United States Department of the Interior
Bureau of Land Management
Central California District Office

BAKERSFIELD FIELD OFFICE OIL AND GAS LEASING AND DEVELOPMENT

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

DOI-BLM-CA-C060-2025-0053-RMP-EIS
https://eplanning.blm.gov/eplanning-ui/project/2037500/570

December 10, 2025

<This page intentionally left blank>

Bakersfield Field Office Oil and Gas Leasing and Development

Draft Supplemental Environmental Impact Statement

DOI-BLM-CA-C060-2025-0053-RMP-EIS

<This page intentionally left blank>

Contents

List of Tables

List of Figures

<This page intentionally left blank>

Acronyms and Abbreviations

1,2,3-TCP	1,2,3-trichloropropane
2012 FEIS	2012 Bakersfield Final Environmental Impact Statement
2014 RMP	2014 Bakersfield Field Office Resource Management Plan
2017 PBO	Programmatic Biological Opinion on Oil and Gas Activities on BLM Lands in the San Joaquin Valley in 2017
2019 FSEIS	2019 Bakersfield Field Office Hydraulic Fracturing Final Supplemental Environmental Impact Statement
2020 DR	Bakersfield Field Office Decision Record for a December 2020 Oil and Gas Lease Sale
2020 EA	Bakersfield Field Office Environmental Assessment for a December 2020 Oil and Gas Lease Sale
ACEC	Area of Critical Environmental Concern
APCD	Air Pollution Control District
AFMSS	Automated Fluid Minerals Support System
Annual GHG Report	2023 *BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends*
APD	Application for Permit to Drill
ARB	Air Resources Board
AQI	Air Quality Index
AQRV	Air Quality Related Values
Bcf/d	Billion cubic feet per day
b/d	barrels per day
BMP	best management practices
CAA	Clean Air Act
$CaCO_3$	calcium carbonate
CA PRC	California Public Resources Code
CARB	California Air Resources Board
CalGEM	California Geologic Energy Management Division (formerly DOGGR)
CCR	California Code of Regulations
CCST	California Council on Science and Technology
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	methane
COA	Conditions of Approval
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
DSEIS	Draft Supplement Environmental Impact Statement
DOGGR	California Division of Oil, Gas, and Geothermal Resources
DOI	Department of the Interior

DWR	California Department of Water Resources
EIA	Energy Information Administration
EIR	Environmental Impact Report
E.O.	Executive Order
EOI	Expressions of Interest
EOR	Enhanced Oil Recovery
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
GHG	greenhouse gas
GREET	Greenhouse gases, Regulated Emissions, and Energy use in Technologies
GSA	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plan
H_2S	Hydrogen sulfide
HAPs	hazardous air pollutants
HAP/TAC	air toxics
IDT	Interdisciplinary Team
Mt	megatonnes
MLA	Mineral Leasing Act
MMst	million short tons
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Health
NOI	Notice of Intent
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NSR	New Source Review
O_3	ozone
PFAS	polyfluoroalkyl substances
PFYC	Paleontological Potential Fossil Yield Classification
Planning Area	Bakersfield Field Office Planning Area
PM	particulate matter
PM_{10}	particulate matter smaller than 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than 2.5 microns in diameter
PTW	Pump-to-Wheels
RFDS	Reasonably Foreseeable Development Scenario
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROD	Record of Decision
ROG	reactive organic gases

SB4 EIR	California Department of Conservation (2015) Analysis of Oil and Gas Well Stimulation Treatment in California, Volume II
STEO	short-term energy outlook reports
SB4	California Senate Bill 4
SEIS	Supplemental Environmental Impact Statement
SGMA	Sustainable Groundwater Management Act
SIP	State Implementation Plan
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
SO_X	sulfur oxides
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TMDL	Total Maximum Daily Loads
U.S.C.	United States Code
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds

Executive Summary

Introduction

The Bureau of Land Management (BLM) has prepared a 2025 Draft Supplemental Environmental Impact Statement (DSEIS) to supplement the 2019 Hydraulic Fracturing Final Supplemental EIS (FSEIS) and the 2020 Lease Sale Environmental Assessment (EA) for the Bakersfield Field Office. This action responds to litigation challenging the adequacy of the 2019 FSEIS and the 2020 EA. In 2022, the U.S. District Courts for the Central and Eastern Districts of California approved stipulated settlement agreements. These agreements require BLM to prepare a new supplemental EIS and reconsider the 2014 Resource Management Plan's (RMP) fluid minerals decisions, as well as to supplement the 2020 Lease Sale EA.

The Planning Area includes approximately 400,000 acres of BLM-managed lands and 1.2 million acres of federal mineral estate across eight counties: Fresno, Kern, Kings, Madera, San Luis Obispo, Santa Barbara, Tulare, and Ventura. Four areas—Lost Hills, Buena Vista, Bakersfield, and Sespe—are identified as most likely to experience new hydraulic fracturing activity.

The DSEIS carries forward the five alternatives originally analyzed in the 2012 FEIS. No new alternatives are proposed. The Preferred Alternative (B) maintains current management under the 2014 RMP, balancing energy development with environmental protection.

Purpose and Need

The purpose of this 2025 DSEIS is to supplement the 2019 FSEIS and analyze the environmental effects of hydraulic fracturing technology for oil and gas leasing and development of new leases within the Planning Area, and to determine whether changes are needed to the fluid minerals decisions in the 2014 RMP based on new information or changes in circumstance. Additionally, this DSEIS supplements the analysis of potential environmental impacts from leasing seven parcels. The focus of this analysis is on future lease sales and site-specific review of seven suspended leases. Existing oil and gas leases are recognized as valid existing rights and are not subject to fluid mineral decisions in the 2014 RMP unless the lease expires and is reissued under the 2014 RMP.

The need to develop the 2025 DSEIS and analyze the environmental impacts of leasing parcels is established by the Settlement Agreements, filed with the U.S. District Court for the Central District of California on July 29, 2022 (Case No. 2:20-cv-00371-DSF) and the Eastern District of California on July 31, 2022 (Case No. 1:21-cv-00475-DAD-SAB).

Supplemental Analysis

The Draft Supplemental Environmental Impact Statement (DSEIS) considers new data from internal and external scoping addressing air quality, biological resources, soil, and water resources. A review of new data related to air quality resulted in the inclusion of updated emissions inventories indicating that oil and gas operations contribute less than 0.1% of total regional air

pollutants. The primary contributors to air pollution in the region continue to be wildfires, mobile sources, and agricultural activities. The analysis also includes visibility trends for Class I areas such as Sequoia National Park. Since 2019, five species have been newly listed or proposed for listing under the Endangered Species Act. Among these, the monarch butterfly—a proposed species—may occur within the lease parcels, while the presence of the other species is considered unlikely. All seven lease parcels are located in areas endemic to Valley Fever. To mitigate potential health risks, the BLM requires the implementation of best management practices during ground-disturbing activities associated with the construction of new wells and oil and gas operations. Additionally, the DSEIS includes updated groundwater data and an analysis of land subsidence. The findings confirm that oil and gas development continues to use only a small fraction of the region's overall water supply.

Environmental Consequences

The Draft Supplemental Environmental Impact Statement (DSEIS) concludes that emissions from oil and gas development are minor and are not expected to significantly affect regional air quality or public health. Regarding biological resources, the impacts on newly listed species are minimal, though site-specific environmental reviews and the implementation of best management practices will be necessary. For soil resources, the risk of Valley Fever is considered moderate but manageable through the application of appropriate best practices. Lastly, this DSEIS finds that impacts on water resources are minimal and relevant state agencies provide proper oversight and protection.

The results of this supplemental analysis, additive to those identified in the 2012 Final EIS, and the 2019 Supplemental EIS did not show a notable increase in total impacts. No conflicts were found between the estimated impacts of hydraulic fracturing and the resource or program management goals and objectives stated in the 2012 Proposed RMP. Therefore, an amendment to the 2014 RMP has been determined to be unnecessary, and this Draft Supplemental EIS documents that decision.

Scoping

A Notice of Intent (NOI) was published in the *Federal Register* on June 23, 2025, initiating a 30-day public scoping period that closed on July 23, 2025. During this period:

- 264 submissions were received via ePlanning.
- Comments focused on air quality, water resources, wildlife, and public health.
- Tribal consultation letters were sent to 13 federally recognized tribes.
- No cooperating agencies were formally designated, but coordination with state and local agencies informed the analysis.

The full Public Scoping Report is available at: https://eplanning.blm.gov/eplanning-ui/project/2037500/510

Chapter 1. Introduction

1.0 Background

The Bureau of Land Management (BLM) has prepared this Draft Supplemental Environmental Impact Statement (hereafter referred to as the 2025 DSEIS) to supplement the 2019 Bakersfield Field Office Hydraulic Fracturing Final Supplemental Environmental Impact Statement (2019 FSEIS) to consider whether to amend the fluid minerals decisions in the 2014 Bakersfield Field Office Resource Management Plan (2014 RMP). The BLM prepared a Final Environmental Impact Statement for the 2014 RMP in 2012 (2012 FEIS) and issued a Record of Decision (ROD) in 2014. The U.S. District Court, Central District of California, issued an order on summary judgment in 2016 finding the 2012 FEIS failed to take a hard look at the environmental impacts of hydraulic fracturing technology commonly known as fracking. The Court upheld the range of alternatives analyzed in the 2012 FEIS and found that the Reasonably Foreseeable Development Scenario (RFDS) was acceptable (*Los Padres Forest Watch v. BLM*, No. 2:15-cv-04378-MWF-JEM (C.D. Cal.)). The Court then approved a settlement agreement in 2017 in which the parties agreed that BLM would prepare a supplemental National Environmental Policy Act (NEPA) document to address the deficiencies found by the Court and issue a new decision document. The BLM prepared the 2019 FSEIS and issued a ROD in December 2019.

In January 2020, complaints were filed against the BLM regarding its 2019 FSEIS and ROD in the U.S. District Court for the Central District of California by Earthjustice, National Parks Conservation Association, Natural Resources Defense Council, The Wilderness Society, Center for Biological Diversity, Los Padres Forest Watch, Patagonia Works, and the Sierra Club (collectively grouped as the "Environmental Plaintiffs" by the Court) and the State of California. The Court consolidated the complaints into *Center for Biological Diversity v. BLM*, Case No. 2:20-cv-00371-DSF. The parties subsequently entered into the 2022 Stipulated Settlement Agreement (Settlement Agreement). The Settlement Agreement requires BLM to prepare a supplement to the 2019 FSEIS and issue a new decision document, which will amend or supersede the 2019 ROD to the extent determined necessary or appropriate by BLM. BLM also agreed to consider amending the 2014 RMP in preparing the supplement. The Settlement Agreement provides that the supplement may tier to the 2019 FSEIS and 2012 FEIS in accordance with 40 C.F.R. Secs 1502.20 and 1508.28 (1978). While those regulations have since been rescinded, the Settlement Agreement provides that the BLM will apply the 1978 version of the regulations to the extent consistent with law.

The Leasing Reform Act directs BLM to conduct quarterly oil and gas lease sales whenever eligible lands are available for leasing. In 2020, in compliance with the Leasing Reform Act, the Bakersfield Field Office issued a decision record (2020 DR) offering for sale seven oil and gas leases encompassing 4,134 acres of public land in Kern County, California, supported by an accompanying Environmental Assessment (2020 EA) and Finding of No Significant Impact

(FONSI). On December 10, 2020, the Bakersfield Field Office held an oil and gas lease sale involving the seven parcels. Center for Biological Diversity, Friends of the Earth, and Sierra Club challenged the 2020 DR in the U.S. District Court for the Eastern District of California (Case No. 1:21-cv-00475-DAD-SAB). Parties subsequently entered into a settlement agreement, wherein BLM agreed to prepare a supplement to the 2020 EA pursuant to NEPA. The agreement reserved the right to combine the supplemental analysis for the 2020 EA with the supplement to the 2019 FSEIS.

This DSEIS supplements the environmental analysis of the 2019 FSEIS and the 2020 EA.

Management of Fluid Minerals in the 2014 RMP

In compliance with the Mineral Leasing Act of 1920 (30 U.S.C. § 181 et seq.), as amended, BLM is responsible for administering the leasing of onshore federal mineral estate, including oil and gas. Such leasing is conducted consistent with the applicable BLM Field Office RMP.

The 2012 FEIS analyzed approximately 1.2 million acres of federal mineral estate as open to fluid mineral leasing, subject to restrictions and resource-protective measures contained in the 2014 RMP. An RFDS was prepared as a foundational document for the 2014 RMP (see Appendix M of 2012 FEIS). The RFDS projected the exploration, drilling, and production activity that would likely occur in the next 10 years, the anticipated life of the 2014 RMP. This was predicted to be approximately 100 to 400 federal wells to be drilled on federal mineral estate per year during the life of the 2014 RMP. This includes 90 to 360 wells per year on existing leases issued and 10 to 40 wells per year on new leases issued subsequent to the 2014 RMP approval date. A portion of these wells were expected to be hydraulically fractured. At the time of preparation of this 2025 DSEIS, BLM's Automated Fluid Minerals Support System (AFMSS2) records indicate over the last 10 years, BLM has approved an average 85 wells per year through APDs. No wells have been approved since 2019.

Prior to signing the 2014 ROD, the BLM commissioned a review of the state of the knowledge of oil and gas well stimulation and completions technologies in California. This independent assessment was published by the California Council on Science and Technology (CCST). It was prepared by Lawrence Berkeley National Laboratories and the Pacific Institute. Titled *An Independent Review of Scientific and Technical Information on Advanced Well Stimulation Technologies in California*, the assessment was published in 2014 (CCST, 2014) and updated in 2016 (CCST, 2016); no updates have been made to this report since 2016. Both reports are cited extensively throughout the 2019 FSEIS. The conclusions of the reports support and affirm the decisions presented in the 2014 RMP and the conclusion of the 2019 FSEIS that a Resource Management Plant Amendment (RMPA) was not necessary.

Supplemental Analysis

This document supplements the analysis of the 2019 FSEIS regarding the impacts of hydraulic fracturing technology on BLM-managed land and mineral estate in the Planning Area, exclusive of the California Coastal National Monument and the Carrizo Plain National Monument, which are addressed in Monument-specific RMPs. The focus of this supplemental analysis addresses the

potential impacts of hydraulic fracturing technology on the future leasing and development decisions consistent with the 2014 RMP fluid mineral management decisions.

For the purposes of this supplemental analysis, hydraulic fracturing is defined as an optional part of the well completion process employed after drilling an oil or natural gas well. It involves injecting a mixture of highly pressurized fluids and proppant (usually sand) into a geologic formation to create and prop open fissures, or pathways, through which the produced fluids can more easily flow into the wellbore. When the hydraulic pressure is removed from the well, the small grains of sand remain in the fissures and hold the fractures open, allowing for higher production rates of the desired oil and gas resource than would otherwise be achieved.

Oil and gas leasing and development on federal mineral estate requires multiple stages of BLM environmental review and authorization. It is important to note that this 2025 DSEIS, like the 2019 FSEIS it supplements, is prepared at the land use planning level of impact analysis, with the addition of a lease sale aspect analyzed in the 2020 EA.

Pursuant to NEPA, BLM review must address the direct, indirect, and cumulative effects of the specific action proposed at each of these stages. The environmental review, including direct and indirect effects, for the development of leased parcels, including well completion techniques such as hydraulic fracturing, is a site-specific review of potential impacts from an identified proposed project. Applications for Permits to Drill (APDs) are required to be submitted by developers/ operators and typically include an initial on-the-ground, site-specific field evaluation by BLM resource specialists in addition to compliance with NEPA. This review allows site-specific information regarding local resource conditions to be evaluated, and potential impacts disclosed. During this project-specific review, BLM would finalize project mitigation measures, Best Management Practices (BMPs), and apply appropriate stipulations from the 2014 RMP.

In this document, the BLM will provide supplemental information for the 2020 EA (DOI-BLM-CA-C060-2020-0120-EA) for on-the-ground, site-specific field evaluations for the seven lease parcels (4,134 acres) nominated through Expressions of Interest (EOI) and leased during the December 2020 Competitive Oil and Gas Lease Sale. Updated site-specific information can be found in this document under the appropriate resource area under the heading “Lease Considerations.”

This supplemental analysis tiers to the 2019 FSEIS, 2012 FEIS, and incorporates by reference the 2020 EA. When referenced, this 2025 DSEIS identifies the specific sections and/or page numbers of those documents. It may be helpful to a reader of this DSEIS to have those documents available when reading. The 2012 FEIS, 2019 FSEIS, and 2020 EA are available on the BLM NEPA Register (ePlanning) at:

- **2012 FEIS**: https://eplanning.blm.gov/eplanning-ui/project/70273/570
- **2019 FSEIS**: https://eplanning.blm.gov/eplanning-ui/project/100601/570
- **2020 EA**: https://eplanning.blm.gov/eplanning-ui/project/2000634/570.

1.1 Purpose and Need

The purpose of this 2025 DSEIS is to supplement the 2019 FSEIS and analyze the environmental effects of hydraulic fracturing technology for oil and gas leasing and development of new leases within the Planning Area, and to determine whether changes are needed to the fluid minerals decisions in the 2014 RMP based on new information or changes in circumstance. Additionally, this DSEIS supplements the analysis of potential environmental impacts from leasing seven parcels.

The focus of this analysis is on future lease sales and the seven previously mentioned (suspended) leases because fluid mineral decisions in the 2014 RMP would apply to these leases. Existing oil and gas leases are recognized as valid existing rights and are not subject to fluid mineral decisions in the 2014 RMP unless the lease expires and is reissued under the 2014 RMP.

The need to develop the 2025 DSEIS and analyze the environmental impacts of leasing parcels is established by the Settlement Agreements, filed with the U.S. District Court for the Central District of California on July 29, 2022 (Case No. 2:20-cv-00371-DSF) and the Eastern District of California on July 31, 2022 (Case No. 1:21-cv-00475-DAD-SAB).

1.2 Description of Planning Area

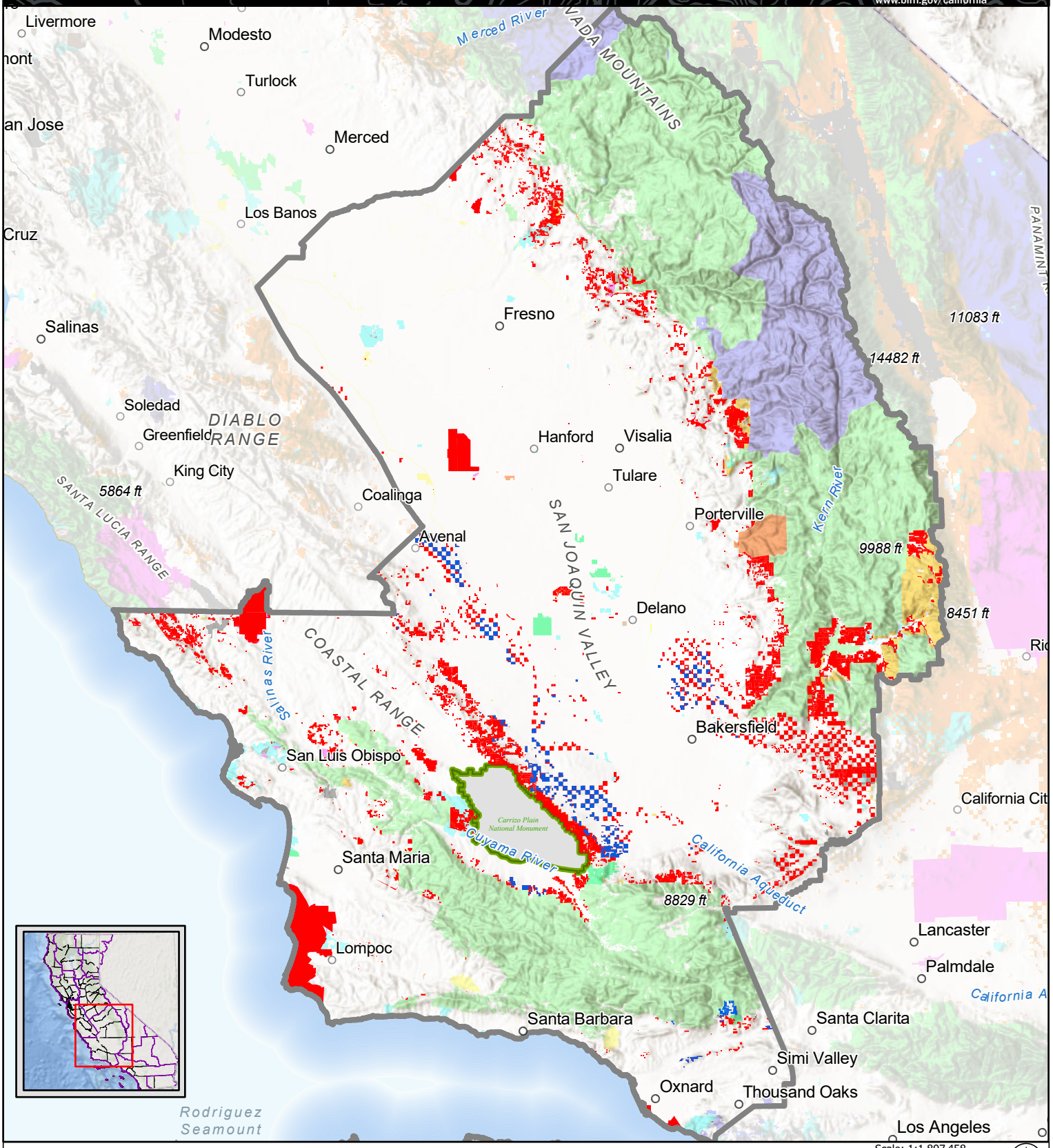
The Planning Area encompasses approximately 400,000 acres of public land and 1.2 million acres of federal mineral estate which includes parts of Fresno, Kern, Kings, Madera, San Luis Obispo, Santa Barbara, Tulare, and Ventura Counties in California (**Figure 1-1**). The Planning Area is described in Section 1.3 of the 2014 RMP.

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

Bakersfield Field Office

Bakersfield Field Office Planning Area

www.blm.gov/california



LEGEND:

Scale: 1:1,897,458
0 36,755 73,510 147,020 US Feet

- Field Office
- Carrizo Plain National Monument
- Oil and Gas Leases

Land Status

- Open for Leasing
- Bureau of Land Management
- US Forest Service
- National Park Service
- US Fish and Wildlife Service
- Bureau of Reclamation
- Bureau of Indian Affairs
- Department of Defense
- Other Federal
- State
- Local Government
- Private

Path: \\blm\dfs\loc\GBP\CA\BKFO\projects\minerals\oil\Romina\Projects\Amendments\O&G_EA_EIS\O&G_EA_EIS.aprx

Date Revised: 9/12/2025

Supplemental Hydraulic Fracturing Analysis Areas

The 2019 FSEIS used historical data to identify four spatial areas where hydraulic fracturing would be most likely to be employed. See **Figure 1-2**. The total area of the four supplemental hydraulic fracturing analysis areas (referred to in this report as the Supplemental Analysis Areas) is 416,515 acres. See **Table 1-1**. This represents 16 percent (66,037 acres) of BLM surface acres, and 7 percent (56,472 acres) of unleased federal mineral estate, in the Planning Area. Further information about how the Supplemental Analysis Areas were delineated is included in Chapter 4, pages 44, 49, and 51 of the 2019 FSEIS.

The four supplemental hydraulic fracturing analysis areas are named for associated oil fields and are assumed to be the most likely places for locating new wells on new federal oil and gas leases that would be hydraulically fractured. The Supplemental Analysis Areas help to identify locations where impacts are most likely to occur and add context to potential surface disturbance impacts.

Table 1-1 *Acreages of the four Supplemental Analysis Areas.*

Analysis Area	Acreage
Lost Hills	34,029
Buena Vista	268,469
Bakersfield	17,557
Sespe	96,460
Total	**416,515**

Lease Parcels

The seven parcels included in the 2020 Lease Sale include a total of 4,134 acres in Kern County, California. See **Figure 1-3**. The leases include a mixture of split estate (3,008 acres) and public lands (1,126 acres). Descriptions of the lease sale parcels are included in Appendix A of the 2020 EA. **Table 1-2** includes the lease numbers, acreages, and number of idle wells located on each lease parcel.

