT payment of \$941,625.

From 2016 to 2023, in Rio Arriba County, New Mexico, the population has increased by 0.6%, the median household income has increased by 24.6%, the unemployment rate has decreased by 4.4%, the percentage of population with high school or higher education has increased by 2.2%, the percentage of population over age 64 has increased by 4.7%, and the GDP has decreased by 4.9%.

In 2023, comparatively, in Rio Arriba County, the median household income was 0.87 times the state level and 0.69 times the national level; the unemployment rate was 0.85 times the state level and 0.98 times the national level; the percentage of the population having a high school or higher education was 0.99 times the state level and 0.97 times the national level; and, the percentage of population over age 64 was 1.13 times the state level and 1.26 times the national level.

F.3.2.5 Sandoval County

In 2023, Sandoval County had a population of 151,538 people, a median household income of \$84,053, an unemployment rate of 5.4%, with 92.6% of population having a high school or higher education, 19.6% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) professional, scientific, technical and managerial services sector, and (3) transportation and warehousing and utilities sector, and a GDP of \$5,389,854,000, with the top three economic sectors by GDP being (1) finance, insurance, real estate, rental and leasing sector, (2) public administration and government sector, and (3) manufacturing sector, a total entitlement land area for PILT of 908,563 acres, a BLM portion of entitlement land area for PILT of 504,040 acres, a total section 6902 PILT payment of \$2,889,184, and a BLM portion of the section 6902 PILT payment of \$1,602,821.

From 2016 to 2023, in Sandoval County, New Mexico, the population has increased by 9.7%, the median household income has increased by 9.7%, the unemployment rate has decreased by 3.1%, the percentage of population with high school or higher education has increased by 1.8%, the percentage of population over age 64 has increased by 4.6%, and the GDP has increased by 26.3%.

In 2023, comparatively, in Sandoval County, the median household income was 1.35 times the state level and 1.07 times the national level; the unemployment rate was 0.90 times the state level and 1.04 times the national level; the percentage of population with high school or higher education was 1.06 times the state level and 1.04 times the national level; and, the percentage of population over age 64 was 1.04 times the state level and 1.17 times the national level.

F.3.2.6 McKinley County

In 2023, McKinley County had a population of 71,172 people, a median household income of \$44,496, an unemployment rate of 9.4%, with 80.9% of population having a high school or higher education, 13.2% of population over age 64, with the top three economic sectors by employed population being (1) educational services, health care and social assistance sector, (2) wholesale trade and retail trade sector, and (3) arts, entertainment, recreation, accommodation and food services sector, and a GDP of \$2,879,914,000, with the top three economic sectors by GDP being (1) public administration and government sector, (2) finance, insurance, real estate, rental and leasing sector, and (3) wholesale trade and retail trade sector, a total entitlement land area for PILT of 419,726 acres, a BLM portion of entitlement land area for PILT of 228,756 acres, a total section 6902 PILT payment of \$1,244,132, and a BLM portion of the section 6902 PILT payment of \$678,068.

From 2016 to 2023, in McKinley County, New Mexico, the population has decreased by 4.3%, the median household income has increased by 19.4%, the unemployment rate has decreased by 6.3%, the percentage of population with high school or higher education has increased by 7.1%, the percentage of population over age 64 has increased by 2.7%, and the GDP has decreased by 3.4%.

In 2023, comparatively, in McKinley County, the median household income was 0.72 times the state level and 0.57 times the national level; the unemployment rate was 1.57 times the state level and 1.81 times the national level; the percentage of population with high school or higher education was 0.92 times the state level and 0.90 times the national level; and, the percentage of population over age 64 was 0.70 times the state level and 0.79 times the national level.

F.3.2.7 Summary

The current, changing, and comparative socioeconomic conditions reveal the following characteristics of the study area.