Table 1-2 *Seven lease parcels included in the 2020 Lease Sale.*

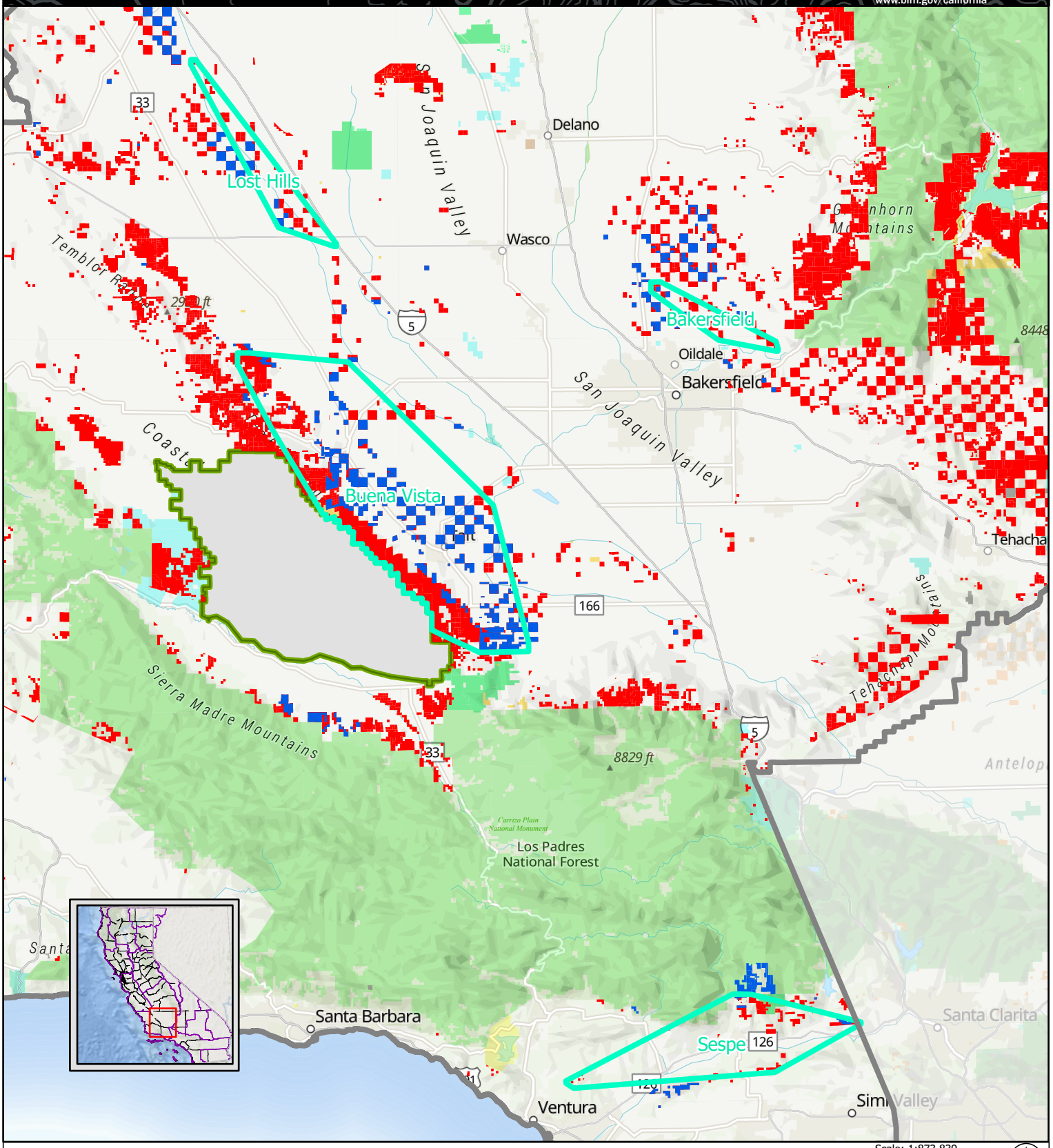
Lease Number / Legacy Number	# of Idle Wells	Acreage
CACA105513039 / CACA 059099	3	538.06
CACA105513040 / CACA 059100	0	278.28
CACA105513041 / CACA 059101	19	160
CACA105513043 / CACA 059102	0	957.24
CACA105513044 / CACA 059103	0	920
CACA105513045 / CACA 059104	0	600
CACA105513046 / CACA 059105	0	680

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

Bakersfield Field Office

Supplemental Analysis Areas

www.blm.gov/california



LEGEND:

Scale: 1:873,839
0 15,000 30,000 60,000 US Feet

- Field Office
- Carrizo Plain National Monument
- SHF Analysis Area
- Oil and Gas Leases
- Open for Leasing

Land Status

- Bureau of Land Management
- US Forest Service
- National Park Service
- US Fish and Wildlife Service
- Bureau of Reclamation
- Bureau of Indian Affairs
- Department of Defense
- Other Federal
- State
- Local Government
- Private

Path: \\blm\dfs\loc\GBP\CA\BKFO\projects\minerals\oil\Romina\Projects\Amendments\O&G_EA_EIS\O&G_EA_EIS.aprx

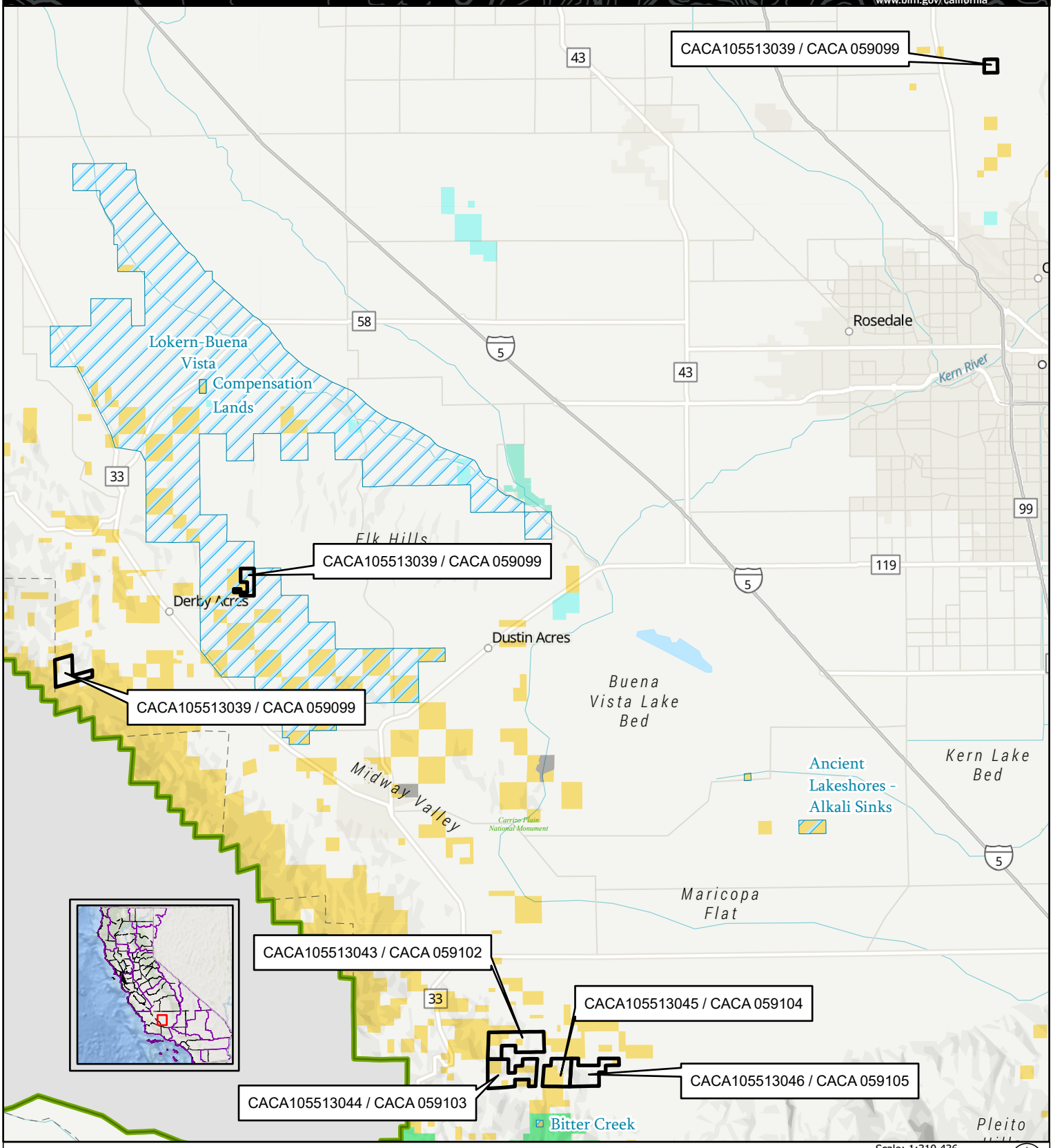
Date Revised: 9/12/2025

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

Bakersfield Field Office

Lease Areas

www.blm.gov/california



LEGEND:

Scale: 1:310,436
0 5,000 10,000 20,000 US Feet

- Field Office
- ACEC
- Carrizo Plain National Monument
- Lease Parcels

Land Status

- Bureau of Land Management
- US Fish and Wildlife Service
- Other Federal
- State
- Local Government
- Private

1.3 Scoping and Planning Issues

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis, including alternatives if necessary, and guide the planning process.

1.3.1 Scoping Process

A Notice of Intent (NOI) to prepare a Draft Supplemental Environmental Impact Statement and potential RMPA was published in the Federal Register on June 23, 2025.

The NOI identified the purpose and need for the DSEIS and provided information about the DSEIS, preliminary planning issues and criteria, the scoping process, and contact information. It also initiated a 30-day scoping period, which closed on July 23, 2025. The BLM received a total of 264 submissions during the scoping period via ePlanning from which 215 individual substantive comments were identified. The complete results of the scoping process are summarized in the Public Scoping Report (https://eplanning.blm.gov/eplanning-ui/project/2037500/510).

1.3.2 Issues Addressed

Public scoping for the 2012 FEIS identified six planning issues that were addressed during the development of the alternatives for the 2014 RMP. These are described in Section 1.4.2, pages 7-9, of the 2012 FEIS. Issues identified and evaluated for the 2019 FSEIS are described in Section 1.6.2, pages 10-11, of that document.

Internal and external scoping efforts identified five resource areas with specific substantive issues which required further consideration based on new information or circumstances identified during the preparation of this DSEIS. In **Table 1-3**, "Issue Questions" are grouped with the relevant "Resource Area" and the section in this DSEIS where analysis of the issue can be found. Additionally, the table includes the sections or page numbers in previous documents associated with this effort (2012 FEIS, 2019 FSEIS, or 2020 EA) where previous analysis can be found.

Table 1-3 *Issue questions analyzed in detail and location(s) of analysis documentation.*

Resource Area	Issue Question	Planning Level Analysis Location	Lease Level Analysis Location
Air & Atmospheric Values	How will the BLM assess and mitigate the impacts of oil and gas development on air quality, including greenhouse gasses?	2012 FEIS, §4.1 2019 FSEIS, §4.1 **2025 DSEIS, §4.1**	2020 EA, pg. 40-51 **2025 DSEIS, §4.1.5**
Biological Resources (Special Status Species)	How will the BLM evaluate and mitigate the impacts of oil and gas leasing on threatened and endangered species and their habitats?	2012 FEIS, §4.2 2019 FSEIS, §4.2 **2025 DSEIS, §4.2**	2020 EA, pg. 60-67 **2025 DSEIS, §4.2.2**

Resource Area	Issue Question	Planning Level Analysis Location	Lease Level Analysis Location
Soil Resources	How will the BLM reduce risk of impacts from soil disturbance to protect human health?	2012 FEIS, §4.7 2019 FSEIS, §4.6 **2025 DSEIS, §4.3**	2020 EA, pg. 52-53 **2025 DSEIS, §4.3.3**
Water Resources	How will the BLM assess and protect water resources from the impacts of oil and gas development?	2012 FEIS, §4.9 2019 FSEIS, §4.8 **2025 DSEIS, §4.4**	2020 EA, pg. 67-68 **2025 DSEIS, §4.4.3**

1.3.3 Issues Considered but Not Further Analyzed

All substantive issues raised during public scoping that the BLM determined had not been sufficiently analyzed in previous documents are included in this DSEIS. Issues which the BLM Interdisciplinary Team (IDT) considered but did not carry forward for further analysis in this DSEIS are listed in **Table 1-4**.

Table 1-4 *Issues not carried forward for analysis in this DSEIS, and rationale for determining no further analysis is needed.*

Resource Area	Issue Question	Reason for elimination from further analysis
Cultural Resources	How will the BLM protect cultural resources in relation to oil and gas leasing and development activities near historically significant areas?	Impacts of oil and gas leasing and development on cultural resources are sufficiently analyzed in Section 4.4 of the 2012 FEIS and supplemented in relation to hydraulic fracturing in Section 4.3 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 67-68 of the 2020 EA. Thirty-seven cultural resource inventories have been conducted and forty-seven new cultural resources have been recorded in the Supplemental Analysis Areas since the publication of the 2019 FSEIS. Based on a review of the BLM Bakersfield Field Office cultural geodatabase and the BLM Bakersfield Field Office cultural resource inventories, there was no significant new information specific to the leases since the 2020 EA was completed. Following review of this information, BLM determined the new information would not change the analysis of cultural resource impacts in either the 2019 FSEIS or 2020 EA. Section 106 compliance related to the 2019 FSEIS and 2020 EA was reviewed and is sufficient for the 2025 DSEIS.
Native American Values	How will the BLM protect Native American values in relation to oil and gas leasing and development activities near archaeological sites or tribal resources?	Impacts of potential hydraulic fracturing associated with oil and gas leasing and development on Native American values in the Planning Area are sufficiently analyzed in Section 4.4 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on page 81 of the 2020 EA. Native American Tribes were notified about the project in a letter dated May 22, 2025. (See Section 5.5.3 of this document.) None of the Tribes contacted during preparation of this DSEIS provided new information. Therefore, the previous analysis is sufficient, and no further analysis is warranted.

Resource Area	Issue Question	Reason for elimination from further analysis
Paleontological Resources	How will the BLM evaluate and mitigate the impacts of oil and gas leasing on paleontological resources?	Impacts of oil and gas leasing and development on paleontological resources are sufficiently analyzed in Section 4.6 of the 2012 FEIS and supplemented in Section 4.5 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 68-69 of the 2020 EA. The BLM determined that this analysis is sufficient because the geology in the region has not changed, and no updates or changes to the Paleontological Potential Fossil Yield Classification (PFYC) have been recorded. Additionally, no new fossil localities have been recorded within the area of the lease sale parcels. Therefore, the previous analysis is sufficient, and no further analysis is warranted.
Visual Resources	How will the BLM evaluate and mitigate the visual impacts of oil and gas development on designated scenic highways and surrounding landscapes?	Impacts of oil and gas leasing and development on visual resources are sufficiently analyzed in Section 4.8 of the 2012 FEIS and supplemented in Section 4.7 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 39-40 of the 2020 EA. There have been no changes to the Visual Resource Inventory for the Planning Area, therefore the previous analysis is sufficient, and no further analysis is warranted.
Livestock Grazing	How will oil and gas leasing and development activities impact livestock grazing?	Impacts of oil and gas leasing and development on livestock grazing are sufficiently analyzed in Section 4.13 of the 2012 FEIS and supplemented in Section 4.9 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on page 69 of the 2020 EA. In the 2012 FEIS analysis, fluid mineral development was deemed to have negligible effects on livestock grazing. The 2019 FSEIS determined that additional impacts associated with hydraulic fracturing would not change the 2012 FEIS analysis. No new circumstances or information were identified during internal or external scoping in the preparation of this DSEIS that would change these conclusions. Therefore, no further analysis is warranted.
Minerals Management (Seismicity)	How will the BLM evaluate and address the risks of increased seismic activity associated with oil and gas development in areas prone to earthquakes?	Seismic activity related to potential hydraulic fracturing associated with oil and gas leasing and development in the Planning Area is sufficiently analyzed in Section 4.10 of the 2019 FSEIS. In the 2019 FSEIS analysis, BLM determined impacts related to hydraulic fracturing-induced earthquakes would be negligible. No new circumstances or information were identified during preparation of this DSEIS that would change these conclusions. Therefore, no further analysis is warranted.

Resource Area	Issue Question	Reason for elimination from further analysis
Areas of Critical Environmental Concern	How will BLM manage oil and gas leasing and development on lands designated as ACECs?	Impacts of oil and gas leasing and development on Areas of Critical and Environmental Concern (ACEC) are sufficiently analyzed in Section 4.17 of the 2012 FEIS and supplemented in Section 4.11 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 60-67 of the 2020 EA. In the 2019 FSEIS analysis, fluid mineral development, including hydraulic fracturing, was deemed to have negligible effects on ACECs. The BLM determined this analysis is sufficient because no new ACECs have been established or nominated in the Planning Area since 2019, and no changes have occurred to the management of the Lokern-Buena Vista ACEC located within Lease #CACA105513040.
Social and Economic Resources	How will the BLM evaluate the social and economic impacts of oil and gas leasing on nearby communities?	Impacts of oil and gas leasing and development on social and economic resources are sufficiently analyzed in Section 4.23 of the 2012 FEIS and supplemented in Section 4.12 of the 2019 FSEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 37-39 of the 2020 EA. In the 2019 FSEIS analysis, fluid mineral development, including hydraulic fracturing, was deemed to have negligible effects on social and economic resources. No new circumstances or information were identified during preparation of this DSEIS that would change these conclusions. Therefore, no further analysis is warranted.
Environmental Justice	How will the BLM evaluate the disproportionate impacts from oil and gas leasing and development on underserved communities?	Executive Order (E.O.) 14154, Unleashing American Energy (Jan. 20, 2025), and a Presidential Memorandum, Ending Illegal Discrimination and Restoring Merit-Based Opportunity (Jan. 21, 2025), require the Department to strictly adhere to the NEPA, 42 U.S.C. §§ 4321 et seq. Further, such Order and Memorandum repeal E.O. 12898 (Feb. 11, 1994) and E.O. 14096 (Apr. 21, 2023). Because E.O. 12898 and E.O.14096 have been repealed, complying with such Executive Orders is a legal impossibility. The BLM verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 C.F.R. Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum.
Recreation and Visitor Services	How will the BLM evaluate and protect recreational access and the integrity of recreation areas?	Impacts of oil and gas leasing and development on recreation are sufficiently analyzed in Section 4.15 of the 2012 FEIS. Impacts of leasing the seven parcels included in the 2020 lease sale are sufficiently analyzed on pages 39-40 of the 2020 EA. The Butterfield Overland National Historic Trail, designated in 2023, crosses 0.14 miles of BLM managed lands (surrounded by private land and inaccessible to the public) and 5.43 miles of BLM mineral estate, where recreation is not managed due to private surface ownership. These new circumstances would not change the analysis of recreation impacts in the 2012 FEIS and 2020 EA. No other new circumstances or information were identified that would change these conclusions. Therefore, no further analysis is warranted.

1.4 Planning Criteria and Legislative Constraints

1.4.1 Planning Criteria

The planning criteria are the standards, rules, and guidelines that help guide the development of a Supplemental Environmental Impact Statement (SEIS) and potential RMPA. The preliminary planning criteria published in the NOI include:

1. Only those portions of the existing plan that need to be updated to respond to the issues and management concerns identified in the court order and settlement agreement will be reviewed. Other portions of the plan will be brought forward from the existing 2014 RMP approved on December 22, 2014, and the 2019 FSEIS for hydraulic fracturing approved on December 12, 2019.
2. The planning process will be completed in compliance with Federal Land Policy and Management Act of 1976 (FLPMA) and all other applicable laws.
3. The planning process will include a SEIS that will comply with the NEPA standards.
4. The scope of analysis will be consistent with the level of analysis in approved plans and in accordance with Bureau-wide standards and program guidance.
5. Public comments will be addressed during the planning process.

1.4.2 Legislative Constraints

Section 1.5.2 (page 11) of the 2012 FEIS discusses legislative constraints for this 2025 DSEIS document.

1.4.3 Planning Process

The BLM planning process integrated into the 2012 FEIS is fully described in Section 1.6, pages 10-13, of the 2012 FEIS. This process would apply to any planning decision that may arise on the basis of this supplemental analysis, whether that be to establish, revise, amend, or, in this instance, possibly supersede, an RMP.

The Notice of Intent was styled to prepare a potential resource management plan amendment, because at the time, BLM was considering whether or not the integration of the information regarding hydraulic fracturing would warrant amendment of the 2014 RMP, or whether BLM should propose a resource management plan to supersede the 2014 RMP. For reasons discussed in this DSEIS, no amendment to the 2014 RMP is warranted.

The results of this draft supplemental analysis analyzing the impacts of hydraulic fracturing, additive to those identified in the 2012 FEIS, did not show notable increase in total impacts. No conflicts were found between the estimated impacts of hydraulic fracturing and the resource or program management goals and objectives stated in the RMP. The range of alternatives has not

changed between the approved 2014 RMP and its 2012 FEIS and the DSEIS. Therefore, no amendment to the 2014 RMP is necessary.

The title of this document has been changed to reflect that it addresses the Court's decision, as well as the subsequent Settlement Agreement. In that agreement the BLM agreed to prepare a supplement to the 2019 FSEIS pursuant to NEPA. Following issuance of the supplemental NEPA analysis, Federal Defendants agree to issue a new decision document. The new decision document will amend or supersede the 2019 Record of Decision (ROD) to the extent determined necessary or appropriate by Federal Defendants.

1.4.4 Related Plans

The Secretary of the Interior is directed to develop land use plans consistent with state and local plans to the maximum extent found consistent with federal law and the purposes of FLPMA. 43 U.S.C. 1712 (c)(9). A complete description of other land management plans that relate to the 2014 RMP is provided in Section 1.8, pages 16-17, of the 2012 FEIS.

1.4.5 Policy

The 2014 RMP is consistent with the requirements identified in various laws, regulations and policies as described in Section 1.9, pages 17-182 of the 2012 FEIS.

Chapter 2. Alternatives

The ROD for the 2019 FSEIS incorporated the 2019 FSEIS into the 2012 FEIS. The 2019 FSEIS concluded that no changes to the land use planning decisions presented in the 2014 RMP were necessary and retained the alternatives presented in the 2012 FEIS. The 2012 FEIS presented five alternatives considered in detail. These five alternatives represented five management directions that could be taken to resolve the issues identified through the scoping process. Each alternative was intended to be consistent with the law, regulation, and policy while providing varying levels of compatible resource uses and development opportunities.

The U.S. District Court upheld the range of alternatives analyzed in the 2012 FEIS. The 2019 FSEIS analysis carried the range of alternatives forward, making no changes. This DSEIS also carries forward those same alternatives for supplemental analysis. A summary of the alternatives is presented below, and a comparison of alternative fluid minerals management decisions can be found in Table 2.1 in the 2019 FSEIS on pages 17-34. The description of the alternatives for the 2014 RMP can be found in Chapter 2 of the 2012 FEIS on pages 19-216.

The description of the alternatives for the 2020 EA can be found in Chapter 2 of the 2020 EA on pages 10-11. No new alternatives are being considered as part of the analysis for the seven lease parcels.

Alternative A (No Action) describes management under the 1997 Caliente RMP and 1984 Hollister RMP, as amended. Management of resources and sensitive habitats would remain at current levels but would not address emerging issues concerning public lands. This alternative also would not address the use of lands acquired after the signing of these RODs, including public lands at Atwell Island, Piedras Blancas Light Station, and portions of the San Joaquin River Gorge.

Alternative B (Preferred Action) continues current management under 2014 ROD, and balances resource conservation and ecosystem health with the production of commodities and public use of the land. This alternative provides opportunities to produce commodities from natural resources and to use the land for public purposes on a sustainable basis, while maintaining important ecological, cultural, and recreational values. This alternative includes changes made as a result of public comment and internal review on the 2011 Draft RMP/Draft EIS.

Alternative C emphasizes conserving cultural and natural resources, maintaining functioning natural systems, and restoring natural systems that are degraded. Management would focus on protecting sensitive resources through greater limitation of resource uses.

Alternative D mimics Alternative C in all aspects except livestock grazing. This alternative eliminates livestock grazing from all the public lands for the extent of the plan where individual pastures of allotments or entire allotments which lie primarily within the Bakersfield Field Office Planning Area and, therefore, the 2014 RMP provides administrative direction for the livestock grazing program.

Alternative E emphasizes the production of natural resources commodities and public use opportunities. Resource uses such as recreation, livestock grazing, mining, and oil/gas leasing, consistent with BLM guidance and constraints, would be emphasized. Potential impacts on sensitive resources would be mitigated on a case-by-case basis.

Chapter 3. Affected Environment

3.0 Introduction

The *affected environment* describes "the environmental conditions that would prevail in the absence of the implementation of the proposed action or action alternatives." (DOI, 2025). Chapter 3 of the 2012 FEIS (pages 217-392) used the best available information at that time to describe the affected environment for BLM resource programs, resource uses, special designations, and the social and economic environment in the Planning Area.

During preparation of a SEIS, DOI directs bureaus to consider "significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its effects." (DOI, 2025). Chapter 3 of the 2019 FSEIS (pages 35-41) supplemented Chapter 3 of the 2012 FEIS by including significant new circumstances and information pertinent to understanding the effects of hydraulic fracturing in the management and development of oil and gas resources in the Planning Area. More specifically, during preparation of the 2019 FSEIS BLM identified and provided new circumstances and information pertinent to the affected environment for Air and Atmospheric Values, Cultural Resources, Native American Values, Paleontological Resources, and Minerals Management. No other new or supplemental information was determined to be necessary at that time to supplement the affected environment described in the 2012 FEIS.

"Significant new circumstances or information" related to Chapter 3 of this 2025 DSEIS include new studies, data, or other information identified which may potentially impact analysis of the effects of hydraulic fracturing in the management and development of oil and gas resources in the Planning Area. This chapter does not provide detail about environmental components that would not be affected or that are not essential to the understanding or resolution of planning issues. Significant new circumstances or information were identified and are described in this chapter to supplement the affected environment for Air and Atmospheric Values, Biological Resources, Soil Resources and Water Resources. Site specific information regarding lease parcels subject to this DSEIS has been added where appropriate. This chapter provides context for the analysis in Chapter 4 of this document.

California Oil and Gas Development

Oil and gas development in California differs significantly from other major producing regions of the United States in terms of geologic setting, well depth, and recovery techniques. In the southern San Joaquin Basin—part of the planning area and California's most prolific producing area—oil wells are comparatively shallow, with average depths commonly ranging from approximately 1,000 to 4,000 feet (CalGEM, 2025c). These wells predominantly target heavy crude oil reservoirs with low American Petroleum Institute (API) gravity, which necessitates the use of enhanced oil recovery (EOR) methods such as cyclic steam stimulation, steam flooding, and, in some cases, in-situ combustion (EIA, 2015).

In contrast, development in other major oil-producing states (such as Texas and North Dakota) typically involves wells that are substantially deeper, frequently exceeding 10,000 feet in measured depth. Wells in the Permian Basin (West Texas) and the Bakken Formation (North Dakota) are designed to produce light crude oil and condensates from tight formations, requiring advanced technologies including horizontal drilling and multi-stage hydraulic fracturing (EIA, 2016; EIA, 2023; Marra et al., 2021). These wells are generally more capital- and technology-intensive but result in significantly higher production rates per well relative to California's heavy oil reservoirs.

The combination of shallower well depths, complex structural geology, and the proximity of many producing fields to urbanized and agricultural areas shapes California's operational and regulatory environment. Development is subject to a robust state-level regulatory framework administered by the California Geologic Energy Management Division (CalGEM), with additional oversight from local air quality management districts and water boards. This results in operational practices that emphasize environmental protection, surface access coordination, and regulatory compliance, rather than the high-volume, high-efficiency development strategies commonly employed in other regions (CalGEM, 2025a; CalGEM, 2025b; SWRCB, 2025a; CARB, 2024).

Additionally, BLM does not have regulatory authority over hydraulic fracturing in California; that authority rests with the California Department of Conservation's Geologic Energy Management Division (CalGEM), which oversees all well stimulation activities in the state. The BLM currently lacks the authority to regulate hydraulic fracturing on federal and Indian lands, a position affirmed by the U.S. District Court for the District of Wyoming in the 2016 case *Wyoming v. Department of the Interior*. In that ruling, the court vacated BLM's 2015 hydraulic fracturing rule, concluding that the agency had exceeded its statutory authority. The court emphasized that the Energy Policy Act of 2005 had explicitly removed most hydraulic fracturing activities from federal oversight under the Safe Drinking Water Act (except in cases where diesel fuels are used) thereby preempting further federal regulation in this area. The court further held that BLM could not rely on broader land management statutes such as FLPMA, Mineral Leasing Act, or the Indian Mineral Leasing Acts to justify its regulatory efforts. As a result, the rule was struck down and later rescinded, leaving primary regulatory authority over fracking to individual states, while BLM continues to oversee other aspects of oil and gas development on federal lands, such as leasing, royalties, and surface use.

The State of California is advancing policy measures aimed at moving away from hydraulic fracturing. As of October 1, 2024, the state implemented a ban on the issuance of new hydraulic fracturing permits, effectively formalizing a de facto moratorium that had already been in place. In the three years preceding the ban, CalGEM did not approve any new hydraulic fracturing permits, reflecting a broader policy shift away from unconventional extraction methods.

3.1 Air and Atmospheric Values

The affected environment for air quality, climate, and meteorology is described in Section 3.1 of the 2012 FEIS and was supplemented in Section 3.1 of the 2019 FSEIS. BLM used internal and

external scoping and specialist review of new and relevant information to identify the best available information to develop this 2025 DSEIS. BLM resource specialists reviewed the following information:

- Baseline data used to develop the 2012 FEIS and 2019 FSEIS
- California Air Resources Board's (CARB) Ambient Air Quality Standards Designations (reviewed September 2025)
- Updated U.S. Environmental Protection Agency (USEPA) air data (USEPA, 2020; USEPA, 2025a; USEPA, 2025b)
- Emission estimates and analysis prepared by BLM for proposed new wells in the Planning Area during fiscal year (FY) 2024 and FY2025
- New and relevant San Joaquin Valley Air Pollution Control District (SJVAPCD) rules, California Public Resources Code (PRC), California Code of Regulations (CCR), and/or updates to such rules, statutes, and regulations
- SJVAPCD data and health risk estimation procedures related to air toxic emissions

Significant new circumstances or information related to air and atmospheric values is presented below.

3.1.1 Air Quality

Ground-level ozone (O_3) and particulate matter (PM) are the major air quality concerns in the air basins within the Planning Area. O_3 is not emitted directly as a pollutant; it forms in the presence of sunlight by reactions of oxides of nitrogen (NOx) and volatile organic compounds (VOC), including reactive organic gases (ROG). PM includes respirable particulate matter[1] (PM10) and fine particulate matter[2] ($PM_{2.5}$). Both O_3 and PM are found to be above federal and state standards at some monitoring sites within the Planning Area. In addition to O_3, PM_{10}, and $PM_{2.5}$, USEPA has identified nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2) and lead (Pb) as criteria pollutants responsible for smog and other air quality impacts. The USEPA has established National Ambient Air Quality Standards (NAAQS) as required by the Clean Air Act (CAA) for each of the criteria pollutants.

PM is directly emitted to the atmosphere by vehicle travel on paved and unpaved roads and surfaces, from combustion of fuels, waste burning, and agricultural practices; $PM_{2.5}$ is also indirectly formed in the atmosphere by the reaction of precursor gases that include sulfur oxides (SO_X) and NO_X, especially tailpipe emissions from off-road equipment and motor vehicles.

3.1.1.1 Attainment of the National Ambient Air Quality Standard

The USEPA, CARB, and local air districts work together to classify each area as attainment, unclassified, or nonattainment with NAAQS, and related state standard, depending on the historical levels of contaminants measured in the ambient air and the history of pollutants occurring at levels that do not attain the standards. **Table 3-1** and **Table 3-2** summarize the

[1] smaller than 10 microns in diameter
[2] smaller than 2.5 microns in diameter

attainment designations for both the federal and state standards for the criteria pollutants in the San Joaquin Valley and South-Central Coast air basins.

Table 3-1 *Attainment status within the San Joaquin Valley Air Basin as of September 2025.*

Pollutant	Federal Designation	California Designation
O_3	Extreme	Nonattainment
PM_{10}	Maintenance	Nonattainment
$PM_{2.5}$	Serious	Nonattainment
CO	Attainment/Maintenance*	Attainment/Unclassified
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment

Source: CARB, 2025; USEPA, 2025a.
*Fresno County and the City of Bakersfield are in maintenance

Table 3-2 *Attainment status within the South-Central Coast Air Basin (by county) as of September 2025.*

Pollutant	**Federal Designation** *(by county)*			**California Designation** *(by county)*		
	San Luis Obispo	*Santa Barbara*	*Ventura*	*San Luis Obispo*	*Santa Barbara*	*Ventura*
O_3	Attainment/ Marginal*	Attainment	Serious	Non-attainment	Nonattainment - Transitional	Non-attainment
PM_{10}	Attainment	Attainment	Attainment	Non-attainment	Nonattainment	Non-attainment
$PM_{2.5}$	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
CO	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
NO_2	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
SO_2	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
Lead	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment

Source: CARB, 2025; USEPA, 2025a.
*Eastern San Luis Obispo County in nonattainment

The USEPA uses data from certified air quality monitors to calculate the USEPA Air Quality Index (AQI) so that criteria pollutant levels can be reported to the public in real time (see https://www.airnow.gov/). The AQI is one way to evaluate how clean or polluted the air is and whether associated health effects could be a concern. When the AQI value is between 0 and 50, air quality is categorized as "good", and criteria air pollutants pose little or no risk. AQI between 51 and 100 indicates moderate air quality posing little risk. An AQI of 100 indicates at least one pollutant is at the NAAQS concentration threshold. AQI values between 101 and 150 indicate a pollutant concentration above the NAAQS and air quality that might be unhealthy for sensitive groups. AQI values higher than 150 means generally unhealthy, very unhealthy, or hazardous air quality. Five-year (2019-2023) AQI data for each county in the Planning Area is presented in **Table 3-3** below.

Table 3-3 *Planning Area Air Quality by County, Average Daily AQI (number/percentage of days per year), 2019 - 2023*

County	Good Days	Moderate Days	Days Unhealthy for Sensitive Groups	Unhealthy Days	Very Unhealthy Days	Hazardous Days
San Luis Obispo	194.8 (53%)	160.2 (44%)	8.2 (2%)	1.6 (0%)	0.4	0.0
Santa Barbara	257.8 (71%)	104.4 (29%)	2.2 (1%)	0.8 (0%)	0.0	0.0
Ventura	207.6 (57%)	144.0 (39%)	12.6 (3%)	1.0 (0%)	0.0	0.0
Fresno	102.0 (28%)	188.2 (52%)	61.6 (17%)	12.0 (3%)	1.4	0.0
Kern	78.8 (22%)	177.4 (49%)	89.8 (25%)	17.8 (5%)	1.0	0.4
Kings	111.6 (31%)	205.6 (56%)	41.4 (11%)	5.8 (2%)	0.0	0.8
Madera	158.4 (43%)	181.0 (50%)	20.4 (6%)	5.0 (1%)	0.4	0.0
Tulare	87.2 (24%)	168.8 (46%)	88.2 (24%)	19.6 (5%)	1.2	0.2

Source: USEPA, 2025a.

The AQI data shows that air quality in the South-Central Coast air basin (San Luis Obispo, Santa Barbara, and Ventura Counties) is usually good, with all pollutant concentrations below the NAAQS on more than 96% of days. Air quality is less favorable in the San Joaquin Valley air basin (Fresno, Kern, Kings, Madera, and Tulare Counties), with air quality exceeding the NAAQS on 7% (Madera County) to 29% (Tulare County) of days on average. Note that very unhealthy and hazardous days are generally associated with upwind wildfires.

3.1.1.2 Air Emission Sources

There are many sources of air pollutants in the Planning Area. Table 3-4 presents 2020 criteria pollutant emissions as estimated by the USEPA for counties within the Planning Area, along with the percent contributed by each source category.

Table 3-4 *Sources of Criteria Pollutants in the Planning Area, 2020*

Source	tons per year	% of total
Wildfire	1,459,214	65.48%
Biogenic	343,001	15.39%
Mobile Sources	239,168	10.73%
Agriculture	77,630	3.48%
Residential Fuel Combustion	30,246	1.36%
Solvent Use	29,983	1.35%
Waste Disposal	23,249	1.04%
Commercial and Industrial Fuel Use	10,808	0.49%
Industrial Processes other than Petroleum and Natural Gas	7,194	0.32%
Oil & Gas Production	4,445	0.20%
Commercial Cooking	2,187	0.10%
Oil & Gas Midstream	1,388	0.06%
Total	**2,228,513**	**100%**

Source: USEPA, 2023a.

As shown in **Table 3-4**, wildfires, biogenic sources (natural sources including trees, etc.), mobile sources (cars, trucks, construction equipment), and agriculture caused about 95% of the criteria air

pollution in the Planning Area in 2020. Oil and gas production operations and related oil and gas midstream infrastructure were the source of about 0.26% of criteria air pollutants.

The CAA regulations also address the release of hazardous air pollutants (HAPs), chemicals that are known or suspected to cause cancer or other serious health effects, such as reproductive effects, birth defects, or adverse environmental effects. In addition to federally listed HAPs, California also regulates state-identified Toxic Air Contaminants (TACs). HAPs and TACs are referred to collectively as air toxics. The USEPA currently lists 189 compounds as HAPs, some of which can be emitted from oil and gas development operations (e.g. benzene, toluene, and formaldehyde). The NAAQS have not been set for HAPs; rather HAP emissions are controlled by source type or industrial sector-specific regulations through National Emission Standards for Hazardous Air Pollutants (NESHAP). Hydrogen sulfide (H_2S) gas is not regulated under the NAAQS or as an air toxic emission. However, it is known to be hazardous and is monitored for worker health and safety at oil and gas sites.

Table 3-5 presents 2020 total HAP emissions in the Planning Area as estimated by the USEPA, along with the percent of total HAPs from each source category.

Table 3-5 *HAP emissions and their sources in the Planning Area, 2020*

Source	tons per year	% of total
Wildfire	40,286	45.95%
Biogenic	32,709	37.31%
Mobile Sources	5,625	6.42%
Agriculture	4,886	5.57%
Solvent Use	2,409	2.75%
Residential Fuel Combustion	1,194	1.36%
Waste Disposal	343	0.39%
Oil & Gas Midstream	99	0.11%
Industrial Processes other than Petroleum and Natural Gas	39	0.04%
Oil & Gas Production	64	0.07%
Commercial and Industrial Fuel Use	20	0.02%
Total	**87,675**	**100%**

Source: USEPA, 2023a.

Similar to criteria pollutants, the top four source categories (wildfire, biogenic, mobile sources, and agriculture) emitted over 95% of all HAPs in the Planning Area in 2020. Oil and gas production operations and related oil and gas midstream infrastructure were the source of about 0.18% of HAP emissions in the Planning Area.

3.1.1.3 Air Quality Related Values

Air Quality Related Values (AQRVs) are resources sensitive to air quality and include visibility as well as biological and terrestrial resources such as vegetation, soils, water, and wildlife. The USEPA-designated Class I areas are afforded specific AQRV protection for visibility under the CAA. There are several Class I areas located in the Planning Area, including Kings Canyon, Sequoia, and Yosemite National Parks, and the Ansel Adams, Domeland, Kaiser, John Muir, and

San Rafael Wilderness areas. Although they are not Class I areas, the Carrizo Plain National Monument and portions of the California Coastal National Monument are also located in the Planning Area.

Air pollution can impact AQRVs through exposure to elevated atmospheric concentrations of criteria pollutants and precursors including NO_2, SO_2, VOC, and $PM_{2.5}$. Examples of air pollution impacts to AQRVs include O_3 effects to vegetation; deposition of air pollutants on the earth's surface through precipitation or dry deposition; and impairment of scenic views by haze related to pollutant particles in the atmosphere.

Impairment of scenic views can result from pollutant particles degrading the contrast, colors and how far and how well an observer can see a distant and varied scene. Visibility can be assessed in terms of the distance a person can distinguish a large dark object on the horizon. Visibility degradation is primarily due to anthropogenic nitrate, sulfate, and particulate emissions as well as wildfires. Visibility is measured as the standard visual range in miles, and a deciview (dv) is a unit of measurement to quantify human perception of the change of visibility. One (1) deciview is roughly the smallest change in visibility (haze) that is barely perceptible. Because visibility at any one location is highly variable throughout the year, annual visibility is characterized by four groupings: the clearest 20 percent of days, the average of all days, the days most impacted by ongoing air pollution, and the haziest 20 percent of days including the effects of wildfire. **Figure 3-1** shows the current visibility trend at the Sequoia National Park.

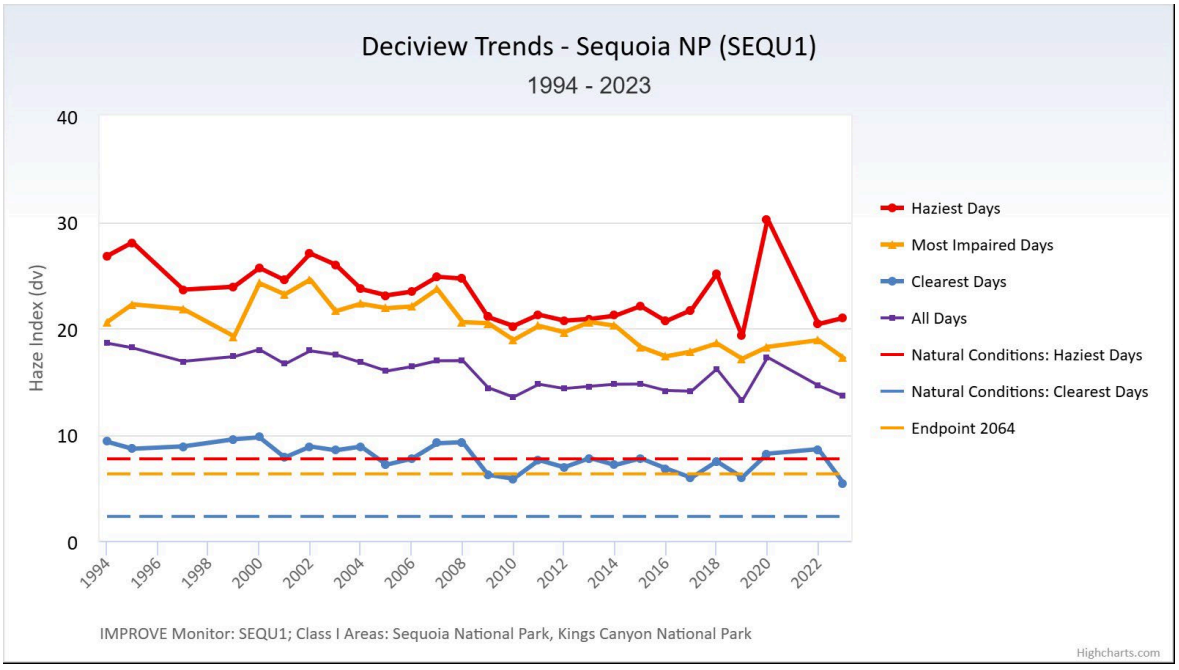


Figure 3-1 *Visibility trends (1994-2024) at Sequoia National Park*

Figure 3-1 shows two trends related to AQRVs in the Planning Area. First, haze has been reduced, and visibility has improved over time despite the many criteria pollutant sources in the area (See **Table 3-4**). Second, the Haziest Days and All Days lines show that nearby wildfires in 2018 and 2020 significantly increased haze and reduced average visibility during those years.

3.1.1.4 General Conformity Rule

The classification of any area as a federal nonattainment or maintenance area introduces applicability of the federal General Conformity rule for federal agencies. Section 176(c) of the federal CAA and regulations (40 CFR 93, Subpart B) state that "no department, agency or instrumentality of the federal government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an applicable implementation plan." The intent of the General Conformity rule is to prevent the air quality impacts of federal actions from causing or contributing to a violation of the NAAQS or interfering with the purpose of the State Implementation Plan (SIP). This means that federal agencies must make a determination that proposed actions in federal nonattainment areas conform to the applicable USEPA approved implementation plans (if pertinent) before the action is taken.

Since the ROD related to this DSEIS will not approve any specific action that would have direct or indirect air emissions (40 CFR 93.153(c)), but rather will authorize further steps in the administrative process of granting leases under the ongoing BLM Fluid Mineral program which will be similar in scope and operation to current leases and operations (40 CFR 93.153(c)(2)(xi)), General Conformity Determination is not applicable to this federal action. General Conformity applicability will be analyzed for each APD submitted on any leases issued following this action.

3.1.2 Greenhouse Gases

Table 3-6 shows the total estimated greenhouse gas (GHG) emissions from fossil fuels at the global, national, and state scales over the last five years. Emissions are shown in megatonnes (Mt) per year of carbon dioxide equivalent (CO_2e). State and national energy-related GHG emissions include emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed.

Table 3-6 *Global and U.S. Fossil Fuel GHG Emissions, 2018-2022 (Mt CO_2e/yr)*

Scale	2018	2019	2020	2021	2022
Global	49,800	50,200	47,800	50,100	50,600
U.S.	5,989.7	5,913.9	5,249.8	5,586	5,489
California	427	429	380	401	399

Sources: Rivera et al., 2022 (Global); USEPA, 2024a (U.S.); USEPA, 2025d (California).
Mt (megatonne) = 1 million metric tons

Further discussion of BLM's oil and gas management and analysis methodologies are included in the Annual GHG Report. This report presents the estimated emissions of GHGs attributable to development and consumption of fossil fuels produced on lands and mineral estate managed by the BLM. The Annual GHG Report is incorporated by reference as an integral part of this analysis and is available at https://www.blm.gov/content/ghg/. Additional information on current state, national, and global GHG emissions is included in the report (see Chapters 5, 6, and 7 of the Annual GHG Report).

3.1.4 Lease Considerations

The description of the affected environment for the Planning Area described above is representative of the lease areas. The air quality analysis of this action is based on the RFDS in the 2012 FEIS, the 2019 FSEIS and the 2020 EA. The RFDS anticipates (up to) 40 new wells on new leases per year and (up to) four (10%) of those new wells to be hydraulically fractured. The RFDS assumes the BLM would hold four lease sales per year consistent with the Mineral Leasing Act of 1920, as amended. It is estimated that each sale, including the 2020 lease sale supplemented in this 2025 DSEIS, may result in up to 10 new wells; 1 well (10%) that would be hydraulically fractured and 9 conventional wells that would not.

3.2 Biological Resources

The affected environment for biological resources is described in Section 3.2 of the 2012 FEIS and was reevaluated in Section 3.2 of the 2019 FSEIS and determined to be sufficient. The 2012 FEIS separated the affected environment for biological resources into four sub-sections: Special Status Species (Section 3.2.1), Featured Species and Communities (Section 3.2.2), Aquatic, Wetlands, and Riparian Habitat (Section 3.2.3), and Weeds (Section 3.2.4).

BLM used internal and external scoping and specialist review of new and relevant information to identify the best available information to develop the 2025 DSEIS. BLM biologists reviewed the following information:

- Baseline data used to develop the 2012 FEIS and 2019 FSEIS
- U.S. Fish and Wildlife Service – Information for Planning and Consultation
- California Fish and Wildlife – California Natural Diversity Database
- California Code of Regulations 4500, California Noxious Weeds List
- National Oceanic and Atmospheric Administration – Essential Fish Habitat

During this review, the BLM identified significant new information regarding special status species, which is presented below. No significant new information was identified regarding other components of biological resources that would be affected or that are essential to the understanding or resolution of planning issues, therefore no other biological resource components are further discussed in the 2025 DSEIS.

3.2.1 Special Status Species

As mentioned above, the affected environment for special status species is described in Section 3.2.1 of the 2012 FEIS. The BLM consulted with the U.S. Fish and Wildlife Service (USFWS) in 2015 and obtained a Programmatic Biological Opinion on Oil and Gas Activities on BLM Lands in the San Joaquin Valley in 2017 (hereafter referred to as the 2017 PBO). The 2017 PBO replaced a 2001 PBO for oil and gas activities in the same geographical location. Information from the 2017 PBO was incorporated into the 2019 FEIS. No updates have been made to the PBO since that time.

Since the 2019 FSEIS was published, five species have been either proposed for listing or formally listed under Endangered Species Act of 1973 (ESA), some with associated proposed or designated

critical habitat. These species are listed in **Table 3-7** with information on any associated proposed or critical habitat and a general description of the type of habitat in which they occur.