- From 2016 to 2023, the United States, New Mexico, Rio Arriba County, and Sandoval County have had an increase in population (4.3%, 1.5%, 0.6%, and 9.7%, respectively) whereas San Juan County and McKinley County have had a decrease in population (-1.1% and -4.3%, respectively).
- From 2016 to 2023, the United States, New Mexico, and Sandoval County have had an increase in real GDP (18.4%, 18.6%, and 26.3% respectively) whereas San Juan County, Rio Arriba County, and McKinley County have had a decrease in real GDP (-8.9%, -4.9%, and -3.4% respectively).
- In 2023, except in Sandoval County (\$84,053), the other three counties (\$53,020 in San Juan County, \$53,901 in Rio Arriba County, and \$44,496 in McKinley) had a lower median household income level compared with the United States (\$78,538) and New Mexico (\$62,125).
- In 2023, both McKinley County (9.4%) and San Juan County (7.8%) had higher unemployment rates compared with the United States (5.2%) and New Mexico (6.0%).
- In 2023, for United States, New Mexico, and all four counties, the educational services, health care and social assistance sector (all greater than 23.4%) ranked as the highest sector of employment, and the wholesale trade and retail trade sector (all greater than 10.4%) ranked the second highest, among the 12 economic sectors.
- In 2023, for United States and Sandoval County, the finance, insurance, real estate, rental and leasing sector (21.0% and 24.0%, respectively) ranked as the highest sector of GDP among the 12 economic sectors; whereas it was instead the public administration and government sector in New Mexico, Rio Arriba County, and McKinley County (22.2%, 29.8%, and 41.3%, respectively), and the natural resources (forestry, fishing and hunting), agriculture and mining sector in San Juan County (23.2%) which ranked highest.

F.4 ECONOMIC IMPACTS

F.4.1 Methodology

Economic impact study is a study that examines the total economic impact of a final-demand change on a regional or local economy (BEA 2013). The accuracy of an economic impact study's results relies on the choice of the final-demand change, final-demand industry, and final-demand region (BEA 2013). For this analysis, the following considerations are made:

- Final-demand change consists of the changed sales of two economic commodities (development on new leases of crude oil and natural gas) in the Proposed Action (Alternative B) compared with development only on existing mineral leases under the No Action Alternative (Alternative A).
- Final-demand industry is considered as the oil and gas drilling and extraction industry.
- Final-demand region is considered San Juan County, Rio Arriba County, Sandoval County, and McKinley County.

A Multi-Regional Input-Output Model is developed utilizing the IMPLAN platform. San Juan County is considered as the primary impact region and the other three counties as the broader impact regions with the rationale that the oil and gas wells for potential development resulted from the revocation of withdrawal are located in San Juan County as identified by this EA. IMPLAN is an economic impact model that regionalizes the data from the U.S. Input-Output Accounts published by the U.S. Bureau of Economics (BEA 2009). The IMPLAN modeling system includes a Social Accounting Matrices (SAM) system. A SAM is a matrix presentation of certain aspects of the national accounts and of other parts of the economy—such as employment by type of worker or income distributions—using the structural linkages provided by the Input-Output Accounts (BEA 2009).

The scale of each industry in the economy can be represented by its employment and total output. The structure of each industry in the Input-Output Accounts can be represented by eight indicators in three equations as follows.

- Employee compensation + Proprietor income = Labor income
- Employee compensation + Proprietor income + Other property income + Tax on production and imports net of subsidies = Value added
- Value added + Intermediate input = Total output

The economic impact of industrial activities on a regional or local economy can be represented by four types of effects corresponding to each of the above eight indicators connected by the equation as follows.