Table 3-7 *Species listed or proposed for listing on the ESA since publication of the 2019 FSEIS.*

Common Name (Scientific Name)	**Status**[3]	**Proposed or Designated Critical Habitat**	**General Habitat Description**
Fisher (*Pekania pennanti*) Southern Sierra Nevada Distinct Population Segment (DPS)	**USFWS**: FLE **BLM**: N/A **CDFW**: SLE	**Planning Area:** Present **Supplemental Analysis Areas**: Not present **Lease Areas**: Not present	Mature conifer and mixed hardwood forests in the Sierra Nevada.
Kern Canyon slender salamander (*Batrachoseps simatus*)	**USFWS**: FPT **BLM**: S **CDFW**: N/A	**Planning Area:** Present **Supplemental Analysis Areas**: Not Present **Lease Areas**: Not Present	Narrow canyons in rocky habitat along the lower Kern River Canyon, Erskine Creek and Bodfish Creek Drainages. Preference of rocks and woody debris in areas that retain soil moisture.
Monarch butterfly (*Danaus plexippus*)	**USFWS**: FPT **BLM**:S **CDFW**: SGCN	**Planning Area:** Present **Supplemental Analysis Areas**: Not Present **Lease Areas**: Not Present	Found throughout California. Presence of milkweed is critical for habitat selection.
Northwestern pond turtle (*Actinemys marmorata*)	**USFWS**: FPT **BLM**: S **CDFW**: SSC	No proposed or designated critical habitat at this time.	Ponds, lakes, and streams, as well as the adjacent upland features throughout most of California.
Southwestern pond turtle (*Actinemys pallida*)	**USFWS**: FPT **BLM**: S **CDFW**: SSC	No proposed or designated critical habitat at this time.	Ponds, lakes, and streams, as well as the adjacent upland features throughout most of California.

3.2.2 Lease Considerations

The affected environment for biological resources, including for special status species, was described in Chapter 3 (pgs. 26-28) of the 2020 EA. The species listed in **Table 3-7** had not yet been proposed for listing at the time of the 2020 EA. Information regarding the presence or absence of proposed or designated critical habitat for these species within the lease areas is included in that table, as well as a general description of their habitat.

[3] **Species Status Key**:
U.S. Fish and Wildlife Service (USFWS)
FLE = Federally Listed Endangered
FPE = Federally Proposed Endangered
Bureau of Land Management (BLM)
S = BLM Sensitive Species
California Department of Fish and Wildlife (CDFW)
SLE = State Listed Endangered
SSC = Species of Special Concern
SGCN = Species of Greatest Conservation Need

The fisher, Kern Canyon slender salamander, northwestern pond turtle and southwestern pond turtle are not likely to occur within the lease parcels, based on their habitat (described in **Table 3-7**). Since milkweed plant habitat populations occur throughout most of California, monarch butterflies may occur within the lease parcels.

3.3 Soil Resources

The affected environment for soil resources is described in Section 3.7 of the 2012 FEIS and was reevaluated in Section 3.6 of the 2019 FSEIS and determined to be sufficient. BLM used internal and external scoping and specialist review of new and relevant information to identify the best available information to develop this 2025 DSEIS. BLM resource specialists reviewed the following information:

- Baseline data used to develop the 2012 FEIS and 2019 FSEIS
- Natural Resource Conservation Service Web Soil Survey (NRCS, 2016)
- Recent guidance from the California Department of Health (CDHP, 2025), Centers for Disease Control (CDC, 2024), and California Division of Occupational Safety and Health (Cal/OSHA) regarding Valley Fever

During this review, the BLM identified significant new information regarding Valley Fever Endemic Soils (Section 3.7.6 of the 2012 FEIS), which is presented below. No significant new information was identified regarding other components of soil resources that would be affected or that are essential to the understanding or resolution of planning issues.

3.3.1 Valley Fever Endemic Soils

Valley fever (coccidioidomycosis) is a disease caused by the inhalation of the spores of *Coccidioides immitis*, a fungus which inhabits soils of the southwestern United States and is endemic in parts of California (CDC, 2024). Map 3.7.4 (pg. 277) of the 2012 FEIS shows the geographical range of soils where *C. immitis* is known to be endemic, which includes portions of the Planning Area with active oil and gas fields. *C. immitis* grows in the upper 5-20 cm of the soil can be released into the air as spores during surface disturbing actions (Fisher et al., 2000). The airborne fungal spores can infect construction personnel, oilfield workers, visitors of public lands, and wildlife. Most cases of the disease are mild, with flu-like symptoms that rarely require medical attention; however, extreme cases of the disease can be fatal (CDHP, 2025).

3.3.2 Lease Considerations

The affected environment for soil resources across the lease parcels is sufficiently described on pages 21 and 22 of the 2020 EA. Additionally, based on Map 3.7.4 of the 2012 FEIS, *C. immitis*, the vector for Valley Fever, is endemic to the area in which all seven lease parcels are located.

3.4 Water Resources

The affected environment for water resources is described in Section 3.9 of the 2012 FEIS and was reevaluated in Section 3.8 of the 2019 FSEIS and determined to be sufficient. BLM used internal

and external scoping and specialist review of new and relevant information to identify the best available information to develop this 2025 DSEIS. BLM resource specialists reviewed the following information:

- Baseline data used to develop the 2012 FEIS and 2019 FSEIS
- Best Management Practices for protecting water quality from non-point source pollution (BLM, 2022)
- Recent Kern County Subbasin Groundwater Sustainability Plans (KGA, 2020; KGA, 2022)
- Recent reports published by the California Department of Water Resources (DWR), CalGEM, and the State Water Resources Control Board (SWRCB)
- New and relevant California Water Codes, USEPA standards, Code of Federal Regulations (CFR) and/or updates to such rules, statutes, and other regulations
- Scientific literature regarding potential impacts to water resources including from hydraulic fracturing and land subsidence related to fluid extraction

Significant new circumstances or information related to water resources is presented in the following sections, organized by surface water resources and groundwater resources. Brief, high-level summaries of the regulatory framework in place at the time of report preparation, for water quantity and quality (including BLM's role in promoting the protection of each) are provided directly below.

Water Quantity

Under FLPMA, the BLM manages public lands to avoid permanent impairment of renewable resources (such as water) and to meet its multiple-use and sustained-yield mandate. The allocation and administration of water rights remain the responsibility of the State of California, and operators must obtain and comply with any required state water rights or authorizations. In exercising its permitting authority, including review of APDs and related authorizations, the BLM evaluates proposed Surface Use Plans of Operation and may require design features or conditions of approval to avoid or minimize impacts to surface water and groundwater (43 CFR part 3160; 43 CFR 3171, including §3171.8 regarding protection of surface resources, groundwater, and waste management). The BLM coordinates with the SWRCB and Regional Water Quality Control Boards, as appropriate, to review proposed activities for consistency with applicable state requirements.

The BLM will consider water-quantity risks during APD review under FLPMA and 43 CFR parts 3160 and 3170 (including §3171.8), compliance with California water-rights law, and coordinate as necessary with the SWRCB/Regional Boards and local Groundwater Sustainability Agencies (GSA) to evaluate consistency with the Sustainable Groundwater Management Act (SGMA) and applicable Groundwater Sustainability Plans (GSP). Mitigation may be required through design features and enforceable conditions of approval (COA), for example, source-water selection, pumping limits, and metering/monitoring and reporting.

Water Quality

Under FLPMA, the BLM manages authorizations in a manner intended to provide for compliance with applicable pollution-control laws and standards, by working with state and federal agencies that implement the Clean Water Act (CWA). Discharges to waters of the United States generally require authorization under Section 402 of the CWA through a National Pollutant Discharge Elimination System (NPDES) permit. Where a project involves the discharge of dredged or fill material into jurisdictional waters, a Section 404 permit is also required. Section 313 of the CWA requires federal agencies to meet applicable federal and state water-pollution requirements. In California, the SWRCB and Regional Water Quality Control Boards implement these standards under the CWA and the state's Porter-Cologne Water Quality Control Act (SWRCB, 2025b). The BLM will consider applicable BMPs during project-level NEPA review for inclusion as COAs.

For oil and gas operations, the BLM reviews proposals and applies conditions consistent with 43 CFR part 3160 and part 3170, including §3171.8 (Surface Use Plan of Operations, protection of groundwater and waste management) and subpart 3177 (disposal of produced water). Where produced-water disposal involves underground injection, activities are subject to the federal Safe Drinking Water Act's Underground Injection Control (UIC) program, administered by the USEPA. In California, USEPA has delegated primacy for Class II oil and gas injection wells to the California Geologic Energy Management Division (CalGEM) (formerly California Division of Oil, Gas, and Geothermal Resources, **(**DOGGR)), which implements the program under USEPA oversight

The BLM will assess water-quality risks during project-level authorization review under 43 CFR parts 3160 and 3170 (including §3171.8) and coordinate, as appropriate, with USEPA, the SWRCB/Regional Water Boards, and CalGEM to evaluate consistency with the Clean Water Act (NPDES/§404), the Porter-Cologne Water Quality Control Act, and the Safe Drinking Water Act's UIC program. Mitigation may be required through design features and enforceable COAs (e.g., produced-water handling and disposal controls, secondary containment, spill prevention/response, and monitoring/reporting). Where groundwater-quality sustainability criteria are implicated, BLM will also coordinate, as necessary, with GSAs to support consistency with SGMA and applicable GSPs.

3.4.1 Surface Water Resources

Surface water conditions in the Planning Area continue to be shaped by a combination of natural hydrology, water management infrastructure and major water project operations, and land use practices. Since publication of the previous analyses, several developments have occurred that are considered new and relevant to the affected environment.

The 2024 California Integrated Report (SWRCB, 2024) was reviewed to identify 303(d)-listed impaired water bodies intersecting BLM-managed lands. Since the 2019 FSEIS, two of the waters listed at that time (Pole Creek [tributary to Santa Clara River, Reach 3] and Fresno River [above Hensley Reservoir to confluence with Nelder Creek and Lewis Fork]) have had final Total Maximum Daily Loads (TMDLs) approved. Additionally, three new impaired water bodies were

identified within the Project Area. These additions reflect ongoing water quality challenges related to salinity, nutrients, pH, and other constituents of concern. Despite these changes, the total extent of impaired waters intersecting BLM-managed lands remains a small fraction of the overall impaired listed channel mileage.

As shown in **Table 3-8** below, the query of the 2024 Integrated Report data for this 2025 DSEIS identified three additional impaired water bodies within the Planning Area: The California Aqueduct, Fresno County's Mill Creek, and a segment of the upper Kaweah River. The California Aqueduct (Panoche Creek to Grapevine) is effectively hydrologically disconnected from the Planning Area, and its water quality is primarily influenced by State Water Project and Delta conveyance operations. The middle fork of the Kaweah River is located well outside the area of anticipated federal lease activity. Mill Creek (Fresno County) has only a minimal intersection with the Planning Area, with less than 0.1 percent of its listed reach occurring on BLM-managed lands.

Hydrologic conditions in the Planning Area over the past decade have been marked by extremes. Prolonged droughts in 2012-2016 and again in 2020-2022 significantly reduced streamflows, concentrated water quality constituents, and heightened stress on both managed and natural hydrologic systems. These dry periods were followed by major flood events in 2017 and 2023 that temporarily reconnected historic floodplains, increased sediment and debris transport, and created short-term improvements in habitat connectivity (DWR, 2023).

In response to these hydrologic challenges, emergency drought actions were implemented by the SWRCB, including curtailments of surface water diversions in the San Joaquin River and Tulare basins (SWRCB, 2015; SWRCB, 2021). These curtailments temporarily reduced the volume of water available for both consumptive and non-consumptive uses and demonstrated the level of regulatory intervention that may occur during extreme hydrologic conditions.

The very limited spatial overlap between BLM-managed lands and 303(d) impaired water bodies suggests that 303(d) listed water quality challenges in the Planning Area generally arise from regional watershed conditions rather than localized BLM-managed activities.

3.4.1.1 Lease Considerations

The affected environment for the seven leases is described in Chapter 3 (pgs. 23-24) of the 2020 EA. No additional information outside of that described for the Planning Area above was identified specific to the seven lease parcels.

Table 3-8 *Impaired Rivers and Streams*

Water Body Name	Pollutant, Source	Area Affected (miles)	Intersection with BLM Lands (miles, %)	Listing Decision	Expected TMDL Completion Date
California Aqueduct (Panoche Creek to Grapevine)*	pH, Unknown	184.8	1.31, 0.7%	List on 303(d) list (TMDL required list)	2035
Cuyama River (above Twitchell Reservoir)	Boron, Unknown Chloride, Unknown Sodium, Unknown Specific Conductivity, Unknown Turbidity, Unknown pH, Unknown	96.5	7.52, 7.8%	Do Not Delist from 303(d) list (TMDL required list)	2035
Dairy Creek	Dissolved Oxygen, Grazing-related Sources	4.7	0.12, 2.4%	Do Not Delist from 303(d) list (TMDL required list)	2027
Fresno River (Above Hensley Reservoir to confluence with Nelder Creek and Lewis Fork)	Low Dissolved Oxygen, Unknown	31.1	0.60, 1.9%	List on 303(d) list (TMDL required list)	2021
Kaweah River, Middle Fork (Confluence with Kaweah River East Fork to Dome Creek)*	Alkalinity as calcium carbonate ($CaCO_3$), Unknown	14.3	0.98, 6.9%	List on 303(d) list (TMDL required list)	2033
Las Tablas Creek, South Fork	Metals, Inactive Mining	4.8	0.69, 14.4%	List on 303(d) list (TMDL required list)	2027
Mill Creek (Fresno County)*	Toxicity, Unknown	29.1	0.04, 0.1%	List on 303(d) list (TMDL required list)	2027
Pole Creek (tributary to Santa Clara River Reach 3)	Sulfates, Unknown Total Dissolved Solids, Unknown	9.5	0.26, 2.7%	Do Not Delist from 303(d) list (TMDL required list)	2019
Salinas River (upper, confluence of Nacimiento River to Santa Margarita Reservoir)	pH, Unknown Benthic Community Effects, Unknown Dissolved Oxygen, Unknown Toxicity, Unknown Chloride, Unknown Sodium, Unknown	49.8	0.83, 1.7%	Do Not Delist from 303(d) list (TMDL required list)	2035 (pH, Benthic Community, Dissolved Oxygen, Toxicity) 2027 (Chloride, Sodium)

Source: https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=f0e4ac76fd0e4a53bebead89339ef3c9

** An asterisk indicates waterbody that has been added to the list since the 2012 FEIS*

3.4.2 Groundwater Resources

Groundwater remains understood as the primary source of water supply for agricultural, municipal, and industrial uses throughout the Planning Area. The 2012 FEIS described extensive reliance on groundwater, the occurrence of multiple groundwater basins in the San Joaquin, Tulare Lake, Central Coast, and South Coast hydrologic regions, and the presence of both confined and unconfined aquifer systems. Section 3.8 of the 2019 FSEIS reaffirmed these baseline conditions. Several developments since that time are considered new and relevant to the existing environment.

The most significant regulatory development is the State of California's SGMA of 2014, which established a statewide framework for local GSAs to prepare and implement GSPs for medium- and high-priority basins (DWR, 2015; DWR, 2022). Several groundwater basins underlying the Planning Area are designated as high priority or critically overdrafted. These classifications reflect historic overdraft conditions, particularly along the western and southern margins of the San Joaquin Valley and the Tulare Basin, where long-term groundwater withdrawals have caused declining water levels and regional land subsidence. Implementation of SGMA is ongoing, and full effects on regional groundwater conditions are expected to be realized over decades as GSAs pursue basin sustainability targets. On 17 September 2025 under SGMA authority, SWRCB voted to remove the Kern Subbasin from its enforcement track and return it to Department of Water Resources (DWR) oversight based on an updated GSP.

Groundwater quality across the Planning Area remains generally suitable for agricultural and municipal use but exhibits localized impairments, attribute to land use practices and/or natural sources of contamination. Constituents of concern include, but are not limited to, total dissolved solids, nitrate, boron, and chloride, particularly in areas with intensive irrigation and shallow groundwater. The State of California has also initiated monitoring for emerging contaminants such as per- and polyfluoroalkyl substances (PFAS) and 1,2,3-trichloropropane (1,2,3-TCP) in select basins where potential contamination pathways have been identified. While widespread impacts from these constituents have not been identified across BLM-managed lands, their detection in regional aquifers reflects ongoing watershed scale pressures on water quality.

Federal regulatory protections for groundwater remain unchanged since 2019. While Onshore Orders 1, 2, and 7 are no longer cited by those names, their general substance has been preserved and integrated under 43 CFR 3171, 3172, and 3177, respectively. Underground Injection Control and NPDES programs remain active as additional safeguards.

3.4.2.1 Land Subsidence

Groundwater-related land subsidence in the San Joaquin Valley and Tulare Basin has been documented since the 1920s and attributed to groundwater-level declines and associated aquifer-system compaction (Lofgren and Klausing, 1969; Poland et al., 1975; Ireland, Poland, and Riley, 1984; Galloway, Jones, and Ingebritsen, 1999). By the early 1970s, areas exceeding a foot of subsidence spanned thousands of square miles, with local maxima of several feet in the western San Joaquin Valley, and the valley-wide signal was attributed to inelastic compaction of fine-grained aquitards under chronic groundwater overdraft (Poland et al., 1975; Ireland, Poland, and

Riley, 1984; Galloway, Jones, and Ingebritsen, 1999). Land subsidence is described both in the 2012 FEIS and 2019 FSEIS, and is updated here, using best available information.

Groundwater levels and storage in the Planning Area continue to fluctuate with drought, water use patterns, and variable surface-water availability. The effectively statewide 2012–2016 and 2020–2022 droughts corresponded to increased pumping, water-level declines, and renewed subsidence in parts of the San Joaquin Valley and Tulare Basin (Murray and Lohman, 2018; Ojha, Werth, and Shirzaei, 2019; Lees and Knight, 2024). Long-term mass-balance and groundwater modeling syntheses indicate Central Valley cumulative groundwater storage depletion is on the order of greater than ~100 million acre-feet (maf), with estimates of ~117 maf for 1900–2008 and ~60–65 maf since the 1960s through recent years (Konikow, 2013; Scanlon et al., 2012; USGS, 2009; DWR, 2025). Most depletion is concentrated in the southern Central Valley (i.e., San Joaquin/Tulare basins) and has been associated with intensive agricultural development (Faunt, 2009). For infrastructure planning along the California Aqueduct and San Luis Canal, the California Aqueduct Subsidence Program has developed a probabilistic forecast model to project plausible ranges of corridor subsidence focused on localized "bowls"; this tool is planning-oriented and does not apportion causes among potential drivers such as groundwater pumping or oil-and-gas production (DWR et al., 2024).

Both prolonged groundwater pumping and, in certain oil fields, hydrocarbon fluid extraction have been linked to land subsidence in the San Joaquin Valley and Tulare Basin, or their nearby foothills; however, extensive geodetic and hydrogeologic evidence shows that the basin-wide signal is primarily driven by inelastic compaction of clay-rich aquitards under chronic groundwater overdraft (Murray and Lohman, 2018; Ojha, Werth, and Shirzaei, 2019; Faunt et al., 2016; Lees and Knight, 2024; Jeanne et al., 2019; Galloway, Jones, and Ingebritsen, 1999; Lofgren and Klausing, 1969). By contrast, oil and gas production-related deformation is documented as more localized over discrete oil fields such as Lost Hills and Belridge (Fielding, Blom, and Goldstein, 1998; Xu, Dvorkin, and Nur, 2001). Because effective-stress changes and aquitard drainage are three-dimensional and time-delayed, the locus of maximum surface subsidence may be laterally offset from individual pumping centers, and subsidence may occur where no nearby production or irrigation well is present (Poland et al. 1975; Ireland, Poland and Riley 1984; Galloway, Jones, and Ingebritsen 1999). Accordingly, attribution in overlap zones requires site-specific review using advanced scientific methods, such as integrating continuous Global Navigation Satellite Systems (cGNSS), Interferometric Synthetic Aperture Radar (InSAR), spirit-leveling and extensometry, groundwater-level monitoring, and coupled hydrogeologic–geomechanical modeling (Sneed, Brandt, and Solt, 2018; Murray and Lohman, 2018; Jeanne et al., 2019; DWR, et al, 2024).

Currently, a joint United States Geological Survey (USGS) and DWR case study is underway for a select area of the western margin of the southern San Joaquin Valley at the Lost Hills Oil Field to attempt to quantitatively apportion observed subsidence between aquifer-system compaction driven by groundwater-level declines and reservoir compaction associated with oil-and-gas production, using a physics-based, observation-constrained attribution framework within coupled hydrogeologic–geomechanical modeling; final assessments are anticipated in the approximate 2027-2029 time period (BLM, personal communication with USGS, July 2025). It is BLM's

understanding that subsidence in the Planning Area is driven primarily by chronic long-term groundwater overdraft; substantial uncertainty remains regarding the magnitude and distribution of any oil-and-gas contribution at both regional and local (site-specific) scales, and attribution in overlap areas can only be potentially resolved through site-specific, scientific analyses at the APD stage.

3.4.2.2 Lease Considerations

The affected environment for the seven leases is described in Chapter 3 (pgs. 24-26) of the 2020 EA. No additional information outside of that described for the Planning Area above was identified specific to the seven lease parcels.

Chapter 4. Impact Analysis

4.0 Introduction

This chapter provides analysis of potential impacts to resources and values in the Planning Area as they relate to the planning issues. The 2019 FSEIS includes a thorough analysis of the impacts of employing hydraulic fracturing technology under the 2014 RMP (see Chapter 4 of the 2019 FSEIS, pages 41-104). This impact analysis was designed to take a "hard look" at such impacts and includes a comparison of the impacts of hydraulically fractured wells to conventional wells (see 2019 FSEIS, Table 4.1, pages 45-47).

Potential surface-disturbing activities associated with oil and gas development on parcels leased during the 2020 lease sale, as analyzed in the 2020 EA, are incorporated by reference into this DSEIS (BLM, 2020, Chapter 4, pages 36-80). Proposed surface disturbing activities for those leases will be subject to additional site-specific NEPA review.

Impact Analysis Assumptions

The 2019 FSEIS relied on key assumptions in Chapter 4 (pgs. 43-52) to describe and quantify the potential numbers and locations of new wells that would employ hydraulic fracturing technology in the Planning Area. As stated in Section 1.0 of this document (under subheading *Management of Fluid Minerals in the 2014 RMP*), AFMSS2 records indicate new well development has remained within the range estimated in the RFDS, therefore this 2025 DSEIS will rely on those same assumptions, which include:

- Implementation of fluid minerals management as described in the 2014 RMP could result in an average of 400 new wells per year.
- Over a ten-year period 0 to 40 new wells would employ hydraulic fracturing technology, or 0 to 4 per year on average.
- New hydraulically fractured wells would be located in the vicinity of previously hydraulically fractured wells.
- New wells on new federal mineral leases that would be hydraulically fractured would also likely be located near areas designated for high mineral potential.
- **Table 4-1** summarizes estimated surface impacts (0 to 208.6 acres) that could occur as a result of the hydraulic fracturing of 0 to 40 wells over the 10-year life of the 2014 RMP. These estimates were calculated integrating the parameters summarized in **Table 4-3**.

Table 4-1 *Estimated short- and long-term surface impacts of 0-40 wells completed by hydraulic fracturing on BLM and non-BLM surface over the 10-year life of the 2014 RMP.*

Disturbance Type	Short-term Disturbance BLM Surface (acres)	Long-term Disturbance BLM Surface (acres)	Short-term Disturbance Non-BLM Surface (acres)	Long-term Disturbance Non-BLM Surface (acres)	Total Estimated Disturbance[4] (acres)
New pads[5]	0–9.0	0–16.8	0–47.0	0–87.3	0–160.1
Roads	0–0.7	0–7.0	0–3.7	0–36.6	0–48
Pipelines[6]	0–0.1	0	0-0.4	0	0–0.5
Total	**0–9.8**	**0–23.8**	**0–51.1**	**0–123.9**	**0–208.6**

Lease-Specific Analysis Assumptions

For purposes of analyzing impacts of impacts associated with the seven leases included in the 2020 Lease Sale, **Table 4-2** details the surface disturbance causing activity associated with the proposed lease sale, including differentiation between well pad size for nine non-hydraulically fractured wells and one hydraulically fractured well.

Table 4-2 *Estimated disturbance for 10 new wells across the seven proposed leases, assuming one is hydraulically fractured and nine are completed conventionally.*

Surface Disturbance Causing Activity	Surface Disturbance Per Well	Number of New Wells of Type	Total Disturbance
New Pad (conventionally completed wells)	0.2-0.4 acres	9	1.8-3.6 acres
New Pad (hydraulically fractured well)	4 acres	1	4 acres
Linear Disturbance (roads, pipelines and powerlines)	1.1 acres	10	11 acres

The sum of the total disturbance acres for 10 wells (including one assumed to be hydraulically fractured) and associated linear disturbance ranges from 16.8 to 18.6 acres. The upper end of the range, 18.6 acres, will be used for disclosure of potential environmental effects resulting from the proposed lease sale.

Analysis Area

The analysis area for this DSEIS and the 2019 FSEIS is the Planning Area (**Figure 1-1**, pg. 5). The 2019 FSEIS created more refined analysis areas to use for analysis of potential impacts from hydraulic fracturing. The Supplemental Analysis Areas help to identify locations where impacts are most likely to occur and add context to potential surface disturbance impacts (**Figure 1-2**, pg. 7). The analysis area for impacts of the leasing action is the seven lease parcels. Section 1.2 describes the Planning Area, Supplemental Analysis Areas, and Lease Parcels.

[4] Total assumes no overlap of short- and long-term disturbance areas.
[5] Assumes a single well per pad.
[6] Pipeline disturbance includes disturbance from distribution lines.

Table 4-3 *Comparison of conventionally completed wells and hydraulically fractured wells*[7]

Element for Comparison	Conventionally Completed Wells/Pads	Hydraulically Fractured Wells/Pads
Location and Area	New wells on new leases are expected to occur in the vicinity of areas where: • Federal mineral estate is available for leasing; • Recoverable resource potential is moderate or high; • Interest has been expressed; and • Land has been developed for oil and gas in the past. The total estimated Planning Area is 1,172,480 acres (**Figure 1-1**).	New wells on new leases that may be hydraulically fractured are expected to occur in the vicinity of areas where: • Federal mineral estate is available for leasing; • Recoverable resource potential is moderate or high; • Interest has been expressed; • Land has been developed for oil and gas in the past; and • Hydraulic fracturing currently occurs. The total estimated Supplemental Analysis Area is 416,515 acres (**Figure 1-2**).
Surface Disturbance: • **Short-Term** • **Long-Term**	• The typical pad area is approximately 0.2 to 0.4 acres (8,712 to 17,424 square feet) (California Department of Conservation 2015). • Approximately 35% of the pad surface disturbance is short-term (0.07 to 0.14 acres; 3,049 to 6,098 square feet) (Appendix M, BLM 2012) (calculated based on 35% of 0.2 and 0.4 acres). • Approximately 65% of pad surface disturbance is long-term (0.13 to 0.26 acres; 5,663 to 11,326 square feet (Appendix M, BLM 2012) (calculated based on 65% of 0.2 and 0.4 acres). • During drilling, temporary oil, water, and gas handling equipment, such as tanks, vessels, pumps, and compressors, is typically located on the well pad (Kern County 2015).	• The typical pad area is approximately 4 acres (174,240 square feet) (California Department of Conservation 2015). • Approximately 35% of pad surface disturbance is short-term (1.4 acres; 60,984 square feet) (Appendix M, BLM 2012) (calculated based on 35% of 4.0 acres). • Approximately 65% of pad surface disturbance is long-term (2.6 acres; 113,256 square feet) (Appendix M, BLM 2012) (calculated based on 65% of 4 acres). • During hydraulic fracturing, temporary oil, water, and gas handling equipment, such as tanks, vessels, pumps, and compressors, is typically located on the well pad (Kern County 2015).
Associated Infrastructure: • **Roads** • **Pipelines**	**Roads**: • Existing roads are typically up to the last 0.5 miles to each new pad. • Each new access road comprises approximately 1.1 acres (47,520 square feet) (0.5 miles long by 18 feet wide) per new pad (Kern County 2015). **Pipelines**: • All required pipeline is typically installed within access road right-of-way. • Pipelines typically include a 4-foot corridor within a 20-foot construction corridor (Kern County 2015). **Distribution Lines**: • Each new well would typically require 467 feet of new distribution line. • Distribution lines are typically suspended from wooden poles 30 feet tall, spaced 200 feet apart. • Distribution poles are typically constructed along the existing access road rights-of-way or within the well pad area. Therefore, ground disturbance for distribution line construction is included in the new oil and gas well disturbance acreages (Kern County 2015).	**Roads:** • Existing roads are typically used up to the last 0.5 miles to each new pad. • Each new access road comprises approximately 1.1 acres (47,520 square feet) (0.5 miles long by 18 feet wide) per new pad (Kern County 2015). **Pipelines:** • All required pipeline is typically installed within access road right-of-way. • Pipelines typically include a 4-foot corridor, within a 20-foot construction corridor (Kern County 2015). **Distribution Lines:** • Each new well would typically require 467 feet of new distribution line. • Distribution lines are typically suspended from wooden poles are typically 30 feet tall, spaced 200 feet apart. • Distribution poles are typically constructed along the existing access road rights-of-way or within the well pad area. Therefore, ground disturbance for distribution line construction is included in the new oil and gas well disturbance acreages (Kern County 2015).

[7] When a notable difference is not identified the information related to a conventional well applies to a hydraulically fractured well

Element for Comparison	Conventionally Completed Wells/Pads	Hydraulically Fractured Wells/Pads
Well Depth	Well depth varies from less than 1,000 feet to more than 17,000 feet. Typical exploratory wells are 5,000 to 10,000 feet (California Department of Conservation 2015).	The average vertical depth of wells that were hydraulically fractured in California between February 2011 and 2013 was 2,688 feet (range: 890 to 14,343 feet) (California Department of Conservation 2015).
Process Duration	• Drilling time depends on the depth of the formation; wells in shallower formations may take less than • 24 hours to drill, while wells in deeper formations may take more than 60 days to drill (Kern County 2015). • BLM data indicate that most of the wells are typically drilled into shallow formations where little site preparation is necessary and the drilling normally takes 2 to 4 days (Appendix A, 2012 FEIS). • Operation frequency varies from field to field, but the wells generally operate 24 hours per day, 7 days per week, and 365 days per year (California Department of Conservation 2015).	• Depending on the depth of the formation, some wells may take less than 24 hours to drill, while some wells in deeper formations may take more than 60 days to drill (Kern County 2015). • BLM data indicate that most of the wells are typically in shallow formations where little site preparation is necessary and the drilling normally only takes 2 to 4 days (Appendix A, 2012 FEIS). Hydraulic fracturing is considered an optional part of the "well completion" phase. The process typically takes 1 to 2 days (California Department of Conservation 2015).
Well Lateral Reach	• All new wells on a given pad are generally close to vertical. Downhole locations are not typically greater than 200 yards (600 feet) from surface locations.	• All new wells on a given pad are generally close to vertical and downhole locations are typically not greater than 200 yards (600 feet) from surface locations. • Hydraulic fracturing in California is generally vertical as opposed to the horizontal drilling method that is employed in locations outside of California (California Department of Conservation 2015). • The length of fracture on vertical wells is not typically deeper than 200 feet (California Department of Conservation 2015).
Noise Impacts (per pad)	• Operation frequency varies from field to field, but the wells generally operate 24 hours per day, 7 days per week, and 365 days per year (California Department of Conservation 2015). Electric powered pumpjacks typically used on BLM land produce sound in the 50 – 82 decibel range near the well pad. Sound levels from non-pumped wells would normally be lower. Sound decreases with distance from the source. USEPA determined that outdoor sound levels below 55 decibels are unlikely to cause noise effects. (https://nepis.epa.gov/Exe/ZyPDF.cgi/20012HG5.PDF?Dockey=20012HG5.PDF, Table VIII)	• A single day of hydraulic fracturing pumping activities typically produce sound of approximately 107 decibels. Noise typically attenuates to 80 to 90 decibels at the edge of the site (California Department of Conservation 2015).

Element for Comparison	Conventionally Completed Wells/Pads	Hydraulically Fractured Wells/Pads

Visual Impacts (per pad):
• **Short-Term**
  ○ **Height**
  ○ **Duration**
• **Long-Term**
  ○ **Height**
  ○ **Duration**
	Short-Term:
	• The height of the drilling rig (tallest component) is typically 100 to 150 feet, depending on well depth (California Department of Conservation 2015).
	• During drilling, wells are typically drilled on a 24-hour basis. Sites are lit at night, and the rig masts are lit for aircraft safety (California Department of Conservation 2015).
	• Short-term impacts associated with construction would also include heavy equipment and employee vehicles (stationary and traveling to/from well pad locations), fugitive dust, etc.
	Long-Term:
	• Wells might produce for many years, depending upon the resource; drilling rigs are typically in place during the drilling phase only.
		Short-Term:
		• The height of the drilling rig (tallest component) is typically 100 to 150 feet, depending on well depth (California Department of Conservation 2015).
		• During drilling, wells are typically drilled on a 24-hour basis. Sites are lit at night, and the rig masts are lit for aircraft safety (California Department of Conservation 205).
		• The tallest hydraulic fracturing–related unit on site is typically a 43-foot-tall pump in place for limited days needed to conduct hydraulic fracturing on all wells (California Department of Conservation 2015).
		• Short-term impacts associated with construction would also include heavy equipment and employee vehicles (stationary and traveling to/from well pad locations), fugitive dust, etc.
		Long-Term:
		• Wells might produce for many years, depending on the resource. However, the drilling rig would only be in place during drilling phase.

Emissions	Average per-well emissions from development plus first year of operation for Planning Area wells approved in fiscal years 2024 and 2025, by pollutant: • Nitrogen oxide – 0.569 tons/year • Sulfur oxide – 0.003 tons/year • ROGs – 0.245 tons/year • PM_{10} – 0.327 tons/year • $PM_{2.5}$ – 0.059 tons/year (Appendix A, Table A-2, 2012 FEIS):	Projected emissions from hydraulic fracturing typically increase above inventory, by pollutant, as follows: • Nitrogen oxide – 0.569 + 2.74 = 3.309 tons/year • Sulfur oxide – 0.003 + 0.004 = 0.007 tons year • ROGs – 0.245 + 0.21 = 0.456 tons/year • PM_{10} – 0.327 + 0.08 = 0.407 tons/year • $PM_{2.5}$ – 0.059 + 0.08 = 0.139 tons/year [Note: emissions calculation = conventional well development in addition to hydraulic fracturing well treatment]
Water Use	• Drilling and non-HF completion activities typically use approximately 4,200 gallons of water per day. • Water sources for drilling and completion may include produced water, water supply wells, or public water source (Kern County 2015).	• Drilling activities typically use approximately 4,200 gallons of water, per day. • The hydraulic fracturing completion process typically uses 80,000 to over 200,000 gallons of water during the proppant phase and 2,730 to 12,600 gallons of fresh water or brine to flush excess proppants (California Department of Conservation 2015). • Water sources for drilling and completion comprise produced water (8.8%), water supply wells (groundwater, 25.4%), or surface water from public water source (65.8%) (Kern County 2015).
Groundwater Use	See "Water Use," above.	See "Water Use," above.
Surface Water Depletions	No surface water depletions are expected in the Bakersfield Field Office Planning Area, due to limited availability.	No surface water depletions are expected in the Bakersfield Field Office Planning Area, due to limited availability.
Water Disposal:	Produced water is injected into Class II water injections wells.	Flowback from hydraulic fracturing is required to be treated separately. It is typically maintained in segregated tanks and disposed of per Senate Bill 4 (SB4) regulation and federal regulations.
Pad Construction	Pad construction typically lasts 7 to 10 days (including sump construction, if required) (California Department of Conservation 2015).	Pad construction typically lasts 7 to 10 days (including sump construction, if required) (California Department of Conservation 2015).

Element for Comparison	Conventionally Completed Wells/Pads	Hydraulically Fractured Wells/Pads
Pad Operations	Pad operations typically have a 20- to 30-year life span, but some wells in California are over 100 years old (California Department of Conservation 2015).	• Pad operations typically have a 20- to 30-year life span, but some wells in California are over 100 years old (California Department of Conservation 2015). • Hydraulic fracturing could occur at any time during a well's productive life (1 to 2 days). This most frequently occurs as soon as a well drilling is complete, or shortly thereafter but wells can undergo recompletion.
Potential for Surface Subsidence	Potential surface subsidence is caused by cumulative, regional activities. The potential for surface subsidence cannot be calculated for a single well or well pad.	There is no difference between a conventional and a hydraulically fractured well or well pad, in terms of potential surface subsidence. Therefore, the potential for surface subsidence cannot be calculated for a single well or well pad.
Vehicle Trips (per pad)	**Drilling/Completions:** • Vehicle trips during the construction phase include equipment trucks, worker trips, water trucks, and product transport. • Refer to emissions assumptions, above. **Operations:** • Vehicle trips during the operations phase could include water trucking to dispose of produced water.	**Drilling/Completions:** • Vehicle trips during the construction phase include equipment trucks, worker trips, water trucks, product transport. • Refer to emissions assumptions, above. • Additional vehicle traffic for 1 to 2 days of hydraulic fracturing. **Operations:** • Vehicle trips during the operations phase could include water trucking to dispose of produced water.
Workers	• Crews of 2 to 5 workers (daytime) are typically employed to construct each well pad (California Department of Conservation 2015). • Crews of approximately 12 workers are typically employed to drill each well (Kern County 2015).	• Crews of 2 to 5 workers (daytime) are typically employed to construct each well pad (California Department of Conservation 2015). • During a standard hydraulic fracturing operation, 8 to 15 employees are typically required for each shift, and usually no more than one shift is required per day. Additional personnel from the owner operator may be on site to observe and run ancillary equipment, as necessary (Kern County 2015).

Direct and Indirect Impacts

Direct impacts result from a specific action and occur at the same time and place as that action. Indirect impacts are caused by a specific action but are observed later in time or farther removed in distance but are still reasonably foreseeable. Direct and indirect impacts are described on pages 52-100 in the 2019 FSEIS. Additional information to supplement the analysis in the 2019 FSEIS can be found in the following sections.

4.1 Air and Atmospheric Values

4.1.1 Introduction

The 2012 FEIS and the 2019 FSEIS air quality analysis is based on various activities' potential to produce emissions, including conventional well development and the use of hydraulic fracturing on a portion of those wells. For the purposes of this analysis, emissions from conventional well development and hydraulic fracturing are treated as additive to the well development emissions.

RFDS-related emissions are divided into the following categories for purposes of analysis:

- Well development emissions occur on the well site during site preparation, well drilling and construction, and production testing. Emission sources include diesel drilling rig engines, drill pad construction equipment (i.e., dozers, backhoe, grader, etc.), equipment trucks, water trucks, drill rig crew trucks/vehicles, and portable lift equipment; worker commuting and material deliveries; and fugitive dust emissions resulting from soil disturbance and vehicle traffic on unpaved surfaces. Well drilling and completion is estimated to take an average of four days with a drill rig or generator running 24 hours per day.
- Production emissions occur at the leased well site and include travel for daily inspections. Criteria pollutants or hazardous air pollutants could also occur through venting or fugitive losses during maintenance, emissions from use of chemicals, and leakage from valves, fittings, piping, and the wellhead.
- Mid-stream emissions occur away from the well site and include emissions from transportation and processing of produced fluids after they leave the wellhead and before refined products are offered for sale. Air emissions from midstream facilities are monitored, regulated, limited, and mitigated by the air districts and CARB through the SIP under USEPA oversight. Therefore, midstream emissions related to the RFDS are not expected to affect the NAAQS status.
- End-use emissions come from the consumption of produced petroleum as fuels and other products. Air emissions related to fuel consumption are regulated by CARB in California and by USEPA and delegated state and local agencies in the rest of the country and are outside of BLM jurisdiction. There are many possibilities for the processing and consumption of oil produced and the specific transportation, processing, and consumption of any barrel of oil produced are not reasonably foreseeable. Potential end-use emissions

related to the proposed action are estimated by representing produced crude oil as the equivalent volume of gasoline refined and consumed in cars in the SJVAPCD as modeled by the Argonne National Laboratory Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) Pump-to-Wheels (PTW) calculator.

Before initiating any type of oil and gas development, the entity proposing the development may need to apply for and obtain approval for air permits from the air district where the activity would be located. Each local air district issues permits that must be obtained before constructing and operating new stationary sources of air pollution Air Analysis Assumptions

The emissions related to conventional wells in this 2025 DSEIS are estimated using the average emission rates provided by proponents as part of the APD process for wells proposed on federal mineral estate during fiscal years 2024 and 2025. Additional emissions related to hydraulic fracturing are estimated using emission factors presented in the 2019 FSEIS (Table 4.1.1). Emission factors based on per-well analysis are used in conjunction with a maximum new well development of an average of four new hydraulically fractured wells per year over the 10-year life of the plan. As with all supplemental analyses, hydraulic fracturing emissions are added to the estimated conventional emissions, resulting in a total emissions figure.

It is important to use emission factors based on California activity only. The geology of the region, and the drilling techniques used, result in well development and hydraulic fracturing being conducted differently in California than in other areas where hydraulic fracturing is highly utilized, such as the Marcellus shale region (see Section 1.5 of the 2019 FSEIS). In general, wells in California are shallower and require less effort and material to drill, complete, and treat than wells in many other regions. Related air emissions are therefore lower. Additional discussion of oil and gas development in California is included in the introduction to Chapter 3 of this 2025 DSEIS (Section 3.0, under subheading *California Oil and Gas Development*.)

Emission factors used to estimate the emissions from hydraulic fracturing are taken from the California Department of Conservation (2015) Analysis of Oil and Gas Well Stimulation Treatment in California, Volume II (referred to herein as the SB4 EIR). The SB4 EIR provides emission factors for five criteria pollutants and distinguishes between on-road and off-road sources from hydraulic fracturing activity. The SB4 EIR emission factors are used due to the detail they provide and because they apply specifically to hydraulic fracturing in California.

All federal oil and gas development and production activities are assumed to comply with applicable laws and regulations and may be subject to review for air pollutant emissions by the local air permitting authority. The potential air pollutant emissions from oil and gas development would occur in the following context:

- The operator of emissions sources would apply for, secure, and comply with all appropriate air quality permits for project activities from the local agencies with authority under the Clean Air Act and from other applicable agencies, if appropriate, prior to drilling.
- Downstream use of oil and gas, oil processing at refineries, and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFDS, aside from the need to carry produced oil and gas to the existing transmission

pipeline network over a distance that is likely to be less than 10 miles. The California Energy Commission reports that of the 510,649,000 barrels of crude oil processed in California refineries in 2024, more than 76% was imported. This result continued a decades-long trend of decreasing in-state oil production and increasing oil imports. BLM estimates the maximum annual production related to the RFDS would be about 92,000 barrels or 18% of the 2024 total and there is no foreseeable barrier to increased crude oil imports to meet demand if RFDS production were to be lower than estimated.

4.1.2 Impacts Common to All Alternatives

The 2019 FSEIS determined that air quality impacts would be the same across all alternatives (including the hydraulic fracturing of an average of four wells per year) for all pollutants except for fugitive PM. Chapter 4, Section 4.1.6 through 4.1.9 of the 2019 FSEIS examines the components of each alternative that would cause differences in fugitive PM emissions, including proposed motorized vehicle use, non-energy minerals activity and livestock grazing activity. Ultimately, the 2019 FSEIS concluded that the differences between the action alternatives would not affect the analysis of the impacts of hydraulic fracturing on air quality. These sections were reviewed during the preparation of this DSEIS and BLM determined that impacts to air quality would be substantially the same for all alternatives. Therefore, the following analysis applies to all alternatives.

As shown in **Table 3-4**, well development criteria pollutant emissions are expected to be small compared to ongoing emissions from other sources in the Planning Area. They are associated with common combustion sources such as diesel drill rig engines, drill pad construction equipment (i.e., dozers, backhoes, graders, etc.), temporary production flaring, remedial well work, equipment trucks, hauling of liquids, drill rig crew trucks/vehicles, portable electric power generators, portable testing equipment and temporary production facilities. Diesel emissions also occur from equipment used during well maintenance workovers, and vehicles and materials handling at well sites causes emissions of PM_{10} and $PM_{2.5}$.

Adverse health impacts are correlated to the ambient concentrations of criteria air pollutants and hazardous air pollutants caused by equipment and sources typical of oil and gas development and other emission sources in the area. O_3 precursors that are a result of venting or fugitive losses (ROG) and equipment or mobile source exhaust (ROG and NOx) contribute to: aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort. The fugitive dust emissions (PM_{10} and $PM_{2.5}$) contribute to reduced lung function, aggravation of respiratory and cardiovascular diseases, increases in mortality rate, and reduced lung function growth in children. Dust emissions could also exacerbate the potential exposure of people to Valley Fever (see Section 4.3).

Oil and gas development under the RFDS could introduce localized sources of odors by releasing sulfur-containing compounds that occur in the natural resources, primarily H_2S, and odorous organic compounds (including pentane and hexane) as ROG. These may be released as vented and fugitive emissions. CH_4 itself is odorless, but the odorous H_2S and organic compounds can escape to the air easily from produced oil, produced water, vented natural gas, and leaks. No other notable

source of odors would occur because the use of diesel-fueled construction equipment would be limited by mandatory use of ultra-low sulfur diesel fuel. Under all alternatives, the sources of odors would occur only at well development sites and would have limited impacts beyond the well site, depending on concentration, wind direction, and proximity to residential areas or public facilities.

Table 4-4 quantifies the estimate maximum and average air pollutant emissions related to well development and operations under full buildout of the RFDS. The BLM projects that maximum annual emissions would occur in year 10 of the full buildout of the RFDS.

Table 4-4 *Estimated Maximum Annual Emissions related to the RFDS (tons per year)*

Activity	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	Air Toxics	Total Annual Emissions
Well Development	6.2	1.0	1.24	13.4	13.9	0.045	8.003	43.788
Production Operations	27.6	11.0	102.6	67.6	84.3	0.578	25.542	319.22
Mid-Stream[8]	42.5	28.6	432.6	389.6	238.6	112.2	43.1	1287.2
Total RFDS Emissions	**76.3**	**40.5**	**536.4**	**470.6**	**336.8**	**112.8**	**76.7**	**1650.1**
End Use[9,10]	118.1	25.4	786.9	282.0	9383.4	6.7	78.7	10681.2
Grand Total (RFDS + End Use)	**194.4**	**65.9**	**1323.3**	**752.6**	**9720.2**	**119.5**	**155.4**	**12331.3**

Table 4-5 provides further context for **Table 4-3** by showing the total annual pollutant emissions for all counties within the Planning Area and the State of California reported by USEPA in the 2020 National Emission Inventory (NEI) (USEPA, 2023a).

Table 4-5 *Planning Area and statewide estimated annual pollutant emissions for comparison with RFDS estimated annual emissions (tons per year)*

Location	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	Air Toxics	Total Annual Emissions
Planning Area Counties	153,197	107,958	587,502	81,927	1,288,393	9,536	87,675	**2,316,188**
State of California	867,341	667,424	3,620,907	477,283	8,545,507	60,853	533,537	**14,772,852**

Source: USEPA, 2023a.

As shown in **Table 4-4**, annual RFDS emissions from federal mineral estate would add up to approximately 1,650.1 tons or less each year. Total 2020 emissions of the same pollutants in the Planning Area add up to 2,316,188 tons per year based on the 2020 NEI (USEPA, 2023a).

[8] Midstream emissions estimated as the GREET WTW Calculator Well to Pump (WTP) emissions, minus the average site-specific well operations emissions estimated by BLM for all pollutants except PM_{10} and $PM_{2.5}$. These emissions come largely from facilities that require a permit issued by the SJVAPCD or other California air districts under the NSR program and the applicable SIP or from vehicles over which BLM has no authority to impose controls. BLM does not have practical control or continuing program responsibility over these emissions.

[9] End use emissions estimated based on an equivalent volume of gasoline used as modeled by Argonne National Laboratory 2022. GREET WTW Calculator (https://greet.es.anl.gov/tools). BLM does not have practical control or continuing program responsibility over these emissions. These emission are related to fuel demand and would be expected to occur regardless of whether the proposed actions was approved or not.

[10] End-Use HAP emissions estimated as 1/10th of VOC emissions based on Table 4 of Developing a Consistent Methodology to Calculate VOC and HAP Evaporative Emissions for Stage I and Stage II Operations at Gasoline Service Stations for the 1999 NEI. Glenn Tracy Johnson, Pacific Environmental Services. 2003

Therefore, the maximum RFDS emissions from new BLM leases equates to approximately 0.071% of pollutant emissions in the Planning Area compared to total 2020 emissions.