- Direct effect + Indirect effect + Induced effect = Total economic effect

There are no direct effects on leasing and development of oil, gas, or coalbed methane resources from revocation of a withdrawal; rather, following revocation of a withdrawal in relevant part, the BLM regains discretion whether to issue leases or authorize development. To evaluate the economic impacts of the revocation of withdrawal, the following steps are carried out for the economic modeling process:

- (5) The direct effect of combined intermediate input and employee compensation (oil and natural gas well drilling and completion costs) and direct effect of output (oil and natural gas production sale values) that may occur following revocation of PLO No. 7923 are estimated;
- (6) The baseline input-output dataset (2022 year data, 2023 dollars, 546 industries) for the three main relevant economic industries (20 - Oil and gas extraction, 35 - Drilling oil and gas wells, 36 - Support activities for oil and gas operations) are integrated as an oil and gas development industry via the IMPLAN platform, and dataset customization under this new industry structure for the four counties are carried out;
- (7) The baseline ratio of intermediate input versus employee compensation of the integrated oil and gas development industry in San Juan County is utilized to estimate the direct effect of

intermediate input and direct effect of employee compensation, respectively, resulting from the proposed revocation; and

- (8) The estimates for direct effect of intermediate input, direct effect of employee compensation, and direct effect of output resulting from new mineral leases following implementation of the Proposed Action, revocation of PLO No. 7923, in full are utilized to estimate the four types of economic effects (direct, indirect, induced, and total effects) in regard to employment, labor income, value added, and total output on the four countries resulting from the proposed revocation.

The definitions of the economic indicators are listed below in alphabetic order, respectively.

- **Direct economic impact** (also called direct economic effect) is the change in economic activity resulting from the initial round of inputs purchased by the final-demand industry (BEA 2013).
- **Employee compensation** is the income accruing to employees as remuneration for their work; it is the sum of wage and salary accruals and of supplements to wages and salaries (such as employer contributions to employee pension and insurance funds and employer contributions to government social insurance) (BEA 2009).
- **Other property income** includes rental income, corporate profits, net interest, business transfer payments, consumption of fixed capital, etc.; it is calculated as industry output less the sum of intermediate inputs, employee compensation, proprietor income, and taxes on production and imports less subsidies (BEA 2009).
- **Taxes on production and imports less subsidies** consists of a variety of taxes—sales and excise taxes, customs duties, property taxes, motor vehicle license fees, severance taxes, other taxes, and special assessments—and of subsidies—monetary grants paid by government agencies to private businesses and to government enterprises at another level of government; commodity taxes—such as sales taxes and excise taxes—that make up this component (BEA 2009).
- **Proprietor income** consists of the net earnings of sole proprietorships and partnerships (BEA 2013).
- **Final-demand change** is the change in the purchases of goods or services by final users (BEA 2013).
- **Final-demand industry** is the industry that is initially affected by a final-demand change (BEA 2013).
- **Final-demand region** is the geographic area used for estimating the impacts of a final-demand change (BEA 2013).
- **Indirect economic impact** (also called indirect economic effect) is the change in economic activity resulting from the subsequent rounds of inputs purchased by industries affected by a final-demand change (BEA 2013).
- **Induced economic impact** (also called induced economic effect) is the change in economic activity resulting from the changes in spending by workers whose earnings are affected by a final-demand change (BEA 2013).
- **Input** is intermediate input and labor used by an industry to produce an output (BEA 2013).
- **Intermediate input** is goods and services used by an industry to produce an output; it excludes investment purchases and labor costs (BEA 2013).
- **Labor income** (also called earnings) is the employee compensation plus the net earnings of sole proprietors and partnerships (also called proprietor income) (BEA 2013).

- **Total output** is the total market value of industry output (sales); it equals intermediate inputs plus value added: economic output is not the same as GDP which only includes value added (BEA 2013).
- **Value added** is the total value of income generated from production; this income consists of payments to labor (compensation of employees), payments to government (taxes on production and imports), and returns on investment (gross operating surplus); it is equivalent to GDP (BEA 2013).

F.4.2 Data

For Step (1) in the Methodology section, the two indicators (oil and natural gas well drilling and completion costs; oil and natural gas production sale values) are estimated based on the data identified in this EA and data from publicly available data sources.

As presented in Table 5, this EA identifies 4 horizontal wells and 10 vertical wells for potential development on new leases that BLM could issue following revocation of PLO No. 7923 in the next 20 years, which would consist of 0.2 horizontal wells and 0.5 vertical wells for development on average annually. Drilling and completion costs per horizontal well and per vertical well are estimated as \$9,030,000 and \$3,225,000 in 2023 dollars, respectively, based on the estimates (\$7,000,000 and \$2,500,000 in 2015 \$) for the Permian Basin (EIA 2016) which shares a similar geographical location and geological desert features as the Mancos/Gallup Southern Rim Subplay in the withdrawal area, adjusted by CPI (BLS 2025a). Consequently, the average annual cost for all wells amounts to \$3,418,500 (2023 dollars).

Table 5 Average Annual Cost for Well Drilling and Completion

No.	Indicator	Data
[1]	Horizontal wells for development ¹	4
[2]	Vertical wells for development ¹	10
[3]	Development years ¹	20
[4]	Average annual horizontal wells for development	0.2
[5]	Average annual vertical wells for development	0.5
[6]	Drilling and completion cost per horizontal well (2015 \$) ²	\$7,000,000
[7]	Drilling and completion cost per horizontal well (2023 \$)	\$9,030,000
[8]	Drilling and completion cost per vertical well (2015 \$) ²	\$2,500,000
[9]	Drilling and completion cost per vertical well (2023 \$)	\$3,225,000
[10]	Average annual cost for all wells (2023 \$)	\$3,418,500

Source: 1 – this EA; 2 – estimates for Permian Basin in EIA (2016).

Note: [4] = [1] / [3]; [5] = [2] / [3]; [7] = [6] adjusted by CPI (BLS 2025a); [9] = [8] adjusted by CPI (BLS 2025a); [10] = [4] * [7] + [5] * [9].

As presented in Table 6, this EA estimates the total oil production and the total natural gas production per horizontal well as 274,209 barrels (bbl) and 570,047 thousand cubic feet (mcf), respectively, and the total natural gas production per vertical well as 451,812 mcf. Given the estimates of 0.2 horizontal wells and 0.5 vertical wells for development on average annually in Step (1), this results in the estimates of average annual oil production and natural gas production for all wells as 54,842 bbl and 339,915 mcf, respectively. The latest Annual Energy Outlook (EIA 2025) projects the average crude oil prices and average natural gas prices from 2026 through 2045 for the Lower 48 States as 85.46 \$/bbl and 3.34 \$/mcf, respectively. Consequently, the average annual oil and natural gas sales value amounts to \$5,822,113 (2023 dollars). As presented in Table 7, when applying the current minimum Federal mineral royalty rate of

12.5% (One Big Beautiful Bill Act, Public Law No: 119-21, July 2025), this sales value would yield \$727,764 of minimum Federal mineral royalties for Federal and state government revenue.

Table 6 Average Annual Oil and Natural Gas Sales Value

No.	Indicator	Estimate
[1]	Total oil production per horizontal well (bbl) ¹	274,209
[2]	Total natural gas production per horizontal well (mcf) ¹	570,047
[3]	Total natural gas production per vertical well (mcf) ¹	451,812
[4]	Annual horizontal wells for development ²	0.2
[5]	Annual vertical wells for development ²	0.5
[6]	Average annual oil production for all wells (bbl)	54,842
[7]	Average annual natural gas production for all wells (mcf)	339,915
[8]	Average crude oil prices (2023 \$/bbl) ³	\$85.46
[9]	Average natural gas prices (2023 \$/mcf) ⁴	\$3.34
[10]	Average annual oil and natural gas sales value (2023 \$)	\$5,822,113

Source: 1 – this EA; 2 – Table 5 in this Appendix; 3 – average of 2026-2045 projection values in EIA (2025a); 4 – average of 2026-2045 projection values in EIA (2025b).

Note: bbl – barrel; mcf – thousand cubic feet; [6] = [1] * [4]; [7] = [2] * [4] + [3] * [5]; [10] = [6] * [8] + [7] * [9].