The AQI introduced in Section 3.1.1.1 can be used to illustrate the potential for the proposed emissions to have an impact on air quality. AQI generally increases with increasing pollutant emissions, but the relationship between AQI and emissions is complex, meaning that a change in emissions may not result in the same amount of change in the AQI. However, for purposes of this analysis, the 0.071% emissions increase described in the preceding paragraph would cause only a negligible increase in the AQI. In fact, it appears likely that the AQI change would be less than one point (1% of the AQI at the NAAQS concentration). The AQI is designed so that it takes a 50- or 100-point change to indicate a significant change in health risk. This example illustrates the conclusion that the small pollutant of concern increase related to the RFDS buildout (0.071%) would have a negligible effect on air quality or on air-quality-related impacts.

Table 4-4 also presents estimated maximum HAP/TACs (air toxic) emissions related to the RFDS buildout. Air toxics emissions can cause health effects in persons exposed above threshold concentrations. BLM has considered potential air toxic emissions related to the RFDS in several ways to assess their potential for impacts:

- Beginning in the 1990s, USEPA studied oil exploration and production operations to determine if oil and gas exploration and production HAP emission impacts were significant enough to require regulation under the NESHAP. Oil and gas production NESHAP rules and rule revisions were promulgated in 1999, 2001, 2007, and 2012. To date, only one type of oil exploration and production equipment, glycol dehydrators, has been identified as a significant source of HAP emissions requiring regulation. No glycol dehydrators or any other new processing operations are expected to be installed as part of well development in the Planning Area. BLM reviewed the USEPA rulemaking and data on HAP emissions from representative single oil wells and found that in each case HAP emissions were below the threshold requiring controls under the NESHAP.
- The Planning Area includes a large number and variety of air toxic emission sources including highways (a major source of diesel exhaust particulate), factories, and chemical facilities (See **Table 3-5**). Estimated RFDS air toxic emissions from the proposed action (including development, production, and midstream phases) are 76.6 tons per year spread over many locations across the Planning Area. That would represent 0.087% of the 87,675 tons of air toxic emissions reported in the Planning Area in 2020. Because air toxic emissions related to the RFDS are so small and sources are spread over a large area, they would not be expected to increase current air toxic health impacts.
- The State of California oversees a statewide program required by AB2588 that includes air toxics emissions reporting and health risk assessment covering air toxic sources, including sources in the midstream and end-use supply chain related to the RFDS. The program includes risk screening methods, and a computer modeling package that can be used to perform a basic air toxics risk prioritization if site-specific emissions and the location of a proposed project are known. BLM plans to conduct air toxics risk screening, and health

risk assessment if required, for each APD submitted on any leases issued following this action.

Table 4-6 *Typical annual emissions from hydraulic fracturing equipment in pounds per year (lbs/year).*

Source	PM_{10}/ $PM_{2.5}$ (Per Well)	PM_{10}/ $PM_{2.5}$ (Annual Total)	VOC/ ROG (Per Well)	VOC/ ROG (Annual Total)	NO_X (Per Well)	NO_X (Annual Total)	CO (Per Well)	CO (Annual Total)	SO_X (Per Well)	SO_X (Annual Total)	Air Toxics[11] (Per Well)	Air Toxics (Annual Total)
Pumps (Hydraulic Fracturing)	29.9	119.6	83.3	333.2	1053.1	4212.4	309.2	1236.8	1.4	5.6	8.3	33.3
Blenders	3.4	13.6	11.0	44.0	102.1	408.4	32.9	131.6	0.1	0.4	1.1	4.4
Cranes	0.3	1.2	1.0	4.0	9.1	36.4	3.3	13.2	0.0	0.0	0.1	0.4
Heavy Duty Trucks	7.0	28.0	10.1	40.4	206.6	826.4	52.6	210.4	0.5	2.0	1.0	4.0
Light Duty Vehicles and Medium Trucks	0.1	0.4	0.5	2.0	0.6	2.4	5.1	20.4	0.0	0.0	0.1	0.2
Total Hydraulic Fracturing Emissions	40.7	**162.8**	105.9	**423.6**	1371.5	**5486.0**	403.1	**1612.4**	2.0	**8.0**	10.6	**42.4**

Source: SB4 EIR, Analysis of Oil and Gas Well Stimulation Treatments in California (Volume II), California Department of Conservation 2015, Table 10.3-23.

[11] Air toxic emissions estimated as $1/10^{th}$ of VOC/ROG emissions based on Table 4 of Developing a Consistent Methodology to Calculate VOC and HAP Evaporative Emissions for Stage I and Stage II Operations at Gasoline Service Stations for the 1999 NEI. Glenn Tracy Johnson, Pacific Environmental Services. 2003

Table 4-7 *Estimated annual emissions for the RFDS in tons per year, including hydraulic fracturing.*

Source	PM_{10}/ $PM_{2.5}$	VOC/ ROG	NO_X	CO	SO_X	Air Toxics	Total
Hydraulic Fracturing [12]	0.08	0.21	2.74	0.81	0.004	0.021	3.865
Development, Operations and Mid-Stream Emissions (See Table 4.1.1)	116.8	536.4	470.6	336.8	112.8	76.7	**1650.1**
Total RFDS Emissions, Including Hydraulic Fracturing	**116.9**	**536.6**	**473.3**	**337.6**	**112.8**	**76.7**	**1653.9**

Source: SB4 EIR, Analysis of Oil and Gas Well Stimulation Treatments in California (Volume II), California Department of Conservation 2015, Table 10.3-23.

Table 4-6 shows the estimated annual increase in emissions due to hydraulic fracturing an average of four wells per year on new leases in the Planning Area. The emission sources involved in hydraulic fracturing include off-road items such as pumping units, blenders, and cranes and on-road trucks transporting material to and from the well site.

The 2012 FEIS analyzed all land management decisions that would impact air emissions. For example, CH_4 production from livestock grazing and particulate (dust) from travel management alternatives. This supplemental analysis only addresses potential changes to emissions related to the RFDS, integrating hydraulic fracturing. In the sections below, differences between alternatives for resource management other than fluid minerals will be briefly discussed as a context for the consistent estimates of emissions changes due to hydraulic well fracturing.

Table 4-7 shows the estimated annual increase in emissions from conventional and hydraulically fractured well development. The estimated RFDS emissions related to conventional wells are taken from **Table 4-3**. The total increase in annual emissions from both types of wells is relatively minor, with the largest being in VOC/ROG at 536.6 tons per year.

Table 4-6 and **Table 4-7** show that air resource impacts of four hydraulically fractured wells per year are expected to be very small and would not substantially change the outcome of this analysis.

Reasonably Foreseeable Future

Table 4-8 presents total annual RFDS conventional and hydraulic fracturing emissions in the context of emissions from other sources in the Planning Area.

[12] Hydraulic fracturing emissions estimated in lbs/year in **Table 4-6** converted to tons per year.

Table 4-8 *RFDS emissions in the context of reasonably foreseeable emissions from all sources in the Planning Area.*

Source	tons per year	% of total
Wildfire	1,459,214	65.471%
Mobile Sources	343,001	15.390%
Agriculture	239,168	10.731%
Solvent Use	77,630	3.483%
Waste Disposal	30,246	1.357%
Residential Fuel Combustion	29,983	1.345%
Commercial and Industrial Fuel Use	23,249	1.043%
Industrial Processes other than Petroleum and Natural Gas	10,808	0.485%
Oil & Gas Development and Production	7,194	0.323%
Commercial Cooking	4,445	0.199%
Oil & Gas Midstream	2,187	0.098%
Total RFDS Emissions, Including Hydraulic Fracturing (See **Table 4-7**)	1,654	0.074%
Total	**2,228,779**	**100%**

Source: USEPA. 2023a.

Table 4-8 shows that past agency actions, including the many regulations and other actions taken by CARB and air districts to limit emissions and protect air quality, have kept air pollution and air quality impacts related to oil and gas production and mid-stream processing relatively low.

Table 4-8 also shows that the proposed action will increase total emissions of air pollutants in the Planning Area. However, as described above in the discussion of AQI, the increase is very small compared to ongoing emissions from other sources and would not be expected to degrade current air quality in any substantial or even discernable way. A similar analysis applies to air toxics emissions. Planning Area residents are exposed to a substantial rate of ongoing air toxics emissions and related health risks. The RFDS would increase those emissions; however, as described above, the increase would be too small to cause a discernable change to existing health risks.

For context, total criteria pollutant emissions related to all development projected in the RFDS (90 to 360 wells per year on existing leases, plus 10 to 40 wells per year on new leases related to the proposed action) for a total of up to 400 new wells per year on federal mineral estate, could total as much at 16,540 tons per year, or 0.7% of total criteria emissions in the Planning Area. As discussed above, even these total projected emissions would likely not be large enough to change current air quality trends in a discernable way.

Greenhouse Gas Emissions

Oil and gas development in the Planning Area could lead to emissions of CO_2, CH_4, and N_2O; the three most common greenhouse gases associated with oil and gas development. These GHGs would be emitted from activities occurring on any parcels leased and developed under BLM statutory and regulatory authorities and from the consumption through combustion. The BLM cannot reasonably determine at the planning stage whether, when, and in what manner land would be leased, explored or developed. The uncertainty includes crucial factors that would affect actual GHG emissions and associated impacts, including but not limited to the outcome of lease sales, the future feasibility of developing leases, well density, geological conditions, amount of time to

drill, 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 is likely to vary from what is analyzed in this DSEIS and will be evaluated through a site-specific NEPA review when an operator submits an APD or plan of development to the BLM.

For the purposes of this analysis, the BLM has disclosed the projected potential GHG emissions from oil and gas development on the parcels. Projected emissions estimates are based on past actual oil and gas development analyses and any available information from existing development within the state.

Further discussion of the reasonably foreseeable and cumulative GHG emissions associated with BLM's oil and gas leasing actions and methodologies are included in the Annual GHG Report. This report presents the estimated emissions of greenhouse gases attributable to development and consumption of fossil fuels produced on lands and mineral estate managed by the BLM.

Environmental Consequences

While planning actions do not directly result in development that would generate GHG emissions, emissions from future potential development of the leased parcels can be estimated for the purposes of this analysis. There are four general phases of post-lease development processes that would generate GHG emissions: (1) well development (well site construction, well drilling, and well completion), (2) well production operations (extraction, separation, gathering), (3) mid-stream (refining, processing, storage, and transport/distribution), and (4) end-use (combustion or other uses) of the fuels produced. Well development and production operation emissions (phases 1 and 2) occur on-lease and the BLM has authority over these activities. Mid-stream emissions (phase 3) are typically off-lease but may originate on California public lands and are under the jurisdiction of CAA-delegated agencies. End-use emissions (phase 4) typically occur off-lease where the BLM has little to no authority.

Emissions inventories at the leasing stage are imprecise due to uncertainties including the type of mineral development (oil, gas, or both), scale, and duration of potential development, types of equipment (drill rig engine tier rating, horsepower, fuel type), and the mitigation measures that a future operator may propose in their development plan. Due to these uncertainties, the BLM applies several assumptions to estimate emissions at the leasing stage. The number of estimated well numbers are based on the RFDS combined with per-well drilling, development, and operating emissions data from representative wells in the area. The amount of oil or gas that may be produced if the offered parcels are developed is unknown. For purposes of estimating production and end-use emissions, potential wells are assumed to produce oil and gas in similar amounts as existing nearby wells. While the BLM has no authority to direct or regulate the end-use of the products, for this analysis, the BLM assumes all produced oil or gas will be combusted (such as for domestic heating or energy production). The BLM acknowledges that there may be additional sources of GHG emissions along the distribution, storage, and processing chains (commonly referred to as midstream operations) associated with production from the lease parcels. These sources may include emissions of CH_4 (a more potent GHG than CO_2 in the short term) from pipeline and

equipment leaks, storage, and maintenance activities. These sources of emissions are highly speculative at the leasing stage; therefore, the BLM has chosen to assume that mid-stream emissions associated with lease parcels for this analysis would be similar to the national level emissions identified by the Department of Energy's National Energy Technology Laboratory (NETL, 2008; NETL, 2019). Section 6.5 of the Annual GHG Report includes a more detailed discussion of the methodology for estimating midstream emissions.

The emission estimates calculated for this analysis were generated using the assumptions previously described above in the BLM Lease Sale Emissions Tool and lease development analysis. Emissions are presented for each of the four phases of post-lease development processes described above.

- Well development emissions occur over a short period and may include emissions from heavy equipment and vehicle exhaust, drill rig engines, completion equipment, pipe venting, and well treatments such as hydraulic fracturing.
- Well production operations, mid-stream, and end-use emissions occur over the entire production life of a well, which is assumed to be 30 years for this analysis based on the productive life of a typical oil/gas field.
- Production operation emissions may result from well operation and maintenance and inspection vehicle exhaust. In compliance with state requirements, wells in California are usually electric powered and all produced fluid processing and storage is conducted in permitted midstream facilities.
- Mid-stream emissions occur from storage tank breathing and flashing, truck loading, the transport, refining, processing, storage, transmission, and distribution of produced oil and gas. Mid-stream emissions are estimated by multiplying the estimated ultimate recovery (EUR) of produced oil and gas with emissions factors from NETL life cycle analysis of U.S. oil and natural gas. Additional information on emission factors can be found in the Annual GHG Report (Chapter 6, Table 6-8 and 6-10).
- For the purposes of this analysis, end-use emissions are calculated assuming all produced oil and gas is combusted for energy use. End-use emissions are estimated by multiplying the EUR of produced oil and gas with emissions factors for combustion established by the USEPA (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 Annual GHG Report (Chapter 6).

Table 4-9 shows the estimated maximum year and average year GHG emissions over the 10-year RFDS for both 100-yr and 20-yr CO_2e potentials.

Table 4-9 *Estimated direct and indirect RFDS emissions on an annual and life of lease basis (metric tonnes)*

Timeframe	CO_2	CH_4	N_2O	CO_2e (100-yr)	CO_2e (20-yr)
Max Emissions, Year 10	1,317,239	490.31	11.355	1,334,950	1,360,790
Average Year	433,875	206.90	3.685	441,047	451,950
30-year Production life	16,921,125	8,069.15	143.699	17,200,815	17,626,059

Table 4-10 lists the estimated direct (well development and production operations) and indirect (mid-stream and end-use) GHG emissions in metric tonnes (t) for the RFDS over the average 30-year production life of the wells. In summary, potential GHG emissions from the Proposed Action could result in GHG emissions of 17,200,815t CO_2e over the life of the RFDS. Eighty percent (80%) of these emissions are related to the assumed end-use combustion.

Table 4-10 *Estimated production life emissions from well development, production operations, mid-stream, and end-use (metric tonnes)*

Activity	CO_2	CH_4	N_2O	CO_2e (100-yr)	CO_2e (20-yr)
Well Development	29,668	1.701	0.345	29,812	29,902
Production Operations	1,366,290	249.716	16.004	1,378,100	1,391,261
Mid-Stream	1,837,571	7,311.26	29.967	2,063,628	2,448,931
End-Use	13,687,596	506.47	97.38	13,729,274	13,755,966
Total (Life of Lease)	16,921,125	8,069.15	143.699	17,200,815	17,626,059

GHG emissions vary annually over the production life of a well due to declining production rates over time. **Figure 4-1** shows the estimated GHG emissions vary annually over the production life of a well due to declining production rates. **Figure 4-1** shows the estimated GHG emissions profile over the productive life of a typical well including the four phases of lease development processes: well development, well production operations, mid-stream, end-use, and gross (total of well development, well production, mid-stream, and end-use) emissions.

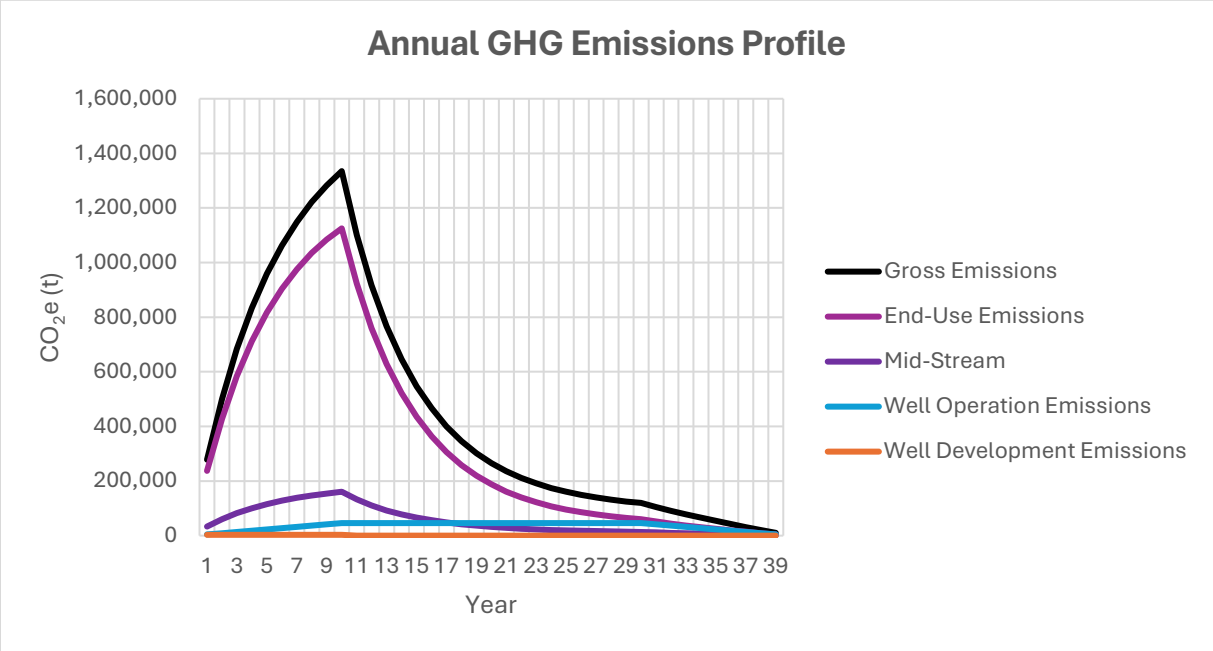


Figure 4-1 *Estimated GHG emissions profile over the production life of the RFDS*

As illustrated in **Figure 4-1**, GHG emissions related to the RFDS come mostly from end use combustion of the RFDS production stream. It also shows how emissions are expected to decline rapidly within a few years of well development and drop to nearly zero by the end of the 30-year productive life of the wells.

Table 4-11 compares the estimated annual lease sale emissions to existing federal fossil fuel (oil, gas, and coal) emissions, state, and U.S. total GHG emissions.

Table 4-11 *Comparison of proposed annual RFDS emissions to other sources*

Reference	Mt CO_2e[13] per year
RFDS Emissions (Maximum Year)	1.33
CA Onshore Federal (O&G)[14]	5.10
CA Total Emissions (all sources)[15]	393.35
U.S. Onshore Federal (Oil & Gas)	611.55
U.S. Federal Onshore (Oil, Gas and Coal)	1,046.33
U.S. All Federal (Oil & Gas)	1,462.29
U.S. Total	7,260.36

Reasonably Foreseeable Effects

The analysis of GHG emissions contained in this DEIS includes estimated RFDS emissions as described above. An assessment of GHG emissions from other BLM fossil fuel authorizations, including coal leasing and oil and gas leasing and development, is included in the Annual GHG Report in Chapter 7. The Annual GHG Report 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 portfolio based on actual production and statistical trends as they are presently known.

The methodologies used in the Annual GHG Report provide estimates of foreseeable short-term and projected long-term GHG emissions from activities across the BLM's fluid minerals portfolio. The foreseeable short-term methodology includes a trends analysis of (1) leased federal lands that are held-by-production[16], (2) approved APDs, and (3) leased lands from competitive lease sales projected to occur over the next annual reporting cycle. The data 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 Energy Information Administration (EIA) to estimate GHG emissions out to 2050 that could occur from past, present, and future development of federal fluid minerals. For both methodologies, the emissions are calculated using life-cycle-assessment data and emission factors. These analyses are the basis for projecting GHG emissions from lease parcels that are likely to go into production during the analysis period of the Annual GHG Report and represent both a hard look at GHG emissions from oil and gas leasing and the best available estimate of

[13] Mt (megatonne) = 1 million metric tons. Estimates are based on 100-GWP values.
[14] Federal values come from the BLM Specialist Report on Annual Greenhouse Gas Emissions. Tables ES-1 and ES-2 and Figure ES-1. U.S Federal-All includes offshore and onshore oil and gas production.
[15] Total state emissions from all sectors are found in Table 5-2 of the BLM Specialist Report on Annual GHG Emissions
[16] held-by-production - A provision in an oil or natural gas property lease that allows the lessee to continue drilling activities on the property as long as it is economically producing a minimum amount of oil or gas. The held-by-production provision thereby extends the lessee's right to operate the property beyond the initial lease term.

reasonably foreseeable cumulative emissions related to any one lease sale or set of quarterly lease sales that could occur annually across the entire federal onshore mineral estate.

Table 4-12 presents the summation of the 30-year life-of-project 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 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, technological advancements in production or end-use efficiency standards, or an accelerated economy-wide transition away from fossil fuel derived energy production.

A detailed explanation of the short-term and long-term emissions estimate methodologies are provided in Sections 6.6 and 6.7 of the Annual GHG Report.

***Table 4-12** GHG emissions from past, present, and reasonably foreseeable federal onshore lease development (Mt CO_2e)*

State	Existing Wells (Report Year)	Existing Wells (Projected)	Approved APDs	New Leasing	Short-Term Foreseeable Totals	Long-Term Projected Totals
AL	0.57	8.52	0.00	0.18	8.70	16.62
AK	1.27	18.90	20.82	43.96	83.67	36.10
AZ	0.00	0.00	0.00	0.00	0.00	0.00
AR	0.60	9.52	0.24	0.24	9.99	17.56
CA	5.10	70.48	4.75	2.17	77.41	140.49
CO	44.72	387.63	16.46	16.29	420.39	1,293.28
ID	0.00	0.00	0.00	0.29	0.30	0.00
IL	0.01	0.10	0.00	0.02	0.12	0.21
IN	0.00	0.00	0.00	0.02	0.02	0.00
KS	0.23	3.43	0.00	0.22	3.65	6.70
KY	0.01	0.07	0.00	0.03	0.10	0.22
LA	5.20	64.56	31.84	14.98	111.38	151.44
MD	0.00	0.00	0.00	0.00	0.00	0.00
MI	0.06	1.17	0.00	0.29	1.46	1.74
MS	0.11	1.50	0.38	0.38	2.25	3.06
MT	2.02	20.63	1.53	5.41	27.57	56.36
NE	0.01	0.21	0.00	0.03	0.24	0.39
NV	0.13	0.99	0.03	0.10	1.12	3.53
NM	399.96	2,844.84	729.98	113.24	3,688.06	11,218.30
NY	0.00	0.01	0.00	0.00	0.01	0.01
ND	33.50	280.74	29.58	6.63	316.95	933.79
OH	0.24	2.29	0.00	2.65	4.94	7.04
OK	1.34	13.21	1.42	1.18	15.81	38.41
OR	0.00	0.00	0.00	0.12	0.12	0.00
PA	0.00	0.05	0.00	0.67	0.72	0.11
SD	0.10	1.61	0.11	0.11	1.82	2.70
TN	0.00	0.00	0.00	0.00	0.00	0.00
TX	3.20	35.25	15.07	1.31	51.62	93.23
UT	12.93	161.65	14.42	29.97	206.04	369.79
VA	0.01	0.13	0.00	0.03	0.16	0.25
WV	0.00	0.06	0.00	0.59	0.64	0.12

State	Existing Wells (Report Year)	Existing Wells (Projected)	Approved APDs	New Leasing	Short-Term Foreseeable Totals	Long-Term Projected Totals
WY	100.22	892.55	100.35	253.66	1,246.56	2,872.25
Total Onshore Federal	**612**	**4,820**	**967**	**495**	**6,282**	**17,264**

Source: Annual GHG Report, Section 7

Recent short-term energy outlook reports (STEO) published by the EIA (https://www.eia.gov/outlooks/steo/) predict that the world's oil and gas supply and consumption will increase over the next 18-24 months (EIA, 2023). 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 and operations on existing U.S. onshore leases. Recent STEOs includes the following projections for the next two years:

- U.S. liquid fuels consumption is projected to increase to 20.55 million barrels per day (b/d) in 2025 up from 20.30 million b/d in 2024.
- U.S. crude oil production is expected to average 13.59 million b/d in 2025 and rise to 13.73 million b/d 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 from 12 billion cubic feet/day (Bcf/d) in 2024 to 14Bcf/d in 2025.
- U.S. Coal production is expected to total 478 million short tons (MMst) in 2025 and 476 MMst in 2026.
- Generation from renewable sources is forecast to increase from 1,057.25 billion kW/h in 2025 to 1,142.70 billion kW/h in 2025.