Table 7 Average Annual Oil and Natural Gas Mineral Royalties

No.	Indicator	Estimate
[1]	Average annual oil and natural gas sales value (2023 \$) ¹	\$5,822,113
[2]	Minimum Federal mineral royalty rate ²	12.5%
[3]	Minimum Federal mineral royalties	\$727,764

Source: 1 – Table 6 in this Appendix; 2 – One Big Beautiful Bill Act, Public Law No: 119-21, July 2025.

Note: [3] = [1] * [2].

For Step (2) in the Methodology section, the baseline scale and structure of the integrated oil and gas development industry in San Juan County is presented in Table 8. It includes an employment of 3,915 workers, value added of \$2,182,721,884 (that is 61.1% of total output), and intermediate input of \$1,391,422,642 (that is 38.4% of total output), which sums up to total output of \$3,574,144,525. The value added is composed of employee compensation of \$388,418,594 (that is 10.9% of total output), proprietor income of \$10,531,501 (that is 0.3% of total output), other property income of \$1,373,893,472 (that is 38.4% of total output), and tax on production and imports net of subsidies of \$409,878,316 (that is 11.5% of total output). Employee compensation and proprietor income sum up to labor income of \$398,950,096 (that is 11.2% of total output).

Table 8 Oil and Natural Gas Development Industry Structure in San Juan County

No.	Indicator	Data	Percentage
[1]	Employment	3,915	/
[2]	Employee compensation	\$388,418,594	10.9%
[3]	Proprietor income	\$10,531,501	0.3%
[4]	Labor income	\$398,950,096	11.2%
[5]	Other property income	\$1,373,893,472	38.4%
[6]	Tax on production and imports net of subsidies	\$409,878,316	11.5%
[7]	Value added	\$2,182,721,884	61.1%
[8]	Intermediate input	\$1,391,422,642	38.9%
[9]	Total output	\$3,574,144,525	100.0%

Source: based on IMPLAN (2025) dataset and industry integration for 3 industries (20 - Oil and gas extraction, 35 - Drilling oil and gas wells, 36 - Support activities for oil and gas operations) out of 546 industries in 2022 year data with in 2023 dollars.

Note: "Percentage" refers to the percentage of total output; refer to the Methodology section for the relation among the indicators.

For Step (3) in the Methodology section, with the estimates of their sum (\$3,418,500) from Step (1) and their ratio (38.9% versus 10.9%) from Step (2), the direct effect of intermediate input and direct effect of employee compensation resulting from the proposed revocation are estimated as \$2,666,430 and \$752,070, respectively, due to new leasing and development of oil and gas resources.

For Step (4) in the Methodology section, the overall data input for the Multi-Regional Input-Output Model are presented in Table 9 including direct effect of intermediate input of \$2,666,430, direct effect of employee compensation of \$752,070, and direct effect of total output of \$5,822,113, due to new leasing and development of oil and gas resources.

Table 9 Data Input for Estimating Economic Impacts on the Four Counties

No.	Indicator	Data	Percentage
[1]	Direct effect of intermediate input	\$2,666,430	45.8%
[2]	Direct effect of employee compensation	\$752,070	12.9%
[3]	Direct effect of total output	\$5,822,113	100.0%

Source: based on calculations in Step (1), Step (2) and Step (3) of this analysis.

Note: "Percentage" refers to the percentage of total output; refer to the Methodology section for the relation among the indicators.

F.4.3 Results

Implementation of the Proposed Action, the revocation of 10-mile withdrawal is likely to generate the following annual total economic impacts and annual specific economic impacts from new leasing and development of oil and gas, benefiting the four counties in New Mexico:

- For San Juan County, Rio Arriba County, Sandoval County, and McKinley County together, a total effect of increased employment of 14.14 workers, increased labor income of \$1,133,206, increased value added of \$3,963,152, and increased total output of \$7,423,893 (Table 10); and
- For San Juan County, a direct effect of increased employment of 7.05 workers, an indirect effect of increased employment of 3.44 workers, and an induced effect of increased employment of 3.52 workers; a direct effect of increased labor income (that is, the sum of employee compensation and proprietor income) of \$766,178, an indirect effect of increased labor income of \$204,033, and an induced effect of increased labor income of \$156,549; a direct effect of increased value added of \$3,155,683, an indirect effect of increased value added of \$483,897, and an induced effect of increased value added of \$313,376; and, a direct effect of increased total output of \$5,822,113, an indirect effect of increased total output of \$1,024,035, and an induced effect of increased total output of \$553,962 (Table 11).

Table 10 Annual Total Economic Impacts on the Four Counties

County	Impact type	Employment	Labor income	Value added	Total output
San Juan	Total	14.01	\$1,126,760	\$3,952,956	\$7,400,110
Rio Arriba	Total	0.01	\$468	\$1,010	\$1,860
Sandoval	Total	0.10	\$4,814	\$6,097	\$14,373
McKinley	Total	0.02	\$1,165	\$3,089	\$7,550
All	Total	14.14	\$1,133,206	\$3,963,152	\$7,423,893

Source: based on calculations in Step (1), Step (2), Step (3) and Step (4) of this analysis and IMPLAN (2025) dataset.

Table 11 Annual Specific Economic Impacts on the Four Counties

County	Impact type	Employment	Labor income	Value added	Total output
San Juan	Direct	7.05	\$766,178	\$3,155,683	\$5,822,113
San Juan	Indirect	3.44	\$204,033	\$483,897	\$1,024,035
San Juan	Induced	3.52	\$156,549	\$313,376	\$553,962
Rio Arriba	Indirect	0.00	\$21	\$52	\$187
Rio Arriba	Induced	0.01	\$447	\$958	\$1,673
Sandoval	Indirect	0.08	\$4,232	\$4,613	\$11,811
Sandoval	Induced	0.02	\$582	\$1,484	\$2,562
McKinley	Indirect	0.01	\$600	\$1,900	\$5,377
McKinley	Induced	0.01	\$565	\$1,189	\$2,173
All	Total	14.14	\$1,133,206	\$3,963,152	\$7,423,893

Source: based on calculations in Step (1), Step (2), Step (3) and Step (4) of this analysis and IMPLAN (2025) dataset.

F.5 SUMMARY

Based on the latest nation-wide datasets which are consistent in terminologies and comparable across location and time, this analysis identifies the current, changing, and comparative socioeconomic conditions of the study area including San Juan County, Rio Arriba County, Sandoval County, and McKinley County. The analysis then develops a Multi-Regional Input-Output Model with a step-wide and reproducible methodology to estimate the economic impacts from the proposed revocation on these four counties based on the industry structure of oil and natural gas drilling and extraction, the drilling and completion costs for potential development of 4 horizontal wells and 10 vertical wells over 20 years as identified in this EA, and the projected oil and natural gas sales prices. For the four counties together, the total annual impact includes increased employment of 14.14 workers, increased labor income of \$1,133,206, increased value added of \$3,963,152, and increased total output of \$7,423,893. Most of these positive economic impacts are expected for San Juan County and contribute to improving the socioeconomic condition of San Juan County, which has had a decrease in population and a decrease in real GDP from 2016 to 2023, and a lower median household income level and a higher unemployment rate in 2023 compared with the United States and New Mexico. Moreover, the average annual oil and natural gas sales value amounts to \$5,822,113 and contributes \$727,764 of minimum Federal mineral royalties for Federal and state government revenue.