The California Energy Commission (CEC) reported that nearly three-quarters of the crude oil refined in California was imported in 2022 (https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california). The fraction of oil imported has increased from half in 2000 to three-quarters today as California production has decreased. Imports are reasonably foreseeable to increase further as California oil production declines and consumption of imported petroleum would therefore offset some or all of any GHG reductions achieved by reducing in-state oil production unless demand for petroleum products is reduced.

Recent events, both domestically and internationally, have resulted in abrupt changes to the global oil and gas supply. EIA studies and recent U.S. analyses (associated with weather impacts, etc.) regarding short-term domestic supply disruptions and shortages or sudden increases in demand demonstrate that reducing domestic supply (in the near-term under the current supply and demand scenario) will likely lead to the import of more oil and natural gas from other countries, including countries with lower environmental and emission control standards than the United States (EIA,

2023). Recent global supply disruptions have also led to multiple releases from the U.S. Strategic Petroleum Reserve in order to meet consumer demand and curb price surges.

The EIA 2023 Annual Energy Outlook (https://www.eia.gov/outlooks/aeo/) projects energy consumption increases through 2050 as population and economic growth outweighs efficiency gains. As a result, U.S. production of natural gas and petroleum and liquids will rise amid growing demand for exports and industrial uses. U.S. natural gas production increases by 15% from 2022 to 2050. If electricity generation shifts to using alternative sources, as predicted by the report, domestic natural gas consumption for electricity generation is expected to decrease by 2050 relative to 2022. Further discussion of past, present and projected global and state GHG emissions can be found in Chapter 5 of the Annual GHG Report.

At present, no national or Federal agency carbon budgets have been established, primarily due to the lack of consensus on how to allocate the global budget to each nation, and as such the global budgets are not useful for BLM decision making, particularly at the leasing stage, as it is unclear what portion of the budget applies to emissions occurring in the United States.

Emission Control Measures Considered in the Analysis

Emission controls (e.g., vapor recovery devices, no-bleed pneumatics, leak detection and repair, etc.) can substantially limit the amount of GHGs emitted to the atmosphere, while offsets (e.g., sequestration, low carbon energy substitution, plugging abandoned or uneconomical wells, etc.) can remove GHGs from the atmosphere or reduce emissions in other areas.

The USEPA is the federal agency charged with regulation of air pollutants and establishing standards for protection of human health and the environment. The USEPA has issued regulations that will reduce GHG emissions from any development related to the proposed leasing action. These regulations include the New Source Performance Standard for Crude Oil and Natural Gas Facilities (40 CFR 60, OOOOa), Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After November 15, 2021 (40 CFR 60, OOOb) and Waste Emissions Charge for Petroleum and Natural Gas Systems (40 CFR 99). These regulations impose emission limits, equipment design standards, and monitoring requirements on oil and gas facilities and a waste emissions charge on CH_4 emissions that exceed 25,000 metric tonnes of CO_2e for applicable petroleum and natural gas facilities currently required to report under the Greenhouse Gas Reporting Rule. A detailed discussion of existing regulations and Executive Orders that apply to BLM management of federal lands as well as current federal and state regulations that apply to oil and gas development and production as of 2023 can be found in Chapter 2 of the Annual GHG Report. However, Section 2.5 of the Annual GHG Report, Executive Orders, has not been incorporated by reference as the Executive Orders discussed therein have been rescinded as of January 20, 2025.

California also regulates GHG emissions from oil and gas facilities. The California Legislature passed the California Global Warming Solutions Act of 2006 [Assembly Bill 32 (AB 32)], creating a comprehensive, multi-year program to reduce greenhouse gas emissions in California. AB 32

requires the reporting of GHGs by major sources, applicable to industrial facilities, fuel suppliers, and electricity reporters. In 2022, CARB issued an updated Scoping Plan to address AB 32 and subsequent legislative actions and policies. The 2022 plan lays out a path to achieve targets for carbon neutrality and reduce anthropogenic GHG emissions by 85 percent below 1990 levels no later than 2045, as directed by Assembly Bill 1279. The Plan intends to achieve significant reductions in fossil fuel combustion by deploying clean technologies and fuels, further reductions in short-lived atmosphere pollutants, support for sustainable development, increased action on natural and working lands to reduce emissions and sequester carbon, and the capture and storage of carbon.

SJVAPCD has developed *Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA* and District Policy Addressing GHG Emission Impacts for Stationary Source Projects Under California Environmental Quality Act (CEQA), intended to be applied to CEQA analysis. Although these policies are only available for CEQA analyses, the air district guidance may be generally applied by land-use agencies for reference. BLM concludes that the SJVAPCD requirement to quantify GHG emissions would occur at the APD or Sundry stage, to be analyzed in a site-specific NEPA review.

The majority of GHG emissions resulting from federal fossil fuel authorizations occur outside of the BLM's authority and control. These emissions are referred to as indirect emissions and generally occur off-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). This decision authority is applicable when development is proposed on public lands and the BLM assesses the specific location, design and plan of development. In carrying out its responsibilities under NEPA, the BLM has developed BMPs designed to reduce emissions from field production and operations. BMPs may include limiting emissions from stationary combustion sources, mobile combustion sources, fugitive sources, and process emissions that may occur during development of the lease parcel. Approval of future development may include the application of BMPs within BLM's authority, included as COA, 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.

4.1.3 Lease Considerations

The 2014 RFDS predicts (up to) 10 new wells related to each lease sale, including the 2020 Lease sale. Four lease sales at 10 wells each add together to yield the 40 new wells on new leases analyzed in this 2025 DSEIS. Therefore, air emissions and related impacts from the 2020 Lease Sale are considered in this analysis and are included in the emission estimates discussed above.

-

4.2 Biological Resources

Potential impacts to biological resources, including special status species, from all activities and programs except use of hydraulic fracturing in the oil and gas program are analyzed in Section 4.2 of the 2012 FEIS. Potential impacts to biological resources from hydraulic fracturing in the oil and gas program are analyzed in Section 4.2 of the 2019 FSEIS.

4.2.1 Impacts Common to All Alternatives

As described in Section 3.2.1, five species (See **Table 37**) which may occur in the Planning Area have been listed or proposed for listing as endangered or threatened under the ESA since the time of the 2019 FSEIS. However, as discussed in the 2019 FSEIS, potential direct and indirect impacts to special status species from hydraulic fracturing activities depend on species occurrence within a potential leasing area and would therefore be further analyzed at the leasing stage and protective measures and lease stipulations would be applied at that stage.

4.2.2 Lease Considerations

Although the action of leasing does not in itself result in biological resource impacts, the BLM acknowledges biological resource impacts may result as an indirect effect of potential development after leasing. The RFDS estimates up to 10 wells may be developed on the seven lease parcels, which may result in disturbance of up to 18.6 surface acres. Potential impacts on special status species associated with this estimated surface disturbance are covered in detail in the 2020 EA (pgs. 60-67). Potential impacts to the species listed in **Table 3-7** and their associated habitats would be similar to effects on other species discussed in the 2020 EA, including the potential for direct mortality, loss or alteration of habitat, and harassment.

As discussed in Section 3.2.2, the fisher, Kern Canyon slender salamander, and northwestern and southwestern pond turtles are unlikely to be present within the seven lease parcels and therefore would be unlikely to be impacted by surface disturbance resulting from leasing these parcels. The monarch butterfly has the potential to occur within all seven lease parcels. This species is dependent on the milkweed plant, which can be easily identified at most times of the year; thus, populations should be easily identified and avoided.

Controlled surface use (CSU) stipulations would be applied to all parcels (see Appendix B of the 2020 EA). These stipulations reserve to the BLM the right to delay processing; to move, modify, or seasonally restrict activities; or to prohibit surface disturbing activities on all or a portion of the lease to protect biological resources.

Some of the newly proposed for listing or newly listed species may be found within the lease parcels; however, impacts to these species are not expected to be greater than those analyzed in the 2020 EA, and potential impacts would be mitigated by the CSU stipulations. Site specific review would be conducted at the APD phase, and consultation would be conducted on a case-by-case basis, if needed.

4.3 Soil Resources

4.3.1 Impacts Common to All Alternatives

Potential impacts to soil resources from all activities and programs except use of hydraulic fracturing in the oil and gas program are analyzed in Section 4.7 of the 2012 FEIS. Estimated impacts of hydraulic fracturing in the oil and gas program are analyzed in Section 4.6 of the 2019 FSEIS. Based on a review of new circumstances and information, BLM determined that the direct, indirect, and cumulative impacts to soil resources from the oil and gas program were sufficiently analyzed in the 2012 FEIS and 2019 FSEIS. Impacts related to new information regarding Valley Fever endemic soils are described below.

4.3.2 Valley Fever Endemic Soils

Soil disturbance associated with oil and gas leasing and development would primarily affect existing oil fields. People with jobs that require digging in the soil have the greatest chance of getting Valley Fever. Cal/OSHA has taken action to protect workers engaged in earth-moving work or exposed to dusty conditions, including those in the oil and gas industry, from Valley Fever. Drilling and other activities have the potential of disturbing the ground and releasing dust and fungal spores into the air. The CDHP's (2013) "Preventing Work-Related Coccidioidomycosis," outlined the causes of the potentially serious fungal infection and preventative measures while reminding employers to report cases of illness. Because there is no vaccination for Valley Fever, the fact sheet urged employers to take steps to protect their workforces, such as determining whether they work in an endemic area, adopting site plans to reduce exposure, protecting workers against exposure with National Institute for Occupational Safety and Health approved respiratory protection filters, training workers on the risks of Valley Fever, and more. While the fungus is consistently present in the soil of many undeveloped areas, highly endemic counties are Fresno, Kern, Kings, Madera, Merced, San Luis Obispo, and Tulare.

Morbidity and Mortality Weekly Reports published by the CDC reported an average annual increase of 13 percent in the incidence of reported Valley Fever cases in California between 1998 and 2011, and in 2020 reported that the incidence of Valley Fever had significantly increased in California since 2014 (CDC, 2013; CDC, 2020). The increased incidence of new Valley Fever cases reported in California presents a risk to public and worker safety.

Tips for reducing the risk of Valley Fever exposure include:

- Determine if a worksite is in an area where fungal spores are likely to be present.
- Adopt site plans and work practices that minimize the disturbance of soil and maximize ground cover.
- Use water, appropriate soil stabilizers, and/or re-vegetation to reduce airborne dust.
- Limit workers' exposure to outdoor dust in disease-endemic areas.
- When exposure to dust is unavoidable, provide approved respiratory protection to filter particles.

- Train supervisors and workers in how to recognize symptoms of Valley Fever and minimize exposure.

Although the soil disturbance would primarily occur within existing oil fields, where soils have already been disturbed, new surface disturbance could exacerbate the risk of spore aerosolization. This risk is particularly relevant in dry, dusty conditions where dust-generating activities are identified as a key vector for airborne PM, including fungal spores. Fugitive dust emissions associated with oil and gas leasing and development are estimated in the analysis of air and atmospheric conditions (Section 4.1 of the 2019 FSEIS and Section 4.1 of this 2025 DSEIS).

Given the endemic nature of *C. immitis* in the Planning Area and the potential for increased exposure due to soil disturbance, Valley Fever represents a risk to worker safety. However, with the application of appropriate BMPs and adherence to regulatory guidance, the risk is substantially mitigated.

4.3.3 Lease Considerations

The analysis of soil resource impacts within the Planning Area above is representative of impacts to soil resources for the seven lease parcels.

4.4 Water Resources

Potential impacts to water resources from all activities and programs except use of hydraulic fracturing in the oil and gas program are described in Section 4.9 of the 2012 FEIS. Potential impacts to water resources from oil and gas exploration and development, with a focus on hydraulic fracturing, are described in Section 4.8 of the 2019 FSEIS. Updates are provided below in consideration of new, best available information.

Since the release of the 2019 FSEIS, both national and California-specific studies have highlighted the potential impacts of hydraulic fracturing on water resources. However, no hydraulic fracturing stimulation has occurred on federal lands in California since that time (CalGEM, 2025c). Because no hydraulic stimulation has occurred on federal lands in California since the 2019 FEIS, limited opportunity exists in performing new impact analyses.

At the national level, recent peer-reviewed analyses and updated USEPA frameworks reaffirm that all stages of the hydraulic fracturing water cycle—from water acquisition through wastewater disposal—continue to pose possible risks to groundwater and surface water, particularly amid spill events, aging infrastructure, and cumulative extraction effects (USEPA, 2024b; Hwang, 2023). In addition to water quality risks, studies have noted that fracturing operations require substantial volumes of water, which can impose stress on local supplies in arid or drought prone regions (Hwang, 2023). In California, a 2025 study emphasized concerns over fracturing fluid composition and transport pathways that may jeopardize drinking water sources (Makki, 2025).

A 2024 report from CalGEM's Public Health Panel further highlighted vulnerabilities in wastewater handling and legacy well infrastructure, pointing to potential exposure pathways (CalGEM, 2024). Currently, State of California regulations prohibit use of produced hydraulic

fracturing wastewater for crop irrigation—codified through California waste discharge requirements—reinforcing precautionary measures to safeguard agricultural water supplies (SWRCB, 2022). All together, these findings reinforce that oil and gas development, including hydraulic fracturing, remains a dynamic water resources concern. Significant scientific uncertainty, however, persists regarding the frequency and severity of impacts due to hydraulic fracturing, as acknowledged by USEPA's final drinking water assessment (USEPA, 2025).

For the unique water use conditions and trends in California oil fields refer to Section 3.7.4, pg. 3.7-10 of the 2019 FEIS. The BLM would consider site specific conditions and data during project level review.

4.4.1 Impacts of Alternative A (No Action)

Alternative A would maintain the current management situation under the existing Caliente RMP (BLM 1997) and Hollister RMP (BLM 1984), as amended. These RMPs do not address potential hydraulic fracturing in the context of their respective management situations. Management of resources and sensitive habitats would remain at current levels but would not address emerging issues concerning public lands. This alternative also would not address the use of lands acquired after the implementation of these RMPs, including public lands at Atwell Island, Piedras Blancas Light Station, and portions of the San Joaquin River Gorge.

4.4.2 Impacts Common to at All Action Alternatives

4.4.2.1 Impacts to Surface Water

Groundwater extraction for oil and gas exploration or development activities can reduce discharge to interconnected surface waters, leading to lower baseflow in streams and wetlands—an effect SGMA identifies as an "undesirable result" when it impairs beneficial uses (CA Water Code §10721(x)(6); CalGEM, 2022a). Lowered groundwater levels may potentially diminish streamflow and habitat availability (USGS, 2025); however, SGMA defers to CALGEM for groundwater issues related to oil and gas development (Ca Water Code §10721.(g)), and surface water in the Planning Area is limited, as described in the 2019 FEIS. These potential impacts would be avoided or minimized through site-specific monitoring standards and regulations and application of BMPs, as required by applicable federal, state, and local regulations, once sufficiently detailed location information is available.

Oil and gas development may cause land subsidence (as mentioned in Section 3.4.2.1, Land Subsidence) and potential impacts to surface water infrastructure, such as aqueduct and canal damage, are possible. However, impacts are difficult to predict because subsidence magnitude, rate, and location depend on complex geologic heterogeneity and on the timing and distribution of groundwater and oil-field withdrawals, with delayed aquitard drainage causing time-lagged responses. Risk to aqueducts and canals is driven primarily by differential settlement and local foundation conditions, which require not only site-specific investigation but also rigorous, process-based analysis-integrating sustained monitoring, geodetic measurements, subsurface characterization, calibrated hydrogeologic-geomechanical modeling, and engineering assessment

of infrastructure performance. BLM would analyze these impacts once site specific information in known are the permitting phase.

4.4.2.2 Impacts to Groundwater Use

Oil and gas development can contribute to declining groundwater levels and reductions in aquifer storage (USGS, 2025)—both considered undesirable results under SGMA (Ca Water Code §10721(x)(1–2)). Pumping near legacy fields may mobilize degraded water, increasing salinity or introducing contaminants into protected aquifers (CALGEM, 2022b).

Recent estimates of mean annual groundwater use in Kern County range from about 1.9 million acre-feet in 2019 to 3.3 million acre-feet in 2021, compared with a previously reported USGS estimate of about 2.4 million acre-feet per year (USGS 2018; KGA, 2020; KGA, 2022). In contrast, total net fluid extraction from an active oilfield in the Planning Area, such as the Lost Hills Oil Field, from the approximately 2007-2020 period, across all land ownership classes has been estimated at only approximately four thousand acre-feet, or approximately 200 acre-feet per year (CalGEM, 2025c). Across recent reporting years, agriculture consistently accounts for roughly 80–85% of total groundwater use in the Kern County Subbasin, which includes a large portion of the Planning Area, with urban and municipal supply contributing around 8–10%, and other uses making up the remainder (KGA, 2020; KGA, 2022).

The maximum water consumption from four or fewer project wells on annual average would represent a negligible fraction of total annual surface and groundwater use in Kern County (a major portion of the Planning Area) and is therefore considered insignificant in the context of overall basin demand. All water use sourced from aquifers designated as freshwater aquifers under State of California Bulletin 118 is expected to remain in compliance with the SGMA and respective GSPs which govern regional groundwater use.

Oil and gas–related development can contribute to land subsidence, which can permanently reduce the amount of storage available in a groundwater aquifer. However, as described above in Sections 3.4.2.1 and 4.4.2.1, subsidence is difficult to analyze and predict, especially in areas above or proximate to aquifers with recent or historical groundwater overdraft, due to land uses outside of oil and gas development, such as ongoing, recent, or historical agriculture or other municipal or industrial uses of groundwater. The principal aquifers of the Central Valley portion of the Planning Area are in general described as being in chronic groundwater overdraft (Faunt, 2009).

4.4.3 Lease Considerations

The analysis of water resource impacts within the Planning Area above is representative of impacts to water resources for the lease areas.

4.5 Cumulative Impacts

4.5.1 Cumulative Impacts Analysis Process

Cumulative impacts result from the interaction of impacts of the implemented alternative with impacts resulting independently from unrelated actions and activities. For this supplemental analysis, as in the 2019 FSEIS, cumulative impacts include actions related to developing fluid minerals using hydraulic fracturing within the Planning Area.

This DSEIS supplements the 2019 FSEIS which supplemented the 2012 FEIS. The 2019 FSEIS parallels the 2012 FEIS in format and organization for cumulative impacts and provides consistency between the two documents. In order to fully understand the cumulative impacts of actions associated with the 2014 RMP, each alternative must be addressed in its entirety (management common to all action alternatives and the alternative itself), rather than by individual program elements. To aid in understanding, the 2012 FEIS and the 2019 FSEIS grouped the program elements by the six planning issues addressed in the plan and described in the 2012 FEIS Chapter 1, Scoping and Planning Issues (Section 1.4.2, pages 7-9).

The cumulative effects analysis in the 2019 FSEIS followed the methods and assumptions used in the 2012 FEIS. This DSEIS follows those same methods and assumptions to find analysis that may need supplementation. The methods and assumptions used in the 2012 FEIS cumulative impact analysis are described in Section 4.13.1, pages 100-101, and Section 4.25, pages 595-597 of the 2012 FEIS. Cumulative impacts were considered in the context of:

- Baseline conditions described in Chapter 3 of the 2012 FEIS;
- Estimated incremental impacts on individual resources described in Chapter 4 of the 2012 FEIS; and
- The actions and decisions described in the RFDS; and
- Factors from Council on Environmental Quality (CEQ) guidance for considering cumulative impacts under NEPA (CEQ 1997), as follows:
    - Does the affected resource have substantial value relative to legal protection and/or ecological, cultural, economic, or social importance?
    - Are reasonable foreseeable future actions anticipated to have environmental impacts similar to the incremental impacts identified for RMP alternatives?
    - Have any recent or ongoing NEPA analyses of similar actions in the geographic area identified important adverse or beneficial cumulative impact issues?
    - Has the impact to the resource been historically important, such that the importance of the resource is defined by past loss, past gain, or investments to restore resources?

4.5.2 Cumulative Impacts to Resources

The focus of the 2019 FSEIS was on the effects of hydraulic fracturing in fluid minerals management and development. Because of the scope of the 2019 FSEIS, only one of the six

planning issues analyzed for cumulative effects in the 2012 FEIS was found to need supplemental analysis:

> ***Issue 3:*** *Ensure appropriate protection for Threatened and Endangered species, critical habitat, other biological resources, and cultural and paleontological resources in a multiple-use environment.*

The 2019 FSEIS concluded that surface disturbance from implementing the 2014 RMP would impact approximately 2 percent of the Planning Area which would be negligible compared to the other impacts expected to occur in the Planning Area. The alternatives included many management decisions designed to protect and preserve these resources on BLM surface, and some on federal mineral estate. The 2019 FSEIS concluded, however, that the cumulative benefits resulting from protective actions applied to this surface area may not be sufficient to prevent the significant loss (e.g., preclude species recovery of species or habitat, or the loss of eligible cultural resource) of these natural and cultural resources from all cumulative surface-disturbing activities, over time, throughout the Planning Area. This includes many special status species such as California condor and San Joaquin kit fox.

Previous cumulative analysis is still valid and does not need supplementation in this document, see Chapter 4, page 102 in the 2019 FSEIS.

Chapter 5. Public Outreach and Coordination

5.0 Introduction

This chapter describes the public outreach and participation opportunities made available throughout the development of this DSEIS, and describes the consultation and coordination efforts with Tribes, government agencies, and other stakeholders that have occurred to date. It also includes a list of the agencies, organizations, and individuals who have prepared this document.

5.1 Scoping

Scoping is the process used to determine the scope of issues to be addressed in a NEPA process. The focus of the scoping process for this DEIS was to identify new information related to environmental effects, methods of assessment, and mitigation measures that could be used to supplement the 2019 FSEIS. The scoping process provides an avenue to involve the public in identifying significant issues related to potential land use management actions. It also helps identify any issues that are not significant and can therefore be eliminated from detailed analysis. A 30-day scoping period was held from June 23, 2025 and closed on July 23, 2025. A press release posted to the BLM California website and shared on the social media platforms. The press release was emailed to a database of tribal members, stakeholders, and interested parties.

Additionally, BLM notified Congressional and State Legislature elected officials, and county representatives, upon initiation of this DSEIS process and upcoming public scoping period. No

scoping meeting were held, a scoping report is available at https://eplanning.blm.gov/eplanning-ui/project/2037500/510

5.2 Notice of Intent

The NOI for this DEIS was published in the Federal Register on June 23, 2025, which initiated a 30-day public scoping period which closed on July 23, 2025. The NOI is the legal document notifying the public of BLM's intent to initiate the planning process and, in this case, to prepare a DSEIS for a major federal action. The NOI is intended to invite the participation of the affected and interested agencies, organizations, and members of the public in determining the scope and significant issues to be addressed in the planning alternatives and analyzed in this DSEIS.

5.3 Public Outreach

The BLM Central California District distributed a press release that summarized the information contained in the NOI to all television, radio, newspaper, magazine, independent, and blog media outlets within the jurisdiction of the Bakersfield Field Office. The press release highlighted that the 30-day scoping period would begin on June 23, 2025, and close on July 23, 2025. The press release was also posted to the BLM California website and shared on the social media platforms. The press release was also emailed to a database of tribal members, stakeholders, and interested parties.

The project ePlanning website was published with postings of the Federal Register Notice, Planning Area map, and instructions for how to submit comments.

The link to the ePlanning website is: https://eplanning.blm.gov/eplanning-ui/project/2037500/510

BLM notified Congressional and State Legislature elected officials, and county representatives, upon initiation of this DSEIS process and upcoming public scoping period.

5.4 Consultation and Coordination

The following subsections document BLM's consultation and coordination efforts during the preparation of this DSEIS.

5.4.1 Cooperating Agencies

A cooperating agency is any federal, state, or local government agency or Native American Tribe that enters into a formal agreement with the lead federal agency to help develop an environmental analysis. Cooperating agencies support the lead agency by sharing knowledge and resources to help manage public lands and serve communities, while following laws and regulations. No cooperating agencies have been named for the 2025 DSEIS process.