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Appendix G – Additional RMPA and PA Consultation and Informational Meetings

Entity	Date Held	Meeting Type
Section 106 Consultation – Consulting Parties, Potential Consulting Parties, and other interested parties	6/11/2019 6/12/2019	Section 106 for the RMPA/EIS
Pueblo of Zuni	5/15/2019	Formal government-to-government consultation
Pueblo of Acoma	5/13/2019	Formal government-to-government consultation
Ojo Encino Chapter (Tri-Chapters)	4/17/2019	Informational meeting
Section 106 Consultation – Consulting Parties, Potential Consulting Parties, and other interested parties	4/8/2019 4/9/2019	Section 106 for the RMPA/EIS
BLM/BIA RMPA/EIS Section 106 Internal coordination/preparation Meeting	3/19/2019 3/20/2019	Section 106 for the RMPA/EIS
Navajo Nation	2/25/2019	Formal government-to-government consultation
Pueblo of Zuni	2/20/2019	Formal government-to-government consultation
Section 106 Consultation – Consulting Parties, Potential Consulting Parties, and other interested parties	10/26/2018	Section 106 Consultation
Navajo Nation	10/1/2018	Formal government-to-government consultation
Becenti Chapter house	7/3/2018	Informational meeting
Pueblo of San Felipe	6/1/2018	Formal government-to-government consultation
Pueblo of San Felipe	10/13/2017	Formal government-to-government consultation
APCG	8/17/2017	Presentation regarding cooperating agencies
Cooperators and Potential Cooperating Agencies	5/25/2017	Cooperating Agency kick-off meeting
Pueblo of Santa Ana	5/23/2017	Formal government-to-government consultation
Pueblo of San Felipe	5/22/2017	Formal government-to-government consultation
Pueblo of Acoma	3/16/2017	Section 106 Consultation
Laguna Pueblo	2/27/2017	Section 106 Consultation

G. Additional RMPA and PA Consultation and Informational Meetings

Pueblo of Acoma	12/20/2016	Formal government-to-government consultation
APCG	12/13/2016	Formal government-to-government consultation
Navajo Nation	11/30/2016	Formal government-to-government consultation
Ojo Encino Chapter, Navajo Nation	11/3/2016	Informational meeting
Nageezi Chapter, Navajo Nation	10/4/2016	Informational meeting
Ohkay Owingeh	8/3/2016	General consultation meeting
National Park Service, Mesa Verde	8/2/2016	Informational meeting
BIA Navajo Region	7/11/2016	Informational meeting
Tri-Chapters, Navajo Nation	6/15/2016	Informational meeting
Southern All Pueblo Governors Council	6/9/2016	General consultation meeting
BIA Navajo Region	5/19/2016	Informational meeting
Tri-Chapters, Navajo Nation	5/18/2016	Informational meeting
Pueblo of Santa Ana	4/28/2016	Formal government-to-government consultation
Pueblo of San Felipe	4/19/2016	Formal government-to-government consultation
Section 106 Consultation	4/13/2016	Section 106
Navajo Nation	3/28/2016	Informational meeting
BIA	3/8/2016	Informational meeting
Tri-Chapters, Navajo Nation	2/24/2016	Informational meeting
Navajo HPD	2/18/2016	General consultation meeting
Ojo Encino, Torreon, and Counselor Tribal representatives	2/18/2016	General consultation meeting
Tri-Chapters, Navajo Nation	2/17/2016	Informational meeting
Navajo Historic Preservation Department, Ojo Encino, Torreon, Tribal representatives	2/10/2016	Informational meeting
Section 106 Consultation	12/3/2015	Section 106
Santa Ana and San Felipe Pueblos	April 2015	Informational meeting
Tri-Chapters, Navajo Nation	3/5/2015	Informational meeting
Tri-Chapters, Navajo Nation	2/24/2015	Informational meeting
Tri-Chapters, Navajo Nation	2/20/2015	Informational meeting
Hopi Tribe	5/21/2014	General consultation meeting

G. Additional RMPA and PA Consultation and Informational Meetings

Navajo Nation	5/2/2014	General consultation meeting
Counselor and Ojo Encino Chapters, Navajo Nation	4/29/2014	Informational meeting
Huerfano Chapter, Navajo Nation	4/22/2014	Informational meeting
Nageezi Chapter, Navajo Nation	4/15/2014	Informational meeting
Navajo Nation Tribal Government	2014	General consultation meeting
Hopi Tribe	2014	General consultation meeting