5.4.2 National Historic Preservation Act Review

NHPA review, including consultation with Native American tribes and the State Historic Preservation Officer, was conducted for the 2012 FEIS. It was determined that those issues addressed in this DSEIS did not require additional Section 106 review.

5.4.3 Tribal Consultations

Native American Tribes have a unique legal and political relationship with the government of the United States. E.O. 13175 requires federal agencies to coordinate and consult on a government-to-government basis with sovereign Native American tribal governments whose interests may be directly and substantially affected by activities on BLM-managed lands. Other laws, regulations, DOI guidance, and Executive Orders require consultation to identify the cultural values, religious beliefs, traditional practices, and legal rights of Native American people that could be affected by BLM actions on federal lands. These include the NHPA of 1966 (as amended), the American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act, E.O. 13175 (2010), DOI Secretarial Order 3215 (DOI 2000), Secretarial Order 3317 with DOI Tribal Consultation Policy (2011), 512 Department Manual Chapter 2 (DOI 1995), BLM Handbook 1780-1 Improving and Sustaining BLM- Tribal Relations (BLM 2016), BLM Manual H-8160-1 (BLM 2005b), and E.O. 13007 Indian Sacred Sites.

Consultation with Native American Tribes is also part of the NEPA scoping process and a requirement of FLPMA.

The BLM sent notification letters on May 22, 2025 to the Native American Tribes to inform them of the NOI and scoping period. Native American Tribes contacted are listed in **Table 5-1**.

Table 5-1 *Native American Tribes contacted during preparation of this DSEIS.*

Organization	Contacts
Big Pine Paiute Tribe	Ms. Cheyenne Stone, Chairperson Ms. Danelle Gutierrez, THPO
Big Sandy Rancheria Band of Western Mono Indians	Ms. Elizabeth Kipp, Chair Mr. Tom Zizzo, Tribal Administrator Ms. Susan Carter, Environmental Director
Bishop Paiute Tribe	Mr. Steven Orihuela, Chairman Mr. Jeff Romero, Vice Chairman Mr. Mitchell David, Council Member Mr. Brian Poncho, Council Member Ms. Joyce White, Council Member Mr. Darren Delgado, THPO
Cold Springs Rancheria of Mono Indians	Mr. Curtis Lee, Tribal Chairperson Mr. Gavin Begaye, Vice Chairperson Ms. Brandy Lewis, Secretary Treasurer Mr. Jared Aldern, EPA Manager Mr. Raymond Gutteriez, Environmental Program Manager
Fort Independence Indian Reservation	Mr. Carl Dahlberg, Chairman Ms. Alisa Lee, Vice Chairman
Lone Pine Paiute-Shoshone Tribe	Mr. Thomas Swab, Chairman Ms. Mel O. Joseph, Environmental Director

Organization	Contacts
North Fork Rancheria of Mono Indians	Mr. Fred Beihn, Tribal Chairman Ms. Christina McDonald, Secretary Leora Beihn, THPO Lance Fink, EPD/Heritage Manager Mr. George Lopez, Cultural Resources
Picayune Rancheria of Chukchansi Indians	Tracey Hopkins, Chairwoman Ms. Heather Airey, Tribal Archaeologist
Santa Rosa Rancheria Tachi-Yokut Tribe	Mr. Leo Sisco, Chairperson Ms. Nichole Escalon, THPO Mr. William 'Kenny' Barrios, Cultural Liaison Ms. Cristina Gonzales, Cultural Registrar Ms. Samantha McCarty, Cultural Specialist II
Santa Ynez Band of Chumash Indians	Mr. Kenneth Kahn, Chairman Ms. Antonia Flores, Chairperson Tribal Elders Council Governing Board Ms. Karen Keever, Tribal Administrator Ms. Nakia Zavala, THPO Mr. Walter Viar, Legal Counsel Mr. Sam Cohen, Legal Counsel and Government Affairs Ms. Alison McAdams, Executive Assistant, Legal Department Ms. Amanda Dobrov, Consulting Archaeologist
Table Mountain Rancheria	Ms. Michelle Heredia-Cordova, Tribal Chairperson Mr. Samuel Elizondo, Environmental Officer Mr. Cliff Raley, Environmental Director Sara Lively, Cultural Resources Manager Mr. Bob Pennell, Cultural Resources Ms. Rosalyn Jamili, Legal Counsel Ms. Brenda D. Lavell Ms. Michelle Carr
Tejon Indian Tribe	Mr. Octavio Escobedo, Chairperson Curtis Alcantar, Cultural & Natural Resources Manager Ms. Candice Garza, Cultural Program
Tule River Tribe	Mr. Shine Nieto, Chairperson Mr. Kenneth McDarment, Tribal Council Ms. Kerri Vera, Environmental Director Mr. Felix Christman, THPO

5.4.4 Endangered Species Act Consultations

The ESA requires federal agencies to complete consultation with the USFWS for any action that "may affect" federally listed species or designated critical habitat. The ESA also requires federal agencies to use their authorities to carry out programs for the conservation of endangered and threatened species. The BLM completed formal consultation with the USFWS for the 2014 RMP and, on October 23, 2014, the USFWS issued a no jeopardy Biological Opinion (08ESMF00-2012-F-0682). Oil and gas development on BLM lands was further analyzed in the 2017 PBO. Both consultations concluded that the effects of the proposed action(s) are not likely to jeopardize the continued existence of any species listed as threatened or endangered under the ESA. The results of supplemental analysis calculating the impacts of limited hydraulic fracturing in the 2019 FSEIS and this DSEIS, additive to those identified in the 2012 FEIS, did not show a notable increase in

total impacts to listed species in the Planning Area. Therefore, additional consultation has been determined to be unnecessary, and this DSEIS documents that decision.

At the leasing phase, there would be no direct impact on the environment because, by itself, a lease does not authorize any on the ground oil and gas activities; however, a lease does grant the lessee certain rights to drill for and extract oil and gas subject to further environmental review and reasonable regulation, including applicable laws, terms, conditions, and stipulations of the lease. At the APD stage, the BLM would complete site-specific ESA review. If the BLM determines the proposal "may affect" listed species, a secondary consultation would be completed before approving the development proposal. Secondary consultation may take the form of coverage under an existing valid programmatic biological opinion, such as the 2017 PBO, if the parameters for use of the opinion are met by the development proposal. For any newly listed or future listed species, consultation would be conducted on a case-by-case basis at the APD stage, if needed. As such, BLM has determined that no further analysis is needed at this time.

5.5 List of Preparers

Name	BLM Title and Office Location
John Hodge	Acting Field Manager, Bakersfield Field Office
Jennifer Nastor	Assistant Field Manager (Resources), Bakersfield Field Office
Brian Ludt	Acting Assistant Field Manager (Resources)/ Supervisory Outdoor Recreation Planner, Bakersfield Field Office
Sarah Mathews	Project Manager, Central California District Office
Rebecca Daniels	Planning and Environmental Coordinator, Bakersfield Field Office
Simona Platukyte	Planning and Environmental Coordinator, California State Office
Sky Murphy	Planning and Environmental Coordinator, Central Coast Field Office
Clara J. Chase	Supervisory Wildlife Biologist, Bakersfield Field Office
Matthew Thomas	Supervisory Natural Resources Specialist, Bakersfield Field Office
Zachary Day	Archeologist, Bakersfield Field Office
Nicole Montoya	Natural Resource Specialist (Range/Wildlife Biology), Bakersfield Field Office
Teungku Muchlis Krueng	Petroleum Engineer, Bakersfield Field Office
Romina Copado	Geographic Information Systems (GIS) Specialist, Bakersfield Field Office
Zachary Miller	Social Scientist, Branch of Technical Operations
Frank Giles	Physical Scientist – Air Resources, California State Office
David O'Connor	Hydrologist – Water Resources, California State Office
Robert Sovil	Petroleum Engineer – Minerals, California State Office
Forrest Mayer	Natural Resources Specialist, California State Office
Romina Copado	Geographic Information Systems (GIS) Specialist, Bakersfield Field Office

Chapter 6. References

Bureau of Land Management (BLM). 2007. *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* ("Gold Book"), 4th Edition. U.S. Department of the Interior, Bureau of Land Management and U.S. Forest Service. Denver, CO.

Bureau of Land Management (BLM). 2022. *Best Management Practices for Water Quality*. Attachment to CA IM-2022-012, "Implementing Clean Water Act Non-Point Source Provisions in California." Sacramento, CA: BLM, September 2022

California Air Resources Board (CARB). 2024. *Oil and Gas Methane Regulation: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities*. Title 17, CCR, Sections 95665-95677. Available at: http://oal.ca.gov/publications/ccr/

California Air Resources Board (CARB). 2025. *Ambient Air Quality Standards Designation Tool*. Available at: https://ww2.arb.ca.gov/capp/cst/tch/ ambient-air-quality-standards-designation-tool (Accessed September 2025).

California Code of Regulations (CCR) Title 17, §§ 95665-95677. State of California, 2020.

California Council on Science and Technology (CCST). 2014. *Advanced Well Stimulation Technologies in California*. http://ccst.us/publications/2014/2014wstES.pdf.

California Council on Science and Technology (CCST). 2015. *An Independent Scientific Assessment of Well Stimulation in California: Volume II Potential Environmental Impacts of Hydraulic Fracturing and Acid Stimulations.*

California Council on Science and Technology (CCST). 2016. *Advanced Well Stimulation Technologies in California*. Updated Version. https://ccst.us/projects/hydraulic_fracturing _public/BLM.php.

California Department of Public Health (CDPH). 2013. *Preventing work-related coccidioidomycosis (Valley Fever)*. https://www.cdph.ca.gov/Programs/CCDPHP/ DEODC/OHB/HESIS/CDPH%20Document%20Library/CocciFact.pdf

California Department of Public Health (CDPH). 2025. *Valley fever (coccidioidomycosis)*. Available at: https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioido mycosis.aspx

California Department of Water Resources (DWR). 2015. *SGMA 2015 Basin Prioritization Process and Results*. Sacramento, CA.

California Department of Water Resources (DWR). 2022. *SGMA Basin Prioritization and Critically Overdrafted Basins Update*. Sacramento, CA.

California Department of Water Resources (DWR). 2023. *Hydrologic Conditions and Flood/Drought Summaries for the Central Valley*. Sacramento, CA.

California Department of Water Resources (DWR). 2025. *California Central Valley Groundwater – Surface Water Simulation Model – Fine Grid (C2VSimFG), Version 1.5.* Sacramento, CA: DWR, 2025. (Official dataset page with model files & docs; released June 6, 2025).

California Department of Water Resources (DWR), UCLA Luskin Center for Innovation, and Stantec. 2024. *Probabilistic Subsidence Forecast Model for the California Aqueduct*

Subsidence Program, San Joaquin Valley, California: Revision 1 Design Report. Sacramento, CA: California Department of Water Resources, October 10.

California Geologic Energy Management Division (CalGEM). 2022a. *California Geologic Energy Management Division Groundwater Monitoring Program: Surface Water–Groundwater Interaction Overview*.

California Geologic Energy Management Division (CalGEM). 2022b. *Groundwater Protection Model Criteria for Oil and Gas Production*. California Department of Conservation.

California Geologic Energy Management Division (CalGEM). 2024. *Public Health Dimensions of Upstream Oil and Gas Development: Final Report of the Public Health Panel.* Sacramento, CA: California Department of Conservation, June 21, 2024.

California Geologic Energy Management Division (CalGEM). 2025a. *Geologic Energy Management Laws and Rulemaking*. Available at: https://conservation.ca.gov/calgem/laws-regulations Accessed September 2025.

California Geologic Energy Management Division (CalGEM). 2025b. *Oil and Gas*. Available at: https://www.conservation.ca.gov/calgem/Pages/Oil-and-Gas.aspx Accessed September 2025.

California Geologic Energy Management Division (CalGEM). 2025c. *Well Finder*. Available at: https://www.conservation.ca.gov/calgem/Pages/WellFinder.aspx. Accessed September 2025.

California Public Resources Code (CA PRC) § 3300. State of California, 2020.

California Public Resources Code (CA PRC) § 3500. State of California, 2020.

California Water Code §10721(x). Definitions of undesirable results under the Sustainable Groundwater Management Act.

California Water Code §10727.8. Authority of the Division of Oil, Gas, and Geothermal Resources.

Centers for Disease Control and Prevention (CDC). 2013. *Increase in Reported Coccidioidomycosis — United States, 1998–2011*. MMWR Morb Mortal Wkly Rep 2013; 62(12);217-221. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6212a1.htm

Centers for Disease Control and Prevention (CDC). 2020.*Valley Fever (Coccidioidomycosis) Awareness — California, 2016–2017*. MMWR Morb Mortal Wkly Rep 2020; 69:1512–1516. DOI: http://dx.doi.org/10.15585/mmwr.mm6942a2

Centers for Disease Control and Prevention (CDC). 2024. *About Valley Fever.* Available at: https://www.cdc.gov/valley-fever/about/index.html

Faunt, Claudia C., ed. 2009. *Groundwater Availability of the Central Valley Aquifer, California.* U.S. Geological Survey Professional Paper 1766. Reston, VA: U.S. Geological Survey

Faunt, Claudia C., Michelle Sneed, Jon Traum, and Justin T. Brandt. 2016. *Water Availability and Land Subsidence in the Central Valley, California, USA*. Hydrogeology Journal 24: 675–684.

Fielding, Eric J., Ronald G. Blom, and Richard M. Goldstein. 1998. *Rapid Subsidence over Oil Fields Measured by SAR Interferometry*. Geophysical Research Letters 25 (17): 3215–3218.

Fisher, Frederick S., Bultman, Mark W., and Pappagianis, Demosthenes. 2000. Operational Guidelines (version 1.0) for Geological Fieldwork in Areas Endemic for Coccidioidomycosis (Valley Fever): U.S. Geological Survey Open-File Report 00-348, 16 pp., https://pubs.usgs.gov/of/2000/0348/.

Galloway, Devin L., David R. Jones, and S. E. Ingebritsen, eds. 1999. *Land Subsidence in the United States*. U.S. Geological Survey Circular 1182. Reston, VA: U.S. Geological Survey.

Hwang, B. 2023. *Environmental Implications of Shale Gas Hydraulic Fracturing*. *Water* 15, no. 19 (2023): 3334. https://doi.org/10.3390/w15193334.

Ireland, R. L., J. F. Poland, and F. S. Riley. 1984. Land *Subsidence in the San Joaquin Valley, California, as of 1980*. U.S. Geological Survey Professional Paper 437-I. Washington, DC: U.S. Government Printing Office.

Jeanne, Pierre, Tom G. Farr, Jonny Rutqvist, and Donald W. Vasco. 2019. *Role of Agricultural Activity on Land Subsidence in the San Joaquin Valley, California*. Journal of Hydrology 569: 462–469.

Kern Groundwater Authority (KGA). 2020. *Kern County Subbasin Groundwater Sustainability Plan – Water Year 2019 Annual Report*. Bakersfield, CA: Kern Groundwater Authority, April 2020.

Kern Groundwater Authority (KGA). 2022. *Kern County Subbasin Groundwater Sustainability Plan – Water Year 2021 Annual Report*. Bakersfield, CA: Kern Groundwater Authority, March 2022.

Konikow, Leonard F. 2013. *Groundwater Depletion in the United States (1900–2008)*. U.S. Geological Survey Scientific Investigations Report 2013–5079. Reston, VA: U.S. Geological Survey.

Lees, Matthew, and Rosemary Knight. 2024. *Quantification of Record-Breaking Subsidence in California's San Joaquin Valley*. Communications Earth & Environment 5: 677.

Lofgren, B. E., and R. L. Klausing. 1969. *Land Subsidence due to Ground-Water Withdrawal, Tulare–Wasco Area, California*. U.S. Geological Survey Professional Paper 437-B. Washington, DC: U.S. Government Printing Office.

Makki, S. *Review of the Environmental and Health Risks of Hydraulic Fracturing Fluid Impacts on Drinking Water Sources*. *Heliyon* 11, no. 2 (2025): e34913. https://doi.org/10.1016/j.heliyon.2025.e34913.

Marra, K. R., et al. 2021. *Assessment of undiscovered continuous oil resources in the Bakken and Three Forks Formations of the Williston Basin Province, North Dakota and Montana, 2021.* Fact Sheet 2021–3058. U.S. Geological Survey. https://doi.org/10.3133/fs20213058

Murray, Kyle D., and Rowena B. Lohman. 2018. *Short-Lived Pause in Central California Subsidence after Heavy Winter Precipitation of 2017*. Science Advances 4 (8): eaar8144.

National Energy Technology Laboratory (NETL). 2008. *Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels. National Energy Technology Laboratory*. November 26.

National Energy Technology Laboratory (NETL). 2019. *Life Cycle Analysis of Natural Gas Extraction and Power Generation*. April 19.

Ojha, Chandrakanta, Susanna Werth, and Manoochehr Shirzaei. 2019. *Groundwater Loss and Aquifer System Compaction in the San Joaquin Valley during the 2012–2015 Drought*. Journal of Geophysical Research: Solid Earth 124 (3): 3127–3143.

Poland, Joseph F., B. E. Lofgren, R. L. Ireland, and R. G. Pugh. 1975. *Land Subsidence in the San Joaquin Valley, California, as of 1972*. U.S. Geological Survey Professional Paper 437-H. Washington, DC: U.S. Government Printing Office.

Rivera, A., S. Movalia, H. Pitt, and K. Larsen. 2022. *Global Greenhouse Gas Emissions: 1990-2020 and Preliminary 2021 Estimates*. Research Note. Rhodium Group, New York, NY.

San Joaquin Valley Air Pollution Control District (SJVAPCD). *Rule 4311: Flares*.

Scanlon, Bridget R., Claudia C. Faunt, Laurent Longuevergne, Robert C. Reedy, William M. Alley, Virginia L. McGuire, and Peter B. McMahon. 2012. *Groundwater Depletion and Sustainability of Irrigation in the U.S. High Plains and Central Valley*. Proceedings of the National Academy of Sciences 109 (24): 9320–9325.

Sneed, Michelle, Justin T. Brandt, and Michael Solt. 2018. *Land Subsidence along the California Aqueduct in West-Central San Joaquin Valley, California, 2003–10*. U.S. Geological Survey Scientific Investigations Report 2018–5144. Reston, VA: U.S. Geological Survey.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture (NRCS). 2016. *Web Soil Survey*. Available at: https://websoilsurvey.nrcs.usda.gov/ (Accessed September 2025)

State Water Resources Control Board (SWRCB). 2015. *Emergency Drought Curtailment Notices and Orders for Central Valley Watersheds*. Sacramento, CA.

State Water Resources Control Board (SWRCB). 2021. *Updated Drought Emergency Curtailment Orders*. Sacramento, CA.

State Water Resources Control Board (SWRCB). 2022. *2022 California 303(d)/305(b) Integrated Report: List of Impaired Water Bodies*. Sacramento, CA.

State Water Resources Control Board (SWRCB). 2024. *California Integrated Report Program: 303(d) Listing and 305(b) Reporting*. Sacramento, CA.

State Water Resources Control Board (SWRCB). 2025a. *Oil and Gas Programs*. Available at: https://www.waterboards.ca.gov/oil-gas/ (Accessed September 2025.)

State Water Resources Control Board (SWRCB). 2025b. *Waste Discharge Requirements Program under the Porter-Cologne Water Quality Control Act*. California State Water Resources Control Board. Available at: https://www.waterboards.ca.gov/water_issues/ programs /waste_discharge_requirements. (Accessed September 2025).

Tong, L., Liu, D. *A review of environmental issues caused by hydraulic fracturing of shale gas*. *Discov Appl Sci* **7**, 588 (2025). https://doi.org/10.1007/s42452-025-07122-x

U.S. Energy Information Administration (EIA). 2015. *Assumptions to the Annual Energy Outlook 2015* (DOE/EIA-0554(2015)). U.S. Department of Energy. https://www.eia.gov/outlooks/aeo/assumptions/pdf/0554(2015).pdf

U.S. Energy Information Administration (EIA). 2016. *Hydraulic fracturing accounts for about half of current U.S. crude oil production*. Today in Energy. https://www.eia.gov/today inenergy/detail.php?id=25372

U.S. Energy Information Administration (EIA). 2023. *Advances in technology led to record new well productivity in the Permian Basin in 2021*. Today in Energy. https://www.eia.gov/todayinenergy/ detail.php?id=54079.

U.S. Environmental Protection Agency (USEPA). 2015. *Clean Water Rule: Definition of "Waters of the United States"*. 80 FR 37054. Washington, DC.

U.S. Environmental Protection Agency (USEPA). 2016. *Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources* (Final Report). The composition of a typical water-based hydraulic fracturing fluid by volume is 90 % to 97 % water, 2 % to 10 % proppant, and 2 % or less additives

U.S. Environmental Protection Agency (USEPA). 2020. *Navigable Waters Protection Rule: Definition of "Waters of the United States"*. 85 FR 22250. Washington, DC.

U.S. Environmental Protection Agency (USEPA). 2023a. *National Emissions Inventory (NEI) Online 2020 NEI Data Retrieval Tool*. https://www.epa.gov/air-emissions-inventories/2020-air-emissions-data

U.S. Environmental Protection Agency (USEPA). 2023b. *Revised Definition of "Waters of the United States"*. 88 FR 3004. Washington, DC.

U.S. Environmental Protection Agency (USEPA). 2024a. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022*. U.S. Environmental Protection Agency, EPA 430-R-24-004. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022.

U.S. Environmental Protection Agency (USEPA). 2024b. *The Hydraulic Fracturing Water Cycle.* Updated October 21, 2024. U.S. Environmental Protection Agency. https://www.epa.gov /hfstudy/hydraulic-fracturing-water-cycle.

U.S. Environmental Protection Agency (USEPA). 2025a. *AirData website file download page*. USEPA. https://aqs.epa.gov/aqsweb/airdata/download_files.html#Annual (Accessed September 2025).

U.S. Environmental Protection Agency (USEPA). 2025b. *California Nonattainment/ Maintenance Status for Each County by Year for All Criteria Pollutants*. Available at: https://www3.epa.gov/airquality/greenbook/anayo_ca.html (Accessed September 2025).

U.S. Environmental Protection Agency (USEPA). 2025c. *Final Report on Hydraulic Fracturing and Drinking Water Resources: Data Gaps and Uncertainty Assessment*. USEPA 600/R-25/012, Office of Research and Development, Washington, DC.

U.S. Environmental Protection Agency. (2025d). *Greenhouse Gas Inventory Data Explorer*. U.S. EPA. Available at: https://cfpub.epa.gov/ghgdata/inventoryexplorer/#allsectors/ allsectors/allgas/econsect/all (Accessed September 2025).

U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE). 2025. *Memorandum: Conforming the Amended 2023 "Waters of the United States" Definition to the Supreme Court's Sackett Decision*. Issued March 12, 2025. Washington, DC. Available at: https://www.epa.gov/system/files/documents/2025-03/2025cscguidance.pdf and https://www.usace.army.mil/media/announcements/article /4117958 (accessed May 2025).

U.S. Geological Survey (USGS). 2009. *California's Central Valley Groundwater Study: A Powerful New Tool to Assess Water Resources in California's Central Valley*. Fact Sheet 2009–3057. Reston, VA: U.S. Geological Survey.

U.S. Geological Survey (USGS). 2018. *California Water Use, 2015: Estimated Use of Water in Kern County*. Reston, VA: U.S. Geological Survey, 2018.

U.S. Geological Survey (USGS). 2022. *Land Subsidence in the San Joaquin Valley and Tulare Basin: Updated Findings*. Reston, VA.

U.S. Geological Survey (USGS). 2025. *Coastal and Inland Groundwater Sustainability Indicators Report*. U.S. Geological Survey, Reston, VA.

U.S. Geological Survey (USGS) and California Department of Water Resources (DWR). 2025. *Lost Hills Oil Field and San Joaquin Valley Subsidence Study: Task 11 Scope and Monitoring Plan*. Sacramento, CA and Reston, VA.

U.S. Department of the Interior (DOI). 2025. *DOI NEPA Handbook*. Available at: https://www.doi.gov/media/document/doi-nepa-handbook (Accessed September 2025).

Xu, Haibin, Jack Dvorkin, and Amos Nur. 2001. *Linking Oil Production to Surface Subsidence from Satellite Radar Interferometry*. Geophysical Research Letters 28 (7): 1307–1310.